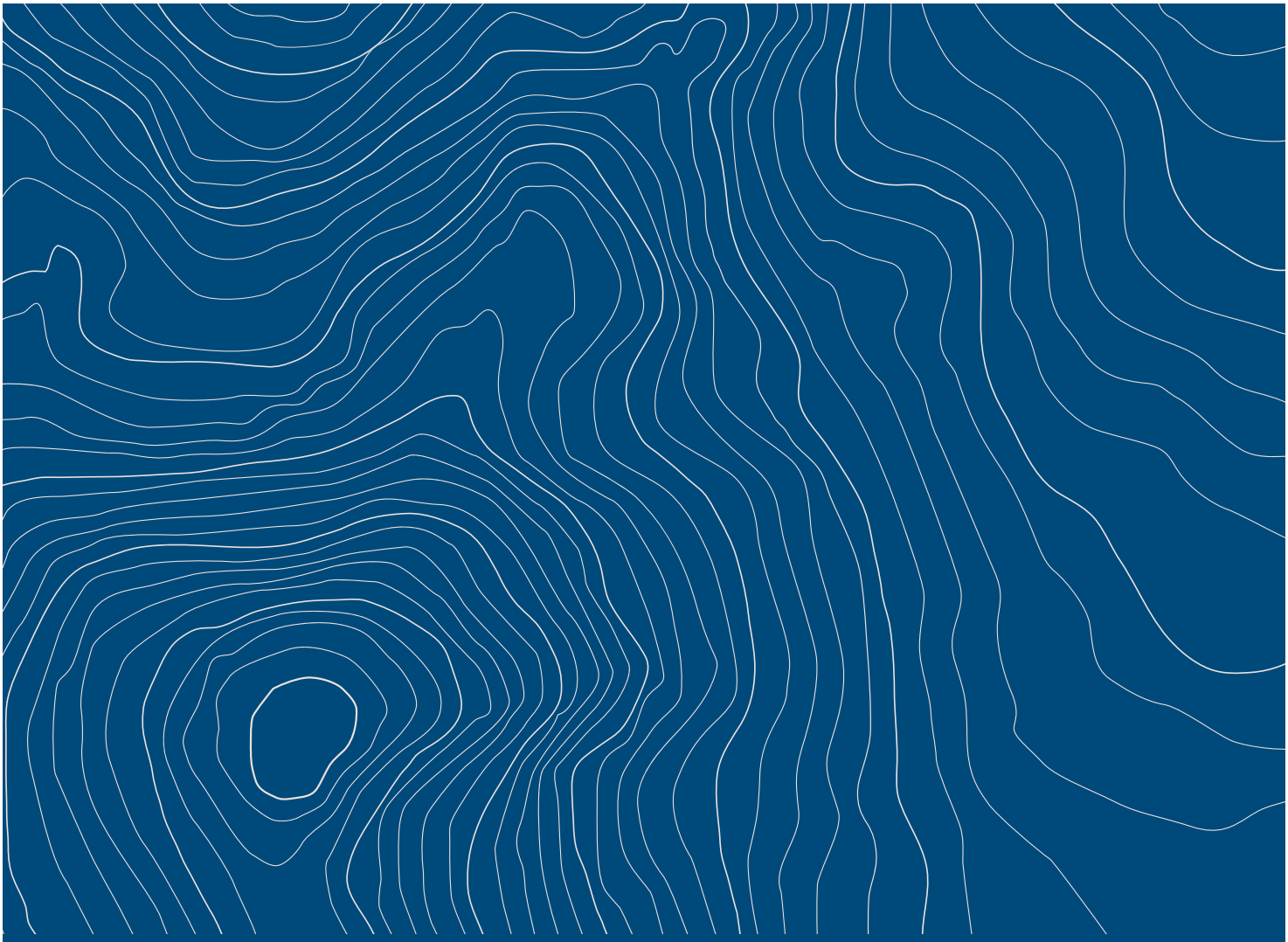

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EIAR Volume 4: Offshore Infrastructure Technical Appendices Appendix 4.3.4-2 A Fisheries survey of the Kish and Bray Banks

Kish Offshore Wind Ltd

RWE SLR GoBe APEM Group

www.dublinarray-marineplanning.ie

A Fisheries survey of the Kish and Bray Banks

Produced by

AQUAFACT International Services Ltd

On behalf of

Innogy

July 2019

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AQUAFACT

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1. Introduction

Innogy proposes to develop an off-shore wind energy farm at a site on the Kish and Bray banks in the Irish Sea off the coast of County Dublin and Wicklow and has therefore applied for a license to develop the site. The Dublin Array project is currently in the development stage and no consents have been granted, although two applications for Foreshore Leases (FS006462 and FS006463) have been made. The Foreshore Lease Applications were submitted in 2006 by Kish Offshore Wind Ltd and Bray Offshore Wind Ltd for relating to two adjacent areas of the seabed on the Kish and Bray Banks respectively. These applications included an EIS covering the offshore development as it was then proposed and were subsequently updated in 2009 and 2012/13.

Figure 1-1 Image showing the crew of the Eblana releasing Tow 1 from the Cod end of the Net into partitions for sorting 08/07/2019.

In response to the licence application, a commercial fisheries survey has been requested by the Sea Fisheries Protection Authority (SFPA) to provide a further understanding of the function of the banks in relation to the

local fisheries resource, as the Dublin Array study area is somewhat deficient in real-time data regarding fish species. This commercial fisheries survey was commissioned in response to that request as part of a wider refresh of the environmental baseline and proposed update to the EIAR for the project. On the 12th of September 2018 a meeting was held with Declan McGabhann of the SFPA, in Blanchardstown Corporate Business Park, Dublin. The objective of the survey was agreed as being to provide further data regarding species diversity and particular abundance of juveniles on the banks. It was noted that sufficient shellfish data for the area is available and that shellfish surveys were not required. A minimum of four trawls should be undertaken in addition to trawls within control areas, one to the east and one to the west of the banks. The restrictions regarding water depth and the presence of other gear were acknowledged and it was agreed that the final location of tows would be developed in discussion with the vessel skipper. Aquafact was granted a derogation from the SFPA allowing the vessel Eblana (D-379) to conduct the required survey work in the ICES VIIa-35E3 & 35E4 area. The aim of the current survey is to characterise the fisheries resource present at the Kish and Bray site that is being proposed for offshore windfarm development.

2. Survey Methodology

Initial correspondence was made with Declan McGabhann of the SFPA to develop the survey methodology and ensure that sufficient data was obtained relating to the area. The vessel chosen to conduct the survey was the EBLANA, a suitably sized 22-meter fishing vessel capable of carrying out the survey work with all required onboard facilities for the processing and storage of the landed catch. The EBLANA's skipper and crew are highly experienced having regularly fished this area and are extremely familiar with the grounds, the depths and any navigational hazards in the area. The skipper, John Lynch, has fished these waters for over 30 years.

During the survey the Eblana used an otter trawl, which functions by using two large steel trawl doors that spread the net while it is being towed over the seafloor, the catch is gathered towards the rear of the net in the cod end before being hauled on-board. Two specifications of otter trawl net were used during the survey: Type 1, net used was 320 mesh, 160mm with a height of 6 meters and the width between the doors was ~25 meters, Type 2, net used was 450 mesh, 150mm with a height of 20 meters and a distance between trawl doors of 45-50 meters. As recommended by SFPA, this fishing method is designed to target demersal species, which would characterize the area and does not provide a representation of pelagic species that would be more widely distributed. A pre-survey meeting was conducted with the skipper of the Eblana where the locations of the tows were discussed and mapped out. It was decided to conduct 4 tows on the east and 4 tows on the west of the banks in a north/ south orientation to cover a representative area of the

license application site bearing in mind safe working depths and seabed structures. A further 2 tows were conducted outside the proposed area for comparison with the application site. The timing of the survey in the month of July was agreed with Declan McGabhann of the SFPA and considered suitable to assess the fisheries resource for the area. The locations of each Tow are presented in Figure 2.1.

During each of the tows the vessel trawled at an average speed of 4 knots for an average duration of two hours with depths varying between the start and end of the trawl. All catch was landed on the deck and sorted into species by members of the crew. Boxes were passed to scientific personnel who analyzed the catch recording: species, weight, length and when possible the sex of individuals. During instances where a large amount of a species was caught a maximum and minimum length were recorded. It was common for species caught during a single trawl to be of similar length and weight, when this occurred an average length and weight was recorded. Figure 2.1 indicates the location of these tows in reference to the proposed area.

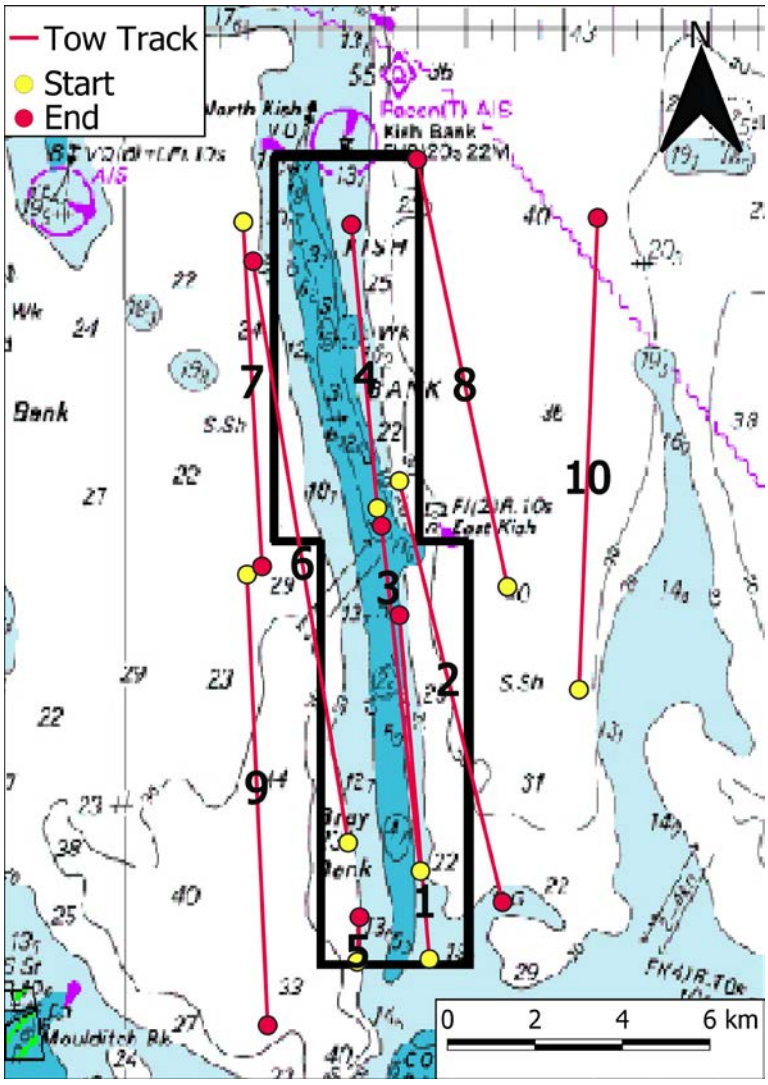

Figure 2-1. Indicates where trawl gear was towed relative to the Kish and Bray Bank. Black lines indicate the approximate position of the proposed wind farm.

Interviews were also conducted with the skipper of the Eblana while on-board and with Declan McGabhann in the SFPA offices after the survey. The results of these interviews are presented in Appendices 2.

Figure 2-2. A specimen of Tope (*Galeorhinus galeus*) being measured, sexed and weighed by scientific personnel.

3. Results

Complete results for each of the tows conducted from 08th-10th July 2019 are presented in Appendix 1.

Tow 1

Tow 1 was carried out just to the east of the bank, gear was shot at 08:30 and hauled at 10:35 with the tow lasting 2 hours and 5 minutes. Depths ranged from 18.28 to 27.43 meters with an average of 22.85 meters. A large amount of jellyfish was present in the net and this would become common across most of the ground. These jellyfish were generally Lion's Mane (*Cyanea capillata*), Compass (*Chrysaora hysoscella*) or the moon jellyfish (*Aurelia aurita*). The number of fish per Km² was calculated, the results of which are displayed in Table 3.1

Table 3-1 Fish/ km² of fish species caught during Tow 1

Species	Fish/ km²
Scad (*Trachurus trachurus*)	204
Tope (*Galeorhinus galeus*)	5
Dab (*Limanda limanda*)	142
Grey Gurnard (*Eutrigla gurnardus*)	153
Plaice (*Pleuronectes platessa*)	56
Mackerel (*Scomber scombrus*)	25
Thornback ray (*Raja clavata*)	5
Spotted ray (*Raja montagui*)	31
John Dory (*Zeus faber*)	31
Haddock (*Melanogrammus aeglefinus*)	204
Whiting (*Merlangius merlangus*)	15
Lesser spotted dogfish (*Scyliorhinus canicula*)	204
Bull Huss (*Scyliorhinus stellaris*)	5
Cod (*Gadus morhua*)	5
Sprat (*Sprattus sprattus*)	5
Long finned squid (*Loligo forbesii*)	5

The number of species caught during Tow 1 can be seen in Figure 3.1. The three most common species caught during Tow 1 were; Scad (*Trachurus trachurus*), Haddock (*Melanogrammus aeglefinus*) and lesser spotted dogfish (*Scyliorhinus canicula*). Scad was recorded as juveniles with an average length of 10cm. Haddock was recorded as juveniles with an average length of 24cm. Both male and female lesser spotted dogfish were recorded at an average length of 55cm. overall the composition of the catch was relatively diverse with a mixture of species present.

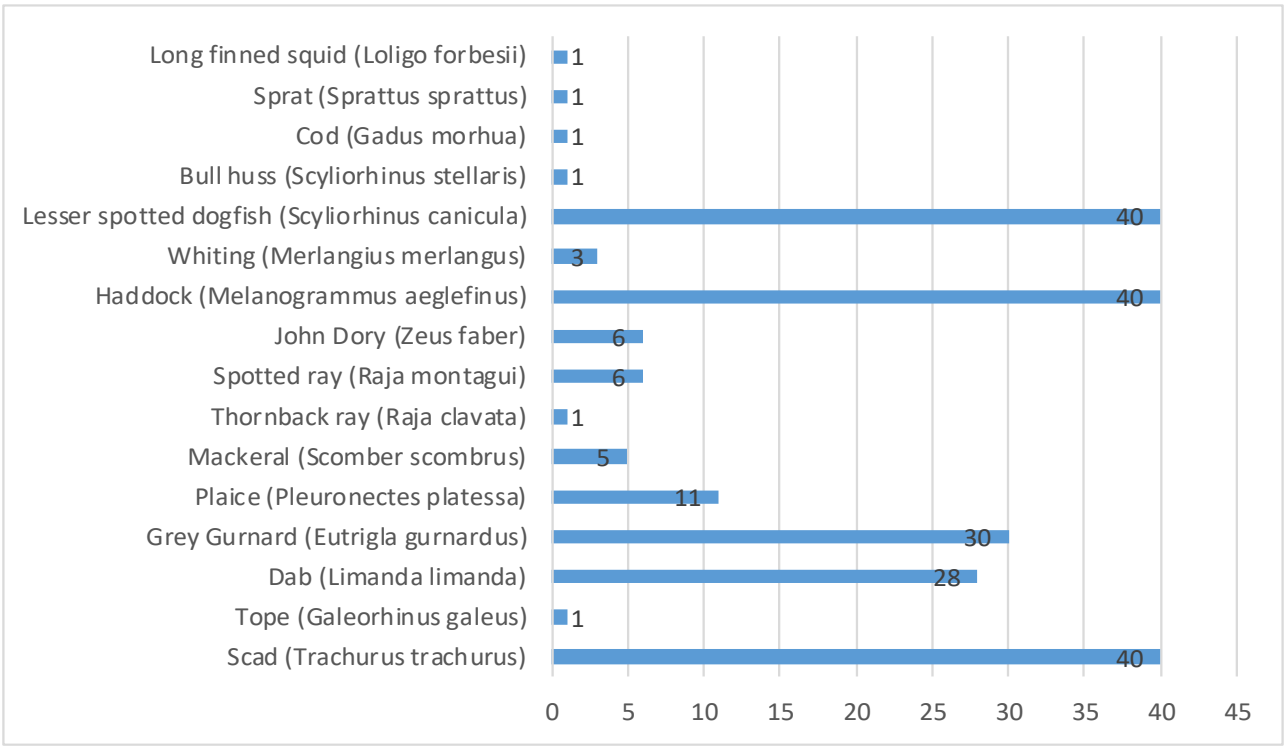

Figure 3-1. Chart showing the numbers of species caught during Tow 1.

Tow 2

Tow 2 was carried out further east of the bank, gear was shot at 11:00 and hauled at 13:30 with the tow lasting 2 hours and 30 minutes. Depths ranged from 21.94 to 29.26 meters with an average of 25.60 meters. As on the previous tow, a large amount of jellyfish was present in the net. The number of fish per km² was calculated, the results of which can be found in Table 3.2.

Table 3-2 Fish/ km² of fish species caught during Tow 2

Species	Fish/km²
Scad (*Trachurus trachurus*)	81
Starry Smooth-hound (*Mustelus asterias*)	12
Tope (*Galeorhinus galeus*)	4
Dab (*Limanda limanda*)	4
Tub Gurnard (*Chelidonichthys lucerna*)	16
Grey Gurnard (*Eutrigla gurnardus*)	32
Plaice (*Pleuronectes platessa*)	24
Mackerel (*Scomber scombrus*)	20
Blonde ray (*Raja brachyura*)	4
Spotted ray (Raja montagui)	24
John Dory (*Zeus faber*)	4
Haddock (*Melanogrammus aeglefinus*)	890
Whiting (*Merlangius merlangus*)	12
Lesser spotted dogfish (*Scyliorhinus canicula*)	141
Bull Huss (*Scyliorhinus stellaris*)	4
Poor Cod (*Trisopterus minutus*)	4
Long finned squid (*Loligo forbesii*)	12

The number of species caught during Tow 2 can be seen in Figure 3.2. Haddock (*Melanogrammus aeglefinus*) was by far the most abundant species caught during Tow 2 (Figure 3.2). Specimens of haddock ranged between 32 and 36cm in length. The second most common species was the lesser spotted dogfish *Scyliorhinus canicula.* There was a diversity of elasmobranchs present in catch with 6 separate species recorded (Figure 3.2).

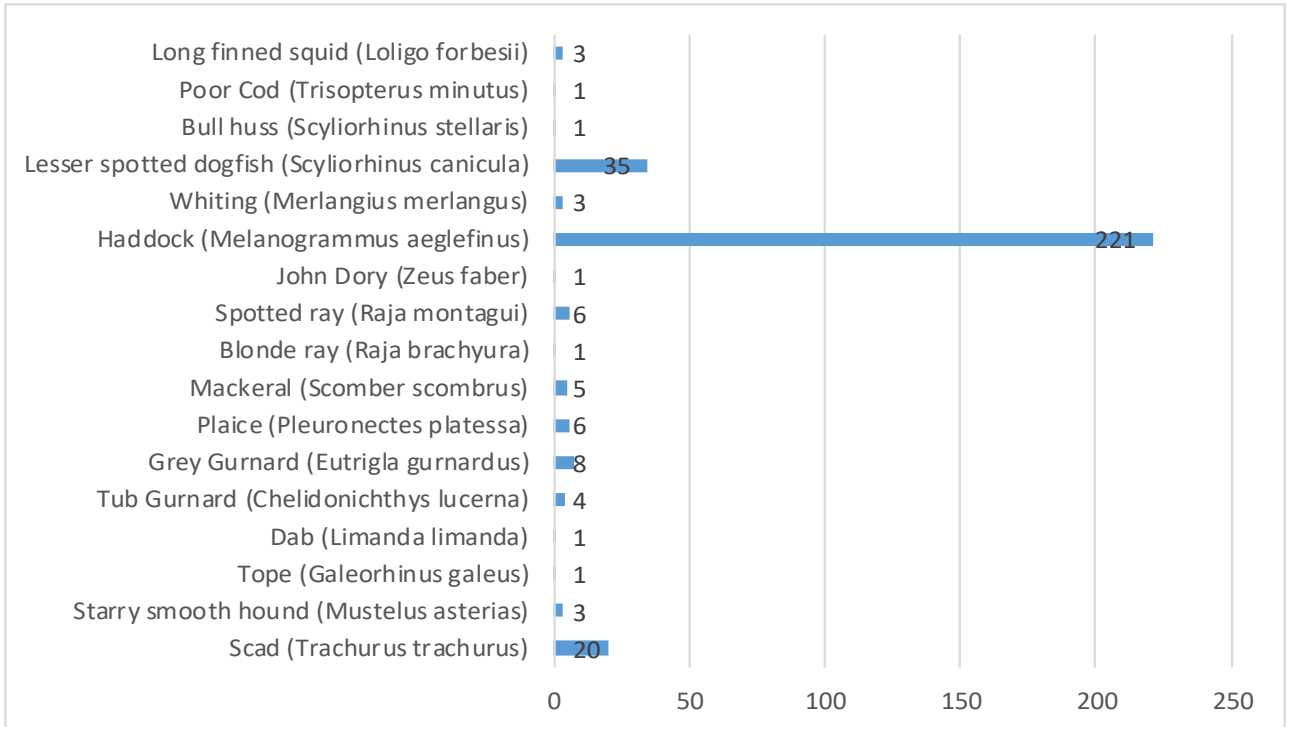

Figure 3-2 Chart showing the numbers of species caught during Tow 2.

Tow 3

Tow 3 was carried out as close to the Bray bank as possible, gear was shot at 14:00 and hauled at 16:15 with the tow lasting 2 hours and 15 minutes. Depths ranged from 9.14 to 23.77 meters with an average of 16.45 meters. Fewer jellyfish were present in the net and species were composed of either Lion's mane (*Cyanea capillata*) or the moon jellyfish (*Aurelia aurita*). The number of fish per km² was calculated, the results of which can be found in Table 3.3.

Table 3-3 Fish/ km² of fish species caught during Tow 3

Species	Fish/km²
Scad (*Trachurus trachurus*)	96
Starry Smooth-hound (*Mustelus asterias*)	10
Dab (*Limanda limanda*)	5
Tub Gurnard (*Chelidonichthys lucerna*)	5
Grey Gurnard (*Eutrigla gurnardus*)	15
Lemon sole (*Microstomus kitt*)	10
Plaice (*Pleuronectes platessa*)	5
Mackerel (*Scomber scombrus*)	15
Blonde ray (*Raja brachyura*)	10
John Dory (*Zeus faber*)	5
Haddock (*Melanogrammus aeglefinus*)	378
Lesser spotted dogfish (*Scyliorhinus canicula*)	192
Bull Huss (*Scyliorhinus stellaris*)	5
Long finned squid (*Loligo forbesii*)	5
Lobster (*Homarus gammarus*)	5

The number of species caught during Tow 3 can be seen in Figure 3.3. Haddock (*M. aeglefinus*) was the most common species recorded in the catch during Tow 3, with an average length of 21.5cm. The second most common species was the lesser spotted dogfish (*S. canicula*) with an average length of 64cm considerably larger than the previous two tows. There was a diverse range of species present with some juveniles present.

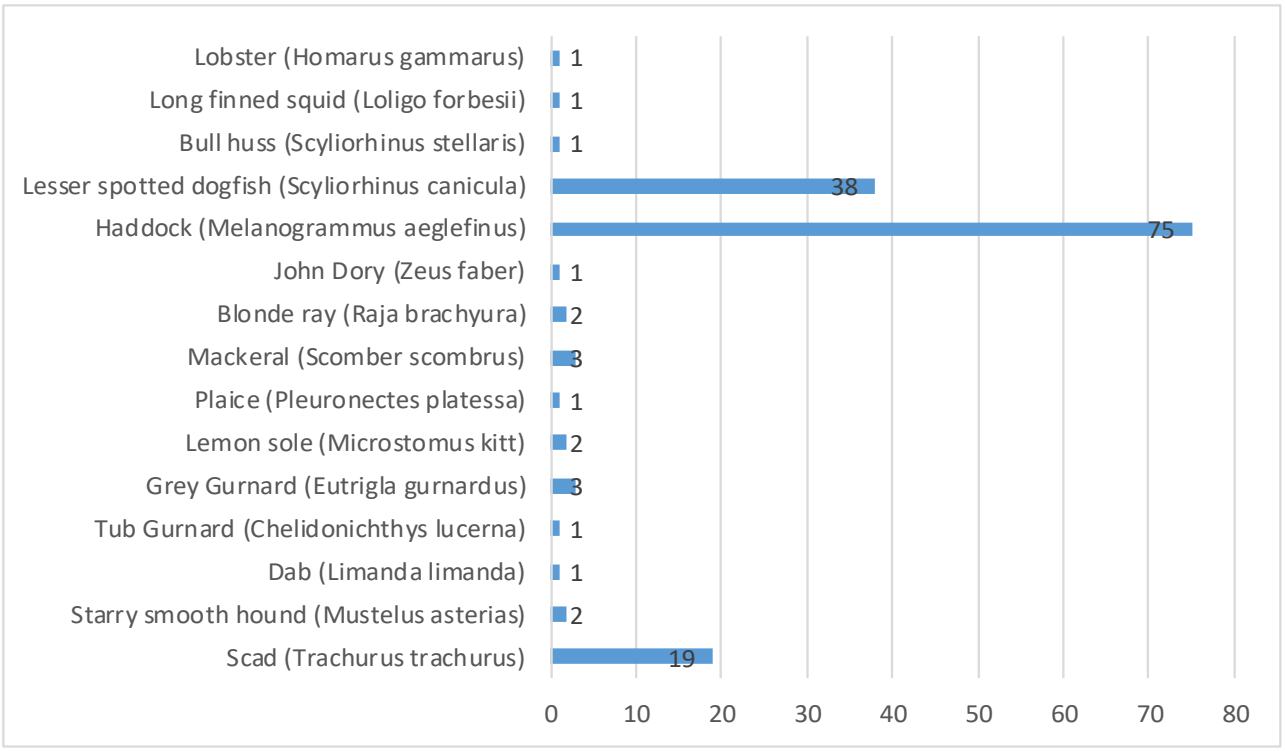

Figure 3-3 Chart showing the numbers of species caught during Tow 3.

Tow 4

Tow 4 was carried out as close to the Kish bank as possible, gear was shot at 16:40 and hauled at 18:45 with the tow lasting 2 hours and 5 minutes. Depths ranged from 12.8 to 27.43 meters with an average of 20.15 meters. A high proportion of the catch was made up of the compass jellyfish (*Chrysaora hysoscella*). The number of fish per km² was calculated, the results of which can be found in Table 3.4

Table 3-4 Fish/ km² of fish species caught during Tow 4

Species	Fish/km²
Scad (*Trachurus trachurus*)	12
Starry Smooth-hound (*Mustelus asterias*)	12
Dab (*Limanda limanda*)	31
Tub Gurnard (*Chelidonichthys lucerna*)	18
Grey Gurnard (*Eutrigla gurnardus*)	18
Plaice (*Pleuronectes platessa*)	80
Thornback ray (*Raja clavata*)	6
Haddock (*Melanogrammus aeglefinus*)	12
Whiting (*Merlangius merlangus*)	18
Lesser spotted dogfish (*Scyliorhinus canicula*)	339
Lesser weaver (*Echiichthys vipera*)	25
Red Mullet (Mullus surmuletus)	12
Dragonet (*Callionymus lyra*)	6
Flounder (*Platichthys flesus*)	6

The number of species caught during Tow 4 can be seen in Figure 3.4. Lesser spotted dogfish (*S. canicula*) was the most common species making up a high proportion of the overall catch with an average length of 53.5cm. Two specimens of Juvenile Scad were recorded with an average length of 12.5cm, these were the only juvenile species observed during this tow.

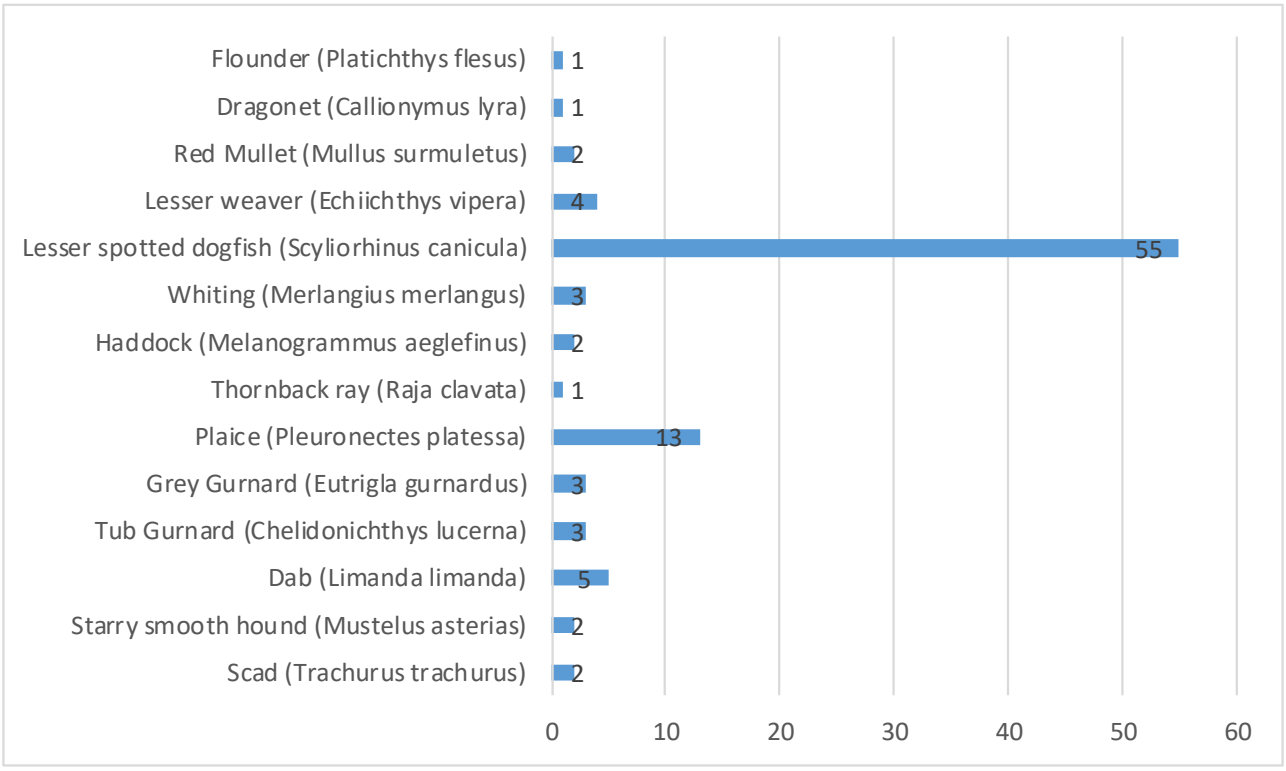

Figure 3-4 Chart showing the numbers of species caught during Tow 4.

Tow 5

Tow 5 was carried out to the West of the Bray bank, gear was shot at 08:30 and hauled at 10:15 with the tow lasting 1 hour and 45 minutes. Depths ranged from 12.43 to 20.11 meters with an average of 16.27 meters. Relative to the previous tows there was fewer jellyfish present. The number of fish per km² was calculated, the results of which can be found in Table 3.5.

Table 3-5 Fish/ km² of fish species caught during Tow 5

Species	Fish/km²
Starry Smooth-hound (*Mustelus asterias*)	87
Tope (*Galeorhinus galeus*)	44
Dab (*Limanda limanda*)	44
Grey Gurnard (*Eutrigla gurnardus*)	806
Brill (*Scophthalmus rhombus*)	22
Plaice (*Pleuronectes platessa*)	370
Mackerel (*Scomber scombrus*)	588
Blonde ray (*Raja brachyura*)	392
Thornback ray (*Raja clavata*)	22
Spotted ray (*Raja montagui*)	174
Haddock (*Melanogrammus aeglefinus*)	392
Lesser spotted dogfish (*Scyliorhinus canicula*)	2397

The number of species caught during Tow 5 can be seen in Figure 3.5. Lesser spotted dogfish (*S. canicula*) was by far the most abundant species caught during Tow 5 (Figure 3.5). Specimens of lesser spotted dogfish ranged between 51cm and 70cm in length. The majority of the species caught during Tow 5 were elasmobranchs. Much of the catch was composed of adult stock with some juvenile plaice (*P. platessa*) also present.

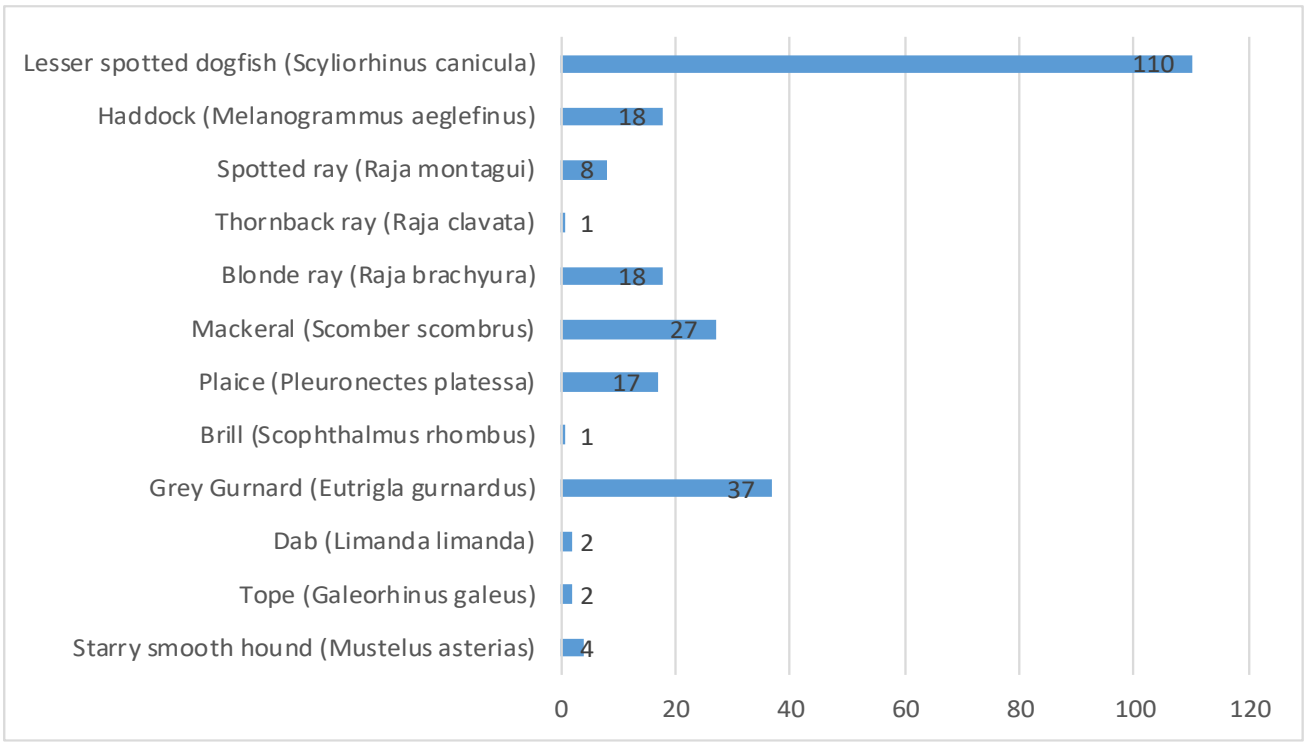

Figure 3-5 Chart showing the numbers of species caught during Tow 5.

Tow 6

Tow 6 was carried out to the West of the area, gear was shot at 10:45 and hauled at 13:10 with the tow lasting 2 hours and 25 minutes. The average depth of the seafloor was 18.28 meters. A considerable amount of the catch was made up of the moon Jellyfish (*Aurelia aurita*). The number of fish per km² was calculated, the results of which can be found in Table 3.6.

Table 3-6 Fish/ km² of fish species caught during Tow 6

Species	Fish/km²
Starry Smooth-hound (*Mustelus asterias*)	18
Dab (*Limanda limanda*)	3
Tub Gurnard (*Chelidonichthys lucerna*)	9
Grey Gurnard (*Eutrigla gurnardus*)	119
Plaice (*Pleuronectes platessa*)	6
Mackerel (*Scomber scombrus*)	3
Blonde ray (*Raja brachyura*)	83
Thornback ray (*Raja clavata*)	18
Spotted ray (*Raja montagui*)	80
John Dory (*Zeus faber*)	6
Haddock (*Melanogrammus aeglefinus*)	54
Whiting (*Merlangius merlangus*)	3
Lesser spotted dogfish (*Scyliorhinus canicula*)	199

The number of species caught during Tow 6 can be seen in Figure 3.6. Lesser spotted dogfish (*S. canicula*) was by far the most abundant species caught during Tow 6 (Figure 3.6). Specimens of lesser spotted dogfish ranged between 48cm and 64cm in length and were composed of both males and females. The Majority of the catch was composed of adult stock.

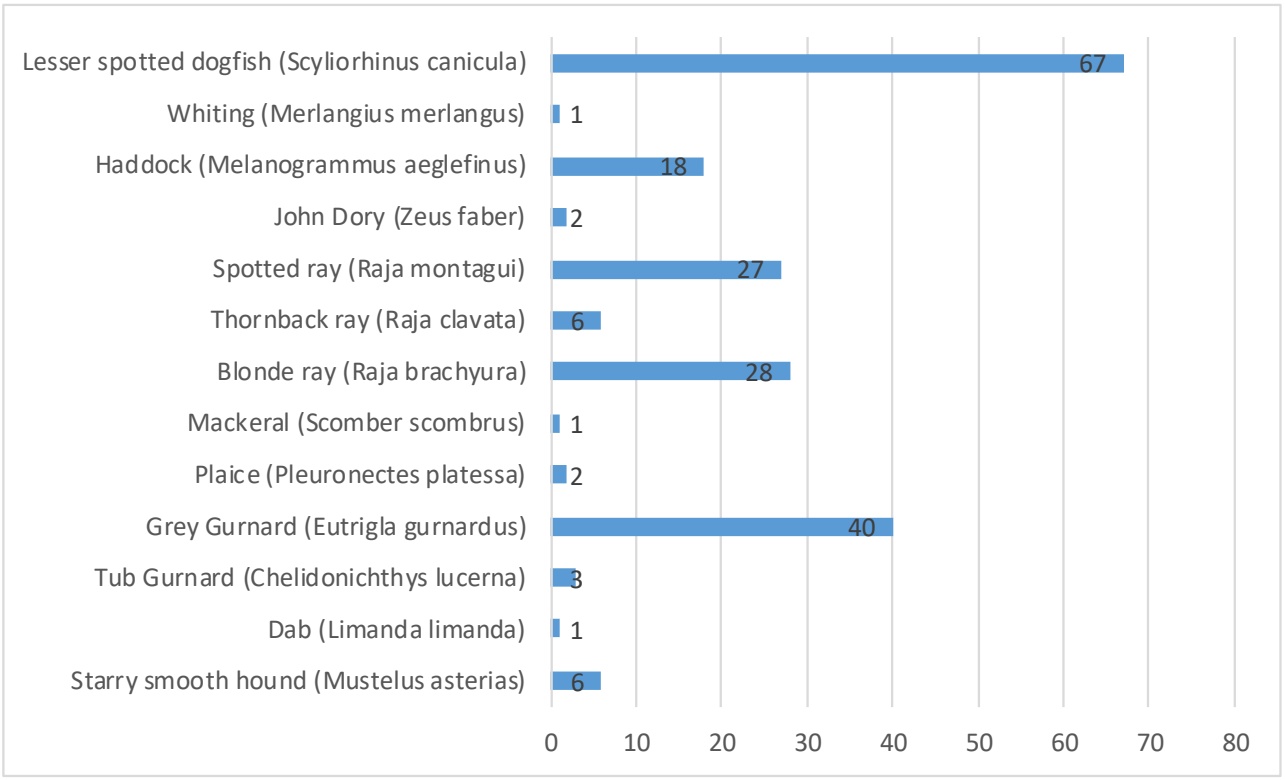

Figure 3-6 Chart showing the numbers of species caught during Tow 6.

Tow 7

Tow 7 was carried out to the west of the Kish Bank, gear was shot at 13:30 and hauled at 16:00 with the tow lasting 2 hours and 30 minutes. Depths ranged from 20.11 to 27.43 meters with an average of 23.77 meters. Many of the species caught during the tow such as Tope (*Galeorhinus galeus*), Starry Smooth-hound (*Mustelus asterias*) and ray species are considered valuable to recreational angling in the area. The number of fish per km² was calculated, the results of which can be found in Table 3.7.

Table 3-7 Fish/ km² of fish species caught during Tow 7

Species	Fish/km²
Starry Smooth-hound (*Mustelus asterias*)	5
Tope (*Galeorhinus galeus*)	10
Dab (*Limanda limanda*)	5
Tub Gurnard (*Chelidonichthys lucerna*)	30
Grey Gurnard (*Eutrigla gurnardus*)	137
Plaice (*Pleuronectes platessa*)	5
Blonde ray (*Raja brachyura*)	36
Thornback ray (*Raja clavata*)	46
Spotted ray (*Raja montagui*)	51
John Dory (*Zeus faber*)	15
Haddock (*Melanogrammus aeglefinus*)	76
Whiting (*Merlangius merlangus*)	15
Lesser spotted dogfish (*Scyliorhinus canicula*)	346
Poor Cod (*Trisopterus minutus*)	51
Angler fish (*Lophius piscatorius*)	5

The number of species caught during Tow 7 can be seen in Figure 3.7. Lesser spotted dogfish (*S. canicula*) was the most common species caught in the tow and measured between 52cm and 66cm in length. A diverse assemblage of elasmobranchs was recorded with 6 species recorded. The majority of the species recorded were adults.

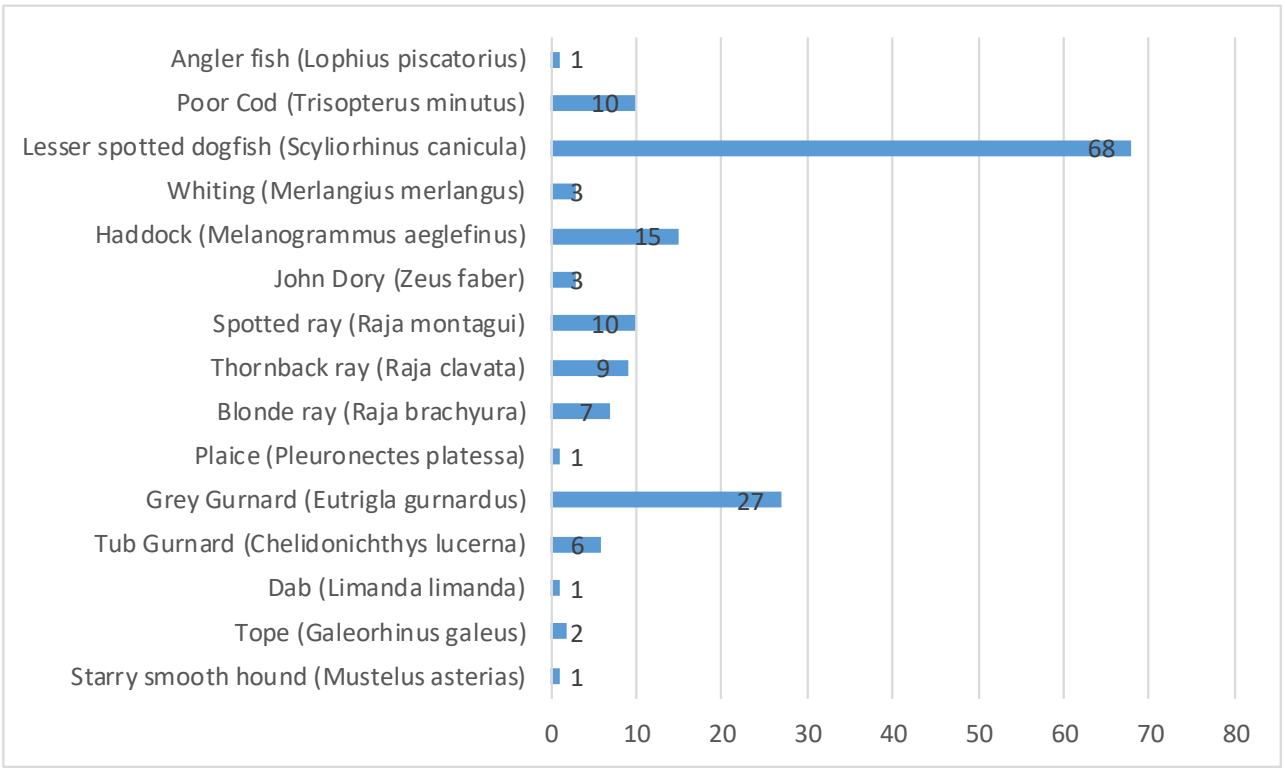

Figure 3-7 Chart showing the numbers of species caught during Tow 7.

Tow 8

The gear was shot at 16:30 and hauled at 18:45 with the tow lasting 2 hours and 15 minutes. Depths ranged from 36.57 to 38.4 meters with an average of 37.48 meters. Many of the species caught during the tow such as juvenile Haddock (*Melanogrammus aeglefinus*) seem to be using this area as a nursery ground. Poor Cod (*Trisopterus minutus*) are known as important mid-trophic species and important prey to a range of predators. The number of fish per km² was calculated, the results of which can be found in Table 3.8.

Table 3-8 Fish/ km² of fish species caught during Tow 8

Species	Fish/km²
Scad (*Trachurus trachurus*)	145
Starry Smooth-hound (*Mustelus asterias*)	52
Dab (*Limanda limanda*)	24
Tub Gurnard (*Chelidonichthys lucerna*)	60
Lemon sole (*Microstomus kitt*)	16
Plaice (*Pleuronectes platessa*)	48
Mackerel (*Scomber scombrus*)	16
Thornback ray (*Raja clavata*)	4
Cuckoo Ray (*Leucoraja naevus*)	4
Spotted ray (*Raja montagui*)	4
John Dory (*Zeus faber*)	16
Haddock (*Melanogrammus aeglefinus*)	3149
Whiting (*Merlangius merlangus*)	361
Lesser spotted dogfish (*Scyliorhinus canicula*)	173
Bull Huss (*Scyliorhinus stellaris*)	16
Poor Cod (*Trisopterus minutus*)	466
Cod (*Gadus morhua*)	8
Long finned squid (*Loligo forbesii*)	28
Red Mullet *(Mullus surmuletus)*	4

The number of species caught during Tow 8 can be seen in Figure 3.8. Haddock (*M. aeglefinus*) was the most common species caught in the tow and measured between 24cm and 29cm in length.

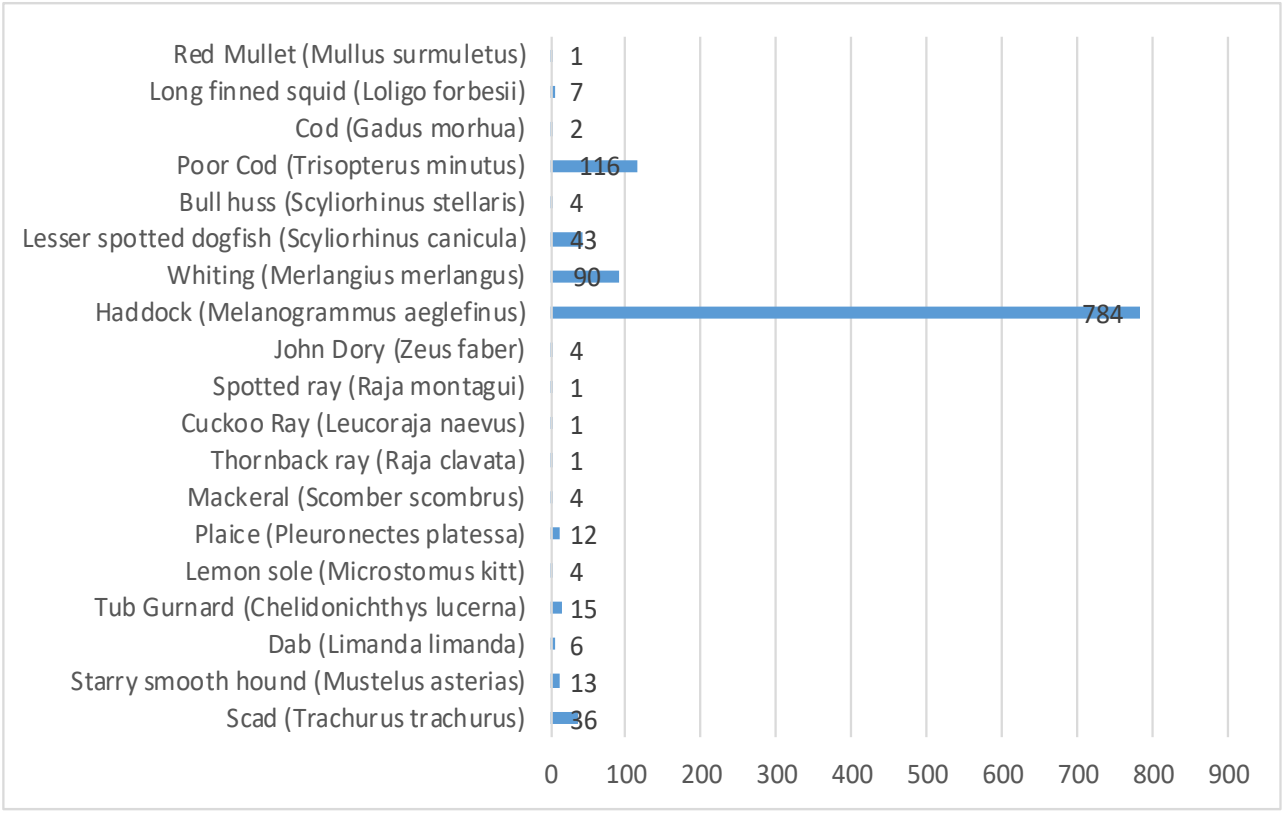

Figure 3-8 Chart showing the numbers of species caught during Tow 8.

Tow 9

Tow 9 was carried out to the west of the Bank and was the first of two reference tows outside of the area. The gear was shot at 07:45 and hauled at 10:15 with the tow lasting 2 hours and 30 minutes. The average depth of the seafloor during the tow was 27.43 meters. The number of fish per km² was calculated, the results of which can be found in Table 3.9.

Table 3-9 Fish/ km² of fish species caught during Tow 9

Species	Fish/km²
Scad (*Trachurus trachurus*)	12
Starry Smooth-hound (*Mustelus asterias*)	137
Tope (*Galeorhinus galeus*)	8
Dab (*Limanda limanda*)	8
Grey Gurnard (*Eutrigla gurnardus*)	27
Plaice (*Pleuronectes platessa*)	16
Mackerel (*Scomber scombrus*)	4
Thornback ray (*Raja clavata*)	12
Spotted ray (*Raja montagui*)	8
John Dory (*Zeus faber*)	4
Haddock (*Melanogrammus aeglefinus*)	2037
Whiting (*Merlangius merlangus*)	78
Lesser spotted dogfish (*Scyliorhinus canicula*)	293
Bull huss (*Scyliorhinus stellaris*)	4
Poor Cod (*Trisopterus minutus*)	827
Cod (*Gadus morhua*)	43
Queen scallops (*Aequipecten opercularis*)	16

The number of species caught during Tow 9 can be seen in Figure 3.9. Haddock (*M. aeglefinus*) was the most common species caught in the tow and measured between 24cm and 39cm in length. Poor cod (*T. minutus*) was the second most common species and measured between 14cm and 18cm in length.

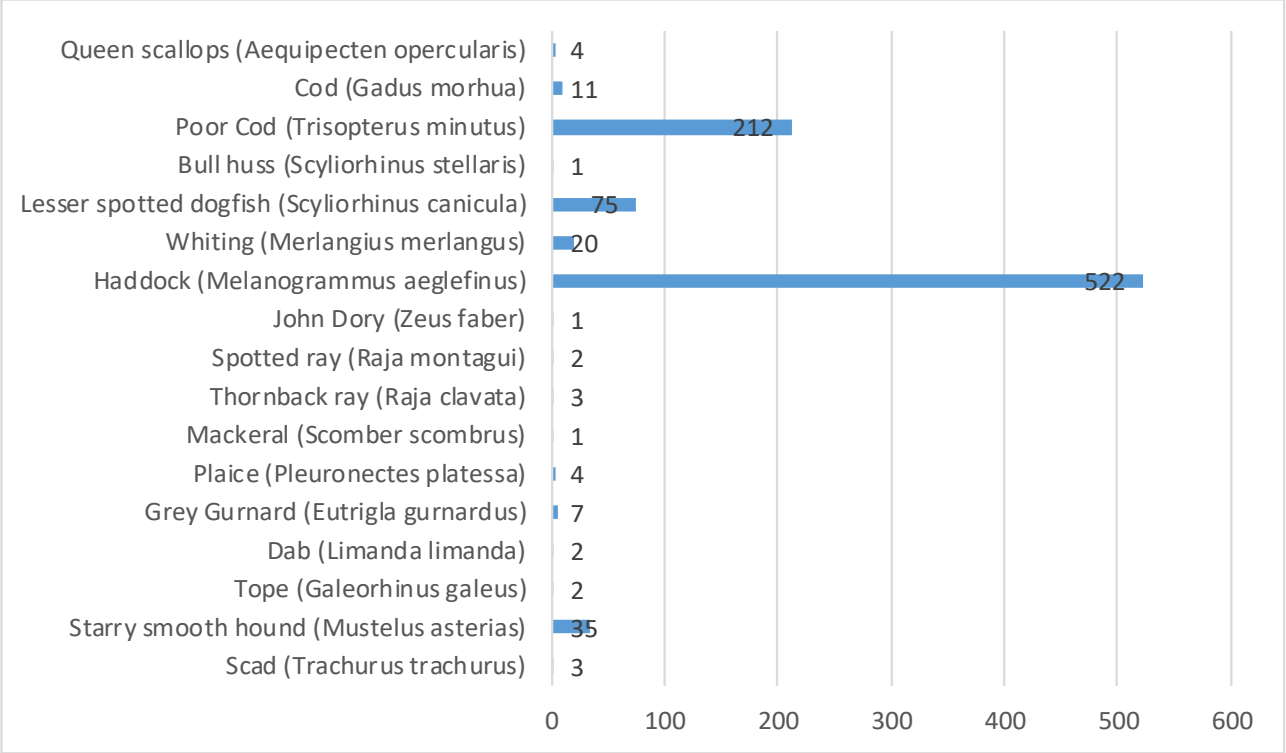

Figure 3-9 Chart showing the numbers of species caught during Tow 9.

Tow 10

Tow 10 was carried out to the east of the Bank and was the second of two reference tows outside of the area. The gear was shot at 10:20 and hauled at 13:20 with the tow lasting 3 hours. Depths ranged from 27.43 to 36.57 meters with an average of 32 meters. A considerable amount of jellyfish was also caught during the tow, species included Lion's mane (*Cyanea capillata*), Compass (*Chrysaora hysoscella*) and the moon jellyfish (*Aurelia aurita*). The number of fish per km² was calculated, the results of which can be found in Table 3.10).

Table 3-10 Fish/ km² of fish species caught during Tow 10

Species	Fish/km²
Scad (*Trachurus trachurus*)	48
Tope (*Galeorhinus galeus*)	4
Dab (*Limanda limanda*)	19
Tub Gurnard (*Chelidonichthys lucerna*)	11
Grey Gurnard (*Eutrigla gurnardus*)	445
Plaice (*Pleuronectes platessa*)	245
Mackerel (*Scomber scombrus*)	15
Thornback ray (*Raja clavata*)	7
Spotted ray (*Raja montagui*)	7
Haddock (*Melanogrammus aeglefinus*)	15
Whiting (*Merlangius merlangus*)	928
Lesser spotted dogfish (*Scyliorhinus canicula*)	434
Bull Huss (*Scyliorhinus stellaris*)	7
Poor Cod (*Trisopterus minutus*)	45
Sprat (*Sprattus sprattus*)	7
Lesser weaver (*Echiichthys vipera*)	4

The number of species caught during Tow 10 can be seen in Figure 3.10. Whiting (*M. merlangus*) was the most common species recorded during Tow 10 and measured between 20cm and 35cm in length. The second most common species caught was the grey gurnard (*Eutrigla gurnardus*) measuring between 45cm and 56cm in length.

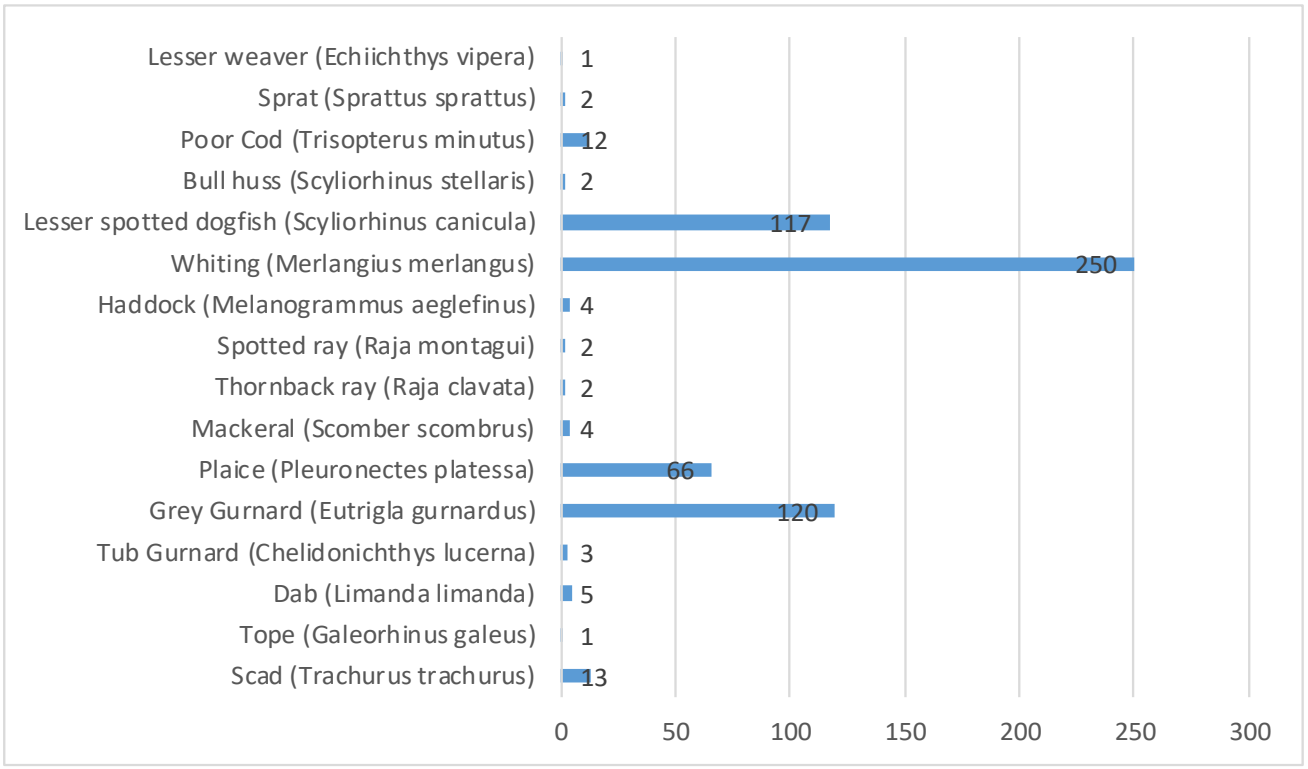

Figure 3-10 Chart showing the numbers of species caught during Tow 10.

4. Discussion

The data obtained from the fisheries survey carried out on and in the vicinity of the Bray and Kish Banks provides a more localized insight into the fish species present in this area. The most abundant species during the survey were Haddock (*M. aeglefinus*), the lesser spotted dogfish (*S. canicula*), whiting (*M. merlangus*) and poor cod (*T. minutus*). It is the opinion of the skipper (see below) that there is no seasonality in the distribution and numbers of the fish species present.

5. Conclusion

From the 8th to the 10th of July 2019 a fisheries survey was carried out on and in the vicinity of the Bray and Kish Banks where the installation of an offshore wind farm is proposed. The survey has highlighted the importance of the grounds as the following:

1. A nursery for juvenile fish such as Haddock, Cod, Plaice and Dab.
2. An important habitat for species valuable to the angling community such as Tope, Bull Huss and Ray species.
3. Species distribution across the area was variable indicating that there is a high level of diversity present.

The data is important not only in assessing the value of the fisheries resource present but also as an example of baseline conditions prior to the installation of a wind farm in the area.

Appendix 1

Species list

Tow #1 (08/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	08:30	53°09'29''	5°53'45''		18.28	22.85
End	10:35	53°13'43''	5°54'22''	27.43		

Species	Weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	2		10		40	U
Tope (*Galeorhinus galeus*)	16		164		1	M
Dab (*Limanda limanda*)	3.15	11	10	9	28	U
Grey Gurnard (*Eutrigla gurnardus*)	3.1	14	13	12	30	U
Plaice (*Pleuronectes platessa*)	5.1	32	31	30	11	U
Mackerel (*Scomber scombrus*)	1.5		34		5	U
Thornback ray (*Raja clavata*)	1		20		1	M
Spotted ray (*Raja montagui*)	3.2		27		6	M and F
John Dory (*Zeus faber*)	1.46	30	21	12	6	U
Haddock (*Melanogrammus aeglefinus*)	6.38		24		40	U
Whiting (*Merlangius merlangus*)	0.38		20		3	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	26.7		55		40	M and F
Bull Huss (*Scyliorhinus stellaris*)	3.7		91		1	M
Cod (*Gadus morhua*)	0.2		11		1	U
Sprat (*Sprattus sprattus*)	0.03		8		1	U
Long finned squid (*Loligo forbesii*)	0.5		10.5		1	U

Additional information: Weather was relatively clear, with light winds 11km from the NW. A substantial percentage of the catch was made up of the jellyfish. Species included: Lion's mane (*Cyanea capillata*), Compass (*Chrysaora hysoscella*) and the moon jellyfish (*Aurelia aurita*). Net used was 320 mesh, 160mm with a height of 6 meters and the width between the doors was ~25 meters.

Tow #2 (08/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	11:00	53°15'22''N	5°53'82''W	29.26		25.6
End	13:30	53°10'11''N	5°52'15''W		21.94	

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	1.16	32	27	22	20	U
Starry Smooth-hound (*Mustelus asterias*)	5.46	82	79	76	3	F
Tope (*Galeorhinus galeus*)	15.43		167		1	F
Dab (*Limanda limanda*)	0.1		9		1	U
Tub Gurnard (*Chelidonichthys lucerna*)	4.2	46	45.5	45	4	U
Grey Gurnard (*Eutrigla gurnardus*)	3.97	43	33.5	24	8	U
Plaice (*Pleuronectes platessa*)	3.21		40		6	U
Mackerel (*Scomber scombrus*)	1.04	30	27.5	25	5	U
Blonde ray (*Raja brachyura*)	0.65		35		1	M
Spotted ray (*Raja montagui*)	3.14		28		6	M and F
John Dory (*Zeus faber*)	0.3		25		1	U
Haddock (*Melanogrammus aeglefinus*)	39.9		34		221	U
Whiting (*Merlangius merlangus*)	0.308		18		3	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	19.06	62	48	34	35	U
Bull Huss (*Scyliorhinus stellaris*)	5.32		114		1	M
Poor Cod (*Trisopterus minutus*)	0.06		16		1	U
Long finned squid (*Loligo forbesii*)	1.5		10.5		3	U

Additional information: Cloud began to clear up as the day progressed, the wind remained light NW, and a substantial percentage of the catch was made up of the jellyfish. Species included: Lion's mane (*Cyanea capillata*), Compass (*Chrysaora hysoscella*) and the moon jellyfish (*Aurelia aurita*).

Tow #3 (08/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	14:00	53°09'94''N	5°53'56''W	23.77		16.45
End	16:15	53°14'49''N	5°54'44''W		9.14	

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	0.97	26	25	24	19	U
Starry Smooth-hound (*Mustelus asterias*)	2.96	78	75.5	73	2	M
Dab (*Limanda limanda*)	0.17		24		1	U
Tub Gurnard (*Chelidonichthys lucerna*)	0.26		20		1	U
Grey Gurnard (*Eutrigla gurnardus*)	1.33	31	30	29	3	U
Lemon sole (*Microstomus kitt*)	0.51		32		2	U
Plaice (*Pleuronectes platessa*)	0.46		28		1	U
Mackerel (*Scomber scombrus*)	0.52		20		3	U
Blonde ray (*Raja brachyura*)	1.51		45		2	M and F
John Dory (*Zeus faber*)	0.19		19		1	U
Haddock (*Melanogrammus aeglefinus*)	12.48	23	21.5	22	75	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	28.57	73	64	55	38	U
Bull Huss (*Scyliorhinus stellaris*)	1.87		84		1	F
Long finned squid (*Loligo forbesii*)	0.5		9.5		1	U
Lobster (*Homarus gammarus*)	1.26		33		1	U

Additional information: Weather conditions unchanged. A substantial percentage of the catch was made up of jellyfish. Species included: Lion's mane (*Cyanea capillata*) and Compass (*Chrysaora hysoscella*).

Tow #4 (08/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	16:40	53°15'02''N	5°54'49''W	23.77		16.45
End	18:45	53°18'31''N	5°54'81''W		9.14	

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	0.05	13	12.5	12	2	U
Starry Smooth-hound (*Mustelus asterias*)	2.82	76	73	70	2	M and F
Dab (*Limanda limanda*)	0.59	26	22	18	5	U
Tub Gurnard (*Chelidonichthys lucerna*)	4.91	51	50	48	3	U
Grey Gurnard (*Eutrigla gurnardus*)	0.42	30	26	22	3	U
Plaice (*Pleuronectes platessa*)	4	38	29	20	13	U
Thornback ray (*Raja clavata*)	5.21		61		1	F
Haddock (*Melanogrammus aeglefinus*)	0.3		19		2	U
Whiting (*Merlangius merlangus*)	0.17	19.5	18.25	17	3	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	40.86	54	53.5	53	55	U
Lesser weaver (Echiichthys vipera)	0.46	14	13	12	4	U
Red Mullet (Mullus surmuletus)	0.1	17	16.5	14.5	2	U
Dragonet (*Callionymus lyra*)	0.1		19		1	U
Flounder (*Platichthys flesus*)	0.17		24		1	U

Additional information: Weather conditions unchanged. A substantial percentage of the catch was made up of Compass jellyfish (*Chrysaora hysoscella*).

Tow #5 (09/07/2019	Time	Latitude	Longitude	Max depth	Min Depth (m)	Avg. Depth
Start	08:30	53°08'87''N	5°54'74''W		12.43	16.27
End	10:15	53°10'00''N	5°55'11''W	20.11		

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Starry Smooth-hound (*Mustelus asterias*)	7.36	94	82	70	4	M (2) and F (2)
Tope (*Galeorhinus galeus*)	23.8	140	132.5	125	2	M
Dab (*Limanda limanda*)	0.31	24		19.5	2	U
Grey Gurnard (*Eutrigla gurnardus*)	8.08	34	30	26	37	U
Brill (*Scophthalmus rhombus*)	0.34		27		1	U
Plaice (*Pleuronectes platessa*)	6.69	36	25.5	15	17	U
Mackerel (*Scomber scombrus*)	5.94	32	29	26	27	U
Blonde ray (*Raja brachyura*)	27.14	64.5	42.25	20	18	M and F
Thornback ray (*Raja clavata*)	2.93		54		1	F
Spotted ray (*Raja montagui*)	39.4	47	38	29	8	M and F
Haddock (*Melanogrammus aeglefinus*)	3	25	23	21	18	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	81.79	70	60.5	51	110	M and F

Additional information: Weather conditions unchanged. Decided to use alternative net with 450 mesh, 150mm with a height of 20 meters and a distance between trawl doors of 45-50 meters.

Tow #6 (09/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	10:45	53°10'55''N	5°55'25''W	18.28		18.28
End	13:10	53°18'04''N	5°57'22''W	18.28		

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Starry Smooth-hound (*Mustelus asterias*)	10.24	94	82	70	6	M
Dab (*Limanda limanda*)	0.1		14.5		1	U
Tub Gurnard (*Chelidonichthys lucerna*)	2.81	36.5	35	33.5	3	U
Grey Gurnard (*Eutrigla gurnardus*)	8.21	32	26	20	40	U
Plaice (*Pleuronectes platessa*)	2.41	36.7	32	27.3	2	U
Mackerel (*Scomber scombrus*)	0.19		26		1	U
Blonde ray (*Raja brachyura*)	21.2	62	45	28	28	M and F
Thornback ray (*Raja clavata*)	24	56.5	45.25	34	6	M and F
Spotted ray (*Raja montagui*)	18	34	28.5	23	27	M and F
John Dory (*Zeus faber*)	0.1	17	15	13	2	U
Haddock (*Melanogrammus aeglefinus*)	3.18	24	21	18	18	U
Whiting (*Merlangius merlangus*)	0.05		17		1	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	48.64	64	56	48	67	M and F

Additional information: Weather conditions similar to the previous day, 30% of the catch made up of Moon jellyfish (*A. aurita*).

Tow #7 (09/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth
Start	13:30	53°18'33''N	5°57'34''W		20.11	23.77
End	16:00	53°14'19''N	5°57'11''W	27.43		

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Starry Smooth-hound (*Mustelus asterias*)	1.23		66		1	F
Tope (*Galeorhinus galeus*)	4.47	100		88	2	M
Dab (*Limanda limanda*)	0.13		23		1	U
Tub Gurnard (*Chelidonichthys lucerna*)	6	44	36.5	29	6	U
Grey Gurnard (*Eutrigla gurnardus*)	6	35	34	33	27	U
Plaice (*Pleuronectes platessa*)	0.46		30.5		1	U
Blonde ray (*Raja brachyura*)	4.14	33.5	24.5	15.5	7	M and F
Thornback ray (*Raja clavata*)	25.88	50	47	44	9	M and F
Spotted ray (*Raja montagui*)	5	37.5	33	28.5	10	M and F
John Dory (*Zeus faber*)	0.6	19	18.5	18	3	U
Haddock (*Melanogrammus aeglefinus*)	3.1		23		15	U
Whiting (*Merlangius merlangus*)	0.18		17		3	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	47.4	66	58	52	68	M and F
Poor Cod (Trisopterus minutus)	0.34	15	14	13	10	U
Angler fish (*Lophius piscatorius*)	0.38		29		1	U

Additional information: A decent amount of species associated with sea angling present in catch e.g. Tope, Smooth-hound, and Bull Huss and skate species.

Tow #8 (09/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth (m)
Start	16:30	53°14'04''N	5°52'09''W		36.57	37.48
End	18:45	53°18'79''N	5°53'60''W	38.4		

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	3	22	17.5	13	36	U
Starry Smooth-hound (*Mustelus asterias*)	17.69	75	65	55	13	M and F
Dab (*Limanda limanda*)	0.75	24	23	25	6	U
Tub Gurnard (*Chelidonichthys lucerna*)	9.82	42	35.5	29	15	U
Lemon sole (*Microstomus kitt*)	1.23	35	30.5	26	4	U
Plaice (*Pleuronectes platessa*)	6.25	41	39	37	12	U
Mackerel (*Scomber scombrus*)	0.88	30	27	24	4	U
Thornback ray (*Raja clavata*)	1.38		41		1	F
Cuckoo Ray (*Leucoraja naevus*)	0.62		25		1	M
Spotted ray (*Raja montagui*)	0.35		24.5		1	M
John Dory (*Zeus faber*)	0.57	26	21.5	17	4	U
Haddock (*Melanogrammus aeglefinus*)	196.12	30	27	24	784	U
Whiting (*Merlangius merlangus*)	10.44	19	18	17	90	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	26.67	63	55.5	48	43	M and F
Bull Huss (*Scyliorhinus stellaris*)	17.55	105	95.5	86	4	M and F
Poor Cod (*Trisopterus minutus*)	4.73	16	14	12	116	U
Cod (*Gadus morhua*)	0.43	25		24	2	U
Long finned squid (*Loligo forbesii*)	3.62		10.5		7	U
Red Mullet *(Mullus surmuletus)*	0.2		17		1	U

Additional information: Appears to be an important Haddock, Cod, Plaice and Dab nursery area. Poor cod present, these species are an important mid-trophic species and source of prey for predators.

Tow #9 (10/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth (m)
Start	07:45	53°14'13''N	5°60'79''W	27.43	27.43	27.43
End	10:15	53°08'40''N	5°57'04''W			

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	0.14	19	16.5	14	3	U
Starry Smooth-hound (*Mustelus asterias*)	49	89	77	65	35	M and F
Tope (*Galeorhinus galeus*)	29.5	153		150	2	M
Dab (*Limanda limanda*)	0.18	18		17	2	U
Grey Gurnard (*Eutrigla gurnardus*)	3.1	35	30.5	26	7	U
Plaice (*Pleuronectes platessa*)	0.67	26	25	24	4	U
Mackerel (*Scomber scombrus*)	0.15		25		1	U
Thornback ray (*Raja clavata*)	6.1	57	44	31	3	F
Spotted ray (*Raja montagui*)	1	34		17.5	2	F
John Dory (*Zeus faber*)	0.24		19		1	U
Haddock (*Melanogrammus aeglefinus*)	83.6	29	26.5	24	522	U
Whiting (*Merlangius merlangus*)	5.1	30	28	26	20	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	45.6	60	56	52	75	M and F
Bull Huss (*Scyliorhinus stellaris*)	4		110		1	M
Poor Cod (*Trisopterus minutus*)	10.6	18	16	14	212	U
Cod (*Gadus morhua*)	3.51	31	27.75	24.5	11	U
Queen scallops (*Aequipecten opercularis*)	0.2				4	U

Additional information: The first of two reference trawls.

Tow #10 (10/07/2019)	Time	Latitude	Longitude	Max depth (m)	Min Depth (m)	Avg. Depth (m)
Start	10:20	53°12'48''N	5°50'41''W		27.43	32
End	13:20	53°18'36''N	5°49'78''W	36.57		

Species	weight (Kg)	Max length (cm)	Avg length (cm)	Min Length (cm)	No. of Ind	Sex
Scad (*Trachurus trachurus*)	0.65	19	16	13	13	U
Tope (*Galeorhinus galeus*)	15		142		1	M
Dab (*Limanda limanda*)	0.42	24	21	18	5	U
Tub Gurnard (*Chelidonichthys lucerna*)	3.38	47	39	31	3	U
Grey Gurnard (*Eutrigla gurnardus*)	20.97	35	27.5	20	120	U
Plaice (*Pleuronectes platessa*)	19.97	33	28.5	24	66	U
Mackerel (*Scomber scombrus*)	0.5	28	24	20	4	U
Thornback ray (*Raja clavata*)	3.93		47.5		2	M
Spotted ray (*Raja montagui*)	1.46		31		2	M (1)and F (1)
Haddock (*Melanogrammus aeglefinus*)	0.4	34	33.5	33	4	U
Whiting (*Merlangius merlangus*)	45.67	24	22	20	250	U
Lesser spotted dogfish (*Scyliorhinus canicula*)	80.22	56	50.5	45	117	M and F
Bull huss (*Scyliorhinus stellaris*)	8.3	120		100	2	M
Poor Cod (*Trisopterus minutus*)	0.62	17	16	15	12	U
Sprat (*Sprattus sprattus*)	0.02	11		10.5	2	U
Lesser weaver (Echiichthys vipera)	0.05		12		1	U

Additional information: The second of two reference trawls.

Appendix 2

Local information

Questions

Q: What is the fishing history of the area?

John Lynch:

Long history of fishing in the area records from 1800s started with long lining for cod and whiting the seining and trawling for cod, whiting, plaice, haddock rays, scallops, There is a large fleet potting whelk and crabs.

Declan McGabhain:

Currently the area is a potting ground for whelk, crab and scallops. Historically the ground would have been fished for queen and king scallop, white fish and crustaceans.

Q: What species are currently fished in the area?

JL:

Haddock, plaice, rays, king and queen scallops, whelk, crab and squid.

DMcG:

Whelk, edible crab all year round. Scallop fishing during autumn and winter by 4-6 vessels.

Q: How many boats currently operate in this area?

JL:

About twelve mainly potting and scallop dredging trawling.

DMcG:

6 potters operating from Dún Laoghaire, Howth and Greystones. 4 scallopers from Northern Ireland, 2 from Howth and Balbriggan.

Q: Seasonality of fishing in the area?

JL:

All year round depending on target species.

DMcG:

All year round.

Additional comments:

John Lynch	Declan McGabhann
	The general area of the Kish bank is a nursery area for commercially important gadoid species such as haddock, whiting and cod. Flatfish and rays also congregate around and on the bank for feeding. The value of crustaceans has increased exponentially since the development of a live shellfish market in Asia. The demand has seen an increase in the number of vessels now fishing off the Dublin and Wicklow coast for this market. An example of this is the increase in the value of whelks per Kilogram from €0.40 to €3.00 /kg.