FOREWIND

DOGGER BANK
TEESSIDE A & B

March
2014

Environmental Statement Chapter 13 Appendix D Tranche A Fish and Shellfish Characterisation Survey

Application Reference 6.13.4

Dogger Bank Offshore Wind Farm

Tranche A

Adult & Juvenile Fish Characterisation Survey

17th to 27th August 2011

Undertaken by
Brown and May Marine Ltd

Ref	Issue Date	Issue Type	Author	Checked	Approved
DBTAOB01	18/07/2012	FINAL	LS	LS/PJM	SJA

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1.0 Summary

1.1 Otter Trawl

A total of 35 species were caught in the otter trawl; 23 within Tranche A, 22 at the control stations and 22 along the cable route. Overall, grey gurnard (*Eutrigla gurnardus*) was the most abundant species caught, followed by dab (*Limanda limanda*) and then plaice (*Pleuronectes platessa)*. The highest catch rates were recorded at stations OT07, OT03 and OT06 within Tranche A with *E. gurnardus* and *L. limanda* accounting for the majority of the catch. Overall, *E. gurnardus* and *L. limanda* represented the greatest proportion of the catch at most sampling stations.

E. gurnardus had the highest catch rate in Tranche A, the control stations and along the cable route, followed by *L. limanda* and *P. platessa*. Whiting (*Merlangius merlangus)* were caught in all locations, with the greatest catch rate found at the control stations; the highest catch rate of *M. merlangus* in this area was found at station OT45.

Overall, the total catch rate was higher within Tranche A than at the control stations and along the cable route. Cod (*Gadus morhua)* were caught in all locations with the greatest catch rate found at the control stations. Herring (*Clupea harengus)* were found only along the cable route, with a catch rate of 19.6 individuals per hour (/hr), the majority of which were caught at station OT49 with a catch rate of 131.2/hr. One greater sandeel (*Hyperoplus lanceolatus*) was found in Tranche A at station OT23.

Most of the *P. platessa* caught within Tranche A and at the control stations were above the MLS, whereas along the cable route the majority were below the MLS. The majority of the *G. morhua* caught within Tranche A were below the MLS, whereas at the control stations and along the cable route most were above the MLS. Greater numbers of *M. merlangus,* caught at all locations, and mackerel (*Scomber scombrus)* caught in Tranche A and at control stations, were below the MLS. Most of the haddock (*Melanogrammus aeglefinus*) caught along the cable route were above the MLS. The majority of the *C. harengus* caught along the cable route were below the MLS. All other species were caught in relatively low numbers.

Overall, females were caught in greater numbers than males at both the control stations and within Tranche A, whereas along the cable route, a greater proportion of the catch was male. The majority of the *E. gurnardus*, *P. platessa*, *M. merlangus* and *S. scombrus* caught at the control stations and within Tranche A were female. The majority of the *L. limanda* caught at all locations were female. Most of the *E. gurnardus*, *M. merlangus* and *S. scombrus* caught at stations along the cable route were male. The sex ratio of the *P. platessa* caught along the cable route was approximately 50:50.

Most of the *E. gurnardus*, *P. platessa*, *M. merlangus* and *S. scombrus* caught at control stations and within Tranche A were maturing females. Along the cable route however, the majority of the *E. gurnardus*, *P. platessa* and *M. merlangus* caught were maturing males. The majority of the *L. limanda* caught at the control stations, within Tranche A and along the cable route were spent females. The majority of the *G. morhua* found at control stations and within Tranche A, and the greatest proportion of those caught along the cable route were immature individuals. *C. harengus* were found only along the cable route; most of which were 'virgin', with a sex ratio of approximately 50:50.

1.2 Beam Trawl

A total of 15 fish species were caught in the beam trawl; eight of which were found at the control stations, nine within Tranche A, 11 along the cable route and six species at the inshore stations. Overall, solenette (*Buglossidium luteum*) was the most abundant species caught, followed by Raitt's sandeel (*Ammodytes marinus*), *L. limanda* and then sand goby (*Pomatoschistus minutus*). *B. luteum* was the most prevalent species at the control stations and within Tranche A, whereas *A. marinus*

were most abundant along the cable route and at the inshore stations. *P. platessa* were found in low numbers along the cable route and in the inshore areas. One *M. merlangus* was found at station BT59 in the inshore area. Overall, catch rates were greater within Tranche A than along the cable route, at the control stations and in the inshore areas.

2.0 Introduction

The following report details the findings of the summer 2011 adult and juvenile fish characterisation survey, undertaken in the area of Tranche A of the Dogger Bank offshore wind farm and along the proposed cable route between the 17th and 27th August. Inshore juvenile fish sampling was undertaken by Precision Marine Survey Ltd (PMSL) on 17th September 2011; sampling included stations BT53, BT54 and BT55 along cable route.

The survey methodology, vessel and sampling gear detailed were agreed in consultation with Cefas and the Marine Management Organisation (MMO). A dispensation from the MMO for the Provisions of Council Regulation 850/98 to catch and retain undersize fish for scientific research and 43/2009 specifically related to days at sea was obtained prior to commencement of this survey. A summary of the health and safety performance of the survey is provided in Appendix 1.

The aim of the survey was to establish the abundance and composition of adult and juvenile fish species within the area of the Dogger Bank. It should be noted that *P. platessa*, sandeel (Ammodytidae sp.), *G. morhua*, *M. merlangus* and *C. harengus* have been defined as species of importance in the area.

It should be noted that all trawls at stations 53, 54 and 55 along the cable route were omitted from the otter trawl survey due to the presence of a high density of static gear in the area. The beam trawl at station 53 was abandoned during the inshore survey after the beam trawl was irreparably damaged. The beam trawls at stations 54 and 55 were included in the inshore survey undertaken by Precision Marine Surveys Ltd., as a smaller vessel was considered more appropriate to trawl the in area, due to the high density of static gear. These trawls however will be analysed as cable route stations, due to their original inclusion in the offshore survey, and their location within the cable corridor.

3.0 Scope of Works

The proposed scope of works for the August 2011 adult and juvenile fish characterisation survey are detailed below and illustrated in Figure 3.1 overleaf.

- **Otter Trawl**
  - 35 tows of approximately 20 minutes duration within Tranche A, ten control tows in adjacent areas and ten tows along the cable route were undertaken

- **Otter Trawl Sample Analysis**
  - Number of individuals and catch rate by species
  - Average length and length distribution by species
    - Finfish & sharks (except *C. harengus* & sprat; *Sprattus sprattus*): individual lengths (nearest cm below)
    - *C. harengus* & *S. sprattus*: individual lengths (nearest ½ cm below)
    - Rays: individual length and wing-width (nearest cm below)
  - Sex ratio by species
  - Spawning condition
    - Finfish species (except *C. harengus* & *S. scombrus*): Cefas Standard Maturity Key - Five Stage
    - *C. harengus*: Cefas Nine Stage Maturity Key
    - *S. scombrus*: Cefas Six Stage Maturity Key
    - Ray and shark species: Cefas Standard Elasmobranch Maturity Key- Four Stage

- **Beam Trawl**
  - 35 tows of approximately 10 minutes duration within Tranche A, ten control tows in adjacent areas, ten tows along the cable route (at the same locations as the otter trawls) and five tows in the inshore areas

- **Beam Trawl Sample Analysis**
  - Number of individuals and catch rate by fish species
  - Average length and length distribution (nearest mm below) for fish species

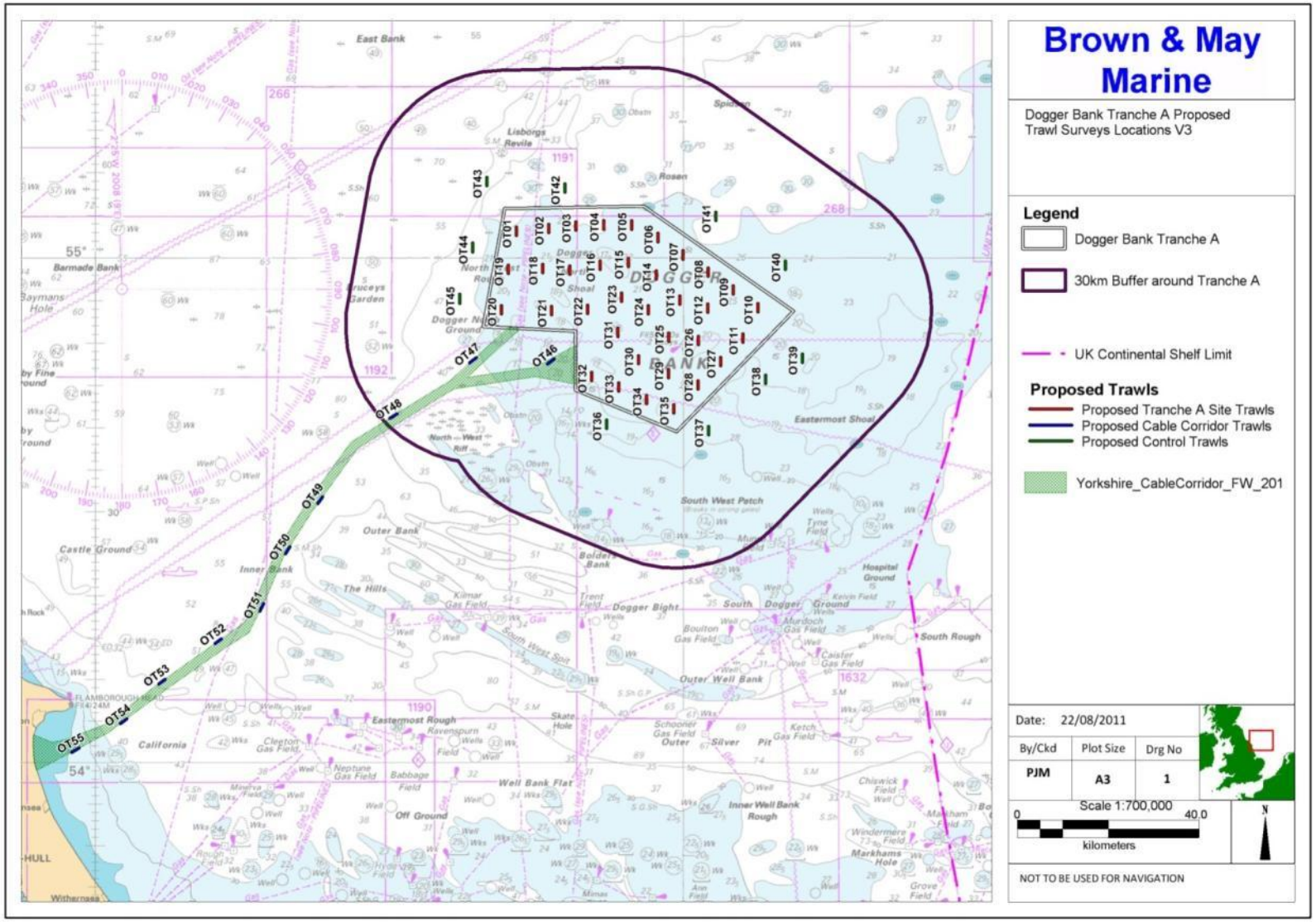


Figure 3.1 Proposed Trawl Locations

4.0 Methodology

4.1 Survey Vessel

The vessel chartered for the survey (Figure 4.1), the “Jubilee Spirit”, is a Grimsby-based commercial trawler whose skipper has experience of fishing on the Dogger Bank and of undertaking fish surveys. The specifications of the vessel are given below in Table 4.1.

Figure 4.1 Survey Vessel "Jubilee Spirit"

Table 4.1 Survey Vessel Specifications

Survey Vessel Specifications	
Length	21.2m
Beam	6.9m
Draft	2.3m
Main engine	Caterpillar Type 340TA 475 BHP
Gearbox	Hydraulic 6: reduction
Propeller	4 Blade Manganese Bronze Fixed Pitch 1.7m diameter
GPS	2-Furuno GP80
Plotters	Sodena Plotter with Electronic Charts
Sounder	Furuno Daylight Viewing

4.2 Sampling Gear

4.2.1 Commercial Otter Trawl

A commercial otter trawl with a 130mm mesh cod-end was used for sampling (Figure 4.2); the specifications for which are given in Table 4.2 below.

Figure 4.2 Otter Trawl Used

Table 4.2 Otter Trawl Specifications

Otter Trawl Specifications	
Towing Warp	18mm, 6x19+1
Depth: Payout Ratio	5:1
Trawl Doors	Perfect B 84
Net	130mm mesh cod-end, square mesh panel 7m from cod-end on top
Ground line length	45.7m
Footrope	Rock-hopper with 6 to 8 inch bobbins
Est. Headline height	2.4m
Distance between doors (est.)	51m

4.2.2 Scientific Beam Trawl

A 2 metre scientific beam trawl (Figure 4.3) was used for juvenile fish sampling; the specifications for which are given in Table 4.3 below.

Figure 4.3 Beam Trawl Used

Table 4.3 Beam Trawl Specifications

Beam Trawl Specifications	
Beam width	2m
Headline height	55cm
Shoe length	77cm
Shoe width	15cm
Cod-end liner	5mm

4.3 Positioning and Navigation

The position of the vessel was tracked at all times using a Garmin GPSMap 278 with an EGNOS differential connected to an external Garmin GA30 antenna. Trawl start times and positions were taken when the winch stopped paying out the gear. Similarly, trawl end times and positions were taken when hauling of the gear commenced.

4.4 Sampling Operations

The survey was undertaken from the 17th to the 27th August 2011. A summarised log of events is given in Table 4.4 below.

Table 4.4 Summarised Log of Events

Wednesday 17th August 2011
HAZOP Meeting in Grimsby
Mobilise survey in Grimsby, steam to survey site
Overnight at sea
Thursday 18th August 2011
Otter Trawls: OT01, OT02, OT03, OT04, OT05
Beam Trawls: BT01, BT02, BT03, BT04, BT05
Overnight at sea
Friday 19th August 2011
Otter Trawls: OT06, OT07, OT41, OT08, OT09, OT10, OT40
Beam Trawls: BT06, BT07, BT41, BT08, BT09, BT10, BT40
Overnight at sea
Saturday 20th August 2011
Otter Trawls: OT39, OT38, OT11, OT12, OT13, OT14
Beam Trawls: BT39, BT38, BT11, BT12, BT13, BT14
Overnight at sea
Sunday 21st August 2011
Otter Trawls: OT15, OT16, OT17, OT18, OT19, OT20, OT21, OT22
Beam Trawls: BT15, BT16, BT17, BT18, BT19, BT20, BT21, BT22
Steam to Scarborough overnight
Overnight at sea
Monday 22nd August 2011
Arrive into Scarborough
Unload samples, load van, load fish boxes onto vessel, vessel take on water
Steam to survey site
Overnight at sea
Tuesday 23rd August 2011
Otter Trawls: OT31, OT23, OT24, OT25, OT26, OT27, OT28
Beam Trawls: BT31, BT23, BT24, BT25, BT26, BT27, BT28
Overnight at sea
Wednesday 24th August 2011
Otter Trawls: OT42, OT43, OT44, OT45, OT47, OT46
Beam Trawls: BT42, BT43, BT44, BT45, BT47, BT46
Overnight at sea
Thursday 25th August 2011
Otter Trawls: OT32, OT33, OT34, OT30, OT29, OT35, OT37
Beam Trawls: BT32, BT33, BT34, BT30, BT29, BT35, BT37
Overnight at sea

Friday 26th August 2011
Otter Trawls: OT36, OT48, OT49, OT50, OT51, OT52
Beam Trawls: BT36, BT48, BT49, BT50, BT51, BT52
Steam to Grimsby overnight
Overnight at sea
Saturday 27th August 2011
Arrive into Grimsby
Demobilise Survey
Saturday 17th September
Inshore beam trawl survey undertaken by PMSL
Beam Trawls: BT53 (abandoned), BT54, BT55, BT56, BT57, BT58, BT59, BT60

4.5 Otter Trawl Sampling

The whole catch from each trawl was retained where possible. Sub-sampling was applied at sea when large homogenous samples were obtained. The samples were then boxed, labelled, photographed, iced and stored at +2°C before transportation to Cefas (Lowestoft) for analysis mid way through the survey, and at the end of the survey.

The start and end times, co-ordinates and the duration of each otter trawl are given in Table 4.5 (control, Tranche A and cable route tows highlighted green, red and blue respectively). The tow tracks are illustrated in Figure 4.4 overleaf.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.5 Start and End Times, Co-ordinates and Duration of each Otter Trawl

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT01	18/08/2011	10:55:53	6,100,797.6	399,814.5	30.6	11:16:01	6,102,962.6	399,812.8	31.9	00:20:08
OT02		12:33:48	6,102,724.1	406,834.6	30.5	12:53:44	6,101,067.0	406,797.1	28.8	00:19:56
OT03		14:14:46	6,102,368.2	412,698.5	30.6	14:34:43	6,104,263.5	412,737.0	33.6	00:19:57
OT04		16:04:37	6,102,457.9	418,890.6	31.4	16:25:09	6,104,185.8	418,858.7	31.2	00:20:32
OT05		17:38:29	6,102,253.5	424,983.3	29.9	17:58:41	6,104,096.5	425,007.9	32.8	00:20:12
OT06	19/08/2011	06:36:12	6,099,037.2	430,525.7	26.6	06:56:28	6,100,582.4	430,582.1	29.2	00:20:16
OT07		08:08:55	6,096,638.9	435,933.2	27.7	08:29:29	6,094,589.0	435,882.6	25.5	00:20:34
OT08		12:30:34	6,092,703.6	441,376.0	27.5	12:50:42	6,090,992.9	441,383.1	26.3	00:20:08
OT09		14:02:39	6,088,882.2	446,794.2	25.2	14:22:51	6,086,984.0	446,865.1	24.6	00:20:12
OT10		15:42:38	6,083,836.7	452,174.4	25.3	16:03:22	6,085,785.2	452,227.1	26.1	00:20:44
OT11	20/08/2011	10:59:02	6,078,092.6	448,850.6	22.8	11:19:03	6,076,320.9	449,008.5	22.2	00:20:01
OT12		13:02:57	6,084,838.7	441,348.0	24.2	13:22:59	6,083,253.4	441,404.7	23.3	00:20:02
OT13		14:42:29	6,086,523.4	435,418.2	22.8	15:02:30	6,084,798.8	435,529.7	23.3	00:20:01
OT14		16:19:01	6,091,132.3	430,128.0	24.2	16:39:00	6,092,875.4	430,171.3	24.1	00:19:59
OT15	21/08/2011	06:48:36	6,094,021.9	424,119.3	25.5	07:08:37	6,095,803.4	424,143.6	25.5	00:20:01
OT16		08:24:04	6,093,344.2	418,783.1	27.7	08:44:49	6,095,244.8	418,824.4	27.5	00:20:45

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT17		10:17:28	6,093,392.4	411,297.2	28.3	10:37:34	6,091,660.7	411,224.0	28.5	00:20:06
OT18		11:52:31	6,094,195.3	405,558.8	31.9	12:12:31	6,092,566.0	405,559.1	32.5	00:20:00
OT19		13:34:19	6,094,316.9	397,979.2	28.3	13:54:19	6,092,565.8	397,699.5	28.6	00:20:00
OT20		15:15:45	6,084,853.4	396,087.1	27.2	15:35:47	6,083,058.8	396,009.4	27.5	00:20:02
OT21		17:13:21	6,083,192.1	407,090.8	28.1	17:34:00	6,084,962.6	407,070.5	26.1	00:20:39
OT22		18:52:26	6,083,954.0	415,017.7	26.4	19:12:28	6,085,592.0	415,053.1	25.9	00:20:02
OT23	23/08/2011	09:39:26	6,086,536.9	422,560.2	25.5	09:59:27	6,088,226.8	422,424.2	26.3	00:20:01
OT24		11:20:44	6,083,619.1	428,249.0	23.3	11:40:48	6,085,413.5	428,250.7	23.1	00:20:04
OT25		12:59:49	6,078,605.7	432,630.0	23.5	13:19:48	6,076,911.5	432,677.7	26.4	00:19:59
OT26		14:40:31	6,077,631.7	439,161.2	21.1	15:00:30	6,075,933.5	439,069.4	22.2	00:19:59
OT27		16:14:25	6,073,167.8	443,899.1	21.5	16:34:33	6,071,446.0	443,983.1	21.9	00:20:08
OT28		17:54:25	6,066,768.3	438,827.8	30.3	18:14:28	6,068,564.0	438,685.1	30.3	00:20:03
OT29	25/08/2011	14:35:39	6,069,518.4	432,420.7	30.1	14:55:38	6,071,345.8	432,478.3	32.3	00:19:59
OT30		12:46:04	6,072,773.1	425,688.8	29.4	13:06:07	6,074,598.0	425,857.0	29.5	00:20:03
OT31	23/08/2011	08:06:08	6,078,703.0	421,612.7	23.7	08:26:12	6,080,454.8	421,765.0	24.6	00:20:04
OT32	25/08/2011	07:24:53	6,070,785.5	415,650.9	27.4	07:44:56	6,069,238.9	415,644.9	22.4	00:20:03
OT33		09:20:22	6,068,213.1	421,529.3	26.4	09:40:30	6,066,575.3	421,479.6	25.7	00:20:08
OT34		11:12:25	6,063,895.9	427,626.1	28.5	11:32:31	6,065,862.0	427,516.7	28.8	00:20:06
OT35		16:17:44	6,063,044.6	433,511.3	30.6	16:37:55	6,061,361.1	433,538.9	28.5	00:20:11
OT36	26/08/2011	06:39:56	6,059,822.4	418,620.2	22.6	06:59:59	6,058,232.1	418,646.5	22.2	00:20:03
OT37	25/08/2011	17:56:54	6,058,260.3	441,090.4	27.0	18:17:24	6,056,621.4	441,052.2	24.1	00:20:30
OT38	20/08/2011	08:54:34	6,067,999.9	453,653.0	22.1	09:15:02	6,069,682.5	453,663.0	22.4	00:20:28
OT39		06:42:25	6,072,289.2	461,836.0	23.1	07:03:06	6,073,899.1	461,863.1	23.3	00:20:41
OT40	19/08/2011	17:36:50	6,093,046.4	458,261.8	28.6	17:56:53	6,094,807.5	458,319.8	27.2	00:20:03
OT41		10:38:45	6,104,783.1	443,364.7	32.1	10:59:05	6,102,933.5	443,324.0	31.0	00:20:20
OT42	24/08/2011	06:42:13	6,111,534.5	410,681.4	37.8	07:02:13	6,109,798.8	410,553.9	39.2	00:20:00
OT43		09:17:59	6,112,053.3	393,687.9	45.1	09:38:34	6,113,735.8	393,740.6	48.9	00:20:35
OT44		11:35:36	6,098,113.1	390,252.8	42.7	11:55:34	6,099,841.6	390,504.3	42.9	00:19:58
OT45		13:38:14	6,088,210.3	387,231.1	42.5	13:58:19	6,086,411.9	387,226.3	41.4	00:20:05
OT46		18:16:42	6,073,341.0	407,056.1	24.6	18:36:37	6,072,073.0	405,884.4	24.6	00:19:55
OT47		15:53:52	6,074,341.5	390,242.6	37.8	16:13:52	6,073,134.8	388,971.5	36.3	00:20:00
OT48	26/08/2011	11:06:22	6,061,714.1	371,098.8	54.4	11:26:31	6,062,300.2	372,649.8	50.6	00:20:09
OT49		14:01:34	6,044,311.3	355,342.2	63.6	14:21:41	6,045,710.5	356,148.3	65.4	00:20:07
OT50		16:07:16	6,033,219.3	347,758.3	66.5	16:27:26	6,034,711.5	348,674.3	60.5	00:20:10
OT51		18:09:50	6,021,297.9	341,908.3	62.5	18:29:52	6,019,815.2	341,161.9	62.1	00:20:02
OT52		19:59:07	6,013,983.6	332,393.0	56.4	20:19:50	6,013,179.4	330,875.6	59.5	00:20:43

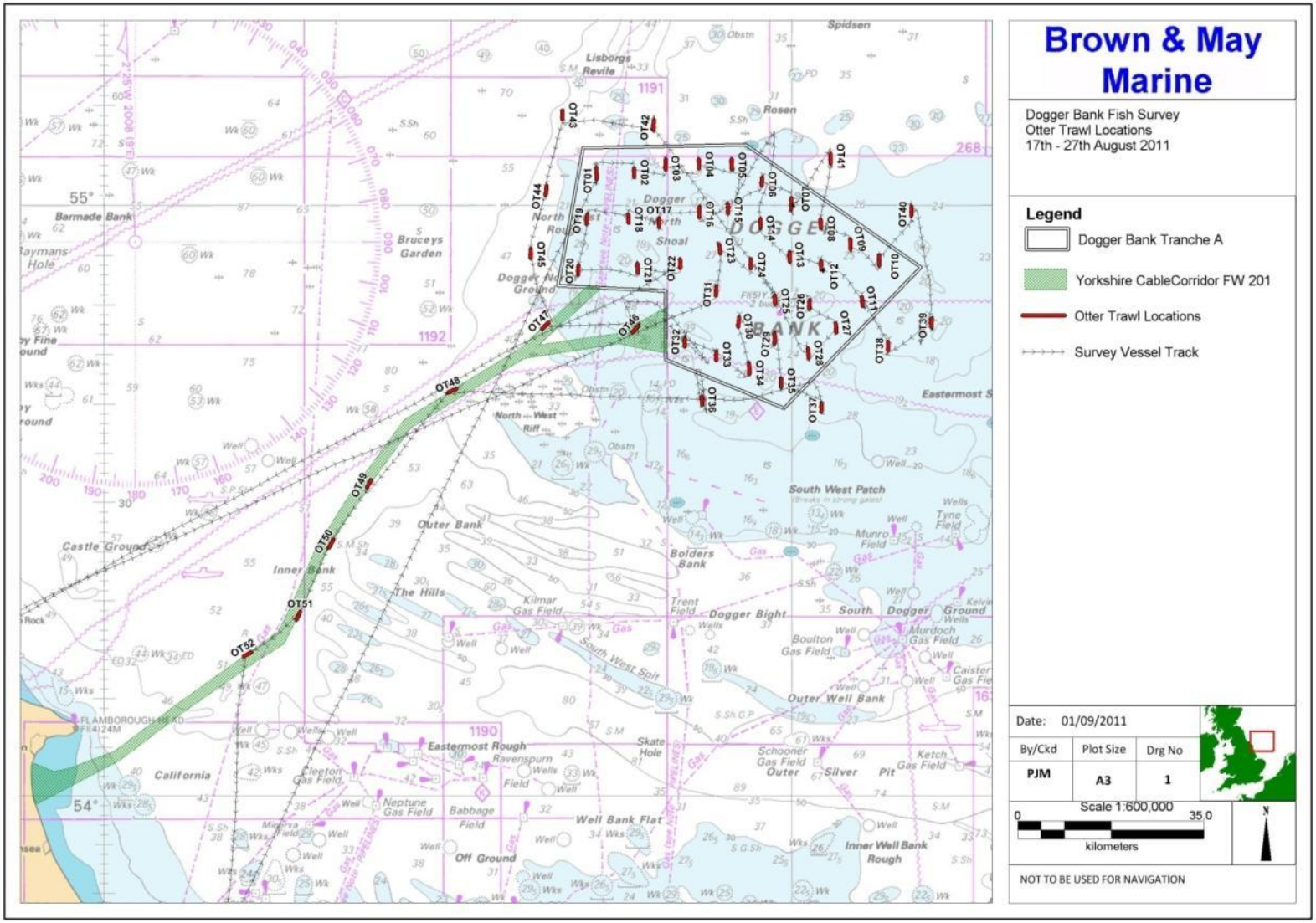


Figure 4.4 Otter Trawl Tow Tracks

4.6 Beam Trawl Sampling

All fish caught in the beam trawl were retained, placed in plastic pots, labelled and photographed. Large fish that could not be retained within the sample pots were identified and measured on board and returned to the sea. Sub-sampling was applied when large (> 4 litres) homogenous samples were obtained. Samples were fixed at the end of every day using a 4% seawater buffered formalin solution.

The start and end times, co-ordinates and the duration of each beam trawl are given in Table 4.6 (control, Tranche A, cable route and inshore tows highlighted green, red, blue and purple respectively). The tow tracks are illustrated in Figure 4.5 overleaf.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 6.1).

Table 4.6 Start and End Times, Co-ordinates and Duration of each Beam Trawl

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT01	18/08/2011	11:37:47	6,103,141.9	399,720.0	32.5	11:47:49	6,103,729.2	399,716.9	33.8	00:10:02
BT02		13:20:10	6,101,133.7	406,744.8	27.5	13:30:15	6,101,736.4	406,700.0	29.0	00:10:05
BT03		15:06:03	6,104,048.4	412,586.7	32.5	15:16:50	6,103,539.2	412,477.1	32.5	00:10:47
BT04		16:46:32	6,104,044.6	418,951.6	31.0	16:56:35	6,103,488.0	418,982.8	31.0	00:10:03
BT05		18:19:47	6,103,734.7	425,066.8	32.5	18:30:01	6,103,202.6	425,171.2	31.4	00:10:14
BT06	19/08/2011	07:17:54	6,100,900.1	430,648.8	32.1	07:28:04	6,100,274.9	430,442.8	27.0	00:10:10
BT07		09:05:53	6,094,366.4	435,972.5	25.2	09:16:31	6,094,681.0	436,071.8	25.3	00:10:38
BT08		13:12:57	6,090,788.2	441,457.1	26.3	13:22:55	6,091,183.1	441,527.2	25.5	00:09:58
BT09		14:44:35	6,086,685.0	446,788.7	24.6	14:54:36	6,087,112.2	446,735.0	24.8	00:10:01
BT10		16:22:02	6,085,846.8	452,198.9	26.1	16:32:04	6,085,409.1	452,158.9	25.9	00:10:02
BT11	20/08/2011	11:40:16	6,076,327.1	449,336.8	22.1	11:50:52	6,076,705.4	449,357.1	23.1	00:10:36
BT12		13:42:38	6,083,334.4	441,636.2	23.3	13:52:38	6,083,818.8	441,688.4	25.0	00:10:00
BT13		15:22:29	6,084,809.6	435,523.1	23.0	15:32:30	6,085,261.9	435,376.4	23.3	00:10:01
BT14		16:59:33	6,092,888.0	430,215.6	24.4	17:09:34	6,092,654.0	430,196.5	25.0	00:10:01
BT15	21/08/2011	07:27:30	6,096,037.0	424,266.2	25.3	07:37:30	6,095,827.7	424,386.7	25.9	00:10:00
BT16		09:03:27	6,095,459.5	419,058.3	27.0	09:13:27	6,095,107.9	419,168.4	27.2	00:10:00
BT17		10:56:44	6,091,741.4	411,166.2	28.3	11:07:13	6,092,181.4	411,073.5	27.4	00:10:29
BT18		12:31:38	6,092,883.6	405,680.0	31.2	12:41:37	6,093,417.4	405,723.7	29.9	00:09:59
BT19		14:12:51	6,092,485.3	397,901.2	29.5	14:22:53	6,093,041.5	397,926.6	30.5	00:10:02
BT20		15:54:10	6,083,070.7	395,793.4	27.7	16:04:11	6,083,597.8	395,736.8	27.7	00:10:01
BT21		17:52:16	6,084,932.5	407,178.7	28.1	18:02:18	6,084,423.6	407,249.7	28.1	00:10:02
BT22		19:29:13	6,085,552.6	415,096.6	25.7	19:39:16	6,085,077.1	415,175.6	25.7	00:10:03
BT23	23/08/2011	10:17:21	6,088,378.9	422,075.3	25.9	10:27:17	6,087,970.9	422,068.8	25.9	00:09:56
BT24		11:59:18	6,085,637.1	428,137.1	23.0	12:09:30	6,085,280.9	428,127.2	22.8	00:10:12
BT25		13:36:27	6,076,780.6	432,629.4	26.4	13:46:29	6,077,137.6	432,482.1	25.9	00:10:02
BT26		15:17:27	6,075,851.3	438,862.1	21.5	15:27:28	6,076,231.0	438,707.3	21.5	00:10:01

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT27		16:53:34	6,071,275.7	443,844.4	21.5	17:03:43	6,071,697.3	443,800.8	21.5	00:10:09
BT28		18:35:42	6,068,790.6	438,439.4	30.3	18:45:44	6,068,414.3	438,406.4	30.6	00:10:02
BT29	25/08/2011	15:15:07	6,071,317.8	432,643.6	32.3	15:25:08	6,071,072.2	432,872.8	33.2	00:10:01
BT30		13:28:24	6,074,538.6	425,985.7	30.3	13:38:33	6,074,322.1	425,992.1	30.6	00:10:09
BT31	23/08/2011	08:45:00	6,080,408.1	421,773.5	25.0	08:55:20	6,080,018.0	421,773.2	25.2	00:10:20
BT32	25/08/2011	08:03:30	6,069,637.9	415,497.0	24.2	08:14:02	6,070,378.2	415,411.0	25.5	00:10:32
BT33		09:57:01	6,066,885.3	421,296.9	25.7	10:07:13	6,067,595.6	421,400.2	26.1	00:10:12
BT34		11:50:21	6,065,907.3	427,567.4	28.8	12:00:20	6,065,709.2	427,493.4	29.2	00:09:59
BT35		16:55:20	6,061,496.7	433,528.2	27.4	17:05:20	6,062,138.8	433,476.8	30.6	00:10:00
BT36	26/08/2011	07:16:40	6,058,440.1	418,561.5	22.2	07:26:52	6,059,024.6	418,382.2	22.4	00:10:12
BT37	25/08/2011	18:35:15	6,057,077.1	441,011.7	23.7	18:45:18	6,057,665.4	440,947.9	23.3	00:10:03
BT38	20/08/2011	09:33:15	6,069,789.3	453,940.2	23.0	09:43:16	6,069,444.6	453,921.2	22.2	00:10:01
BT39		07:21:47	6,074,251.4	462,113.9	23.9	07:31:50	6,073,854.4	462,181.2	23.3	00:10:03
BT40	19/08/2011	18:22:08	6,094,819.5	458,387.4	27.2	18:32:15	6,094,443.2	458,599.4	27.7	00:10:07
BT41		11:18:46	6,102,509.4	443,510.9	33.0	11:28:53	6,102,968.6	443,578.8	33.0	00:10:07
BT42	24/08/2011	07:23:34	6,109,501.9	410,681.5	37.8	07:33:40	6,109,745.0	410,737.9	38.7	00:10:06
BT43		09:57:16	6,113,638.3	393,788.8	47.5	10:07:18	6,113,027.0	393,907.1	46.0	00:10:02
BT44		12:18:22	6,099,762.0	390,341.1	43.8	12:28:23	6,099,293.7	390,398.4	42.7	00:10:01
BT45		14:19:17	6,086,729.6	387,230.3	41.4	14:29:34	6,087,327.4	387,307.5	42.0	00:10:17
BT46		18:54:39	6,072,330.2	405,823.4	24.2	19:04:46	6,072,598.7	406,169.3	25.0	00:10:07
BT47		16:32:46	6,073,252.3	389,048.4	36.9	16:42:53	6,073,550.8	389,492.7	37.8	00:10:07
BT48	26/08/2011	11:50:07	6,062,484.6	372,671.3	50.6	12:00:37	6,062,224.0	372,060.4	52.2	00:10:30
BT49		14:41:51	6,045,112.8	355,824.0	63.4	14:52:59	6,044,424.9	355,659.2	63.4	00:10:08
BT50		16:47:35	6,034,480.3	348,498.0	63.2	16:57:36	6,034,028.0	348,263.9	64.8	00:10:01
BT51		18:48:20	6,019,890.2	341,163.7	62.1	18:58:22	6,020,357.2	341,231.4	63.7	00:10:02
BT52		20:42:41	6,012,711.2	330,955.9	59.0	20:52:43	6,012,723.6	331,188.2	60.8	00:10:02
BT53	Abandoned									
BT54	17/09/2011	14:31:22	5,994,566.5	304,673.7	36.2	14:41:45	5,995,864	305,389	39.3	00.10.23
BT55		12:03:36	5,993,044.0	302,309.2	22.4	12:13:52	5,991,873	301,547	23.0	00.10.14
BT56		16:04:22	5,990,961.1	292,363.4	13.2	16:14:34	5,991,778	293,002	13.4	00.10.12
BT57		16:30:38	5,993,980.9	293,941.3	10.6	16.41:05	5,995,237	294,553	11.2	00.10.17
BT58		15:28:16	5,992,028.6	297,021.3	14.1	15:39:11	5,992,924	297,218	13.6	00.10.55
BT59		13:05:27	5,995,498.2	298,239.5	11.3	13:15:47	5,996,079	297,518	10.8	00.10.20
BT60		10:05:19	5,986,719.7	298,117.2	17.2	10:16:21	5,987,117	298,203	17.9	00.11.02

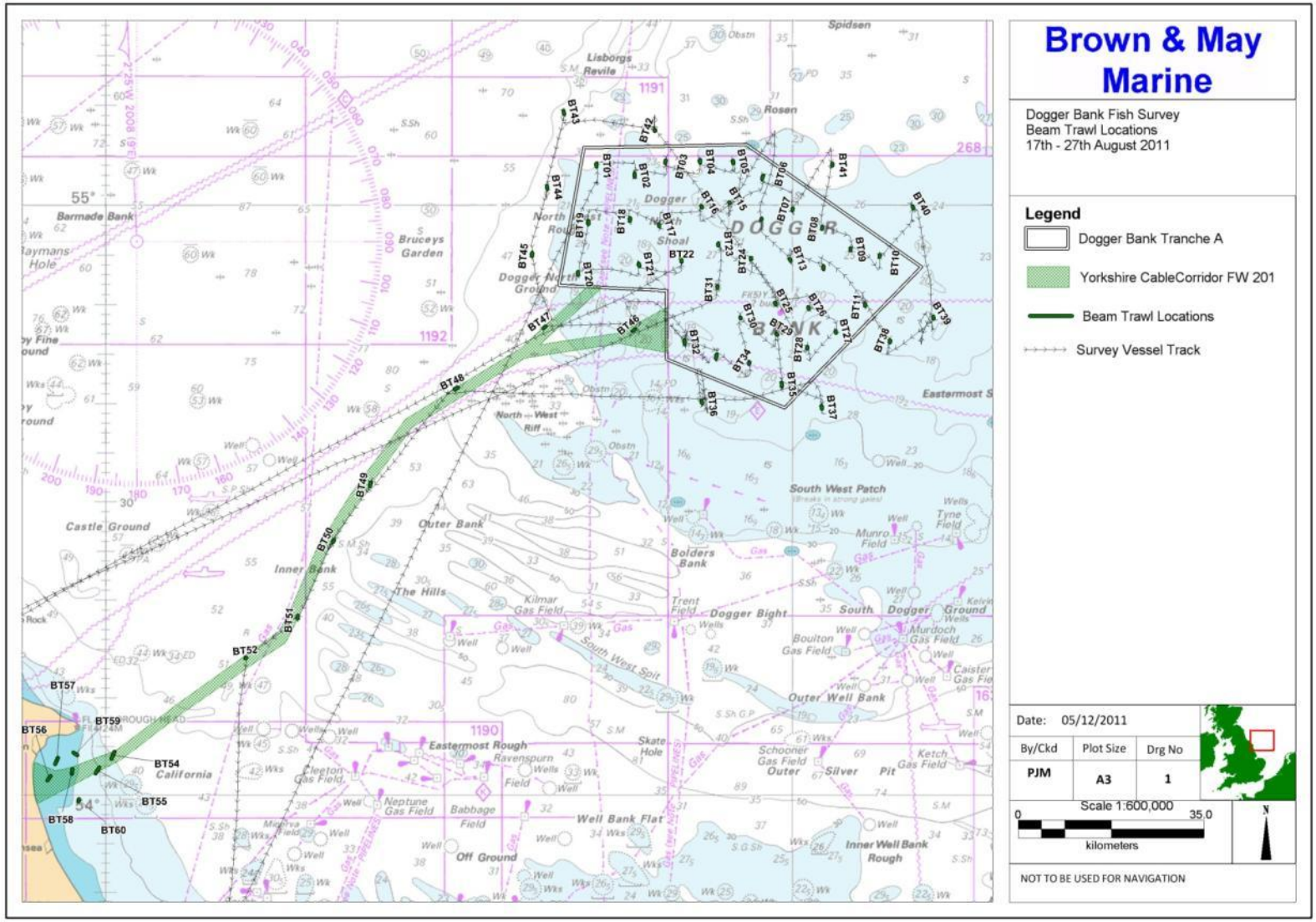


Figure 4.5 Beam Trawl Tow Tracks

5.0 Otter Trawl Results

5.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) for fish species at the control stations, within Tranche A, and along the cable route are given in Table 5.1 and are illustrated in Figure 5.1.

The catch rates for fish species by station and by sampling area are illustrated in Figure 5.2, Figure 5.3 and Figure 5.4 for control, Tranche A and cable route stations respectively.

Spatial distribution plots for the most abundant species are given in Figure 5.5 to Figure 5.8; the distributions for the additional key species are also given in Figure 5.9 and Figure 5.10. One *H. lanceolatus* was found in Tranche A and as such, is not spatially plotted.

Spatial plots show the percentage distribution by catch rate of *E. gurnardus*, *L. limanda*, *P. platessa*, *M. merlangus*, *G. morhua* and *C. harengus*. The circle size corresponds to the catch rate i.e. larger pie charts indicate greater catch rates.

A total of 35 species of fish were caught; 23 within Tranche A, 22 at the control stations and 22 along the cable route. Overall, *E. gurnardus* was the most abundant species caught, followed by *L. limanda* and then *P. platessa*.

E. gurnardus had the highest catch rate in Tranche A (770.1/hr), the control stations (592.3/hr) and along the cable route (446.9/hr), followed by *L. limanda* (399.2/hr, 226.1/hr and 168.0/hr respectively) and *P. platessa* (79.8/hr, 118.7/hr and 220.7/hr respectively).

The highest catch rates were recorded at stations OT07 (5,487.5 individuals per hour), OT03 (3,876.7/hr) and OT06 (3,733.2/hr) within Tranche A, with *E. gurnardus*, and *L. limanda* accounting for the majority of the catch (96.8% at OT07, 94.6% at OT03, 93.6% at OT06). Overall, *E. gurnardus* and *L. limanda* represented the greatest proportion of the catch at most sampling stations.

M. merlangus were caught in all three locations, with the greatest catch rate found at the control stations (97.4/hr); the highest catch rate of *M. merlangus* in this area was found at station OT45 (478.0/hr).

G. morhua were caught in all three locations with the greatest total catch rate found at the control stations (41.4/hr), all of which were found at station OT42 (420.0/hr).

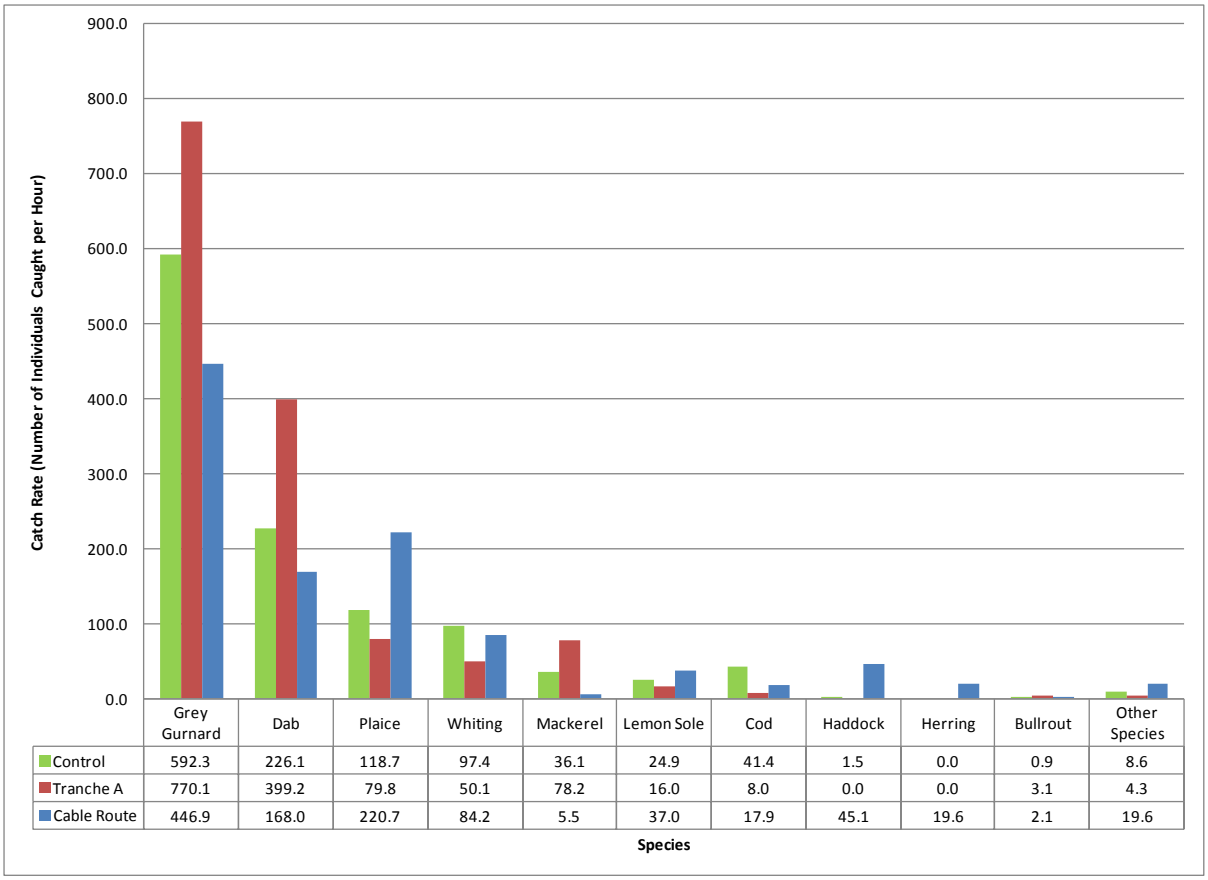
C. harengus were found only along the cable route, with a catch rate of 19.6/hr, the majority of which were caught at station OT49 with a catch rate of 131.2/hr. One *H. lanceolatus* was found in Tranche A at station OT23 (3.0/hr).

Overall, the total catch rate was higher within Tranche A (1,408.8/hr) than at the control stations (1,147.8/hr) and along the cable route (1,066.5/hr).

Table 5.1 Total Numbers of Individuals Caught and Catch Rate by Species and Sampling Area

Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable	Total	Control	Tranche A	Cable
Grey Gurnard	*Eutrigla gurnardus*	2,001	9,050	1,051	12,102	592.3	770.1	446.9
Dab	*Limanda limanda*	764	4,691	395	5,850	226.1	399.2	168.0
Plaice	*Pleuronectes platessa*	401	938	519	1,858	118.7	79.8	220.7
Whiting	*Merlangius merlangus*	329	589	198	1,116	97.4	50.1	84.2
Mackerel	*Scomber scombrus*	122	919	13	1,054	36.1	78.2	5.5
Lemon Sole	*Microstomus kitt*	84	188	87	359	24.9	16.0	37.0
Cod	*Gadus morhua*	140	94	42	276	41.4	8.0	17.9
Haddock	*Melanogrammus aeglefinus*	5	0	106	111	1.5	0.0	45.1
Herring	*Clupea harengus*	0	0	46	46	0.0	0.0	19.6
Bull Rout	*Myoxocephalus scorpius*	3	36	5	44	0.9	3.1	2.1
Hake	*Merluccius merluccius*	12	2	5	19	3.6	0.2	2.1
Blonde Ray	*Raja brachyura*	0	0	18	18	0.0	0.0	7.7
Common Dragonet	*Callionymus lyra*	1	7	1	9	0.3	0.6	0.4
Horse Mackerel	*Trachurus trachurus*	1	7	1	9	0.3	0.6	0.4
Red Mullet	*Mullus surmuletus*	1	7	1	9	0.3	0.6	0.4
Sprat	*Sprattus sprattus*	3	0	6	9	0.9	0.0	2.6
Lesser Spotted Dogfish	*Scyliorhinus canicula*	2	6	0	8	0.6	0.5	0.0
Anglerfish	*Lophius piscatorius*	1	3	2	6	0.3	0.3	0.9
Poor Cod	*Trisopterus minutus*	1	0	5	6	0.3	0.0	2.1
Lesser Weever	*Echiichthys vipera*	0	5	0	5	0.0	0.4	0.0
Red Gurnard	*Aspitrigla cuculus*	2	2	0	4	0.6	0.2	0.0
Turbot	*Psetta maxima*	1	3	0	4	0.3	0.3	0.0
Long Rough Dab	*Hippoglossoides platessoides*	0	0	3	3	0.0	0.0	1.3
Brill	*Scophthalmus rhombus*	2	0	0	2	0.6	0.0	0.0
Starry Ray	*Amblyraja radiata*	0	0	2	2	0.0	0.0	0.9
Thornback Ray	*Raja clavata*	0	2	0	2	0.0	0.2	0.0

Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable	Total	Control	Tranche A	Cable
Tub Gurnard	*Trigla lucerna*	0	2	0	2	0.0	0.2	0.0
Cuckoo Ray	*Raja naevus*	0	0	1	1	0.0	0.0	0.4
Greater Sandeel	*Hyperoplus lanceolatus*	0	1	0	1	0.0	0.1	0.0
John Dory	*Zeus faber*	0	1	0	1	0.0	0.1	0.0
Ling	*Molva molva*	1	0	0	1	0.3	0.0	0.0
Long-Spined Sea Scorpion	*Taurulus bubalis*	0	1	0	1	0.0	0.1	0.0
Scaldfish	*Arnoglossus laterna*	0	1	0	1	0.0	0.1	0.0
Spurdog	*Squalus acanthias*	1	0	0	1	0.3	0.0	0.0
Witch	*Glyptocephalus cynoglossus*	0	0	1	1	0.0	0.0	0.4

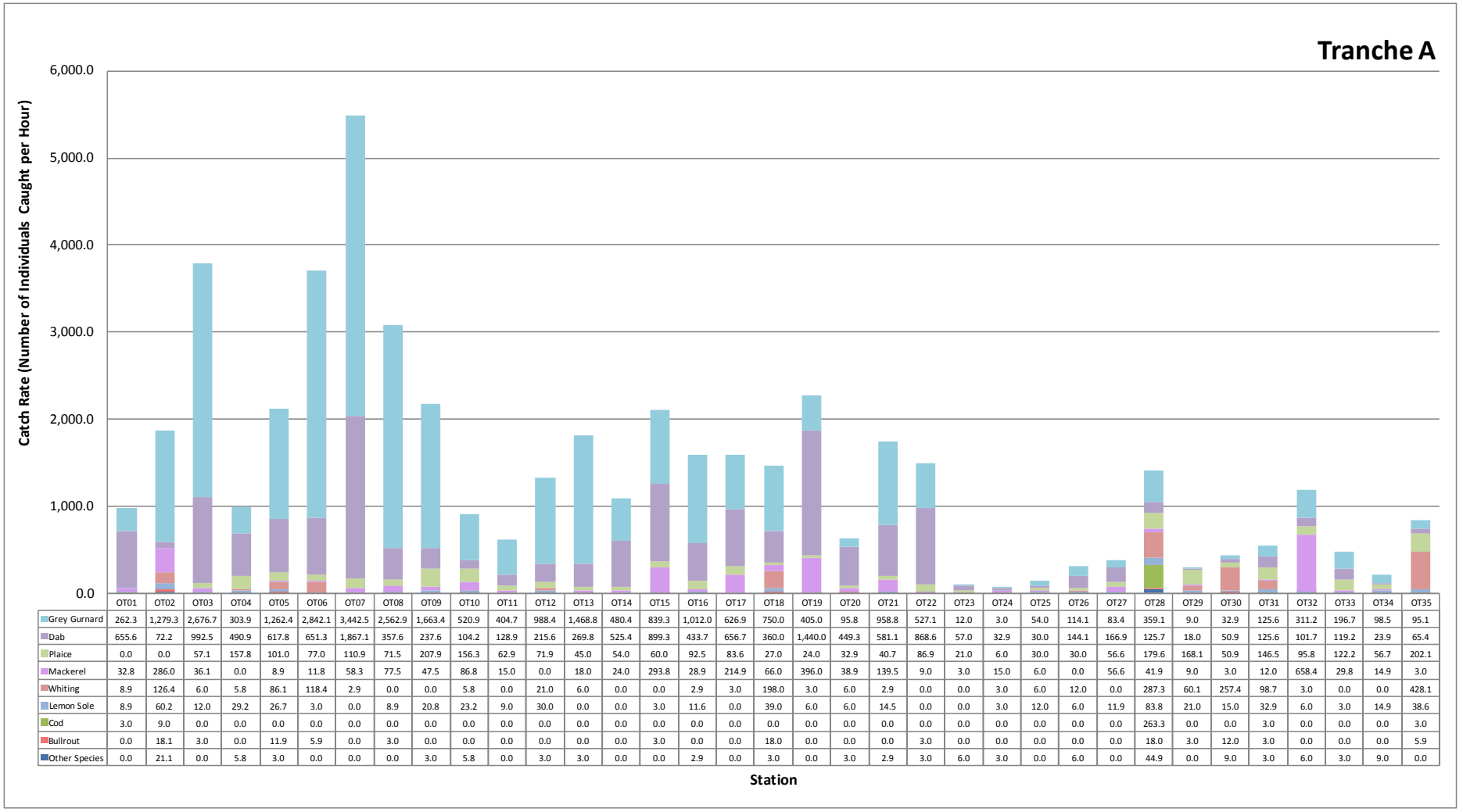


	Grey Gurnard	Dab	Plaice	Whiting	Mackerel	Lemon Sole	Cod	Haddock	Herring	Bullrout	Other Species
Control	592.3	226.1	118.7	97.4	36.1	24.9	41.4	1.5	0.0	0.9	8.6
Tranche A	770.1	399.2	79.8	50.1	78.2	16.0	8.0	0.0	0.0	3.1	4.3
Cable Route	446.9	168.0	220.7	84.2	5.5	37.0	17.9	45.1	19.6	2.1	19.6

Figure 5.1 Catch Rate by Species and Site

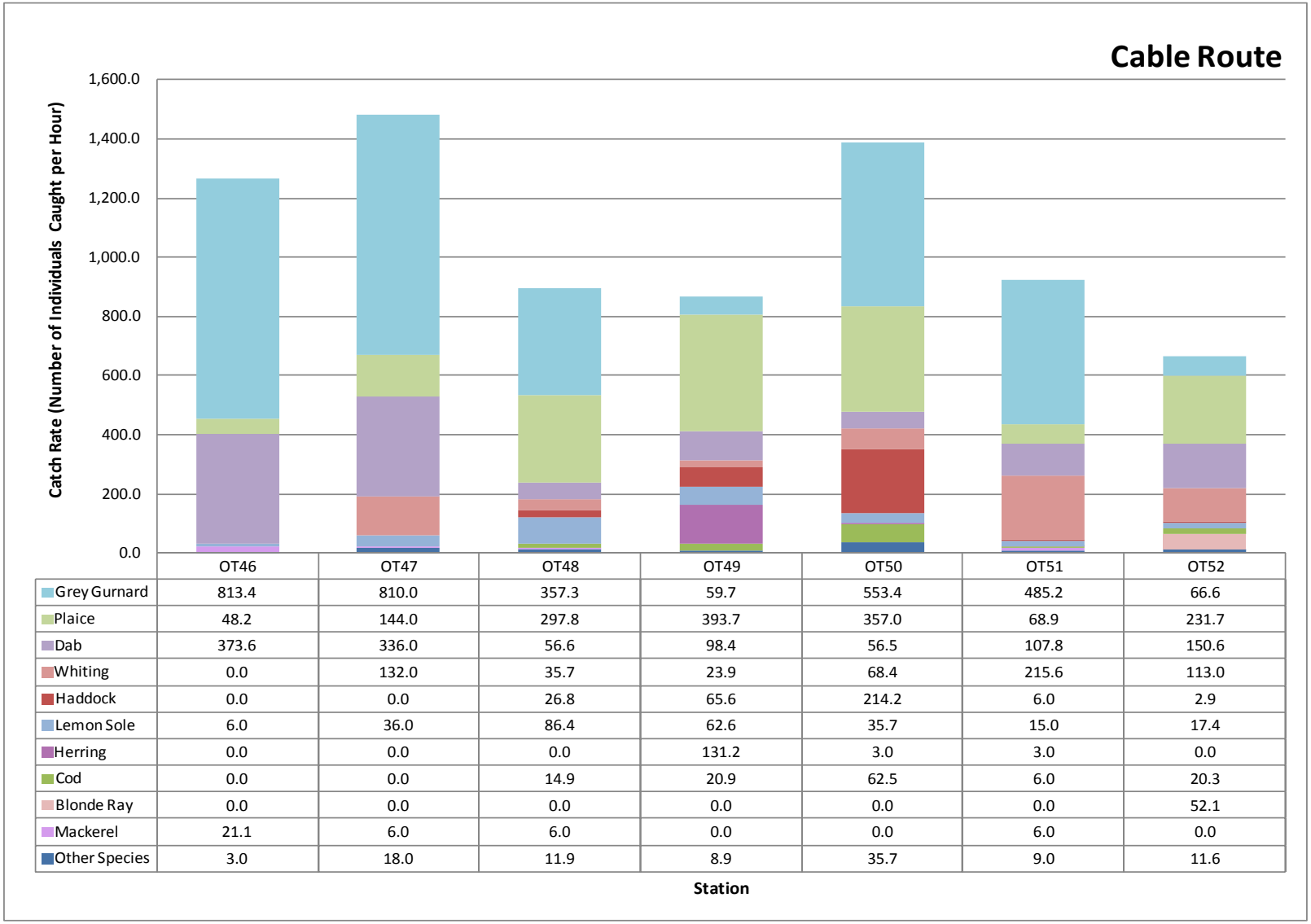
	OT36	OT37	OT38	OT39	OT40	OT41	OT42	OT43	OT44	OT45
Grey Gurnard	323.2	655.6	1,114.0	783.2	374.1	796.7	885.0	201.1	288.5	490.0
Dab	86.8	120.0	158.3	49.3	125.7	354.1	456.0	99.1	465.8	358.5
Plaice	119.7	204.9	26.4	179.9	95.8	129.8	18.0	32.1	165.3	215.1
Whiting	0.0	158.0	0.0	0.0	0.0	3.0	12.0	29.1	300.5	478.0
Cod	0.0	0.0	0.0	0.0	0.0	0.0	420.0	0.0	0.0	0.0
Mackerel	53.9	5.9	58.6	0.0	0.0	236.1	3.0	0.0	3.0	0.0
Lemon Sole	6.0	5.9	26.4	11.6	32.9	23.6	24.0	29.1	45.1	44.8
Hake	0.0	0.0	0.0	0.0	0.0	0.0	6.0	2.9	15.0	12.0
Haddock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	3.0	6.0
Other Species	0.0	2.9	0.0	2.9	0.0	3.0	15.0	2.9	15.0	9.0

Figure 5.2 Catch Rate by Species and Station at Control Stations



	OT01	OT02	OT03	OT04	OT05	OT06	OT07	OT08	OT09	OT10	OT11	OT12	OT13	OT14	OT15	OT16	OT17	OT18	OT19	OT20	OT21	OT22	OT23	OT24	OT25	OT26	OT27	OT28	OT29	OT30	OT31	OT32	OT33	OT34	OT35
Grey Gurnard	262.3	1,279.3	2,676.7	303.9	1,262.4	2,842.1	3,442.5	2,562.9	1,663.4	520.9	404.7	988.4	1,468.8	480.4	839.3	1,012.0	626.9	750.0	405.0	95.8	958.8	527.1	12.0	3.0	54.0	114.1	83.4	359.1	9.0	32.9	125.6	311.2	196.7	98.5	95.1
Dab	655.6	72.2	992.5	490.9	617.8	651.3	1,867.1	357.6	237.6	104.2	128.9	215.6	269.8	525.4	899.3	433.7	656.7	360.0	1,440.0	449.3	581.1	868.6	57.0	32.9	30.0	144.1	166.9	125.7	18.0	50.9	125.6	101.7	119.2	23.9	65.4
Plaice	0.0	0.0	57.1	157.8	101.0	77.0	110.9	71.5	207.9	156.3	62.9	71.9	45.0	54.0	60.0	92.5	83.6	27.0	24.0	32.9	40.7	86.9	21.0	6.0	30.0	30.0	56.6	179.6	168.1	50.9	146.5	95.8	122.2	56.7	202.1
Mackerel	32.8	286.0	36.1	0.0	8.9	11.8	58.3	77.5	47.5	86.8	15.0	0.0	18.0	24.0	293.8	28.9	214.9	66.0	396.0	38.9	139.5	9.0	3.0	15.0	6.0	0.0	56.6	41.9	9.0	3.0	12.0	658.4	29.8	14.9	3.0
Whiting	8.9	126.4	6.0	5.8	86.1	118.4	2.9	0.0	0.0	5.8	0.0	21.0	6.0	0.0	0.0	2.9	3.0	198.0	3.0	6.0	2.9	0.0	0.0	3.0	6.0	12.0	0.0	287.3	60.1	257.4	98.7	3.0	0.0	0.0	428.1
Lemon Sole	8.9	60.2	12.0	29.2	26.7	3.0	0.0	8.9	20.8	23.2	9.0	30.0	0.0	0.0	3.0	11.6	0.0	39.0	6.0	6.0	14.5	0.0	0.0	3.0	12.0	6.0	11.9	83.8	21.0	15.0	32.9	6.0	3.0	14.9	38.6
Cod	3.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	263.3	0.0	0.0	3.0	0.0	0.0	0.0	3.0
Bullrout	0.0	18.1	3.0	0.0	11.9	5.9	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	18.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	18.0	3.0	12.0	3.0	0.0	0.0	0.0	5.9
Other Species	0.0	21.1	0.0	5.8	3.0	0.0	0.0	0.0	3.0	5.8	0.0	3.0	3.0	0.0	0.0	2.9	0.0	3.0	0.0	3.0	2.9	3.0	6.0	3.0	0.0	6.0	0.0	44.9	0.0	9.0	3.0	6.0	3.0	9.0	0.0

Figure 5.3 Catch Rate by Species and Station within Tranche A



	OT46	OT47	OT48	OT49	OT50	OT51	OT52
Grey Gurnard	813.4	810.0	357.3	59.7	553.4	485.2	66.6
Plaice	48.2	144.0	297.8	393.7	357.0	68.9	231.7
Dab	373.6	336.0	56.6	98.4	56.5	107.8	150.6
Whiting	0.0	132.0	35.7	23.9	68.4	215.6	113.0
Haddock	0.0	0.0	26.8	65.6	214.2	6.0	2.9
Lemon Sole	6.0	36.0	86.4	62.6	35.7	15.0	17.4
Herring	0.0	0.0	0.0	131.2	3.0	3.0	0.0
Cod	0.0	0.0	14.9	20.9	62.5	6.0	20.3
Blonde Ray	0.0	0.0	0.0	0.0	0.0	0.0	52.1
Mackerel	21.1	6.0	6.0	0.0	0.0	6.0	0.0
Other Species	3.0	18.0	11.9	8.9	35.7	9.0	11.6

Figure 5.4 Catch Rate by Species and Station at Stations along the Cable Route

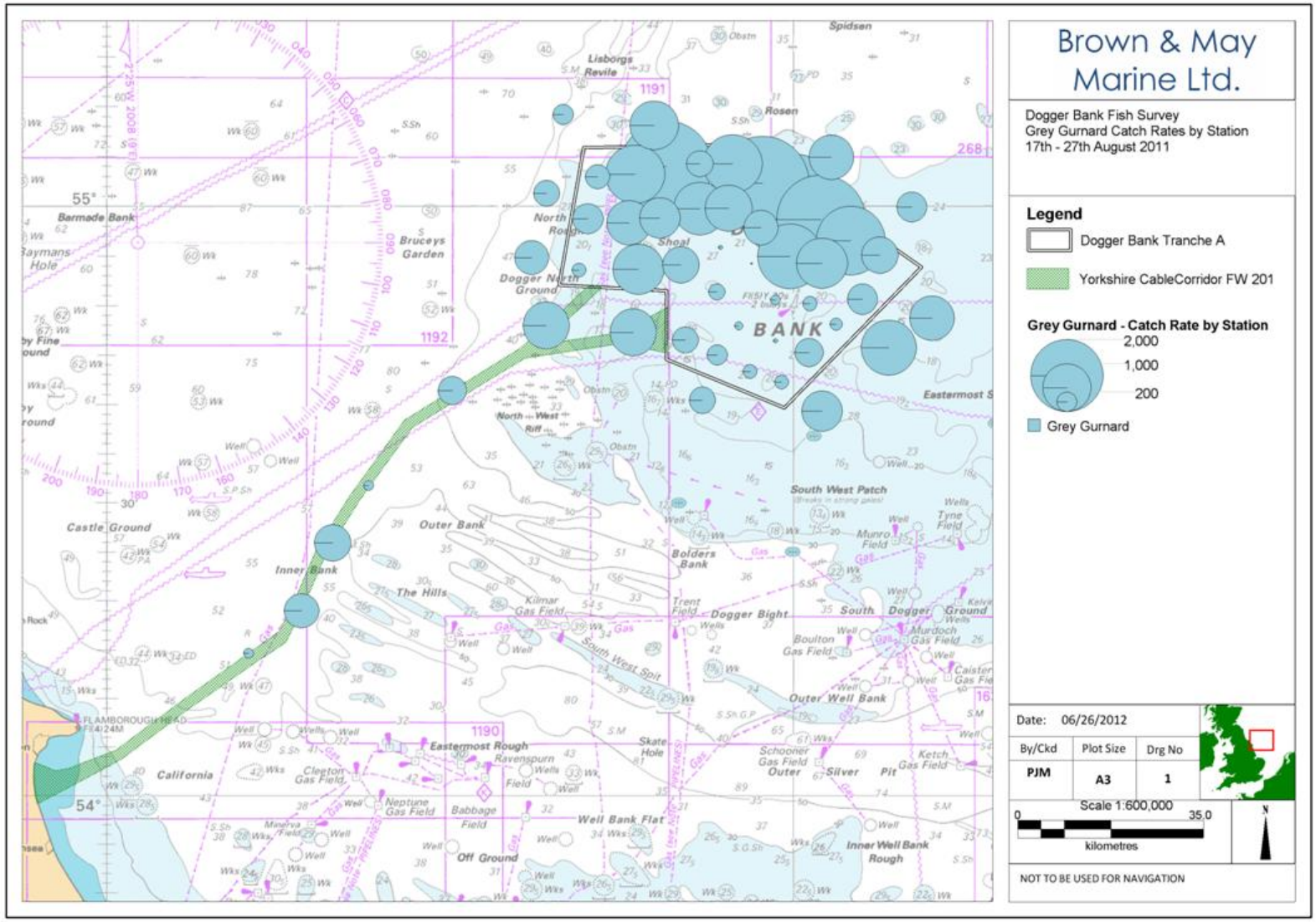


Figure 5.5 Spatial Distribution of Grey Gurnard (*E. gurnardus*) in the Area of Tranche A

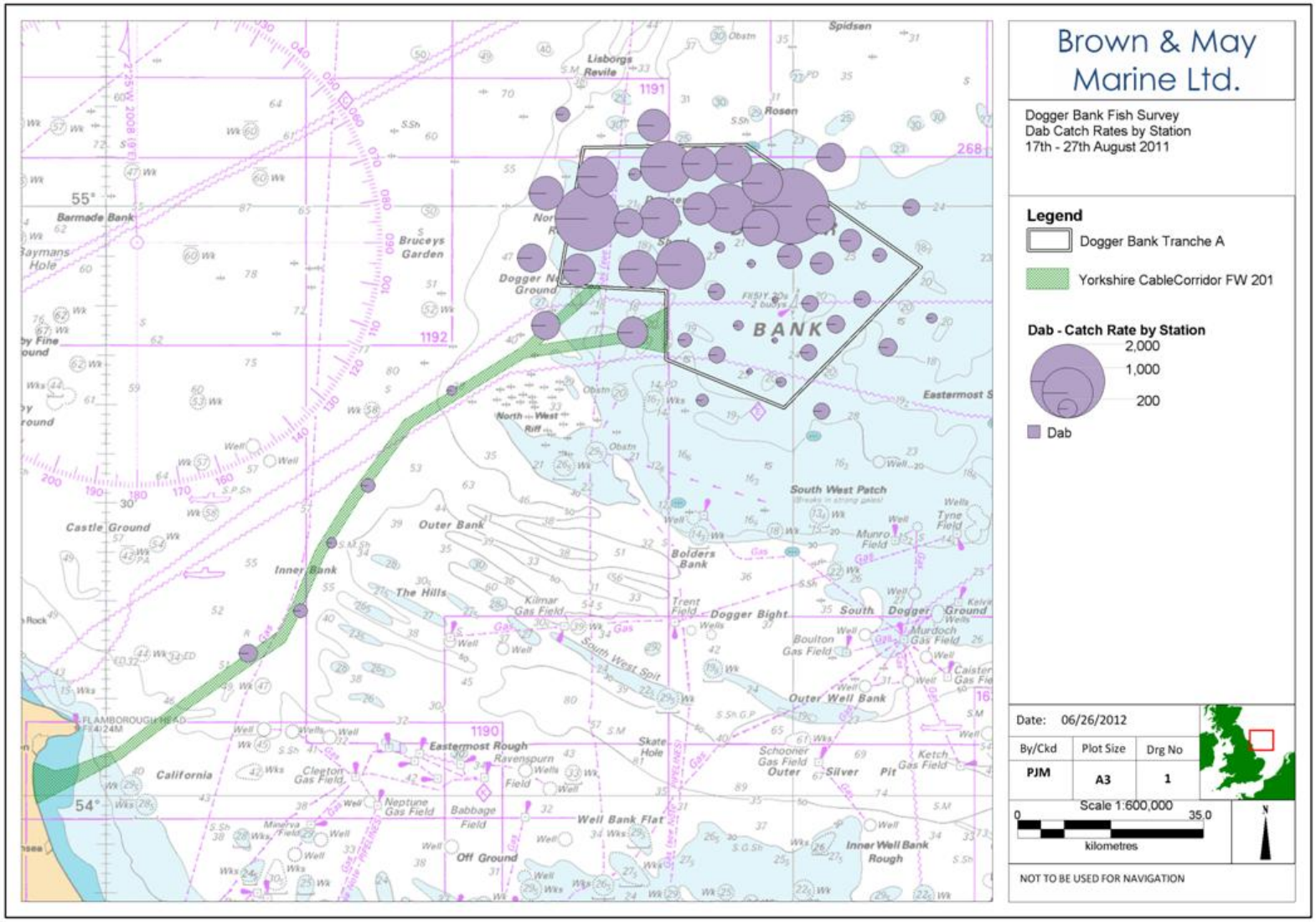


Figure 5.6 Spatial Distribution of Dab (*L. limanda*) in the Area of Tranche A

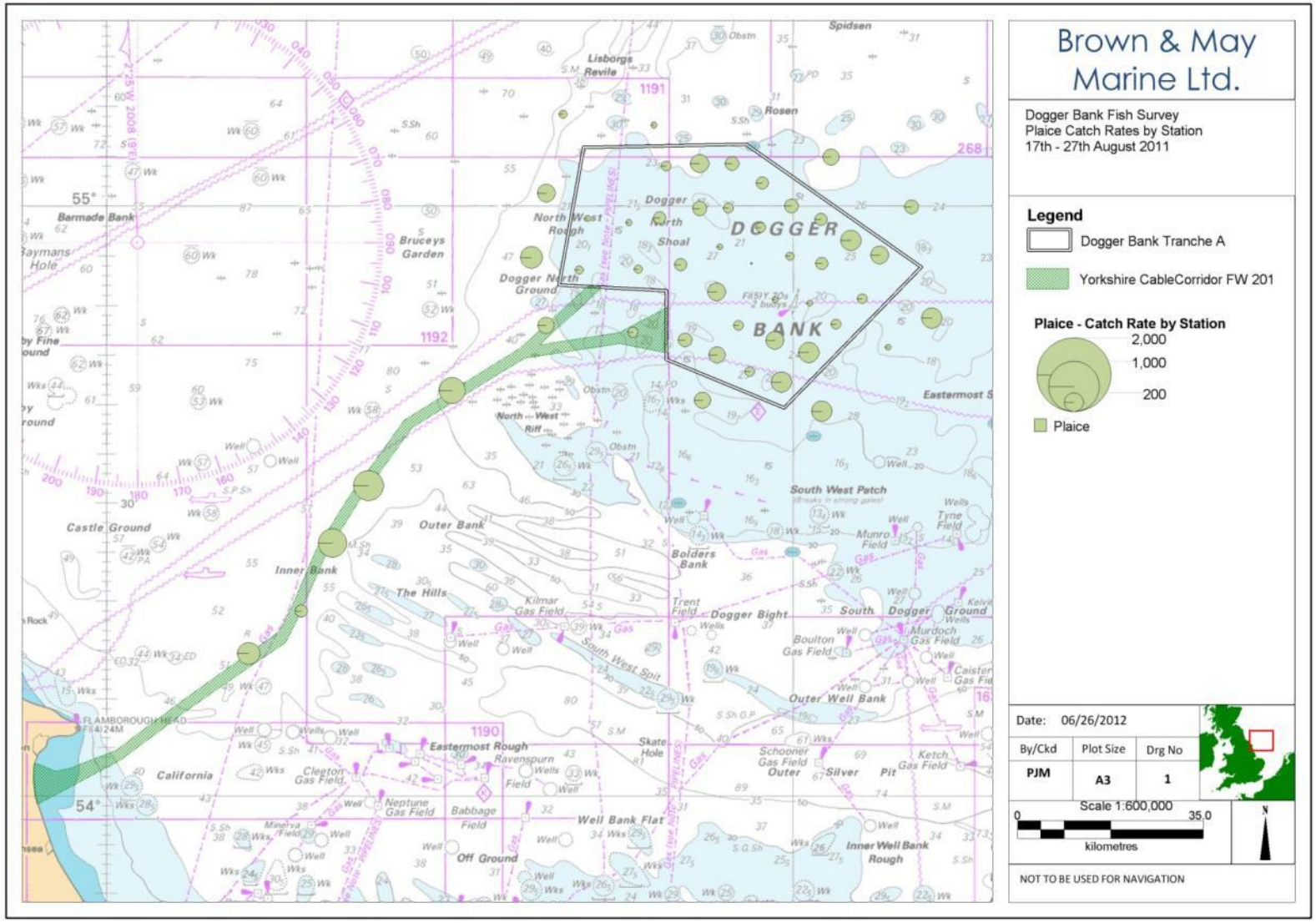


Figure 5.7 Spatial Distribution of Plaice (*P. platessa*) in the Area of Tranche A

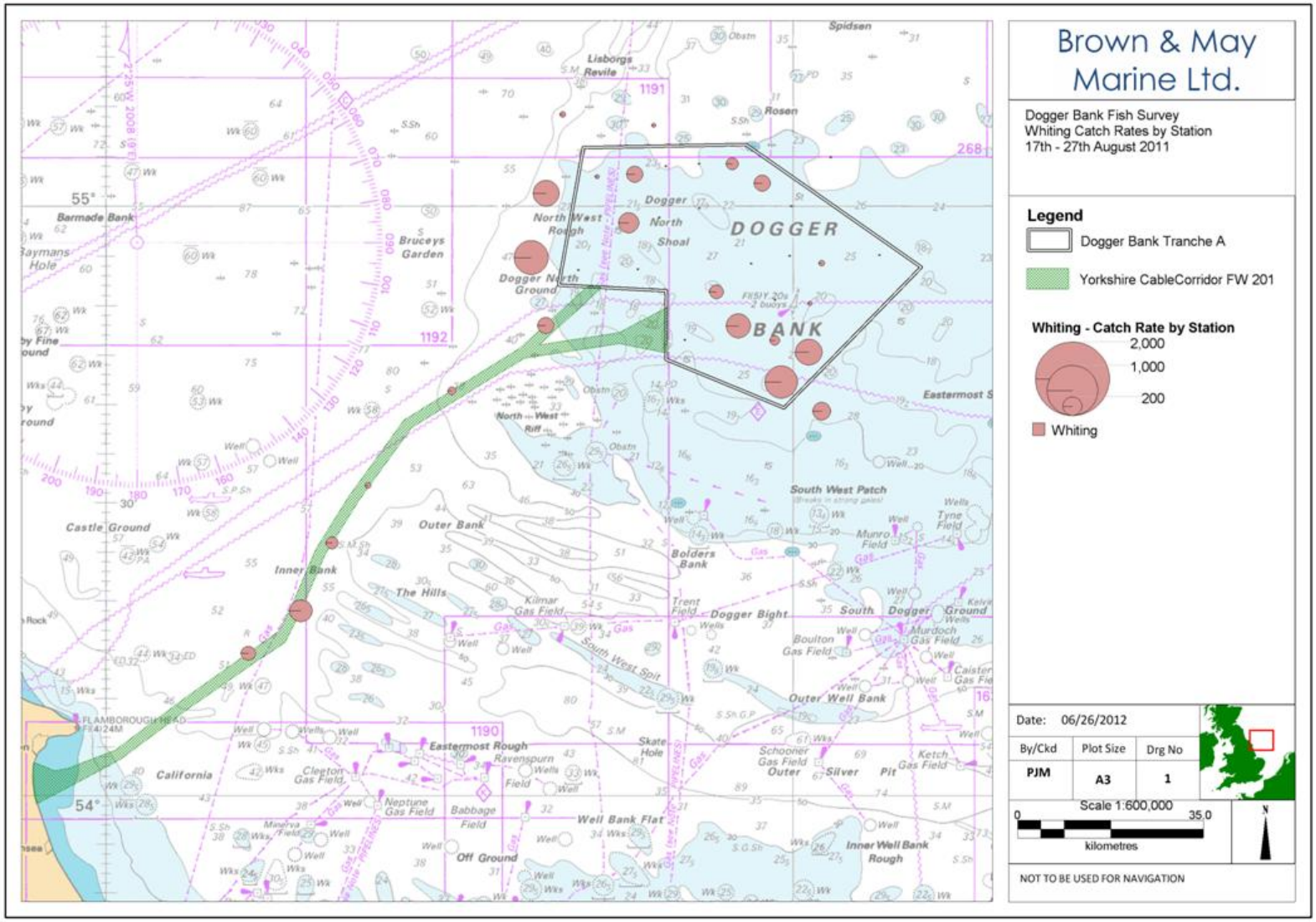


Figure 5.8 Spatial Distribution of Whiting (*M. merlangus*) in the Area of Tranche A

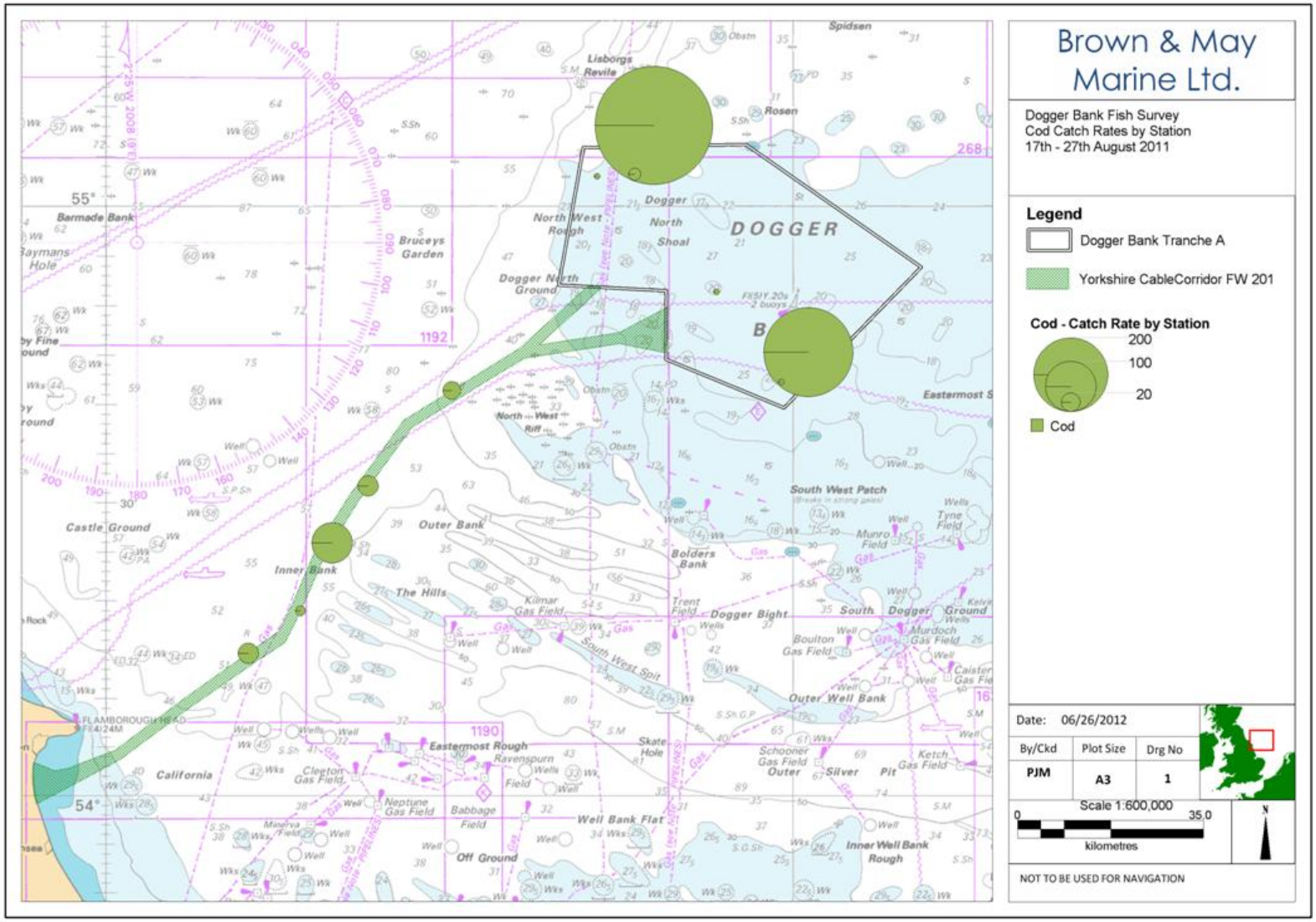


Figure 5.9 Spatial Distribution of Cod (*G. morhua*) in the Area of Tranche A

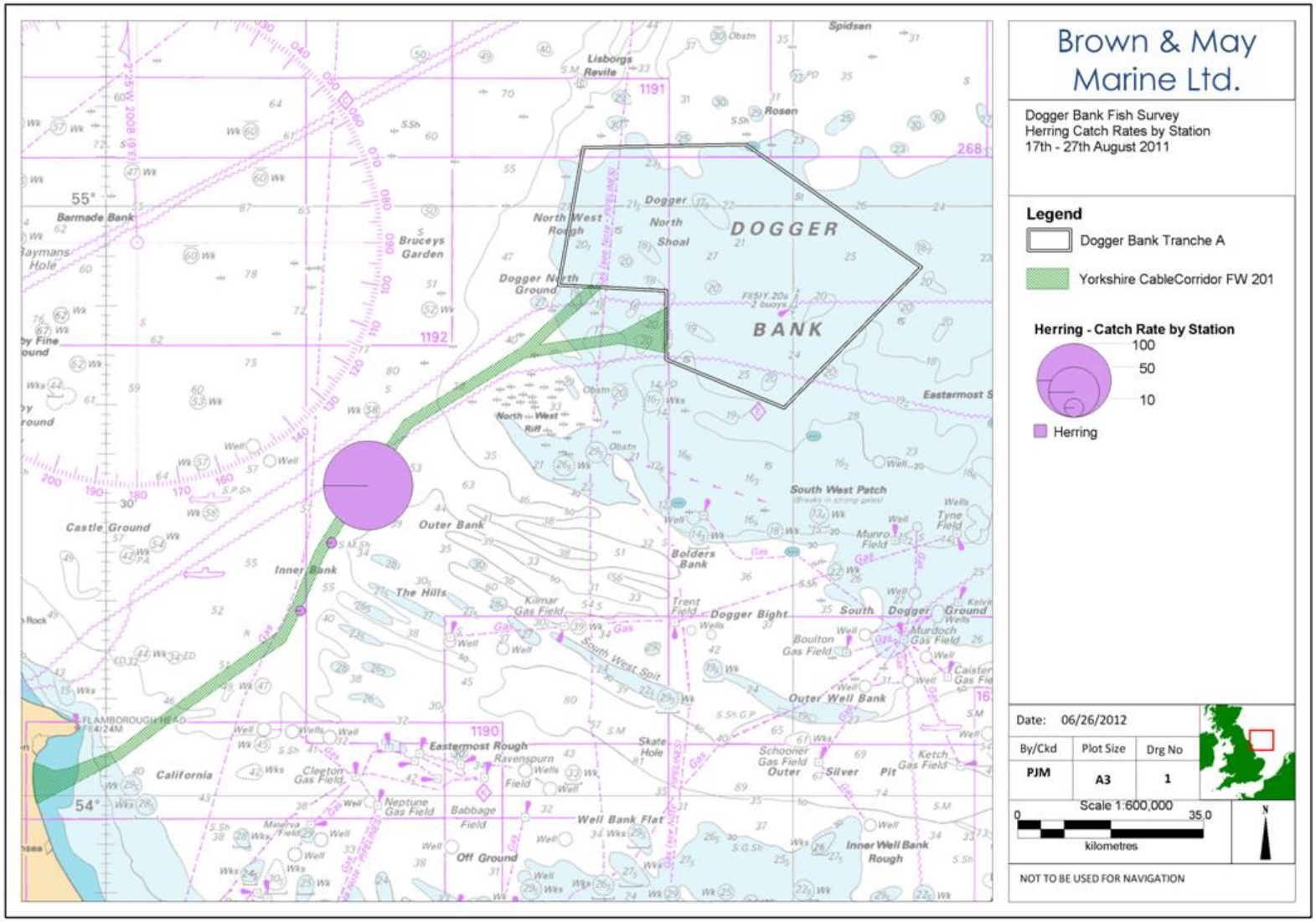


Figure 5.10 Spatial Distribution of Herring (*C. harengus*) in the Area of Tranche A

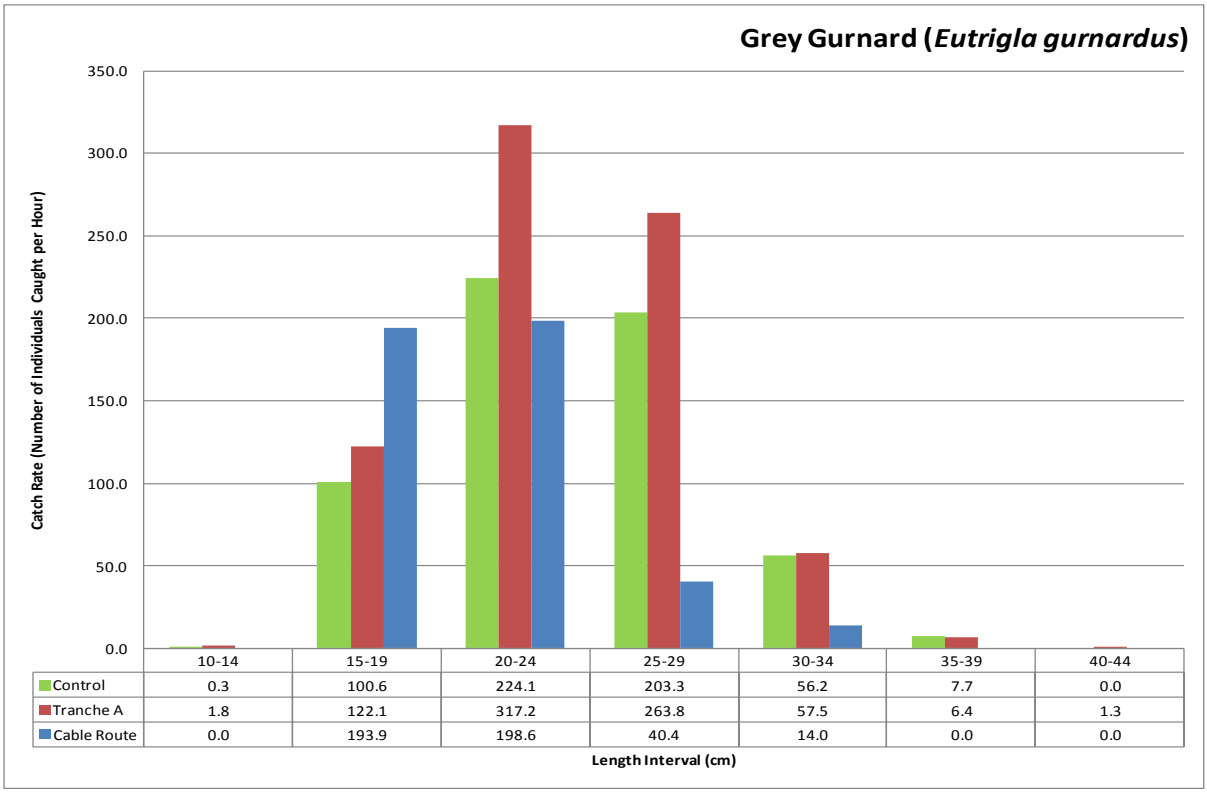
5.2 Length Distributions

The average length (cm) and length range of species caught, by sampling area (control, Tranche A and cable route stations), are given below in Table 5.2.

The length distributions of the most abundant species (>1,000 individuals) caught during the survey, expressed as the catch rate (number of individuals caught per hour) by length (cm) and by sampling area, are shown in Figure 5.11 to Figure 5.15 overleaf.

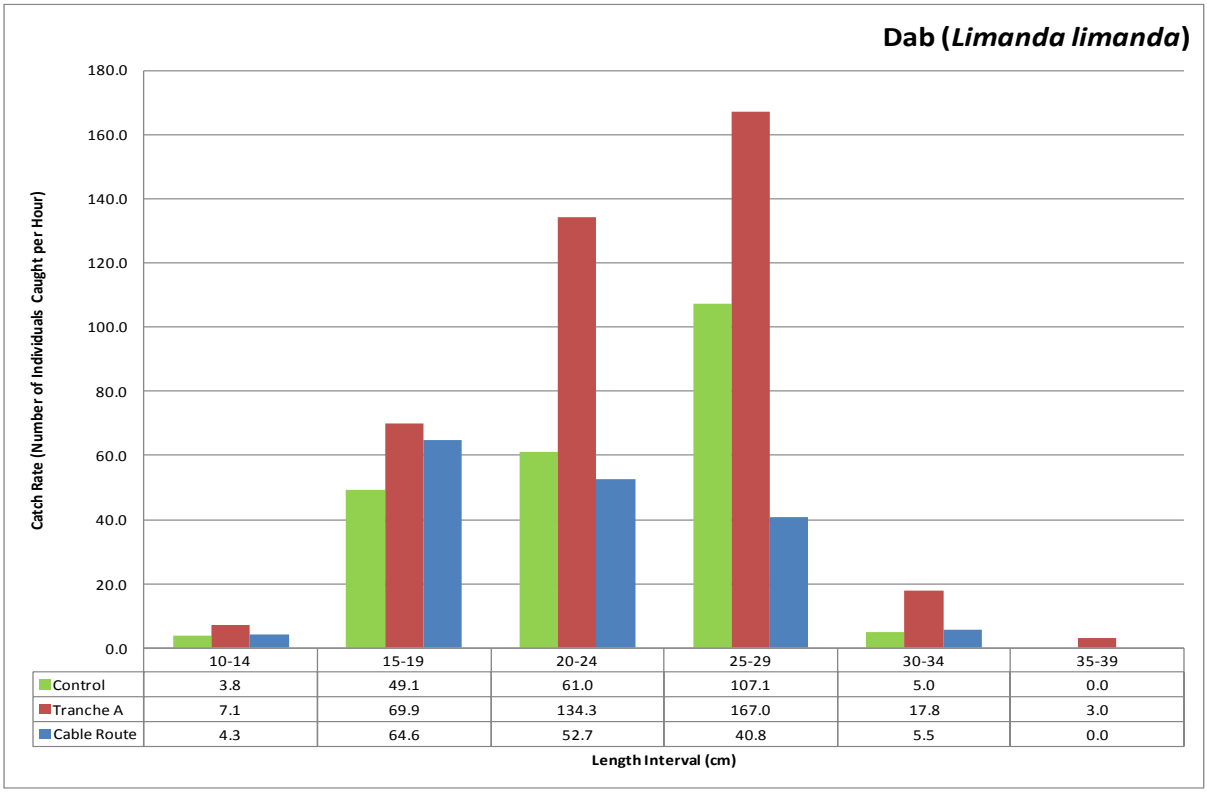
Table 5.2 Average Length and Length Ranges of Species Caught by Sampling Area

Species		Average Length (cm)			Length Range (cm)	
Common Name	Scientific Name	Control	Tranche A	Cable	Min.	Max.
Anglerfish	*Lophius piscatorius*	60.0	54.0	42.5	31	61
Blonde Ray	*Raja brachyura*	-	-	49.2	40	58
Brill	*Scophthalmus rhombus*	33.5	-	-	30	37
Bullrout	*Myoxocephalus scorpius*	19.7	18.9	21.2	14	27
Cod	*Gadus morhua*	40.4	32.9	39.5	23	60
Common Dragonet	*Callionymus lyra*	20.0	18.6	18.0	15	24
Cuckoo Ray	*Raja naevus*	-	-	42.0	42	42
Dab	*Limanda limanda*	23.4	23.7	21.3	10	38
Greater Sandeel	*Hyperoplus lanceolatus*	-	14.0	-	14	14
Grey Gurnard	*Eutrigla gurnardus*	24.0	23.8	20.5	14	40
Haddock	*Melanogrammus aeglefinus*	30.0	-	32.9	25	42
Hake	*Merluccius merluccius*	41.1	52.5	43.6	25	61
Herring	*Clupea harengus*	-	-	19.1	17.5	21.0
Horse Mackerel	*Trachurus trachurus*	22.0	25.4	37.0	22	37
John Dory	*Zeus faber*	-	24.0	-	24	24
Lemon Sole	*Microstomus kitt*	25.2	24.9	27.4	15	38
Lesser Spotted Dogfish	*Scyliorhinus canicula*	59.0	63.2	-	55	71
Ling	*Molva molva*	50.0	-	-	50	50
Long Rough Dab	*Hippoglossoides platessoides*	-	-	20.3	18	22
Long-Spined Sea Scorpion	*Taurulus bubalis*	-	14.0	-	14	14
Mackerel	*Scomber scombrus*	25.1	25.5	26.8	21	39
Plaice	*Pleuronectes platessa*	31.2	30.8	26.7	15	48
Poor Cod	*Trisopterus minutus*	21.0	-	16.4	14	21
Red Gurnard	*Aspitrigla cuculus*	24.0	22.5	-	20	28
Red Mullet	*Mullus surmuletus*	30.0	25.4	24.0	22	30
Scaldfish	*Arnoglossus laterna*	-	10.0	-	10	10
Sprat	*Sprattus sprattus*	14.0	-	13.3	13.0	15.0
Spurdog	*Squalus acanthias*	103.0	-	-	103	103
Starry Ray	*Amblyraja radiata*	-	-	42.0	42	42
Thornback Ray	*Raja clavata*	-	46.5	-	42	51
Tub Gurnard	*Trigla lucerna*	-	31.5	-	30	33
Turbot	*Psetta maxima*	41.0	41.7	-	34	49
Whiting	*Merlangius merlangus*	24.4	24.1	25.5	16	39
Witch	*Glyptocephalus cynoglossus*	-	-	29.0	29	29



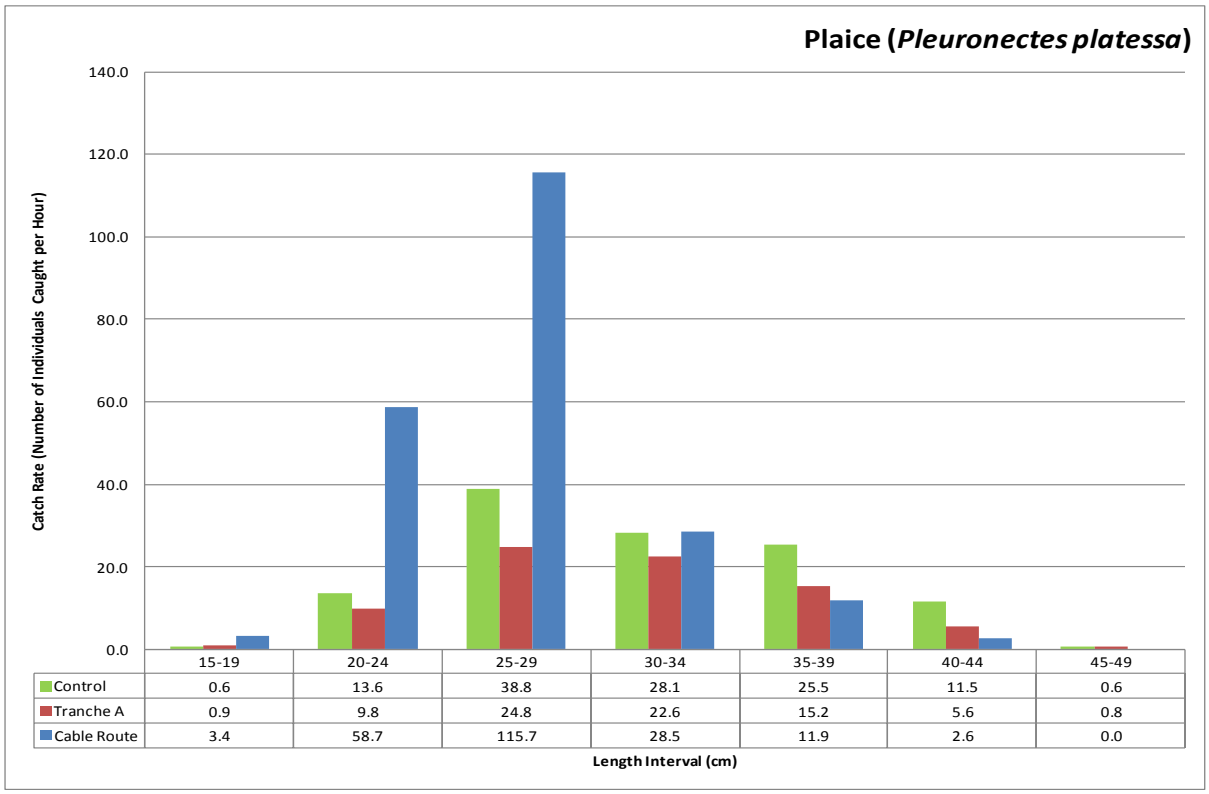
	10-14	15-19	20-24	25-29	30-34	35-39	40-44
Control	0.3	100.6	224.1	203.3	56.2	7.7	0.0
Tranche A	1.8	122.1	317.2	263.8	57.5	6.4	1.3
Cable Route	0.0	193.9	198.6	40.4	14.0	0.0	0.0

Figure 5.11 Grey Gurnard (*E. gurnardus*) Length Distribution by Sampling Area



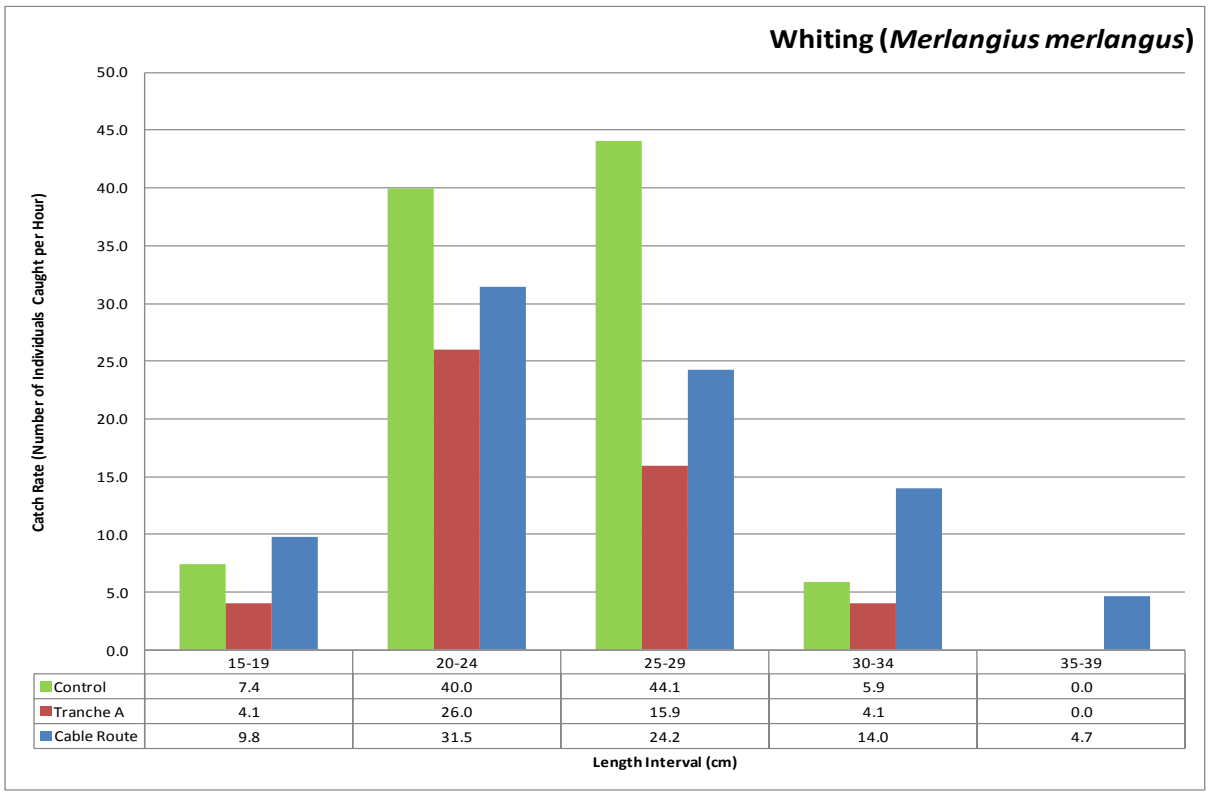
	10-14	15-19	20-24	25-29	30-34	35-39
Control	3.8	49.1	61.0	107.1	5.0	0.0
Tranche A	7.1	69.9	134.3	167.0	17.8	3.0
Cable Route	4.3	64.6	52.7	40.8	5.5	0.0

Figure 5.12 Dab (*L. limanda*) Length Distribution by Sampling Area



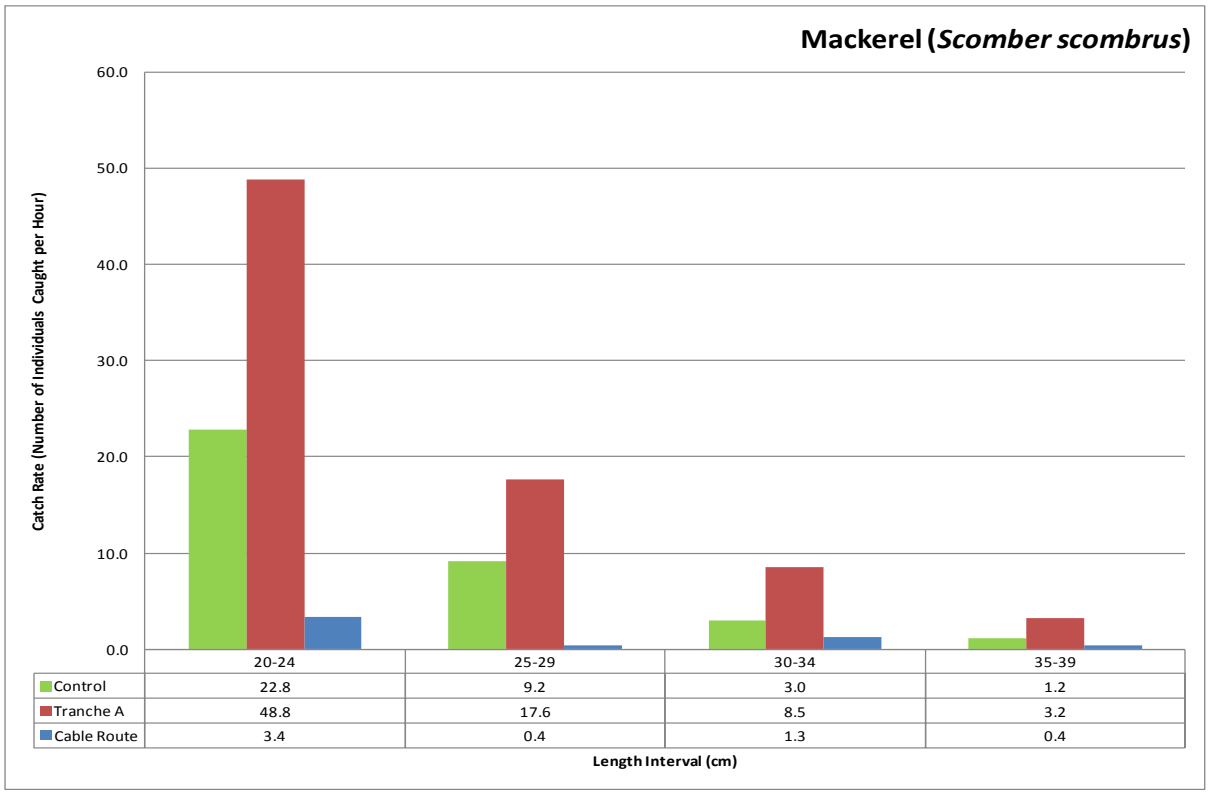
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Control	0.6	13.6	38.8	28.1	25.5	11.5	0.6
Tranche A	0.9	9.8	24.8	22.6	15.2	5.6	0.8
Cable Route	3.4	58.7	115.7	28.5	11.9	2.6	0.0

Figure 5.13 Plaice (*P. platessa*) Length Distribution by Sampling Area



	15-19	20-24	25-29	30-34	35-39
Control	7.4	40.0	44.1	5.9	0.0
Tranche A	4.1	26.0	15.9	4.1	0.0
Cable Route	9.8	31.5	24.2	14.0	4.7

Figure 5.14 Whiting (*M. merlangus*) Length Distribution by Sampling Area



	20-24	25-29	30-34	35-39
Control	22.8	9.2	3.0	1.2
Tranche A	48.8	17.6	8.5	3.2
Cable Route	3.4	0.4	1.3	0.4

Figure 5.15 Mackerel (*S. scombrus*) Length Distribution by Sampling Area

5.3 Minimum Landing Sizes

Minimum landing sizes (MLS) for fish and shellfish species are set by the EC under Regulation No. 850/98 (Annex XII).

Table 5.3 shows the nine species of fish caught for which a MLS has been set, and denotes their presence or absence by sampling area (control, Tranche A and cable route).

Table 5.3 MLS Set by EC

Species		EC MLS (cm)	Presence		
Common Name	Scientific Name		Control	Tranche A	Cable
Cod	*Gadus morhua*	35	✓	✓	✓
Haddock	*Melanogrammus aeglefinus*	30	✓		✓
Hake	*Merluccius merluccius*	27	✓	✓	✓
Herring	*Clupea harengus*	20			✓
Horse Mackerel	*Trachurus trachurus*	15	✓	✓	✓
Ling	*Molva molva*	63	✓		
Mackerel	*Scomber scombrus*	30	✓	✓	✓
Plaice	*Pleuronectes platessa*	27	✓	✓	✓
Whiting	*Merlangius merlangus*	27	✓	✓	✓

The percentage of individuals caught above and below their set MLS by species is shown in Figure 5.16 (Tranche A), Figure 5.17 (control) and Figure 5.18 (cable route).

Most of the *P. platessa* caught within Tranche A (73.7%) and at the control stations (71.1%) were above the MLS, whereas along the cable route the majority were below the MLS (55.3%).

The majority of the *G. morhua* caught within Tranche A were below the MLS (74.5%), whereas at the control stations (85.7%) and along the cable route (64.3%) most were above the MLS.

Greater numbers of *M. merlangus* caught at all locations (Tranche A 71.1%, control 66.3%, cable route 59.1%), and of *S. scombrus* caught in Tranche A (85.0%) and at control stations (88.5%) were below the MLS.

Most of the *M. aeglefinus* caught along the cable route (79.2%) were above the MLS. The majority of the *C. harengus* caught along the cable route were below the MLS (89.1%).

All other species were caught in relatively low numbers.

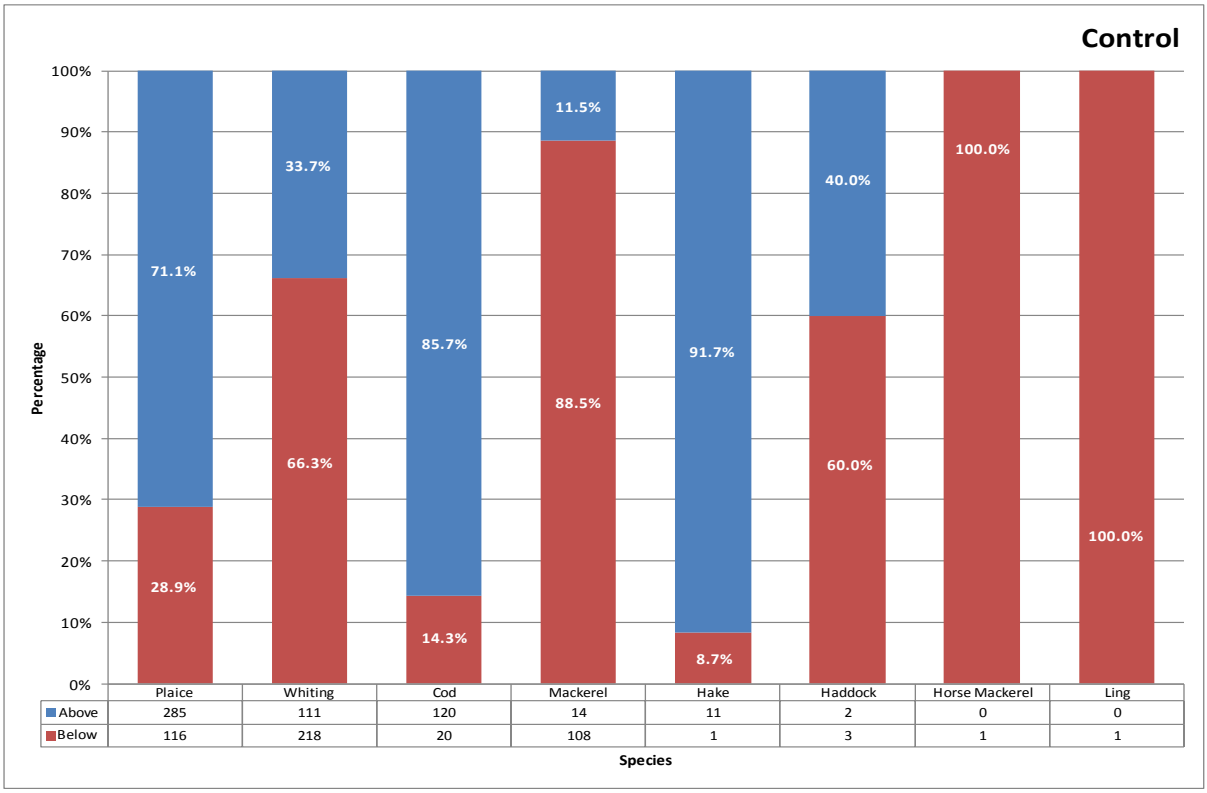


Figure 5.16 Percentage of the Catch Above and Below the MLS by Species at Control Stations

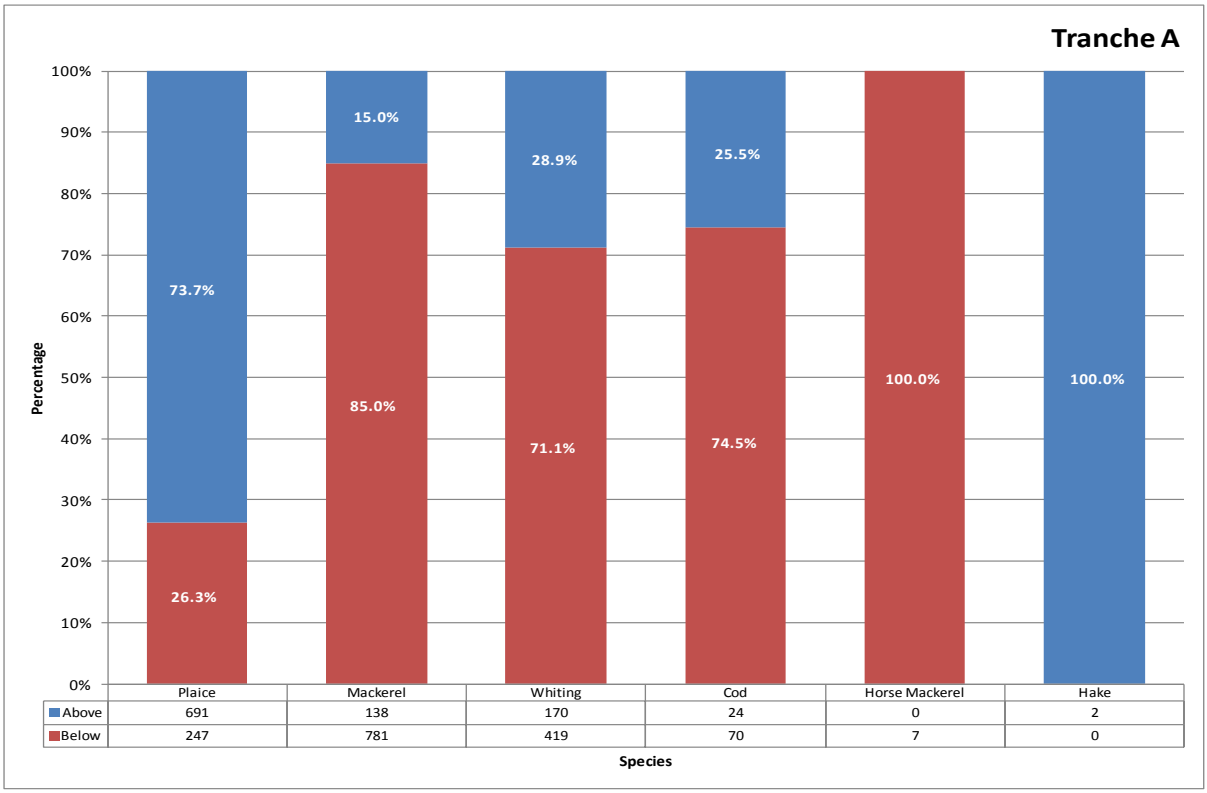


Figure 5.17 Percentage of the Catch Above and Below the MLS by Species within Tranche A

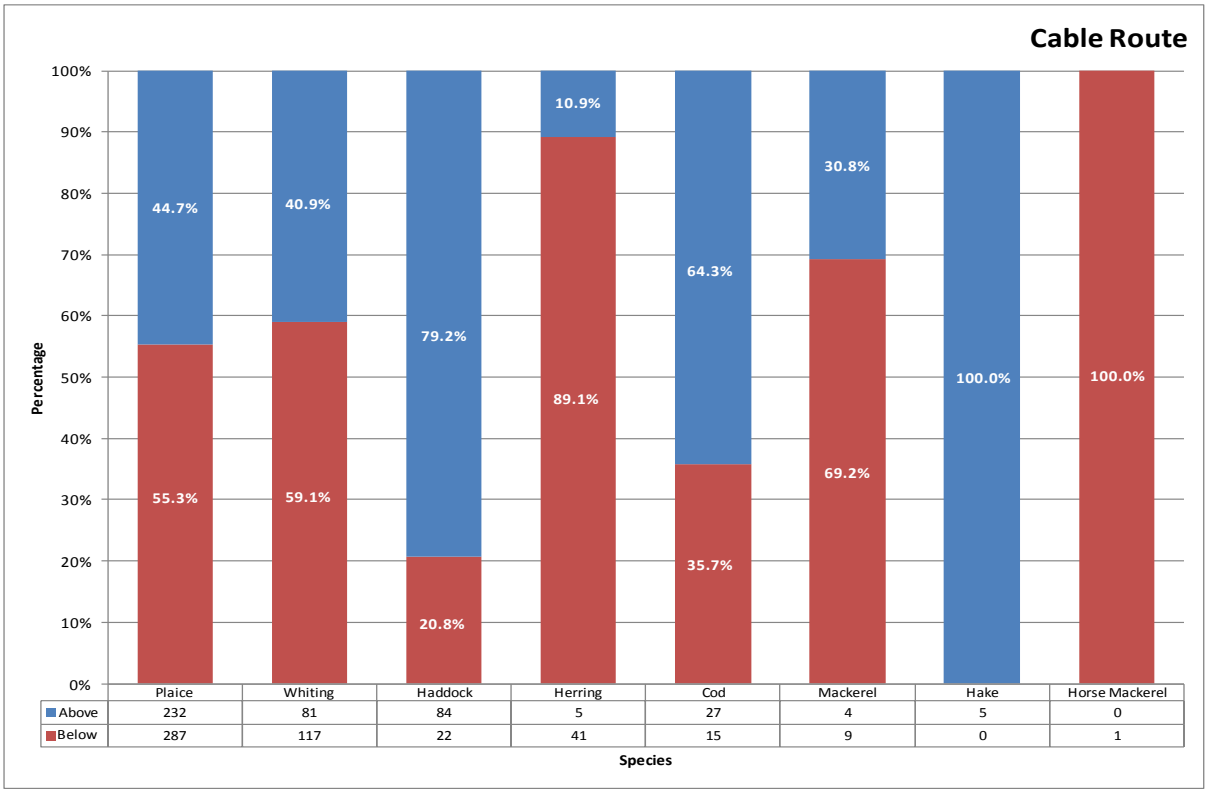


Figure 5.18 Percentage of the Catch Above and Below the MLS by Species at Cable Route Stations

5.4 Sex Ratios

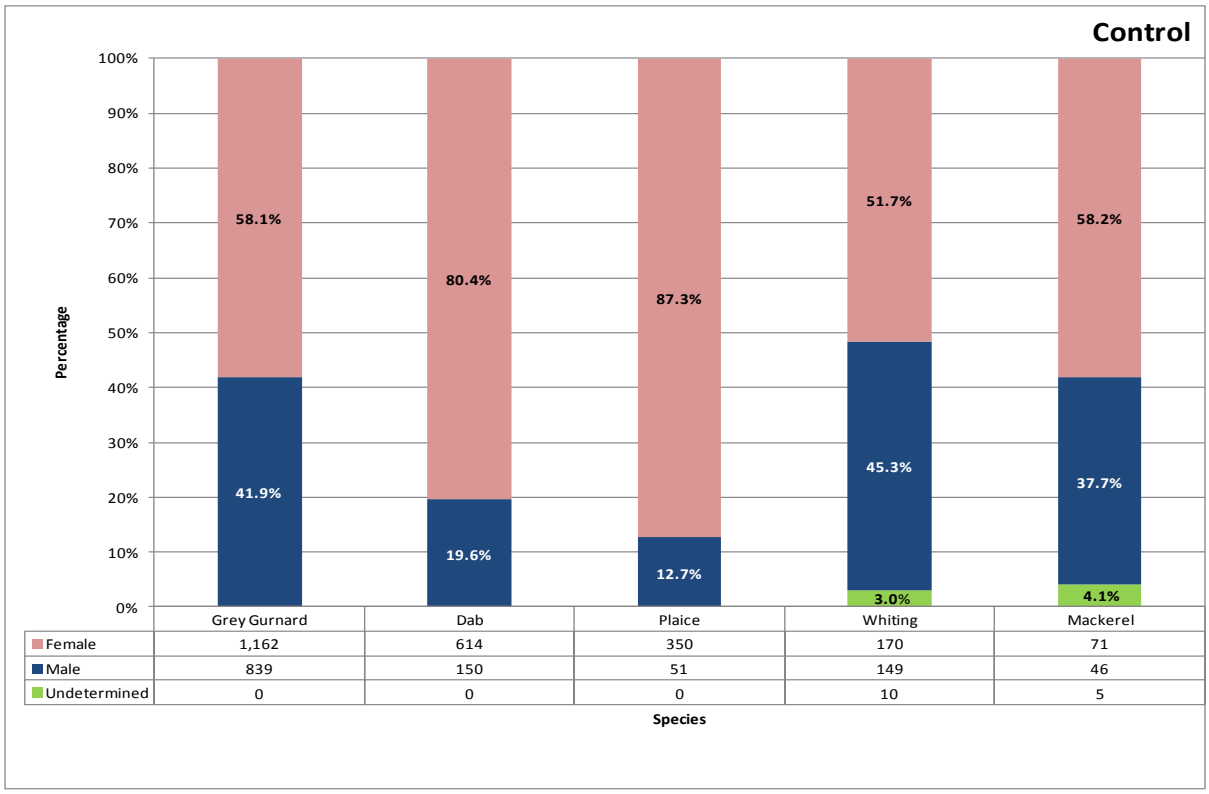
The sex ratios of the five most abundant species (>1,000) caught during the survey are shown in Figure 5.19 (Tranche A), Figure 5.20 (control stations) and Figure 5.21 (cable route). It should be noted that Cefas were unable to confidently determine the sex of a number of immature fish, and as such they have been categorised as 'unsexed'.

Overall, females were caught in greater numbers than males at both the control stations (65.4%) and within Tranche A (74.6%), whereas along the cable route, a greater proportion of the catch was male (54.0%).

The majority of the *E. gurnardus* (control 58.1% and Tranche A 70.1%), *P. platessa* (87.3% and 85.9%), *M. merlangus* (51.7% and 63.8%) and *S. scombrus* (58.2% and 58.9%) caught at the control stations and within Tranche A were female. The majority of the *L. limanda* caught at all locations (control 80.4%, Tranche A 85.4% and cable route 68.4%) were female.

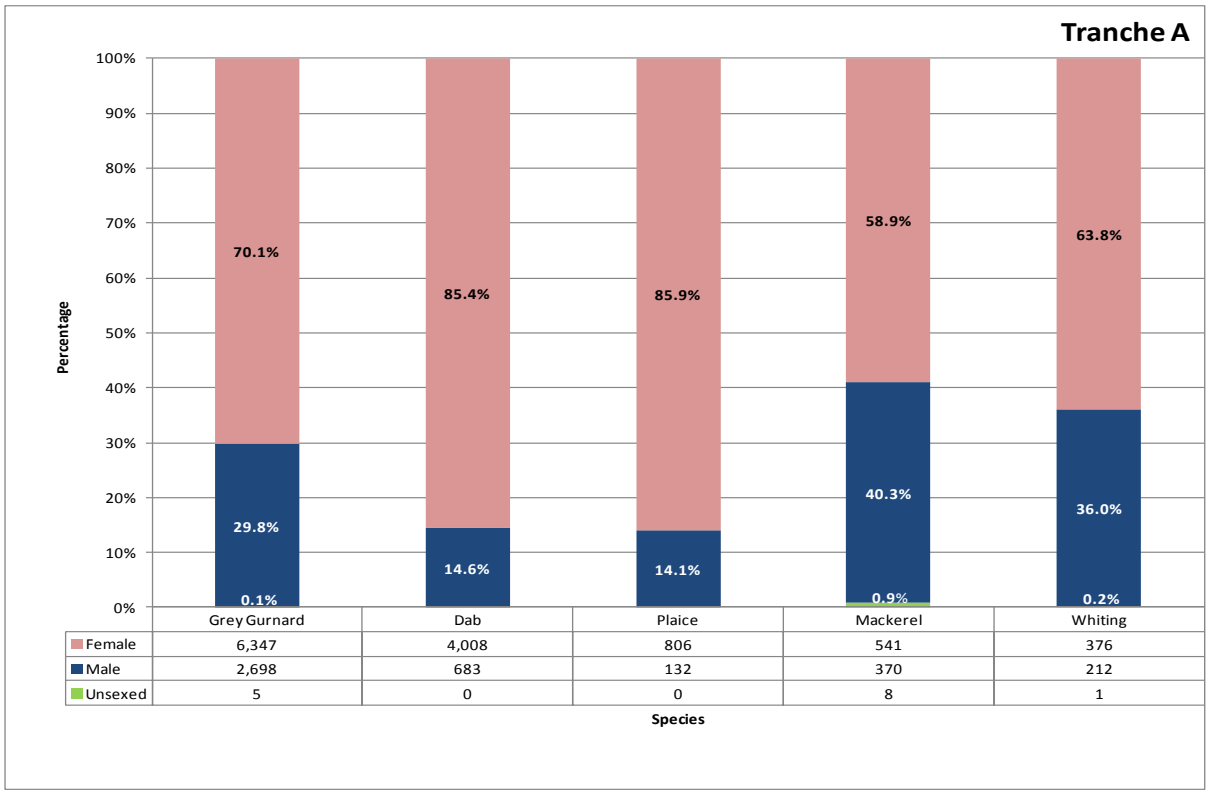
Most of the *E. gurnardus* (63.6%), *M. merlangus* (55.6%) and *S. scombrus* (53.8%) caught at stations along the cable route were male.

The sex ratio of the *P. platessa* caught along the cable route was approximately 50:50.



	Grey Gurnard	Dab	Plaice	Whiting	Mackerel
Female	1,162	614	350	170	71
Male	839	150	51	149	46
Undetermined	0	0	0	10	5

Figure 5.19 Sex Ratio by Species at Control Stations



	Grey Gurnard	Dab	Plaice	Mackerel	Whiting
Female	6,347	4,008	806	541	376
Male	2,698	683	132	370	212
Unsexed	5	0	0	8	1

Figure 5.20 Sex Ratio by Species within Tranche A

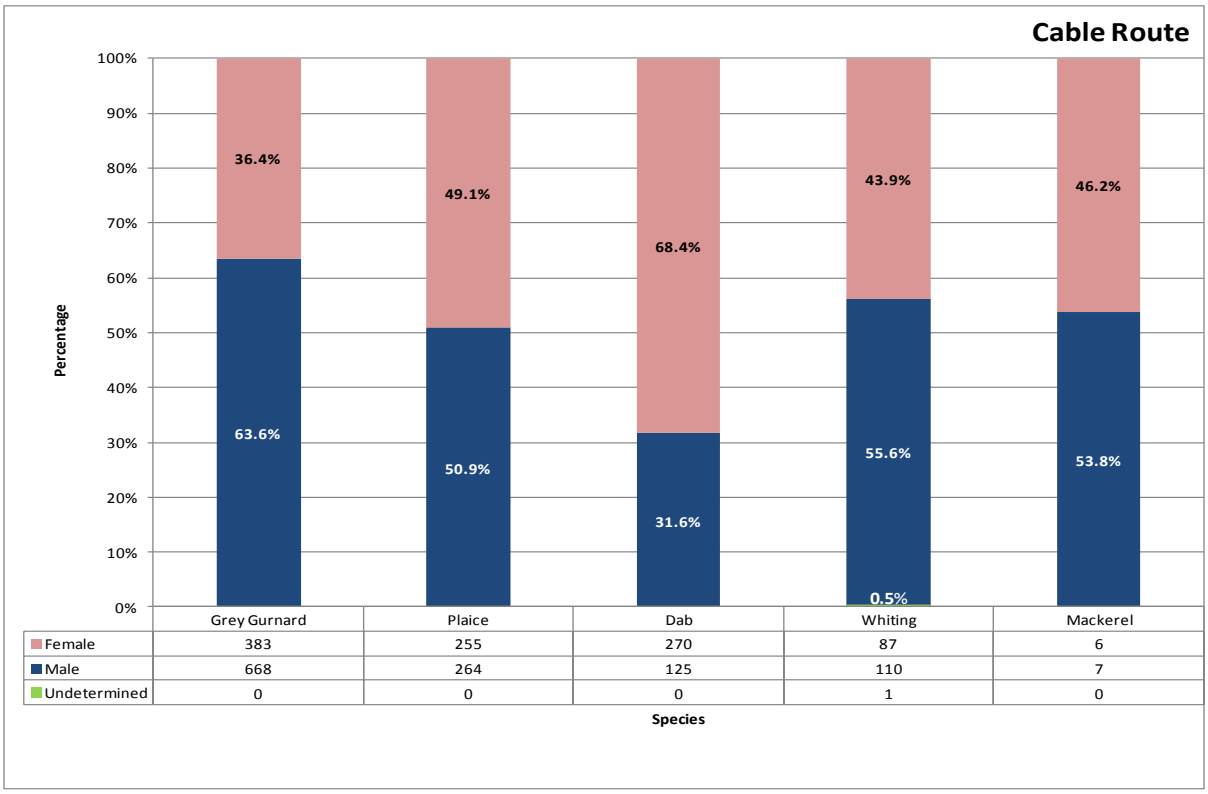


Figure 5.21 Sex Ratio by Species at Cable Route Stations

5.5 Spawning Condition

The spawning condition, sex and length range (nearest cm below) of the most abundant species caught during the survey (>1,000) are given in Table 5.4 to Table 5.10. Where a stage of maturity was not recorded for a species it has not been included in the following tables. It should be noted that Cefas were unable to confidently determine the sex of a number of immature fish, and as such they have been categorised as 'unsexed'.

Most of the *E. gurnardus* (control 44.4% and Tranche A 43.0%), *P. platessa* (70.1% and 71.7%), *M. merlangus* (49.5% and 58.9%) and *S. scombrus* (44.3% and 46.0%) caught at control stations and within Tranche A were maturing females. Along the cable route however, the majority of the *E. gurnardus* (62.4%), *P. platessa* (50.9%) and *M. merlangus* (49.5%) caught were maturing males.

The majority of the *L. limanda* caught at the control stations (53.1%), within Tranche A (51.6%) and along the cable route (39.0%) were spent females.

Spent *P. platessa* were caught at control stations, within Tranche A and along the cable route, representing 13.9% of the total catch for this species.

The majority of the *G. morhua* found at control stations (71.4%) and within Tranche A (92.6%), and the greatest proportion of those caught along the cable route (57.1%) were immature individuals. Immature males were slightly more prevalent at control stations (60.0%) and along the cable route (62.5%). One spent female was recorded along the cable route at station OT51.

C. harengus were found only along the cable route; most of which were 'virgin' (93.5%), with a sex ratio of approximately 50:50.

Table 5.4 Grey Gurnard (*E. gurnardus*) Spawning Condition

Grey Gurnard								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	5	152	32	189	1.6%	14	22
	Maturing	889	3,892	320	5,101	42.2%	15	39
	Hyaline	147	936	24	1,107	9.1%	15	39
	Running	0	10	0	10	0.1%	23	23
	Spent	121	1,357	7	1,485	12.3%	16	40
Male	Immature	0	6	5	11	0.1%	14	17
	Maturing	654	1,890	656	3,200	26.4%	15	33
	Spent	185	802	7	994	8.2%	14	32
Unsexed	Immature	0	5	0	5	0.0%	17	17

Table 5.5 Dab (*L. limanda*) Spawning Condition

Dab								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	11	112	6	129	2.2%	10	2O
	Maturing	197	1,477	110	1,784	30.5%	12	35
	Spent	406	2,419	154	2,979	50.9%	14	38
Male	Immature	8	29	7	44	0.8%	11	20
	Maturing	142	647	118	907	15.5%	13	28
	Spent	0	7	0	7	0.1%	18	23

Table 5.6 Plaice (*P. platessa*) Spawning Condition

Plaice								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	0	14	6	20	1.1%	17	23
	Maturing	281	673	180	1,134	61.0%	15	48
	Hyaline	0	1	0	1	0.1%	40	40
	Spent	69	118	69	256	13.8%	21	44
Male	Maturing	51	125	264	440	23.7%	18	35
	Running	0	4	0	4	0.2%	30	32
	Spent	0	3	0	3	0.2%	32	34

Table 5.7 Whiting (*M. merlangus*) Spawning Condition

Whiting								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	2	24	10	36	3.3%	17	23
	Maturing	163	347	73	583	52.8%	17	39
	Hyaline	5	2	0	7	0.6%	29	31
	Spent	0	3	4	7	0.6%	23	30
Male	Immature	0	6	12	18	1.6%	16	20
	Maturing	149	206	98	453	41.0%	18	38

Table 5.8 Mackerel (*S. scombrus*) Spawning Condition

Mackerel								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Maturing	54	423	6	483	46.4%	21	39
	Spent	17	118	0	135	13.0%	22	37
Male	Maturing	35	279	7	321	30.8%	22	37
	Spent	12	91	0	103	9.9%	22	36

Table 5.9 Cod (*G. morhua*) Spawning Condition

Cod								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	40	46	9	95	34.4%	28	45
	Maturing	10	6	5	21	7.6%	38	50
	Spent	0	0	1	1	0.4%	48	48
Male	Immature	60	41	15	116	42.0%	23	44
	Maturing	30	1	12	43	15.6%	38	60

Table 5.10 Herring (*C. harengus*) Spawning Condition

Herring								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	1 - Virgin	0	0	22	22	47.8%	17.5	21
Male	1 - Virgin	0	0	21	21	45.7%	17.5	21
	2 - Late Virgin	0	0	3	3	6.5%	18	20

6.0 Beam Trawl Results

6.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) by fish species and by sampling area are given in Table 6.1 below. The catch rate of fish species by station and by sampling area (control, Tranche A, cable route and inshore) are shown in Figure 6.1 and Figure 6.2 respectively.

A total of 15 species of fish were caught, eight of which were found at the control stations, nine within Tranche A, 11 along the cable route and six species at the inshore stations.

Overall, *B. luteum* was the most abundant species caught (1,453 individuals), the majority of which were found in Tranche A (1,123), followed by *A. marinus* (942), *L. limanda* (129) and then *P. minutus* (116).

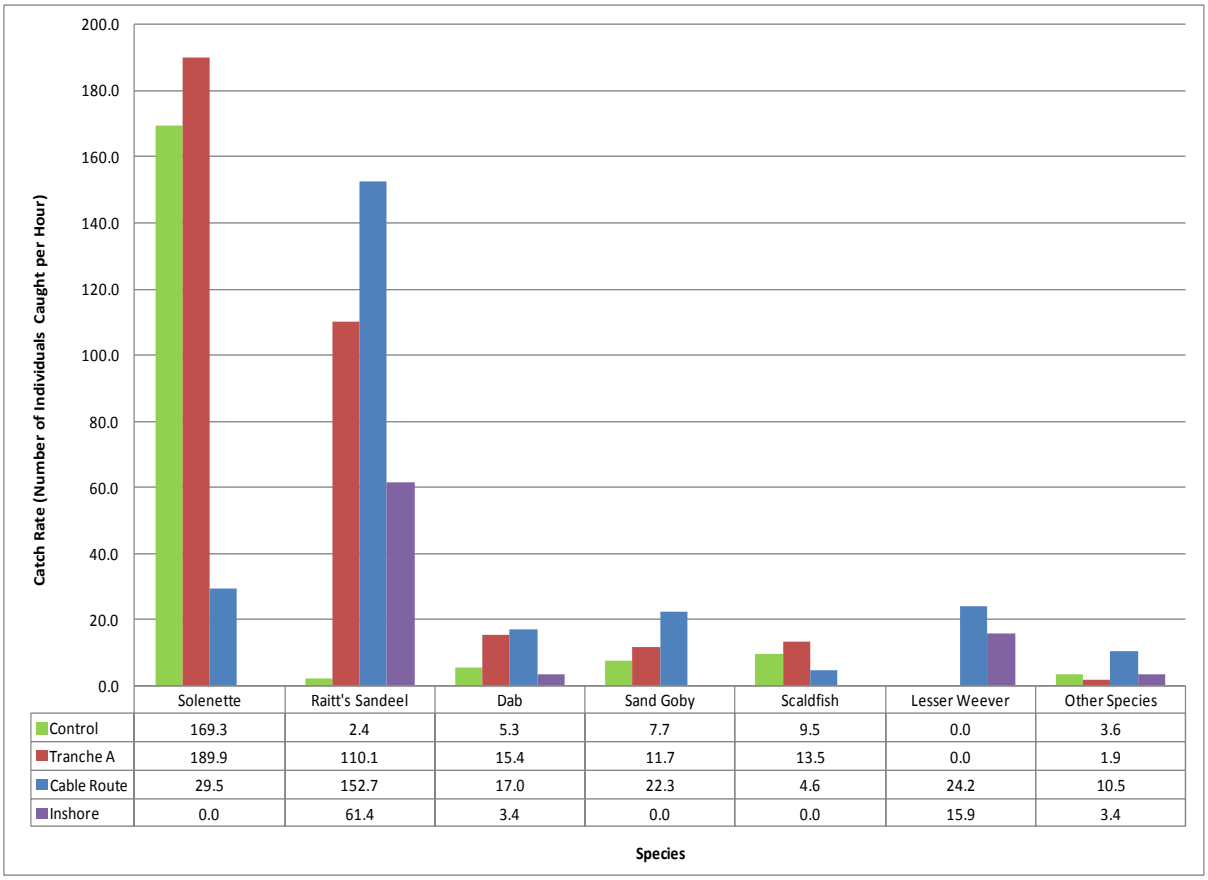
B. luteum was the most prevalent species at the control stations (169.3/hr) and within Tranche A (189.9/hr), whereas *A. marinus* were most abundant along the cable route (152.7/hr) and in the inshore areas (61.4/hr).

P. platessa were found in low numbers along the cable route (BT54, 1 individual, 5.8/hr) and at the inshore stations (BT58, 1 individual, 5.5/hr). One *M. merlangus* was found at station BT59 in the inshore area (5.8/hr).

Overall, catch rates were greater within Tranche A (342.4/hr) than along the cable route (260.8/hr), at the control stations (197.9/hr) and in the inshore areas (84.1/hr).

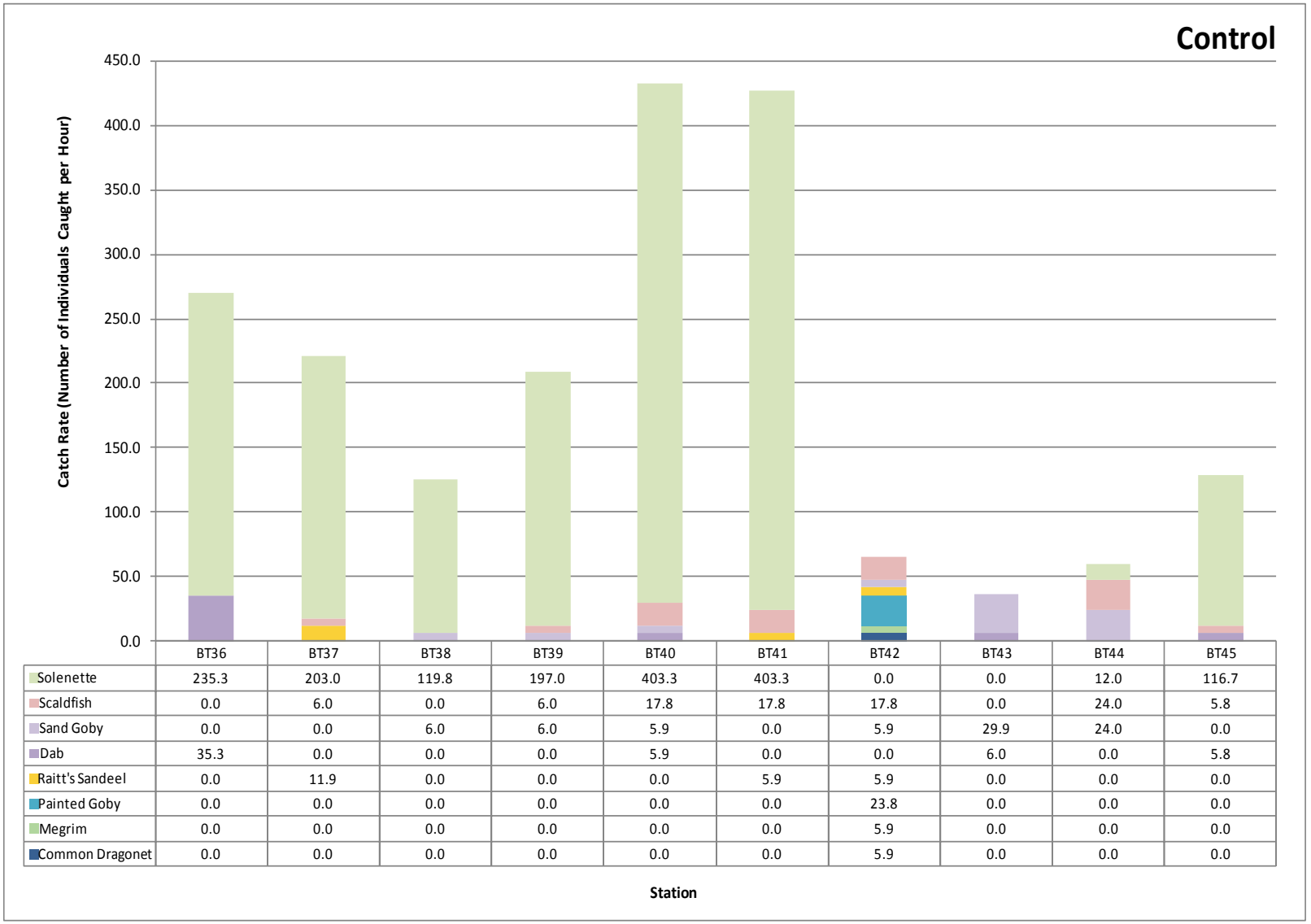
Table 6.1 Number of Individuals Caught and the Catch Rate by Fish Species and Sampling Area

Species		Number of Individuals Caught					Catch Rate (Individuals Caught per Hour)			
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Total	Control	Tranche A	Cable Route	Inshore
Solenette	*Buglossidium luteum*	285	1,123	45	0	1,453	169.3	189.9	29.5	0.0
Raitt's Sandeel	*Ammodytes marinus*	4	651	233	54	942	2.4	110.1	152.7	61.4
Dab	*Limanda limanda*	9	91	26	3	129	5.3	15.4	17.0	3.4
Sand Goby	*Pomatoschistus minutus*	13	69	34	0	116	7.7	11.7	22.3	0.0
Scaldfish	*Arnoglossus laterna*	16	80	7	0	103	9.5	13.5	4.6	0.0
Lesser Weever	*Echiichthys vipera*	0	0	37	14	51	0.0	0.0	24.2	15.9
Greater Sandeel	*Hyperoplus lanceolatus*	0	0	6	1	7	0.0	0.0	3.9	1.1
Painted Goby	*Pomatoschistus pictus*	4	3	0	0	7	2.4	0.5	0.0	0.0
Common Dragonet	*Callionymus lyra*	1	1	4	0	6	0.6	0.2	2.6	0.0
Megrim	*Lepidorhombus whiffiagonis*	1	5	0	0	6	0.6	0.8	0.0	0.0
Juvenile Goby	*Gobiidae sp. juvenile indet*	0	0	4	0	4	0.0	0.0	2.6	0.0
Plaice	*Pleuronectes platessa*	0	0	1	1	2	0.0	0.0	0.7	1.1
Pogge	*Agonus cataphractus*	0	2	0	0	2	0.0	0.3	0.0	0.0
Goldsinny	*Ctenolabrus rupestris*	0	0	1	0	1	0.0	0.0	0.7	0.0
Whiting	*Merlangius merlangus*	0	0	0	1	1	0.0	0.0	0.0	1.1



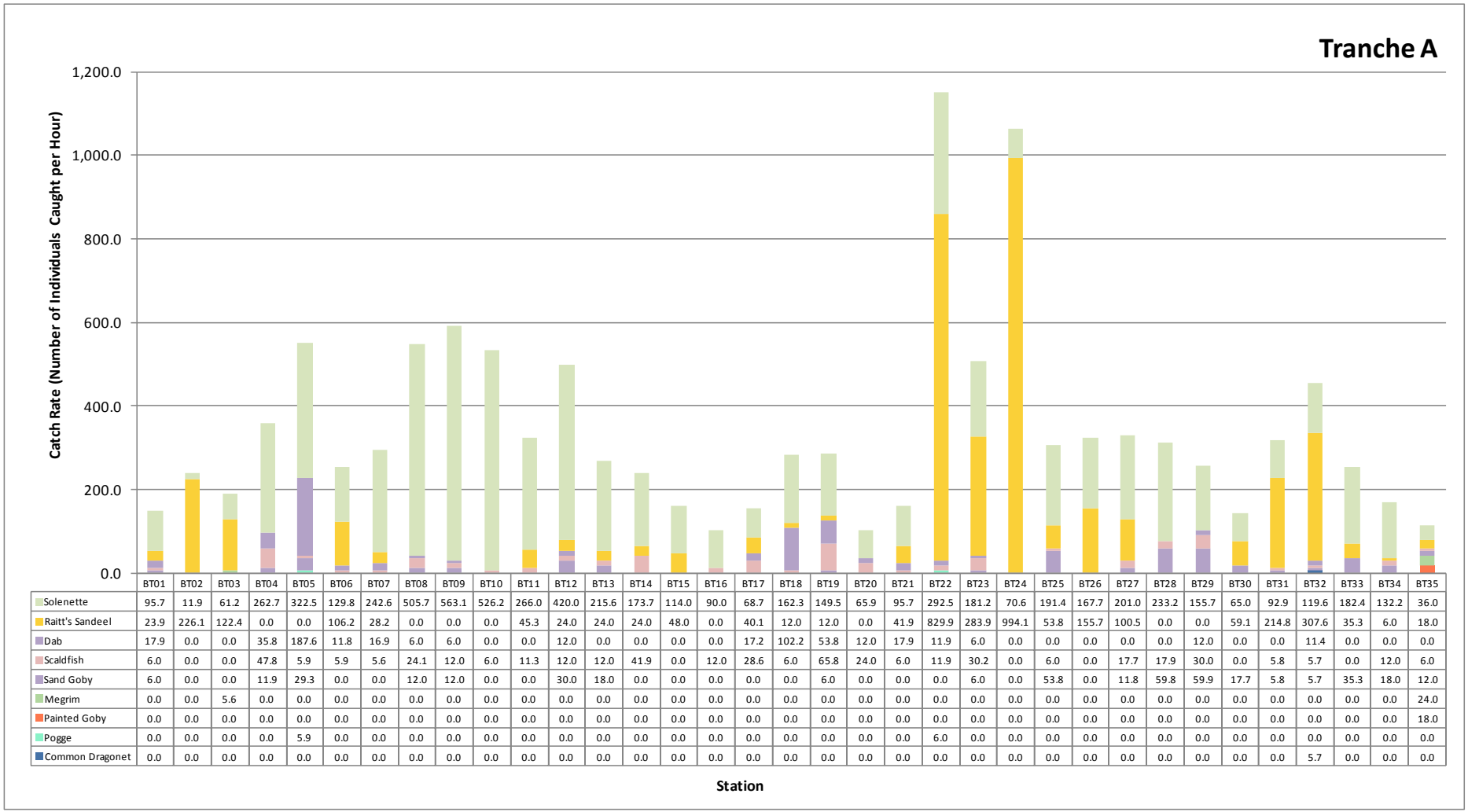
	Solenette	Raitt's Sandeel	Dab	Sand Goby	Scaldfish	Lesser Weever	Other Species
Control	169.3	2.4	5.3	7.7	9.5	0.0	3.6
Tranche A	189.9	110.1	15.4	11.7	13.5	0.0	1.9
Cable Route	29.5	152.7	17.0	22.3	4.6	24.2	10.5
Inshore	0.0	61.4	3.4	0.0	0.0	15.9	3.4

Figure 6.1 Catch Rates by Fish Species and Sampling Area



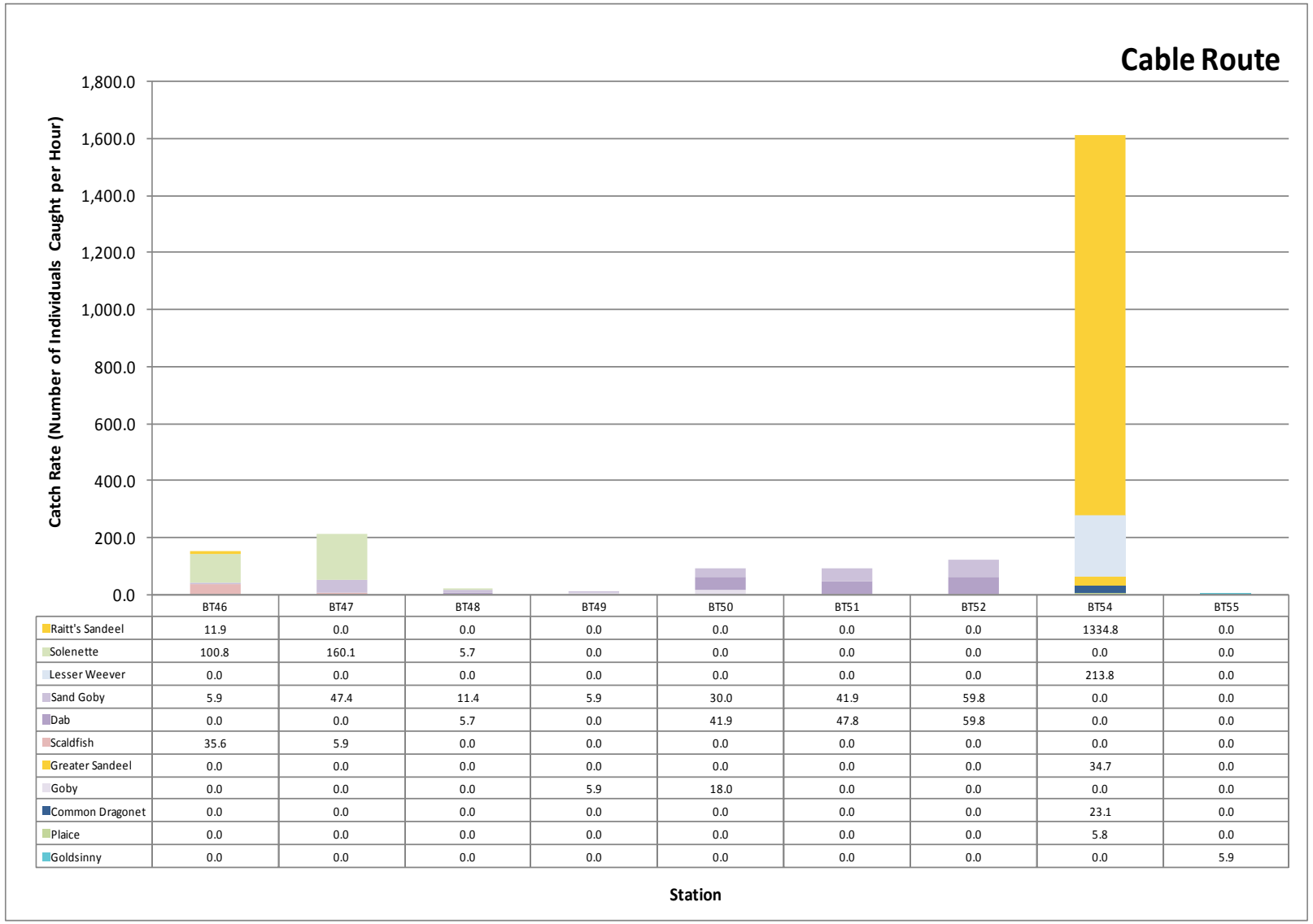
	BT36	BT37	BT38	BT39	BT40	BT41	BT42	BT43	BT44	BT45
Solenette	235.3	203.0	119.8	197.0	403.3	403.3	0.0	0.0	12.0	116.7
Scaldfish	0.0	6.0	0.0	6.0	17.8	17.8	17.8	0.0	24.0	5.8
Sand Goby	0.0	0.0	6.0	6.0	5.9	0.0	5.9	29.9	24.0	0.0
Dab	35.3	0.0	0.0	0.0	5.9	0.0	0.0	6.0	0.0	5.8
Raitt's Sandeel	0.0	11.9	0.0	0.0	0.0	5.9	5.9	0.0	0.0	0.0
Painted Goby	0.0	0.0	0.0	0.0	0.0	0.0	23.8	0.0	0.0	0.0
Megrim	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0

Figure 6.2 Catch Rate by Species and Station at Control Stations



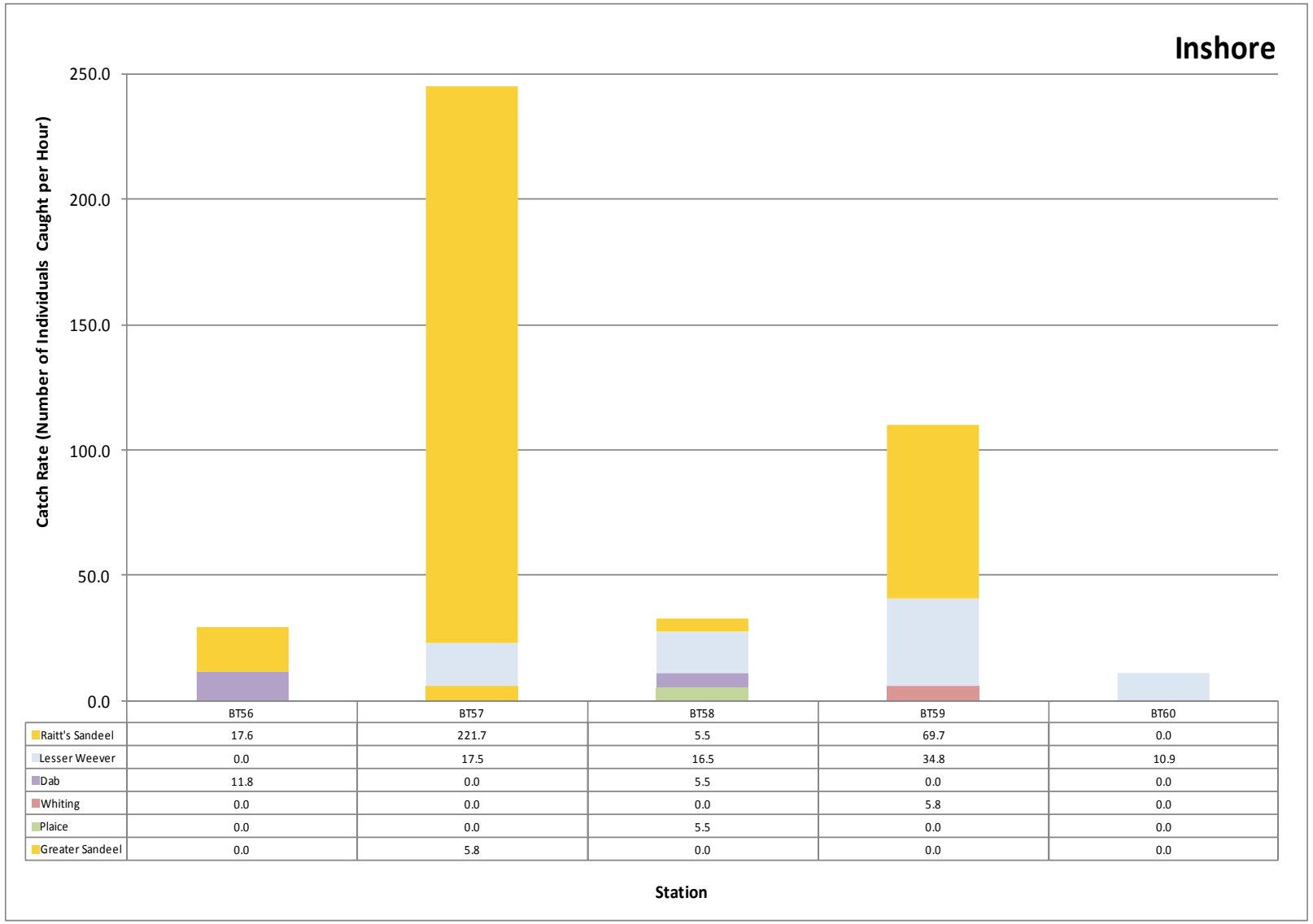
	BT01	BT02	BT03	BT04	BT05	BT06	BT07	BT08	BT09	BT10	BT11	BT12	BT13	BT14	BT15	BT16	BT17	BT18	BT19	BT20	BT21	BT22	BT23	BT24	BT25	BT26	BT27	BT28	BT29	BT30	BT31	BT32	BT33	BT34	BT35
Solenette	95.7	11.9	61.2	262.7	322.5	129.8	242.6	505.7	563.1	526.2	266.0	420.0	215.6	173.7	114.0	90.0	68.7	162.3	149.5	65.9	95.7	292.5	181.2	70.6	191.4	167.7	201.0	233.2	155.7	65.0	92.9	119.6	182.4	132.2	36.0
Raitt's Sandeel	23.9	226.1	122.4	0.0	0.0	106.2	28.2	0.0	0.0	0.0	45.3	24.0	24.0	24.0	48.0	0.0	40.1	12.0	12.0	0.0	41.9	829.9	283.9	994.1	53.8	155.7	100.5	0.0	0.0	59.1	214.8	307.6	35.3	6.0	18.0
Dab	17.9	0.0	0.0	35.8	187.6	11.8	16.9	6.0	6.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	17.2	102.2	53.8	12.0	17.9	11.9	6.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	11.4	0.0	0.0	0.0
Scaldfish	6.0	0.0	0.0	47.8	5.9	5.9	5.6	24.1	12.0	6.0	11.3	12.0	12.0	41.9	0.0	12.0	28.6	6.0	65.8	24.0	6.0	11.9	30.2	0.0	6.0	0.0	17.7	17.9	30.0	0.0	5.8	5.7	0.0	12.0	6.0
Sand Goby	6.0	0.0	0.0	11.9	29.3	0.0	0.0	12.0	12.0	0.0	0.0	30.0	18.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	6.0	0.0	53.8	0.0	11.8	59.8	59.9	17.7	5.8	5.7	35.3	18.0	12.0
Megrim	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
Painted Goby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
Pogge	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0

Figure 6.3 Catch Rate by Species and Station within Tranche A



	BT46	BT47	BT48	BT49	BT50	BT51	BT52	BT54	BT55
Raitt's Sandeel	11.9	0.0	0.0	0.0	0.0	0.0	0.0	1334.8	0.0
Solenette	100.8	160.1	5.7	0.0	0.0	0.0	0.0	0.0	0.0
Lesser Weever	0.0	0.0	0.0	0.0	0.0	0.0	0.0	213.8	0.0
Sand Goby	5.9	47.4	11.4	5.9	30.0	41.9	59.8	0.0	0.0
Dab	0.0	0.0	5.7	0.0	41.9	47.8	59.8	0.0	0.0
Scaldfish	35.6	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Greater Sandeel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.7	0.0
Goby	0.0	0.0	0.0	5.9	18.0	0.0	0.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.1	0.0
Plaice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0
Goldsinny	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9

Figure 6.4 Catch Rate by Species and Station along the Cable Route



	BT56	BT57	BT58	BT59	BT60
Raitt's Sandeel	17.6	221.7	5.5	69.7	0.0
Lesser Weever	0.0	17.5	16.5	34.8	10.9
Dab	11.8	0.0	5.5	0.0	0.0
Whiting	0.0	0.0	0.0	5.8	0.0
Plaice	0.0	0.0	5.5	0.0	0.0
Greater Sandeel	0.0	5.8	0.0	0.0	0.0

Figure 6.5 Catch Rate by Species and Station at Inshore Stations

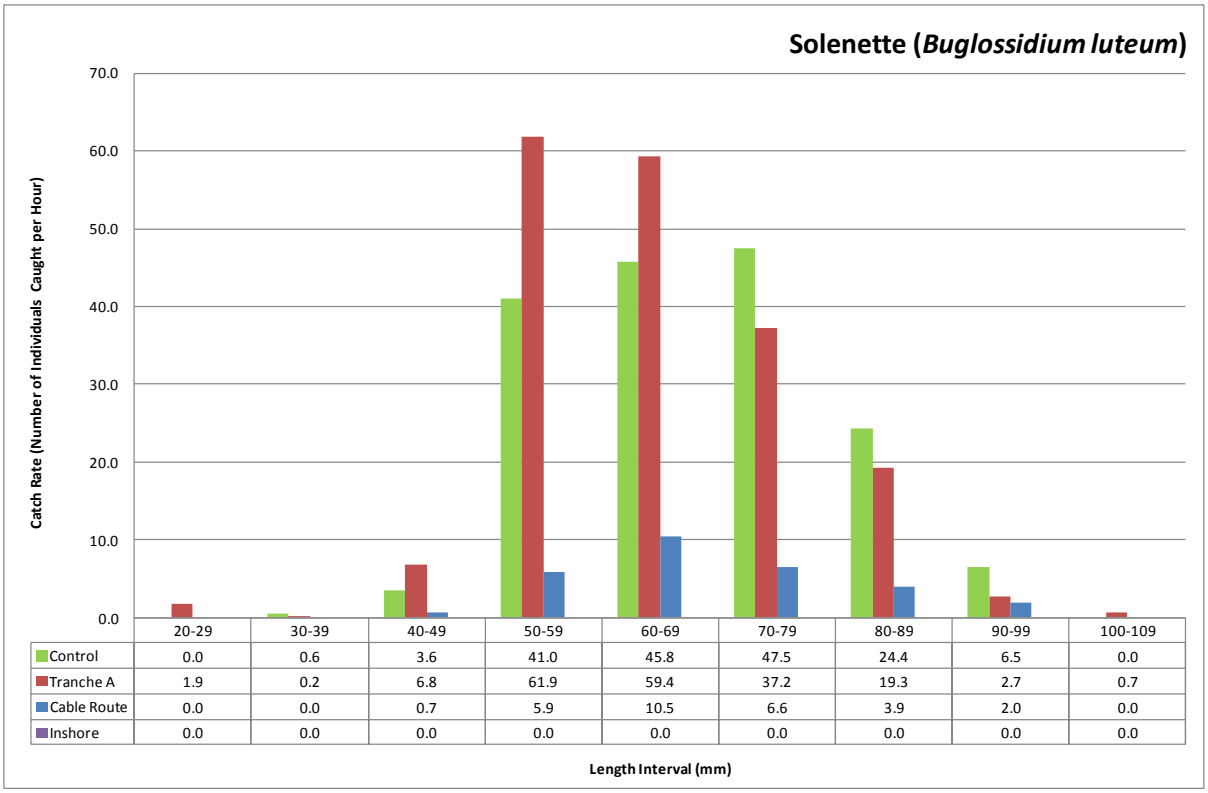
6.2 Length Distributions

The average length (mm) and length range of the fish species caught by sampling area (control, Tranche A, cable route and inshore) given in Table 6.2 below.

The length distributions of the five most abundant species (>100 individuals) caught during the survey, expressed as the catch rate (number of individuals caught per hour) by length (mm) and by sampling area, are shown in Figure 6.7 to Figure 6.10 below.

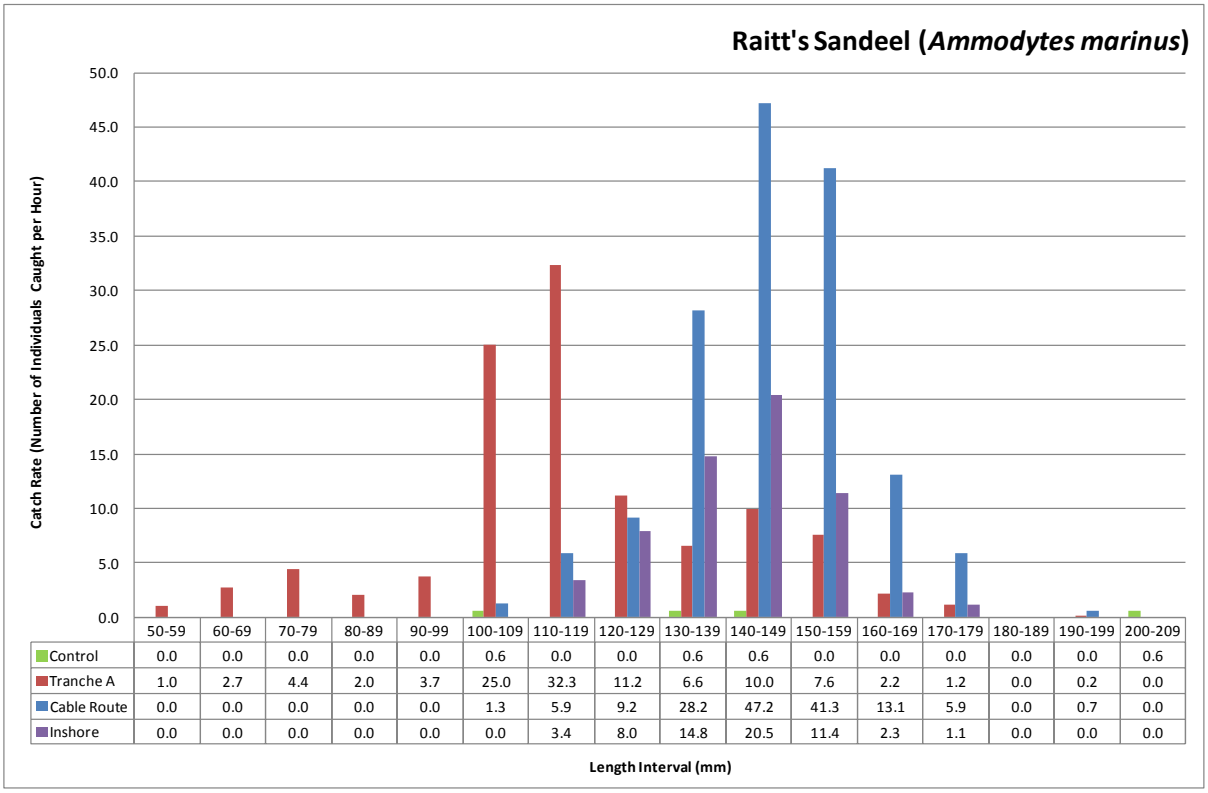
Table 6.2 Average Length and Length Range of Fish Species Caught by Sampling Area

Species		Average Length (mm)				Length Range (mm)	
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Min.	Max.
Solenette	*Buglossidium luteum*	68.0	64.5	66.9	-	20.0	100.0
Raitt's Sandeel	*Ammodytes marinus*	146.3	120.5	140.0	139.5	55.0	205.0
Dab	*Limanda limanda*	91.4	88.5	45.9	150.0	15.0	220.0
Sand Goby	*Pomatoschistus minutus*	30.6	38.5	26.7	-	20.0	55.0
Scaldfish	*Arnoglossus laterna*	83.7	84.7	94.2	-	65.0	110.0
Greater Sandeel	*Hyperoplus lanceolatus*	-	-	205.8	155.0	145.0	245.0
Painted Goby	*Pomatoschistus pictus*	37.5	25.0	-	-	25.0	40.0
Common Dragonet	*Callionymus lyra*	80.0	80.0	90.0	-	80.0	95.0
Megrim	*Lepidorhombus whiffiagonis*	55.0	66.3	-	-	55.0	70.0
Juvenile Goby	*Gobiidae sp. juvenile*	-	-	13.3	-	10.0	15.0
Plaice	*Pleuronectes platessa*	-	-	150.0	150.0	150.0	150.0
Pogge	*Agonus cataphractus*	-	25.0	-	-	20.0	30.0
Goldsinny	*Ctenolabrus rupestris*	-	-	140.0	-	140.0	140.0
Whiting	*Merlangius merlangus*	-	-	-	65.0	65.0	65.0



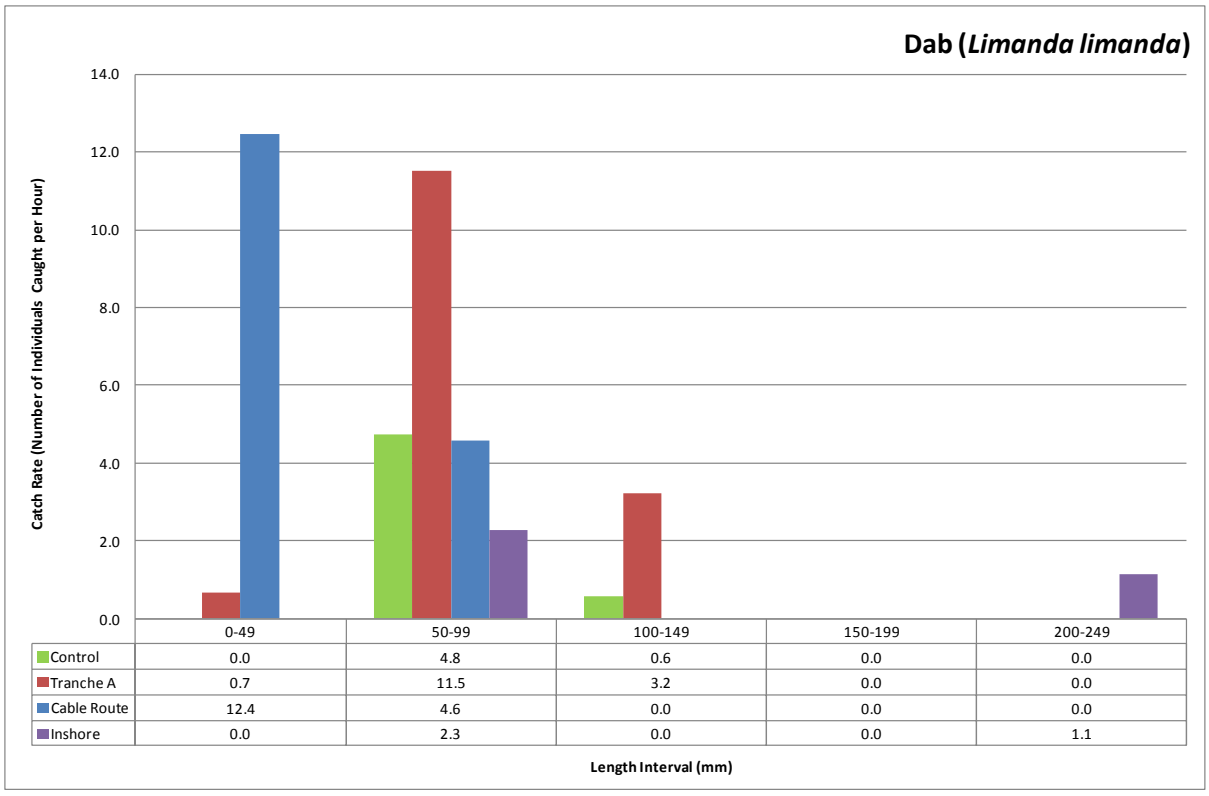
	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109
Control	0.0	0.6	3.6	41.0	45.8	47.5	24.4	6.5	0.0
Tranche A	1.9	0.2	6.8	61.9	59.4	37.2	19.3	2.7	0.7
Cable Route	0.0	0.0	0.7	5.9	10.5	6.6	3.9	2.0	0.0
Inshore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.6 Solenette (*B. luteum*) Length Distribution by Sampling Area



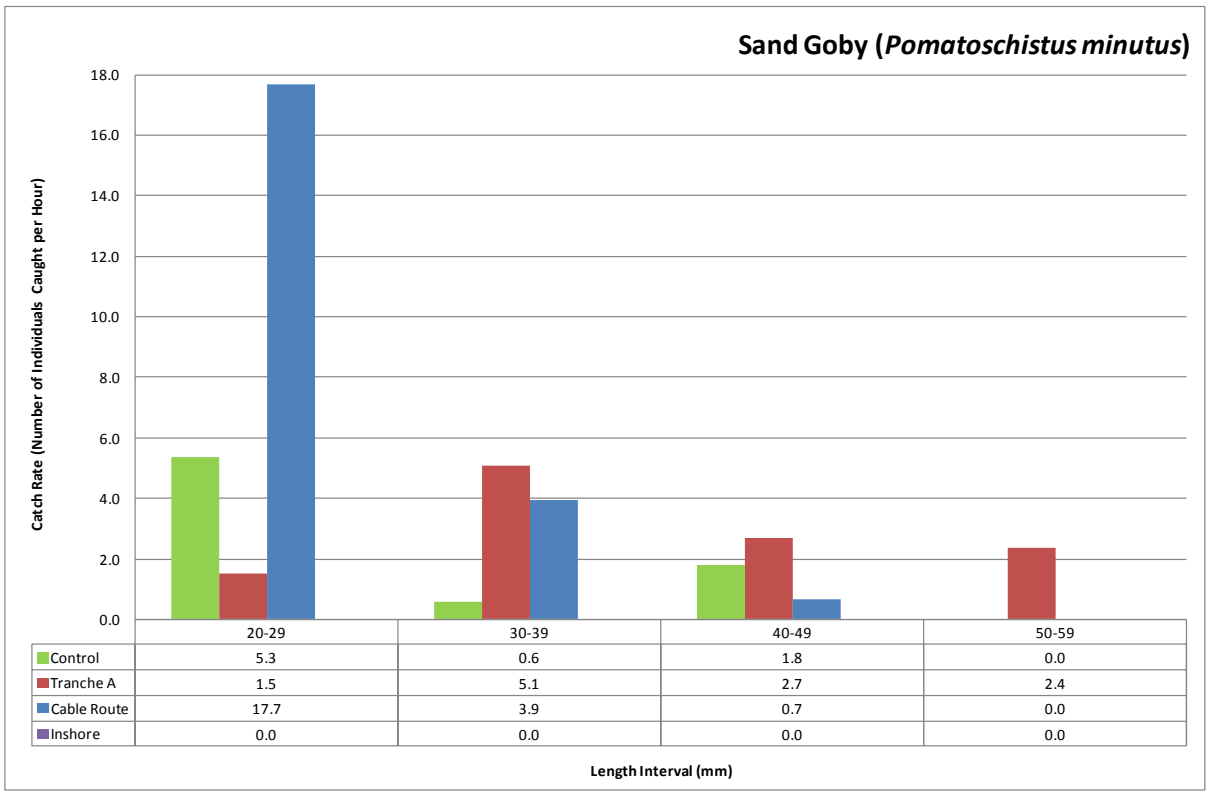
	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	150-159	160-169	170-179	180-189	190-199	200-209
Control	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.6
Tranche A	1.0	2.7	4.4	2.0	3.7	25.0	32.3	11.2	6.6	10.0	7.6	2.2	1.2	0.0	0.2	0.0
Cable Route	0.0	0.0	0.0	0.0	0.0	1.3	5.9	9.2	28.2	47.2	41.3	13.1	5.9	0.0	0.7	0.0
Inshore	0.0	0.0	0.0	0.0	0.0	0.0	3.4	8.0	14.8	20.5	11.4	2.3	1.1	0.0	0.0	0.0

Figure 6.7 Raitt's Sandeel (*A. marinus*) Length Distribution by Sampling Area



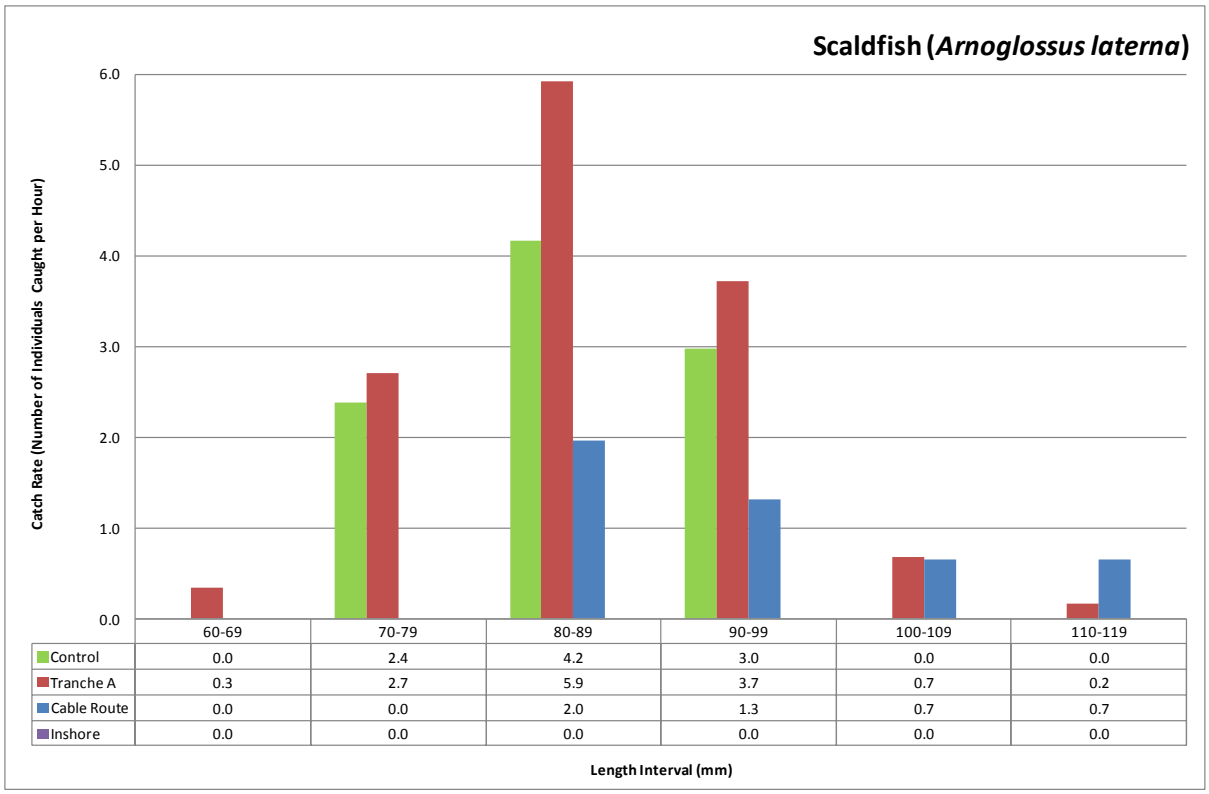
	0-49	50-99	100-149	150-199	200-249
Control	0.0	4.8	0.6	0.0	0.0
Tranche A	0.7	11.5	3.2	0.0	0.0
Cable Route	12.4	4.6	0.0	0.0	0.0
Inshore	0.0	2.3	0.0	0.0	1.1

Figure 6.8 Dab (*L. limanda*) Length Distribution by Sampling Area



	20-29	30-39	40-49	50-59
Control	5.3	0.6	1.8	0.0
Tranche A	1.5	5.1	2.7	2.4
Cable Route	17.7	3.9	0.7	0.0
Inshore	0.0	0.0	0.0	0.0

Figure 6.9 Sand Goby (*P. minutus*) Length Distribution by Sampling Area



	60-69	70-79	80-89	90-99	100-109	110-119
Control	0.0	2.4	4.2	3.0	0.0	0.0
Tranche A	0.3	2.7	5.9	3.7	0.7	0.2
Cable Route	0.0	0.0	2.0	1.3	0.7	0.7
Inshore	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.10 Scaldfish (*A. laterna*) Length Distribution by Sampling Area

7.0 Appendix

7.1 Appendix 1 – Health and Safety

7.1.1 Personnel

Brown and May Marine (BMM) staff protocol followed the standard health and safety protocol outlined in the BMM "Offshore Operational Procedures for Surveys using Commercial Fishing Vessels".

All BMM staff have completed a Sea Survival course approved by the Maritime and Coastguard Agency, meeting the requirements laid down in: **STCW 95 Regulation VI/1 para 2.1.1 and STCW Code section A- VI/1** before boarding any vessel conducting works for the company. Employees are also required to have valid medical certificates (ENG1 or ML5), Seafish Safety Awareness, Seafish Basic First Aid and Seafish Basic Fire Fighting and Fire Prevention certificates before participating in offshore works.

7.1.2 Vessel Induction

Before boarding the survey team were shown how to safely board and disembark the vessel. Prior to departure the skipper briefed the BMM staff on the whereabouts of the safety equipment, including the life raft, emergency flares and fire extinguishers, and also the location of the emergency muster point. The safe deck areas, man-overboard procedures and emergency alarms were also discussed. The survey team were warned about the possible hazards, such as slippery decks and obstructions whilst aboard. The BMM staff were briefed about trawling operations and the need to keep clear of all winch's when operational. All hazards were assessed prior to the survey in the BMM health and safety risk assessment.

7.1.3 Daily Safety Checks

The condition of the life jackets, EPIRB's, and life raft were inspected daily. Also checked were the survey team working areas, including the fish room and the wheelhouse to ensure these areas were clear of hazards such as clutter and obstructions.

7.1.4 Post Trip Survey review

Upon completion of the survey a "Post Trip Survey Review" was filed, see Table 7.1 below.

Table 7.1 Post Trip Survey Review

Project: Dogger Bank August 2011	**Vessel:** Jubilee Spirit
Surveyors: Lucy Shuff, Alexandria Winrow-Giffin	**Skipper:** Ross Crookes
Survey Area: Dogger Bank	**Total Time at Sea:** 11 Days
Dates at Sea: 17/08/2011 - 27/08/2011	

	Comments	Actions
Did vessel comply with pre trip safety audits?	Yes	N/A
Skipper and crew attitude to safety?	Good	N/A
Vessel machinery failures?	None	N/A
Safety equipment failures?	None	N/A
Accidents?	None	N/A
Injuries?	None	N/A

Dogger Bank Offshore Wind Farm

Tranche A

Adult and Juvenile Fish Characterisation Survey

2nd October to 3rd November 2011

Undertaken by
Brown and May Marine Ltd

Ref	Issue Date	Issue Type	Author	Checked	Approved
DBTAOB02	18/09/2012	FINAL	LS	LS/PJM/AWG	SJA

Contents

Figures

Tables

1.0 Summary

1.1 Otter Trawl

A total of 36 species were caught in the otter trawl; 24 within Tranche A, 25 at the control stations and 25 species along the cable route. Overall, grey gurnard (*Eutrigla gurnardus*) was the most abundant species caught, followed by dab (*Limanda limanda*) and then whiting (*Merlangius merlangus*). *E. gurnardus* had the highest catch rate at the control stations and along the cable route, whereas *L. limanda* accounted for the greatest catch rate within Tranche A.

The highest total catch rate was recorded at station OT49 along the cable route, followed by station OT08 within Tranche A, with *E. gurnardus* and *L. limanda* accounting for the majority of the catch. Overall, the total catch rate was higher along the cable route than at the control stations and within Tranche A.

Plaice (*Pleuronectes platessa*) were found in all sampling areas, with the greatest catch rate recorded along the cable route. Cod (*Gadus morhua*) were caught in all sampling areas, with the highest catch rate found along the cable route. Smooth sandeel (*Gymnammodytes semisquamatus*) and greater sandeel (*Hyperoplus lanceolatus*) were found only within Tranche A in low numbers. Herring (*Clupea harengus*) were found in low numbers at the control stations and along the cable route.

The percentage of individuals above and below the MLS was approximately equal for the *P. platessa* caught at the control stations and within Tranche A, whereas along the cable route the majority of the *P. platessa* were below the MLS. Most of the *M. merlangus* caught at the control stations and within Tranche A were below the MLS, whereas along the cable route the percentage of individuals caught above and below the MLS was approximately equal.

The majority of edible crab (*Cancer pagurus*), *G. morhua*, haddock (*Melanogrammus aeglefinus*) and all of the queen scallop caught in all sampling areas were above the set MLS. A greater proportion of the mackerel (*Scomber scombrus*) caught within Tranche A were above the MLS, whereas along the cable route the majority of which were below the MLS. All other species were caught in relatively low numbers.

Overall, a greater proportion of the catch in all sampling areas were female. A greater proportion of the sexed *E. gurnardus* and the *L. limanda* caught in all sampling areas were female. A higher proportion of the *P. platessa* and *M. merlangus* caught at the control stations and within Tranche A were female, whereas along the cable route the sex ratio was approximately equal.

The majority of the *M. merlangus* and *G. morhua* found in all sampling areas were immature fish. A greater proportion of the *E. gurnardus* caught at the control stations and along the cable route was immature, whereas within Tranche A the highest proportion is represented by both maturing females and immature fish. Spent females represented the greatest proportion of the *L. limanda* caught at the control stations and along the cable route, whereas within Tranche A maturing fish and spent females accounted for the highest proportion of the catch.

Maturing fish represented the highest proportion of the *P. platessa* caught at the control stations and within Tranche A, whereas along the cable route maturing males accounted for the greatest proportion. One ‘early ripening’ female *C. harengus* was caught at the control stations, and the majority of the *C. harengus* caught along the cable route were ‘ripening’ males and females.

1.2 Beam Trawl

A total of 29 species of fish were caught, ten of which were found at the control stations, 22 within Tranche A, 14 along the cable route and 11 species at the inshore stations. Overall, solenette

(*Buglossideum luteum*) was the most abundant species caught, followed by *L. limanda*, Raitt's sandeel (*Ammodytes marinus*), and then painted goby (*Pomatoschistus pictus*). *B. luteum* was the most prevalent species at the control stations and within Tranche A, whereas *L. limanda* were most abundant along the cable route and in the inshore areas.

P. platessa were found in low numbers in all sampling areas. *M. merlangus* were found along the cable route and in the inshore areas. Six *G. semisquamatus* were found within the wind farm. Overall, catch rates were greater within Tranche A than at the control stations, in the inshore areas and along the cable route.

2.0 Introduction

The following report details the findings of the autumn 2011 adult and juvenile fish characterisation survey, undertaken within and adjacent to the area of Tranche A of the planned Dogger Bank offshore wind farm and along the proposed cable route between the 2nd October and 3rd November.

The survey methodology, vessel and sampling gear detailed were agreed in consultation with Cefas and the Marine Management Organisation (MMO). A dispensation from the MMO for the Provisions of Council Regulation 850/98 to catch and retain undersize fish for scientific research and 43/2009 specifically related to days at sea was obtained prior to commencement of this survey. A summary of the health and safety performance of the survey is provided in Appendix 1.

The aim of the survey was to establish the abundance and composition of adult and juvenile fish species within the area of the Dogger Bank. It should be noted that *P. platessa*, sandeel (Ammodytidae sp.), *G. morhua*, *M. merlangus* and *C. harengus* have been defined as species of importance in the area.

It should be noted that all trawls at stations 53, 54 and 55 along the cable route were omitted from the otter trawl survey due to the presence of a high density of static gear in the area. The beam trawls at these stations were included in PMSL's inshore survey, as a smaller vessel was considered more appropriate to trawl the area, due to the high density of static gear. These trawls however will be analysed as cable route stations, due to their original inclusion in the offshore survey, and their location within the cable corridor. Additional inshore beam trawls were undertaken in PMSL's November survey that were not included in the previous August survey due to the presence of static gear.

3.0 Scope of Works

The proposed scope of works for the October 2011 adult and juvenile fish characterisation survey replicates that of the August 2011 characterisation survey, and is detailed below and illustrated in Figure 3.1 overleaf.

- **Otter Trawl**
  - Thirty-five tows of approximately 20 minutes duration within Tranche A, ten control tows in adjacent areas and ten tows along the cable route were undertaken

- **Otter Trawl Sample Analysis**
  - Number of individuals and catch rate by species
  - Average length and length distribution by species
    - Finfish & sharks (except *C. harengus* & sprat; *Sprattus sprattus*): individual lengths (nearest cm below)
    - *C. harengus* & *S. sprattus*: individual lengths (nearest ½ cm below)
    - Rays: individual length and wing-width (nearest cm below)
    - Edible crab: carapace width (mm)
    - Lobsters: carapace length (mm)
    - Cephalopods: mantle length (mm)
    - Scallops: shell width (mm)
  - Sex ratio by species
  - Spawning condition
    - Finfish species (except *C. harengus* & *S. scombrus*): Cefas Standard Maturity Key - Five Stage
    - *C. harengus*: Cefas Maturity Key – Nine Stage
    - Mackerel (*Scombrus scombrus*): Cefas Maturity Key – Six Stage
    - Ray and shark species: Cefas Standard Elasmobranch Maturity Key- Four Stage

- **Beam Trawl**
  - Thirty-five tows of approximately 10 minutes duration within Tranche A, ten control tows in adjacent areas, ten tows along the cable route (at the same locations as the otter trawls) and seven tows in the inshore areas

- **Beam Trawl Sample Analysis**
  - Number of individuals and catch rate by fish species
  - Average length and length distribution (nearest mm below) for fish species

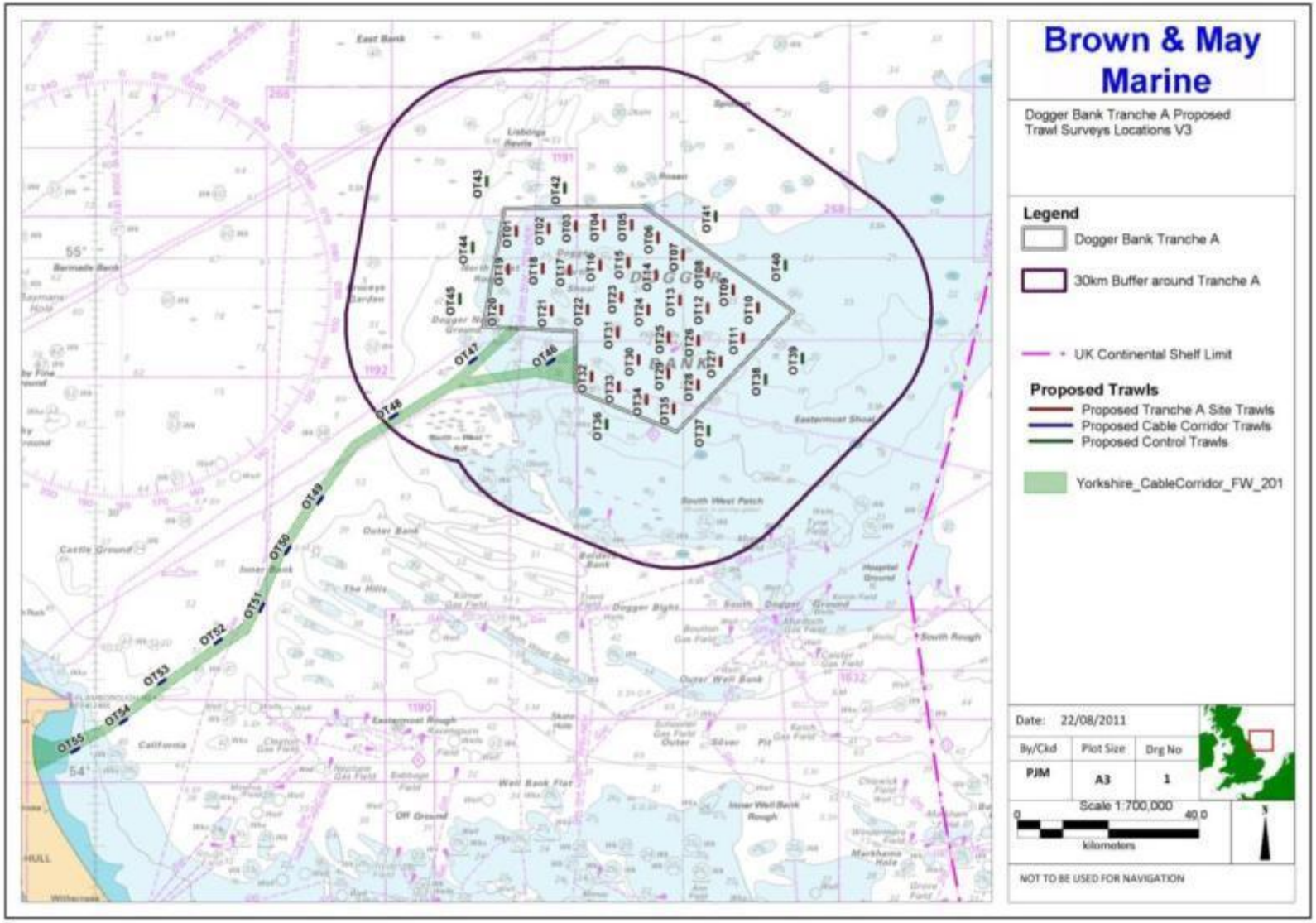


Figure 3.1 Proposed Trawl Locations

4.0 Methodology

4.1 Survey Vessel

The vessel chartered for the survey (Figure 4.1), the “Jubilee Spirit”, is a Grimsby-based commercial trawler whose skipper has experience of fishing on the Dogger Bank and of otter and beam trawl surveys. The specifications of the vessel are given below in Table 4.1.

Figure 4.1 Survey Vessel "Jubilee Spirit"

Table 4.1 Survey Vessel Specifications

Survey Vessel Specifications	
Length	21.2m
Beam	6.9m
Draft	2.3m
Main engine	Caterpillar Type 340TA 475 BHP
Gearbox	Hydraulic 6: reduction
Propeller	4 Blade Manganese Bronze Fixed Pitch 1.7m diameter
GPS	2-Furuno GP80
Plotters	Sodena Plotter with Electronic Charts
Sounder	Furuno Daylight Viewing

4.2 Sampling Gear

4.2.1 Commercial Otter Trawl

A commercial otter trawl with a 130mm mesh cod-end was used for sampling; the specifications for which are given in Table 4.2 below.

Figure 4.2 Otter Trawl Used

Table 4.2 Otter Trawl Specifications

Otter Trawl Specifications	
Towing Warp	18mm, 6x19+1
Depth: Payout Ratio	5:1
Trawl Doors	Perfect B 84
Net	130mm mesh cod-end, square mesh panel 7m from cod-end on top
Ground line length	45.7m
Footrope	Rock-hopper with 6 to 8 inch bobbins
Est. Headline height	2.4m
Distance between doors (est.)	51m

4.2.2 Scientific Beam Trawl

A 2m scientific beam trawl (Figure 4.3) was used for juvenile fish sampling; the specifications for which are given in Table 4.3 below.

Figure 4.3 Beam Trawl Used

Table 4.3 Beam Trawl Specifications

Beam Trawl Specifications	
Beam width	2m
Headline height	55cm
Shoe length	77cm
Shoe width	15cm
Cod-end liner	5mm

4.3 Positioning and Navigation

The position of the vessel was tracked at all times using a Garmin GPSMap 278 with an EGNOS differential connected to an external Garmin GA30 antenna. Trawl start times and positions were taken when the winch stopped paying out the gear. Similarly, trawl end times and positions were taken when hauling of the gear commenced.

4.4 Sampling Operations

The survey was undertaken from the 2nd October to the 3rd November 2011. A summarised log of events is given in Table 4.4 below.

It should be noted that 12 standby days, and two weather days at sea were incurred.

The beam trawls at stations BT20 and BT46 were repeated as the net was shot foul.

Table 4.4 Summarised Log of Events

Sunday 2nd October 2011
Mobilise survey in Grimsby
Monday 3rd October 2011
Steam to survey site
Otter Trawls: OT52, OT51
Beam Trawls: BT52, BT51
Overnight at sea
Tuesday 4th October 2011
Otter Trawls: OT01, OT02, OT03, OT04, OT05, OT06, OT07
Beam Trawls: BT01, BT02, BT03, BT04, BT05, BT06, BT07
Overnight at sea
Wednesday 5th October 2011
Otter Trawls: OT41, OT40, OT10, OT09, OT08, OT12
Beam Trawls: BT41, BT40, BT10, BT09, BT08, BT12
Steam to Scarborough overnight
Overnight at sea
Thursday 6th October 2011
Arrive into Scarborough
BMM personnel unload gear and return to Eye
Friday 7th October 2011
Vessel on standby
Saturday 8th October 2011
Vessel on standby
Sunday 9th October 2011
Vessel on standby
Wednesday 12th October 2011
Vessel on standby
Thursday 13th October 2011
Vessel on standby
Friday 14th October 2011
Vessel on standby
Saturday 15th October 2011
Vessel on standby
Sunday 16th October 2011
Vessel on standby

Monday 17th October 2011
Vessel on standby
Tuesday 18th October 2011
Vessel on standby
Wednesday 19th October 2011
Vessel on standby
Thursday 20th October 2011
BMM travel to Grimsby, load vessel
Vessel on standby
Friday 21st October 2011
Steam to survey site
Overnight at Sea
Saturday 22nd October 2011
Otter Trawls: OT13, OT14
Beam Trawls: BT13, BT14
Overnight at sea
Sunday 23rd October 2011
Otter Trawls: OT15, OT16, OT17, OT18, OT42
Beam Trawls: BT15, BT16, BT17, BT18, BT42
Overnight at sea
Monday 24th October 2011
Weather day at sea
Overnight at sea
Tuesday 25th October 2011
Weather day at sea
Overnight at sea
Wednesday 26th October 2011
Otter Trawls: OT43, OT44, OT45, OT20, OT19
Beam Trawls: BT43, BT44, BT45, BT20, BT19
BT20 repeated as net fouled
Overnight at sea
Thursday 27th October 2011
Otter Trawls: OT26, OT25, OT24, OT23, OT22, OT21
Beam Trawls: BT26, BT25, BT24, BT23, BT22, BT21
Steam to Scarborough overnight
Overnight at sea
Friday 28th October 2011
Arrive into Scarborough
Overnight aboard vessel
Saturday 29th October 2011
Steam to survey site
Otter Trawls: OT50, OT49, OT48
Beam Trawls: BT50, BT49, BT48
Overnight at sea
Sunday 30th October 2011
Otter Trawls: OT47, OT46, OT31, OT30
Beam Trawls: BT47, BT46, BT31, BT30
BT46 repeated as net fouled
Overnight at sea
Monday 31st October 2011
Otter Trawls: OT29, OT28, OT27, OT11, OT38

Beam Trawls: BT29, BT28, BT27, BT11, BT38
Overnight at sea
Tuesday 1st November 2011
Otter Trawls: OT39, OT37, OT35, OT34
Beam Trawls: BT39, BT37, BT35, BT34
Overnight at sea
Wednesday 2nd November 2011
Otter Trawls: OT32, OT33, OT36
Beam Trawls: BT32, BT33, BT36
Steam to Grimsby overnight
Overnight at sea
Thursday 3rd November 2011
Arrive into Grimsby & demobilise survey
Return to office and store samples

4.5 Otter Trawl Sampling

The whole catch from each trawl was retained where possible. Sub-sampling occurred when large (>4 litres) homogenous samples were obtained. The samples were then boxed, labelled, photographed, iced and stored at +2°C before transportation to Cefas (Lowestoft) for analysis in the middle and at the end of the survey, in line with the agreed scope of works.

The start and end times, co-ordinates and the duration of each otter trawl are given in Table 4.5 (control, Tranche A and cable route tows highlighted green, red and blue respectively). The tow tracks are illustrated in Figure 4.4 overleaf.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.5 Start and End Times, Co-ordinates and Duration of each Otter Trawl

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT01	04/10/2011	06:32:49	6,100,906.7	399,739.4	32.5	06:52:49	6,102,488.3	399,961.3	33.6	00.20:00
OT02		08:24:36	6,101,082.0	406,694.8	30.1	08:44:47	6,102,690.7	406,567.9	31.9	00.20:11
OT03		09:59:05	6,101,968.2	412,731.0	31.4	10:19:07	6,103,535.0	413,091.5	32.7	00.20:02
OT04		11:27:09	6,103,234.2	418,949.0	32.5	11:47:18	6,101,595.6	419,208.5	27.7	00.20:09
OT05		13:02:30	6,103,340.7	425,083.3	32.3	13:23:09	6,101,788.9	425,435.5	27.4	00.20:39
OT06		14:35:31	6,100,400.9	430,536.6	27.2	14:55:31	6,098,944.3	430,644.0	25.9	00.20:00
OT07		16:06:15	6,096,957.5	435,753.9	26.8	16:26:24	6,095,339.6	436,006.6	27.0	00.20:09
OT08	05/10/2011	14:37:19	6,091,182.4	441,356.4	26.3	14:57:25	6,093,049.9	441,236.4	28.6	00.20:06
OT09		13:02:12	6,087,274.9	446,791.1	26.1	13:22:19	6,088,924.0	446,704.0	26.6	00.20:07
OT10		11:19:27	6,085,475.6	452,260.8	27.7	11:39:36	6,083,884.6	452,416.2	25.7	00.20:09
OT11	31/10/2011	13:00:02	6,078,591.8	448,843.3	23.1	13:20:04	6,077,035.7	448,891.2	21.9	00.20:02
OT12	05/10/2011	16:23:14	6,084,873.4	441,513.4	24.4	16:43:20	6,083,349.1	441,613.6	24.1	00.20:06
OT13	22/10/2011	14:16:49	6,084,973.0	435,126.6	24.1	14:36:50	6,086,457.0	435,275.1	23.3	00.20:01
OT14		16:11:35	6,092,284.8	430,226.2	25.2	16:31:45	6,090,999.0	430,301.9	23.3	00.20:10

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT15	23/10/2011	06:53:06	6,095,281.4	424,005.8	24.8	07:13:05	6,094,255.1	423,895.0	24.8	00.19:59
OT16		08:45:05	6,094,844.6	418,580.5	28.1	09:05:07	6,093,702.5	418,324.6	26.8	00.20:02
OT17		10:45:21	6,092,516.7	411,216.4	25.7	11:05:25	6,094,232.5	411,127.2	31.7	00.20:04
OT18		12:40:52	6,093,076.6	405,259.5	32.7	13:01:11	6,094,751.8	405,337.9	33.2	00.20:19
OT19	26/10/2011	15:37:08	6,092,627.0	397,881.3	32.8	15:57:12	6,094,227.3	397,955.5	29.9	00.20:04
OT20		13:34:45	6,084,187.1	396,162.9	28.3	13:54:51	6,085,743.4	396,251.7	28.5	00.20:06
OT21	27/10/2011	15:26:06	6,083,445.1	407,115.8	28.8	15:46:15	6,085,156.9	407,282.0	31.9	00.20:09
OT22		13:40:56	6,084,008.4	414,959.9	26.3	14:00:58	6,085,772.5	415,123.8	25.3	00.20:02
OT23		11:48:21	6,088,136.0	422,243.5	25.2	12:08:22	6,086,676.0	421,652.0	24.6	00.20:01
OT24		10:13:03	6,085,056.6	428,101.5	21.5	10:33:11	6,083,718.9	427,872.8	21.9	00.20:08
OT25		08:36:10	6,078,760.1	432,562.2	21.0	08:56:11	6,077,384.8	432,571.4	24.4	00.20:01
OT26		06:37:51	6,077,960.0	439,110.0	22.4	06:57:52	6,076,408.4	439,078.7	21.5	00.20:01
OT27	31/10/2011	11:08:53	6,073,469.0	444,045.7	22.8	11:29:42	6,071,934.7	444,130.5	22.4	00.20:49
OT28		09:20:08	6,067,984.1	438,964.5	34.1	09:40:18	6,066,334.7	439,023.3	31.0	00.20:10
OT29		07:28:06	6,069,634.5	432,562.9	31.2	07:48:09	6,071,361.3	432,680.2	32.5	00.20:03
OT30	30/10/2011	13:59:48	6,074,196.7	425,897.7	28.8	14:19:53	6,072,544.1	425,975.1	29.2	00.20:05
OT31		12:22:22	6,079,763.1	421,450.6	22.2	12:42:22	6,078,029.0	421,480.3	24.8	00.20:00
OT32	02/11/2011	07:36:28	6,069,437.9	415,649.2	26.3	07:56:34	6,071,377.2	415,753.3	25.5	00.20:06
OT33		09:25:16	6,066,897.5	421,540.8	27.7	09:45:30	6,068,840.3	421,603.9	25.2	00.20:14
OT34	01/11/2011	14:54:06	6,065,191.3	427,577.8	28.3	15:14:08	6,063,419.0	427,542.2	28.6	00.20:02
OT35		13:12:49	6,063,096.9	433,594.7	28.8	13:32:50	6,061,321.5	433,583.4	27.5	00.20:01
OT36	02/11/2011	11:06:29	6,059,874.2	418,794.7	25.9	11:26:32	6,058,200.6	418,724.7	25.2	00.20:03
OT37	01/11/2011	11:10:10	6,058,261.8	441,224.8	29.9	11:30:11	6,056,565.7	441,067.1	25.2	00.20:01
OT38	31/10/2011	15:18:39	6,069,282.9	453,556.0	21.5	15:39:01	6,067,802.2	453,585.0	21.0	00.20:22
OT39	01/11/2011	07:38:37	6,072,553.3	461,915.7	23.5	07:58:38	6,074,347.3	462,050.6	24.4	00.20:01
OT40	05/10/2011	09:07:57	6,094,621.9	458,320.0	28.5	09:27:58	6,093,433.5	457,736.9	28.3	00.20:01
OT41		06:37:27	6,105,827.9	443,548.8	37.8	06:57:28	6,104,460.5	443,544.9	32.3	00.20:01
OT42	23/10/2011	14:54:39	6,109,876.3	410,516.1	40.2	15:14:41	6,111,677.1	410,628.6	37.4	00.20:02
OT43	26/10/2011	06:38:20	6,113,791.4	393,964.0	46.7	06:58:55	6,112,596.9	393,528.5	45.5	00.20:35
OT44		09:24:55	6,099,354.6	390,267.3	41.3	09:44:56	6,097,936.0	390,319.0	40.3	00.20:01
OT45		11:36:25	6,087,844.4	387,322.6	41.3	11:56:26	6,086,104.6	387,321.7	40.2	00.20:01
OT46	30/10/2011	09:12:02	6,073,540.1	407,335.3	26.3	09:32:09	6,072,668.2	406,168.7	25.7	00.20:07
OT47		06:43:08	6,073,615.1	389,370.4	39.8	07:03:29	6,074,907.1	390,731.3	38.1	00.20:21
OT48	29/10/2011	14:26:22	6,062,221.9	372,238.7	50.8	14:46:28	6,062,655.9	373,896.8	46.9	00.20:06
OT49		11:04:49	6,043,796.0	354,905.0	59.9	11:24:55	6,045,616.6	355,883.6	62.1	00.20:06
OT50		09:00:01	6,032,769.2	347,359.9	67.4	09:20:02	6,034,509.5	348,519.6	61.4	00.20:01
OT51	03/10/2011	16:27:04	6,019,308.6	340,820.3	61.2	16:47:04	6,020,635.6	341,982.7	59.7	00.20:00
OT52		14:34:36	6,012,867.9	330,544.1	59.0	14:54:32	6,014,449.8	331,752.2	57.9	00.19:56

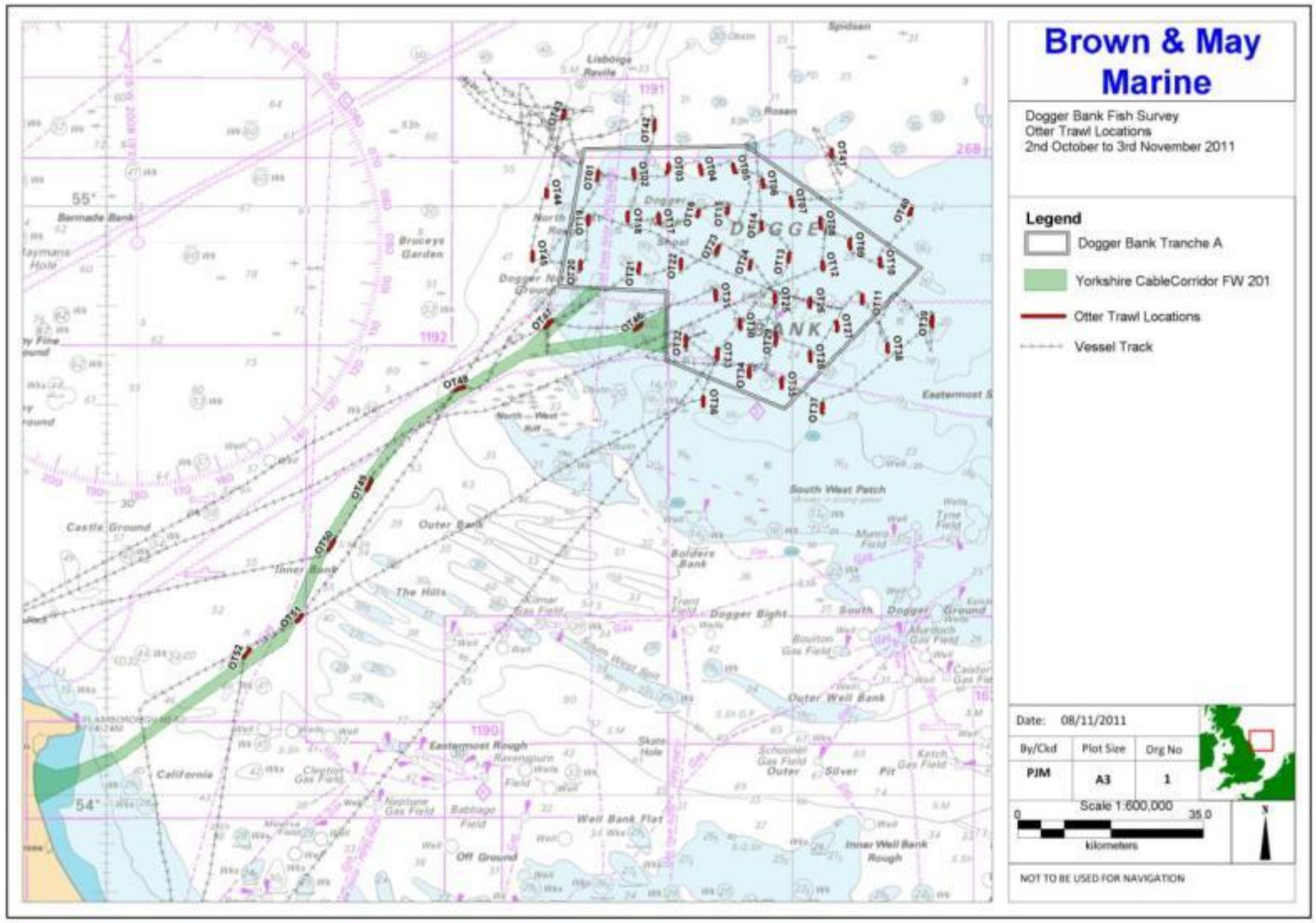


Figure 4.4 Otter Trawl Tow Tracks

4.6 Beam Trawl Sampling

All fish caught in the beam trawl were retained, placed in plastic pots, labelled and photographed. Large fish that could not be retained within the sample pots were identified and measured on board and returned to the sea. Sub-sampling was applied when large (> 4 litres) homogenous samples were obtained. Samples were fixed at the end of every day using a 4% seawater buffered formalin solution.

The start and end times, co-ordinates and the duration of each beam trawl are given in Table 4.6 (control, Tranche A, cable route and inshore tows highlighted green, red, blue and purple respectively). The tow tracks are illustrated in Figure 4.5.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.6 Start and End Times, Co-ordinates and Duration of each Beam Trawl

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT01	04/10/2011	07:10:28	6,102,811.6	400,066.3	33.2	07:20:34	6,102,357.3	400,201.8	33.9	00:10:06
BT02		09:07:22	6,102,819.6	406,519.3	31.9	09:17:23	6,102,417.7	406,575.6	31.2	00:10:01
BT03		10:35:53	6,103,829.0	413,049.6	32.5	10:46:02	6,103,521.4	413,150.7	32.7	00:10:09
BT04		12:04:02	6,101,710.7	419,568.6	31.7	12:14:04	6,101,986.6	419,334.2	30.5	00:10:02
BT05		13:42:19	6,102,054.7	425,728.4	26.8	13:52:25	6,102,281.8	425,451.1	27.2	00:10:06
BT06		15:12:26	6,099,263.4	431,142.3	27.0	15:22:32	6,099,566.4	430,943.2	28.8	00:10:06
BT07		16:46:43	6,095,663.6	436,281.7	27.5	16:56:51	6,095,903.9	435,998.1	28.6	00:10:08
BT08	05/10/2011	15:13:48	6,093,108.6	441,515.0	28.6	15:23:48	6,092,797.9	441,806.8	28.3	00:10:00
BT09		13:41:02	6,089,405.3	446,882.2	28.5	13:51:02	6,089,215.8	446,827.4	27.0	00:10:00
BT10		11:59:12	6,083,945.1	452,877.5	26.8	12:10:21	6,083,798.1	452,697.4	26.4	00:11:09
BT11	31/10/2011	13:38:45	6,076,925.0	448,882.1	22.2	13:48:54	6,077,721.7	448,712.5	22.6	00:10:09
BT12	05/10/2011	16:58:42	6,083,397.6	441,869.5	24.1	17:08:47	6,083,205.2	441,647.2	24.2	00:10:05
BT13	22/10/2011	15:02:30	6,086,745.8	435,540.2	23.7	15:12:41	6,086,688.0	435,558.8	23.9	00:10:11
BT14		16:49:06	6,091,508.9	429,951.5	23.9	16:59:07	6,092,396.6	430,013.6	24.4	00:10:01
BT15	23/10/2011	07:29:31	6,094,540.8	423,865.8	24.8	07:39:40	6,095,406.3	423,979.0	24.4	00:10:09
BT16		09:24:11	6,094,177.8	418,440.5	27.0	09:34:13	6,094,837.9	418,607.2	26.8	00:10:02
BT17		11:23:17	6,094,427.0	411,141.7	32.8	11:33:16	6,094,022.7	411,088.1	31.2	00:09:59
BT18		13:17:45	6,094,673.1	405,529.3	33.9	13:27:52	6,094,321.8	405,472.8	33.2	00:10:07
BT19	26/10/2011	16:14:46	6,094,414.0	398,234.9	31.9	16:25:00	6,094,215.1	398,223.4	30.8	00:10:14
BT20		14:30:23	6,084,899.8	396,347.3	29.0	14:40:26	6,084,509.6	396,414.1	28.5	00:10:03
BT21	27/10/2011	16:03:03	6,084,971.0	407,209.5	30.3	16:13:04	6,084,638.8	407,169.1	29.0	00:10:01
BT22		14:18:11	6,085,673.4	414,997.0	26.8	14:28:13	6,085,335.4	414,818.2	25.7	00:10:02
BT23		12:34:10	6,086,746.6	422,281.3	24.8	12:44:14	6,087,351.1	422,216.5	25.5	00:10:04
BT24		10:55:00	6,084,074.6	427,977.9	22.4	11:05:45	6,084,962.2	427,892.0	21.9	00:10:45
BT25		09:13:59	6,077,334.9	432,486.4	24.2	09:24:01	6,078,101.6	432,629.9	23.0	00:10:02

Station	Date	Start				End				Duration (hh:mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT26		07:16:59	6,076,344.7	439,211.8	21.5	07:27:01	6,077,026.6	439,371.0	21.9	00:10:02
BT27	31/10/2011	11:47:17	6,071,854.0	443,954.9	21.9	11:57:19	6,072,645.2	443,905.5	21.5	00:10:02
BT28		10:01:03	6,066,396.0	439,033.5	30.6	10:11:03	6,067,141.2	439,204.1	34.5	00:10:00
BT29		08:07:53	6,071,387.4	432,906.3	31.9	08:17:55	6,071,015.7	433,005.2	32.8	00:10:02
BT30	30/10/2011	14:43:06	6,072,719.5	425,901.1	30.6	14:53:10	6,073,303.0	425,796.5	29.4	00:10:04
BT31		12:57:43	6,078,527.6	421,561.7	23.9	13:07:44	6,079,171.8	421,439.0	24.1	00:10:01
BT32	02/11/2011	08:13:28	6,071,465.1	415,714.2	25.5	08:23:29	6,071,089.7	415,769.7	26.6	00:10:01
BT33		10:00:30	6,068,570.3	421,645.1	26.1	10:10:32	6,068,354.5	421,655.8	26.6	00:10:02
BT34	01/11/2011	15:33:02	6,063,928.5	427,558.4	28.8	15:43:06	6,064,413.6	427,599.6	28.3	00:10:04
BT35		13:48:40	6,061,421.3	433,591.1	27.2	13:59:00	6,061,986.0	433,601.7	30.8	00:10:20
BT36	02/11/2011	11:43:57	6,058,314.4	418,717.4	23.3	11:53:58	6,058,817.8	418,882.2	23.5	00:10:01
BT37	01/11/2011	11:48:41	6,056,766.3	441,118.5	24.6	11:58:45	6,057,282.4	441,205.7	25.2	00:10:04
BT38	31/10/2011	15:54:16	6,068,237.6	453,368.9	21.9	16:04:18	6,068,950.4	453,307.3	21.3	00:10:02
BT39	01/11/2011	08:16:27	6,074,207.3	462,059.6	25.5	08:26:26	6,073,937.2	462,090.6	23.9	00:09:59
BT40	05/10/2011	09:48:53	6,093,641.2	458,316.3	28.8	09:59:18	6,093,259.9	458,387.4	27.9	00:10:25
BT41		07:16:23	6,104,241.8	444,199.1	34.3	07:26:25	6,104,089.0	443,841.4	30.5	00:10:02
BT42	23/10/2011	15:37:43	6,111,792.0	410,601.6	36.1	15:47:46	6,111,607.8	410,508.9	38.1	00:10:03
BT43	26/10/2011	07:20:42	6,112,829.5	393,710.8	45.5	07:30:43	6,113,668.1	393,847.5	46.2	00:10:01
BT44		10:03:27	6,098,492.1	390,268.2	41.3	10:13:28	6,099,212.4	390,223.6	42.2	00:10:01
BT45		12:21:12	6,086,964.8	387,136.4	40.9	12:31:17	6,086,675.4	387,220.0	41.3	00:10:05
BT46	30/10/2011	10:19:41	6,073,270.0	406,870.2	25.2	10:29:45	6,073,857.2	407,386.8	24.4	00:10:04
BT47		07:24:34	6,074,776.1	390,877.5	37.6	07:34:36	6,074,474.0	390,852.9	38.5	00:10:02
BT48	29/10/2011	15:13:29	6,062,727.9	373,038.4	47.7	15:23:30	6,062,639.4	372,730.1	50.2	00:10:01
BT49		11:58:48	6,045,027.8	355,639.0	60.3	12:08:50	6,045,923.3	355,915.7	62.5	00:10:02
BT50		09:54:03	6,033,996.5	348,118.1	64.3	10:04:09	6,034,673.6	348,486.0	59.5	00:10:06
BT51	03/10/2011	17:07:51	6,020,534.2	341,901.3	61.7	17:17:50	6,020,324.2	341,749.6	62.1	00:09:59
BT52		15:22:42	6,014,143.6	331,349.6	56.2	15:32:46	6,014,628.1	331,852.0	58.3	00:10:04
BT53	05/11/2011	07:11:34	6,005,710.8	319,262.7	50.0	07:25:57	6,005,211.8	319,203.9	48.0	00:14:23
BT54		10:37:29	5,994,165.8	304,445.9	31.6	10:48:37	5,994,286.5	304,535.1	30.0	00:11:08
BT55		12:28:09	5,992,966.2	299,498.4	13.6	12:39:22	5,992,489.0	299,413.3	14.7	00:11:13
BT56		16:24:09	5,988,018.2	290,817.8	7.1	16:34:54	5,988,496.5	291,001.3	6.5	00:10:45
BT57		14:01:11	5,994,765.3	295,098.2	3.9	14:11:23	5,994,805.6	294,985.3	4.2	00:10:12
BT58		14:46:03	5,990,237.6	294,886.9	7.5	14.57:15	5,990,677.9	294,842.9	6.1	00:11:12
BT59		13:15:38	5,997,055.3	299,156.9	16.2	13:25:57	5,997,508.5	299,068.5	15.0	00:10:19
BT60		15:25:34	5,986,880.3	295,934.4	10.0	15:36:11	5,987,411.7	296,519.1	11.1	00:10:37
BT61		09:16:13	5,997,487.7	310,102.1	41.5	09:27:05	5,996,940.2	310,099.3	40.0	00:10:53
BT62		08:22:16	6,000,887.3	314,955.6	46.6	08:32:22	6,000,788.9	314,908.1	47.7	00:10:06

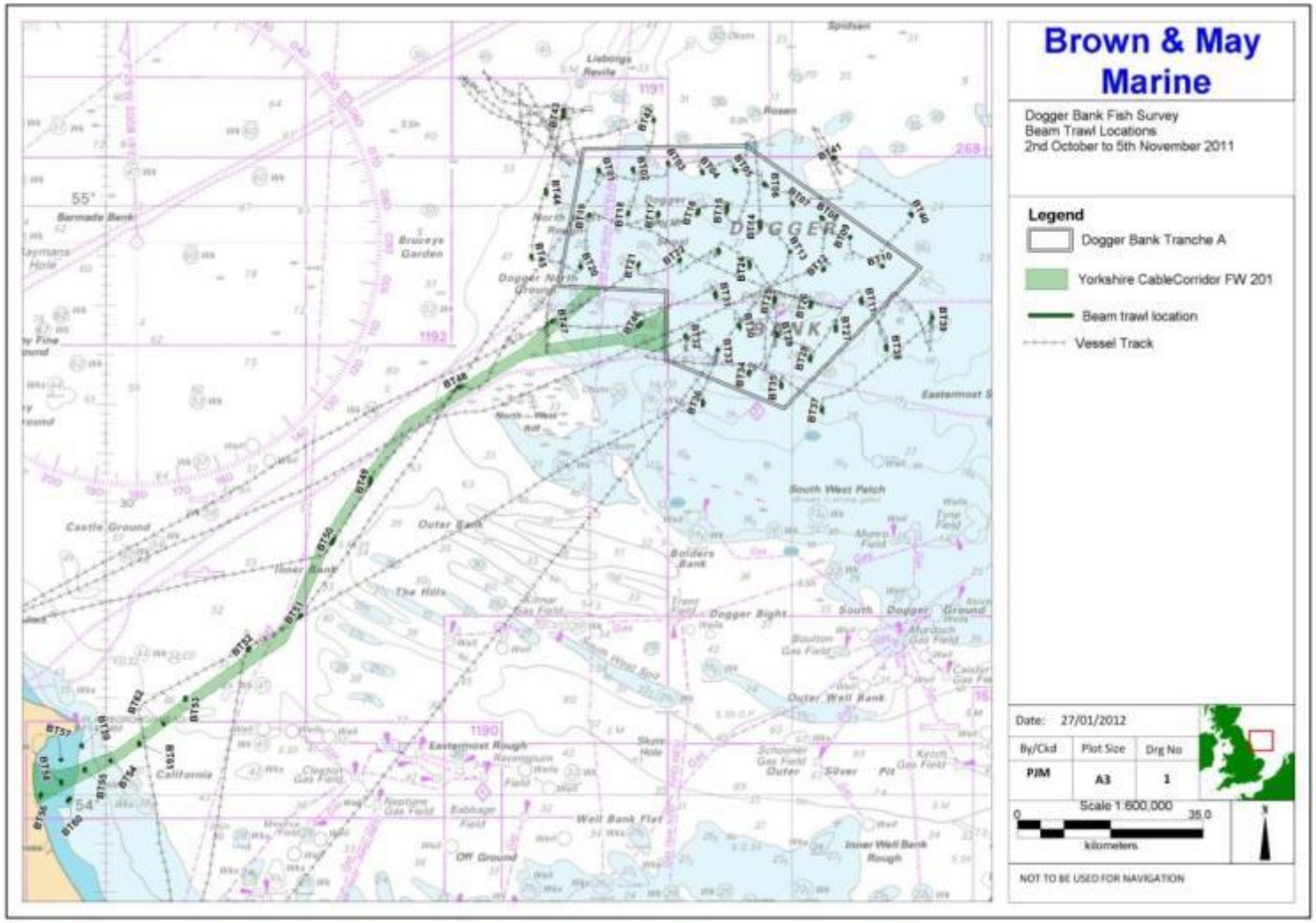


Figure 4.5 Beam Trawl Tow Tracks

5.0 Otter Trawl Results

5.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) for fish species at the control stations, within Tranche A, and along the cable route are given in Table 5.1 and are illustrated in Figure 5.1.

The catch rates for fish and shellfish species by station and by sampling area are illustrated in Figure 5.2, Figure 5.3 and Figure 5.4 for control, Tranche A and cable route stations respectively.

Spatial distribution plots for the most abundant species are given in Figure 5.5 to Figure 5.8; the distributions for the additional key species are also given in Figure 5.9 and Figure 5.10. Low numbers of sandeel were found in Tranche A and as such, are not spatially plotted.

Spatial plots show the percentage distribution by catch rate of *E. gurnardus*, *L. limanda*, *P. platessa*, *M. merlangus*, *G. morhua* and *C. harengus*. The circle size corresponds to the catch rate i.e. larger pie charts indicate greater catch rates.

A total of 36 species were caught; 24 within Tranche A, 25 at the control stations and 25 species along the cable route. Overall, grey gurnard (*Eutrigla gurnardus)* was the most abundant species caught, followed by dab (*Limanda limanda*) and then *M. merlangus*.

E. gurnardus had the highest catch rate at the control stations (390.5 individuals per hour) and along the cable route (633.2/hr), whereas *L. limanda* accounted for the greatest catch rate within Tranche A (351.9/hr).

The highest catch rate for all species combined was recorded at station OT49 (2,794.0/hr) along the cable route, followed by station OT08 (1,877.6/hr) within Tranche A, with *E. gurnardus* and *L. limanda* accounting for the majority of the catch (89.2% at OT49, 93.8% at OT08). *E. gurnardus* and *L. limanda* represented the greatest proportion of the catch at the most sampling stations.

P. platessa were found in all sampling areas, with the greatest catch rate recorded along the cable route (102.4/hr). Station OT48 along the cable route had the highest catch rate for this species (349.3/hr).

G. morhua were caught in all sampling areas, with the highest catch rate found along the cable route (10.2/hr). The greatest catch for this species was recorded at station OT28 (83.3/hr) within Tranche A.

Smooth sandeel (*Gymnammodytes semisquamatus*) were found only within Tranche A with a catch rate of 1.8/hr. All individuals were found at station OT17 with a catch rate at this station of 62.8/hr. One greater sandeel (*Hyperoplus lanceolatus*) was found within Tranche A (0.1/hr) at station OT18 (3.0/hr).

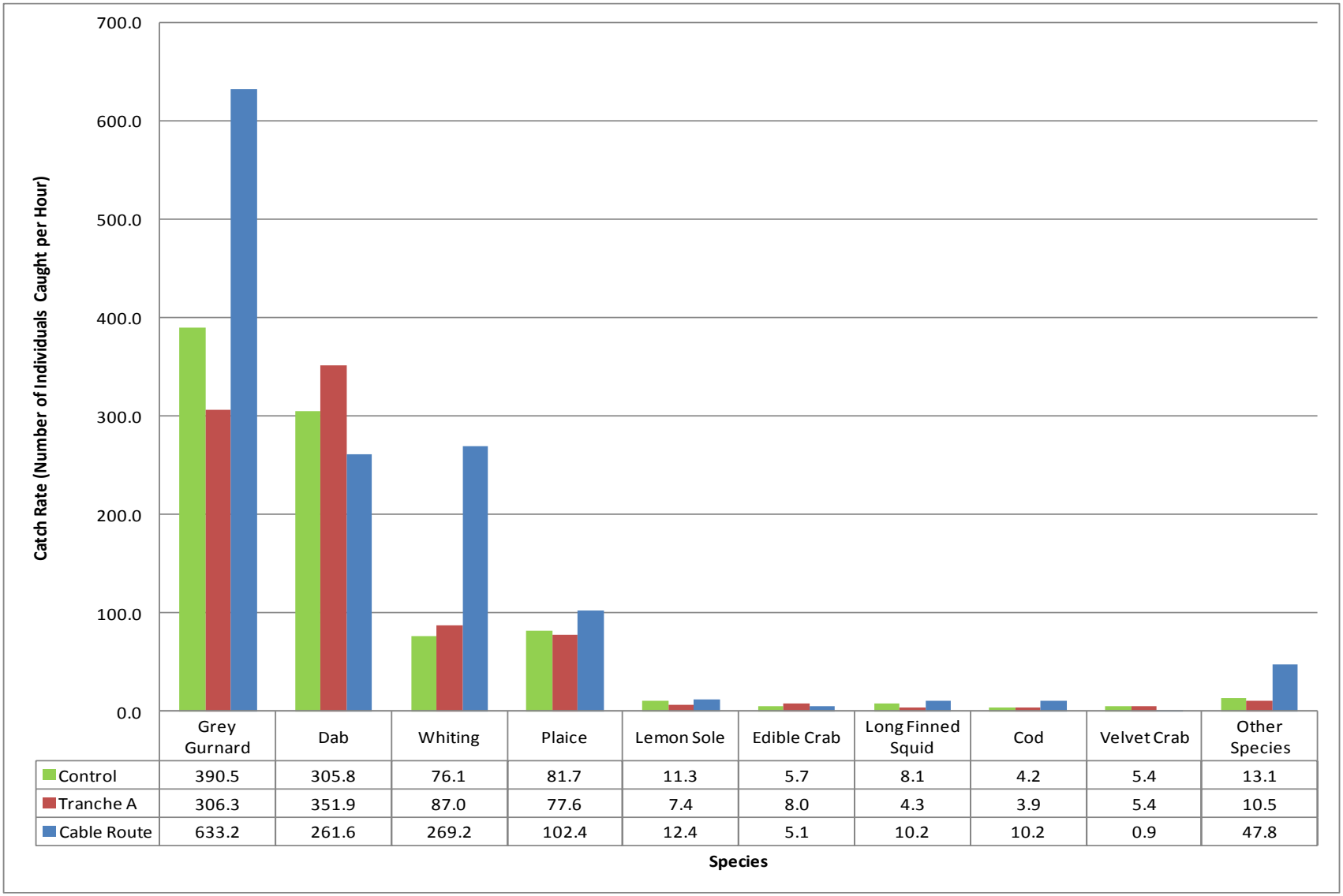
C. harengus was found in low numbers at the control stations (1 individual, 0.3/hr) and along the cable route (8, 3.4/hr). At the control stations one *C. harengus* was found at station OT43 (2.9/hr), along the cable route *C. harengus* were found at stations OT50 (7, 21.0/hr) and OT52 (1, 3.0/hr).

Overall, the total catch rate was higher along the cable route (1,353.0/hr) than at the control stations (901.8/hr) and within Tranche A (862.2/hr).

Table 5.1 Total Numbers of Individuals Caught and Catch Rate by Species and Sampling Area

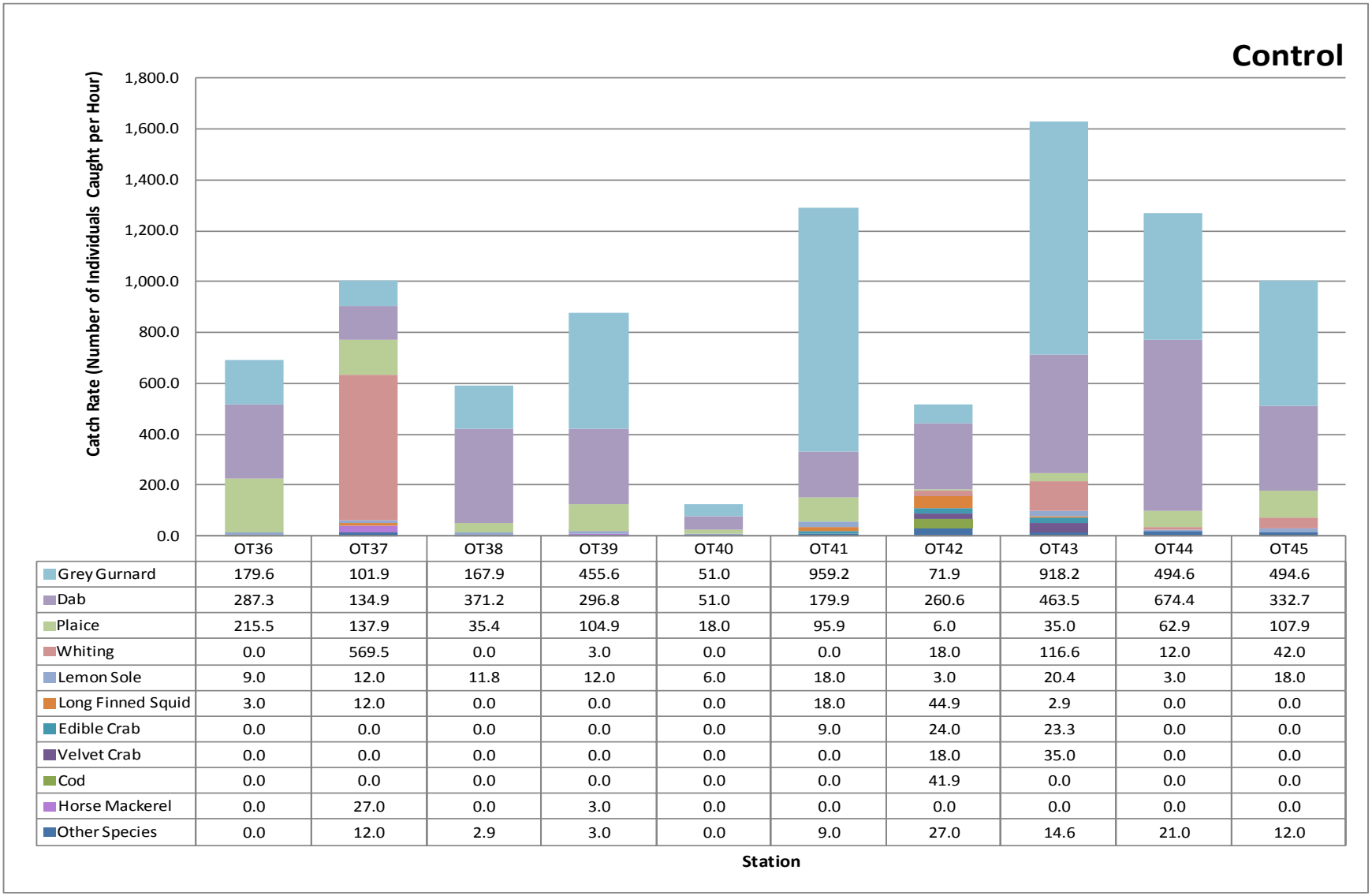
Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable Route	Total	Control	Tranche A	Cable Route
Grey Gurnard	*Eutrigla gurnardus*	1,309	3,595	1,484	6,388	390.5	306.3	633.2
Dab	*Limanda limanda*	1,025	4,131	613	5,769	305.8	351.9	261.6
Whiting	*Merlangius merlangus*	255	1,021	631	1,907	76.1	87.0	269.2
Plaice	*Pleuronectes platessa*	274	911	240	1,425	81.7	77.6	102.4
Lemon Sole	*Microstomus kitt*	38	87	29	154	11.3	7.4	12.4
Edible Crab	*Cancer pagurus*	19	94	12	125	5.7	8.0	5.1
Long-finned Squid	*Loligo forbesii*	27	50	24	101	8.1	4.3	10.2
Cod	*Gadus morhua*	14	46	24	84	4.2	3.9	10.2
Velvet Crab	*Necora puber*	18	63	2	83	5.4	5.4	0.9
Bullrout	*Myoxocephalus scorpius*	9	30	0	39	2.7	2.6	0.0
Queen Scallop	*Aequipecten opercularis*	5	11	21	37	1.5	0.9	9.0
Spotted Ray	*Raja montagui*	2	7	28	37	0.6	0.6	11.9
Mackerel	*Scomber scombrus*	1	14	10	25	0.3	1.2	4.3
Haddock	*Melanogrammus aeglefinus*	1	15	5	21	0.3	1.3	2.1
Smooth Sandeel	*Gymnammodytes semisquamatus*	0	21	0	21	0.0	1.8	0.0
Poor Cod	*Trisopterus minutus*	1	0	15	16	0.3	0.0	6.4
Horse Mackerel	*Trachurus trachurus*	10	1	0	11	3.0	0.1	0.0
Herring	*Clupea harengus*	1	0	8	9	0.3	0.0	3.4
Sprat	*Sprattus sprattus*	0	3	6	9	0.0	0.3	2.6
Common Dragonet	*Callionymus lyra*	1	6	1	8	0.3	0.5	0.4
Lesser Weever	*Echiichthys vipera*	0	8	0	8	0.0	0.7	0.0
Starry Ray	*Amblyraja radiata*	4	1	2	7	1.2	0.1	0.9
Lesser Spotted Dogfish	*Scyliorhinus canicula*	2	3	0	5	0.6	0.3	0.0
Lobster	*Homarus gammarus*	0	0	5	5	0.0	0.0	2.1
Long Rough Dab	*Hippoglossoides platessoides*	2	0	2	4	0.6	0.0	0.9
Starry Smoothhound	*Mustelus asterias*	0	0	4	4	0.0	0.0	1.7
Brill	*Scophthalmus rhombus*	0	0	2	2	0.0	0.0	0.9
Ling	*Molva molva*	2	0	0	2	0.6	0.0	0.0

Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable Route	Total	Control	Tranche A	Cable Route
Turbot	*Psetta maxima*	1	0	1	2	0.3	0.0	0.4
Anglerfish	*Lophius piscatorius*	0	0	1	1	0.0	0.0	0.4
Greater Sandeel	*Hyperoplus lanceolatus*	0	1	0	1	0.0	0.1	0.0
Hake	*Merluccius merluccius*	1	0	0	1	0.3	0.0	0.0
John Dory	*Zeus faber*	0	1	0	1	0.0	0.1	0.0
Red Gurnard	*Aspitrigla cuculus*	1	0	0	1	0.3	0.0	0.0
Red Mullet	*Mullus surmuletus*	0	0	1	1	0.0	0.0	0.4
Spurdog	*Squalus acanthias*	0	1	0	1	0.0	0.1	0.0



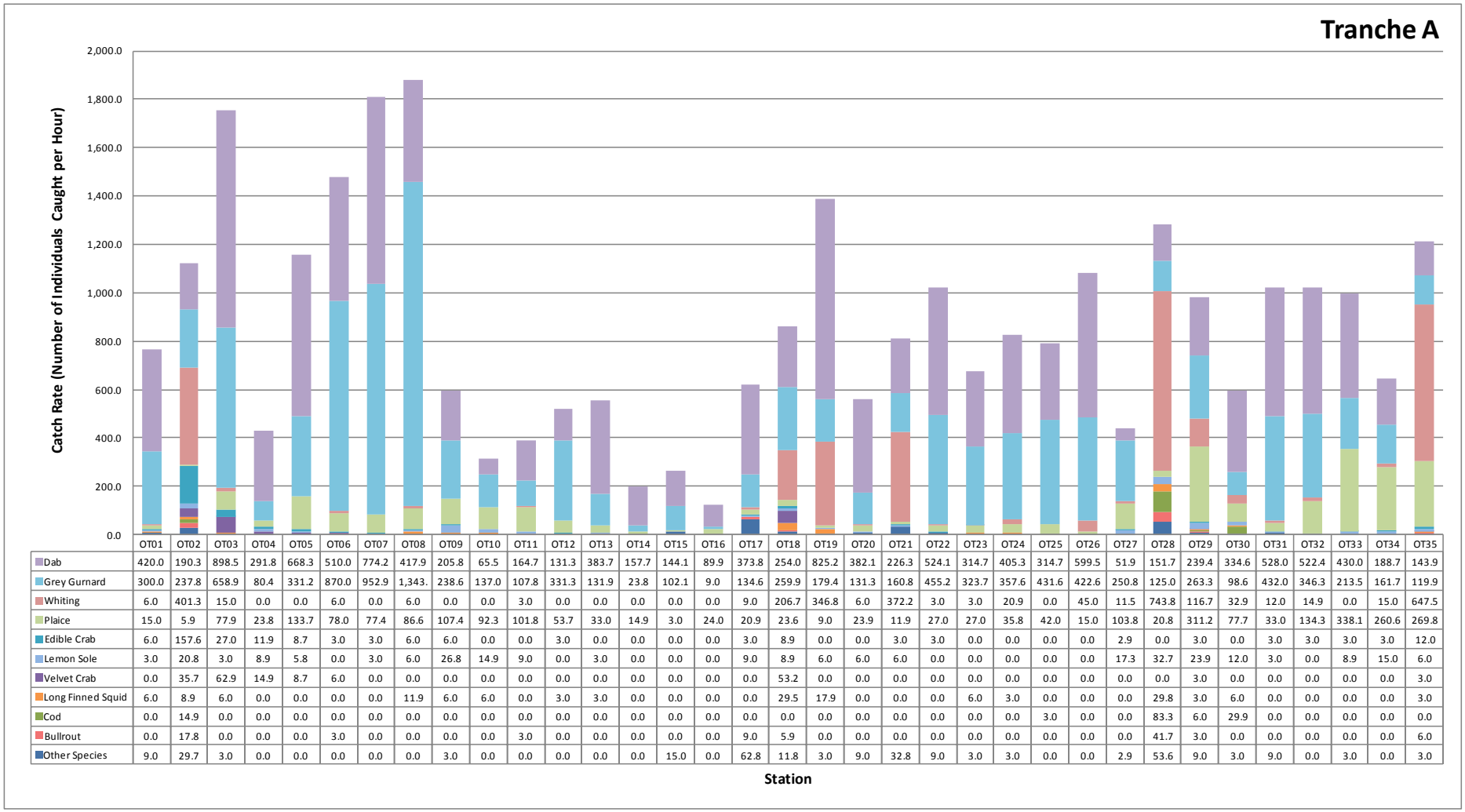
	Grey Gurnard	Dab	Whiting	Plaice	Lemon Sole	Edible Crab	Long Finned Squid	Cod	Velvet Crab	Other Species
Control	390.5	305.8	76.1	81.7	11.3	5.7	8.1	4.2	5.4	13.1
Tranche A	306.3	351.9	87.0	77.6	7.4	8.0	4.3	3.9	5.4	10.5
Cable Route	633.2	261.6	269.2	102.4	12.4	5.1	10.2	10.2	0.9	47.8

Figure 5.1 Catch Rate by Species and Sampling Area



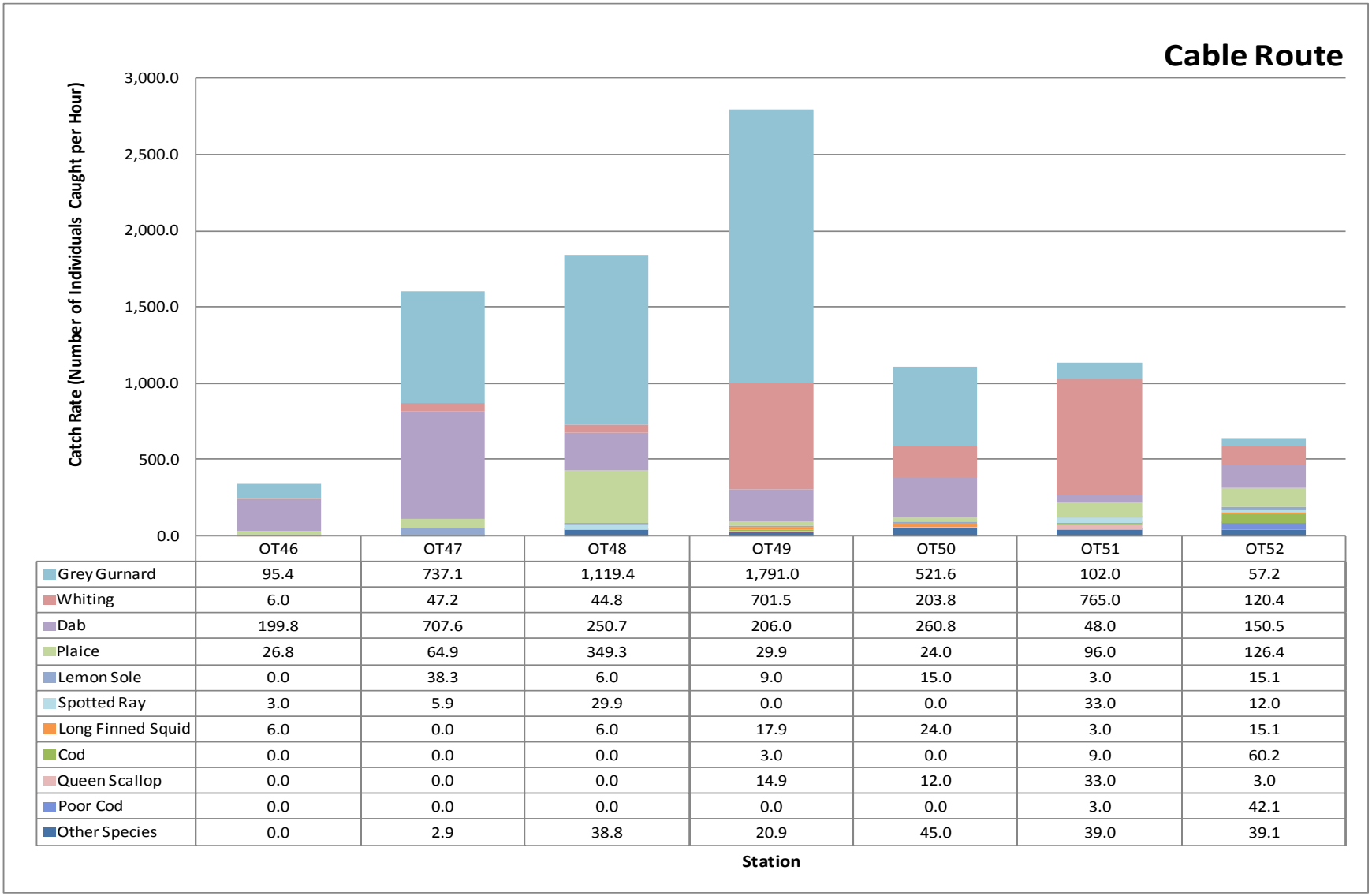
	OT36	OT37	OT38	OT39	OT40	OT41	OT42	OT43	OT44	OT45
Grey Gurnard	179.6	101.9	167.9	455.6	51.0	959.2	71.9	918.2	494.6	494.6
Dab	287.3	134.9	371.2	296.8	51.0	179.9	260.6	463.5	674.4	332.7
Plaice	215.5	137.9	35.4	104.9	18.0	95.9	6.0	35.0	62.9	107.9
Whiting	0.0	569.5	0.0	3.0	0.0	0.0	18.0	116.6	12.0	42.0
Lemon Sole	9.0	12.0	11.8	12.0	6.0	18.0	3.0	20.4	3.0	18.0
Long Finned Squid	3.0	12.0	0.0	0.0	0.0	18.0	44.9	2.9	0.0	0.0
Edible Crab	0.0	0.0	0.0	0.0	0.0	9.0	24.0	23.3	0.0	0.0
Velvet Crab	0.0	0.0	0.0	0.0	0.0	0.0	18.0	35.0	0.0	0.0
Cod	0.0	0.0	0.0	0.0	0.0	0.0	41.9	0.0	0.0	0.0
Horse Mackerel	0.0	27.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Species	0.0	12.0	2.9	3.0	0.0	9.0	27.0	14.6	21.0	12.0

Figure 5.2 Catch Rate by Species and Station at Control Stations



	OT01	OT02	OT03	OT04	OT05	OT06	OT07	OT08	OT09	OT10	OT11	OT12	OT13	OT14	OT15	OT16	OT17	OT18	OT19	OT20	OT21	OT22	OT23	OT24	OT25	OT26	OT27	OT28	OT29	OT30	OT31	OT32	OT33	OT34	OT35
Dab	420.0	190.3	898.5	291.8	668.3	510.0	774.2	417.9	205.8	65.5	164.7	131.3	383.7	157.7	144.1	89.9	373.8	254.0	825.2	382.1	226.3	524.1	314.7	405.3	314.7	599.5	51.9	151.7	239.4	334.6	528.0	522.4	430.0	188.7	143.9
Grey Gurnard	300.0	237.8	658.9	80.4	331.2	870.0	952.9	1,343.	238.6	137.0	107.8	331.3	131.9	23.8	102.1	9.0	134.6	259.9	179.4	131.3	160.8	455.2	323.7	357.6	431.6	422.6	250.8	125.0	263.3	98.6	432.0	346.3	213.5	161.7	119.9
Whiting	6.0	401.3	15.0	0.0	0.0	6.0	0.0	6.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	9.0	206.7	346.8	6.0	372.2	3.0	3.0	20.9	0.0	45.0	11.5	743.8	116.7	32.9	12.0	14.9	0.0	15.0	647.5
Plaice	15.0	5.9	77.9	23.8	133.7	78.0	77.4	86.6	107.4	92.3	101.8	53.7	33.0	14.9	3.0	24.0	20.9	23.6	9.0	23.9	11.9	27.0	27.0	35.8	42.0	15.0	103.8	20.8	311.2	77.7	33.0	134.3	338.1	260.6	269.8
Edible Crab	6.0	157.6	27.0	11.9	8.7	3.0	3.0	6.0	6.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	8.9	0.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	2.9	0.0	3.0	0.0	3.0	3.0	3.0	3.0	12.0
Lemon Sole	3.0	20.8	3.0	8.9	5.8	0.0	3.0	6.0	26.8	14.9	9.0	0.0	3.0	0.0	0.0	0.0	9.0	8.9	6.0	6.0	6.0	0.0	0.0	0.0	0.0	0.0	17.3	32.7	23.9	12.0	3.0	0.0	8.9	15.0	6.0
Velvet Crab	0.0	35.7	62.9	14.9	8.7	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3.0
Long Finned Squid	6.0	8.9	6.0	0.0	0.0	0.0	0.0	11.9	6.0	6.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	29.5	17.9	0.0	0.0	0.0	6.0	3.0	0.0	0.0	0.0	29.8	3.0	6.0	0.0	0.0	0.0	0.0	3.0
Cod	0.0	14.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	83.3	6.0	29.9	0.0	0.0	0.0	0.0	0.0
Bullrout	0.0	17.8	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	9.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.7	3.0	0.0	0.0	0.0	0.0	0.0	6.0
Other Species	9.0	29.7	3.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	62.8	11.8	3.0	9.0	32.8	9.0	3.0	3.0	0.0	0.0	2.9	53.6	9.0	3.0	9.0	0.0	3.0	0.0	3.0

Figure 5.3 Catch Rate by Species and Station within Tranche A



	OT46	OT47	OT48	OT49	OT50	OT51	OT52
Grey Gurnard	95.4	737.1	1,119.4	1,791.0	521.6	102.0	57.2
Whiting	6.0	47.2	44.8	701.5	203.8	765.0	120.4
Dab	199.8	707.6	250.7	206.0	260.8	48.0	150.5
Plaice	26.8	64.9	349.3	29.9	24.0	96.0	126.4
Lemon Sole	0.0	38.3	6.0	9.0	15.0	3.0	15.1
Spotted Ray	3.0	5.9	29.9	0.0	0.0	33.0	12.0
Long Finned Squid	6.0	0.0	6.0	17.9	24.0	3.0	15.1
Cod	0.0	0.0	0.0	3.0	0.0	9.0	60.2
Queen Scallop	0.0	0.0	0.0	14.9	12.0	33.0	3.0
Poor Cod	0.0	0.0	0.0	0.0	0.0	3.0	42.1
Other Species	0.0	2.9	38.8	20.9	45.0	39.0	39.1

Figure 5.4 Catch Rate by Species and Station along the Cable Route

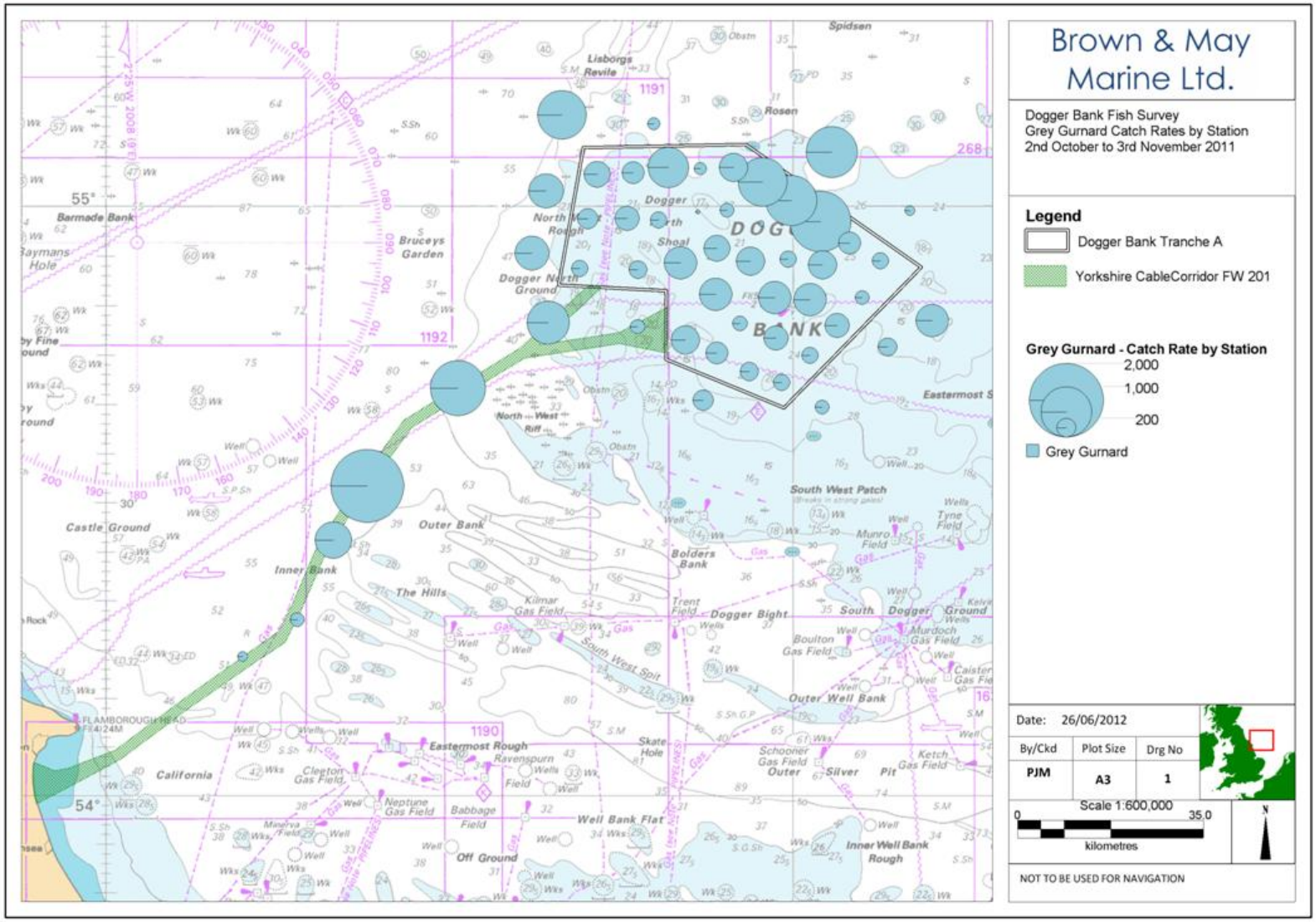


Figure 5.5 Spatial Distribution of Grey Gurnard (*E. gurnardus*) in the Area of Tranche A

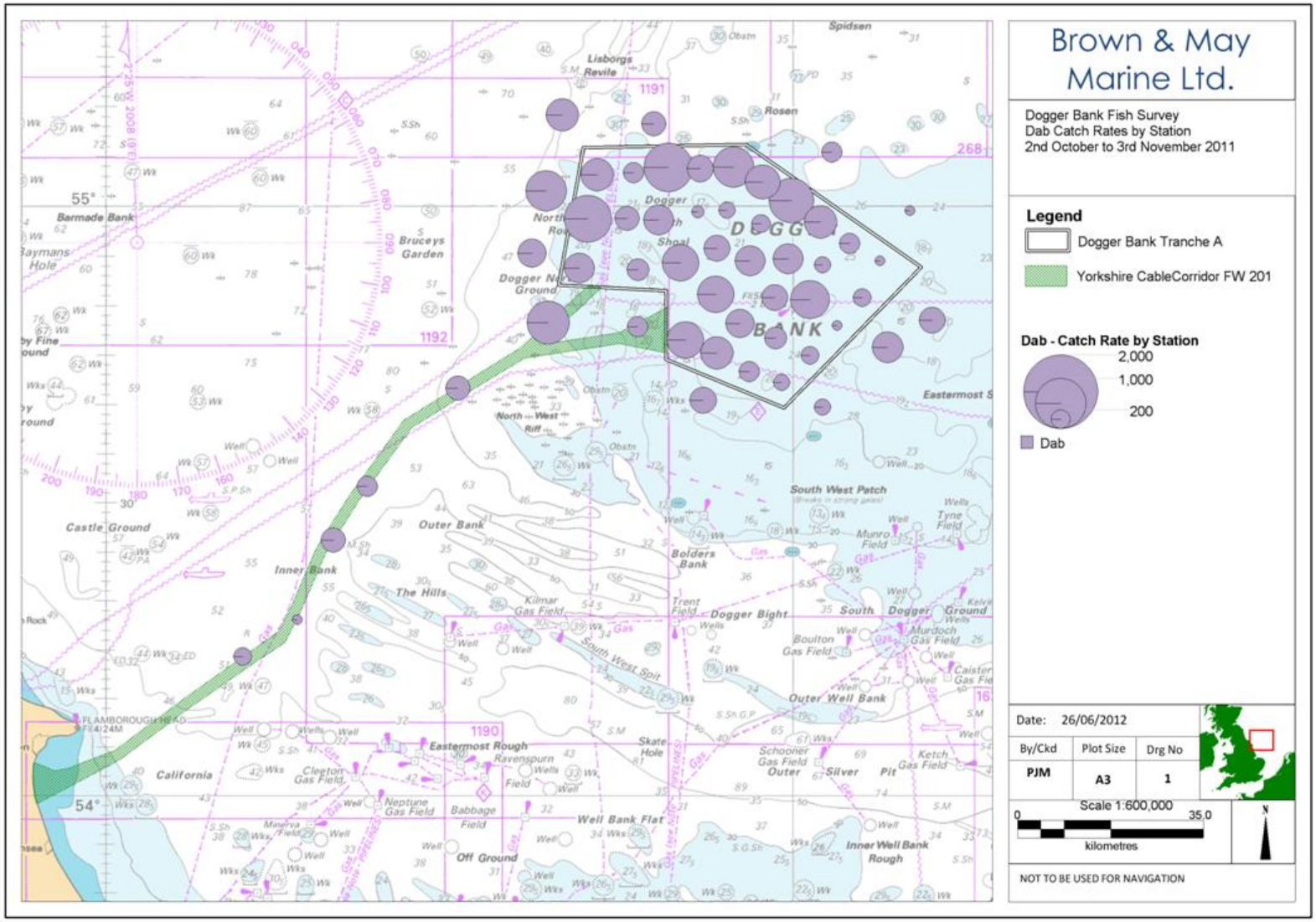


Figure 5.6 Spatial Distribution of Dab (*L. limanda*) in the Area of Tranche A

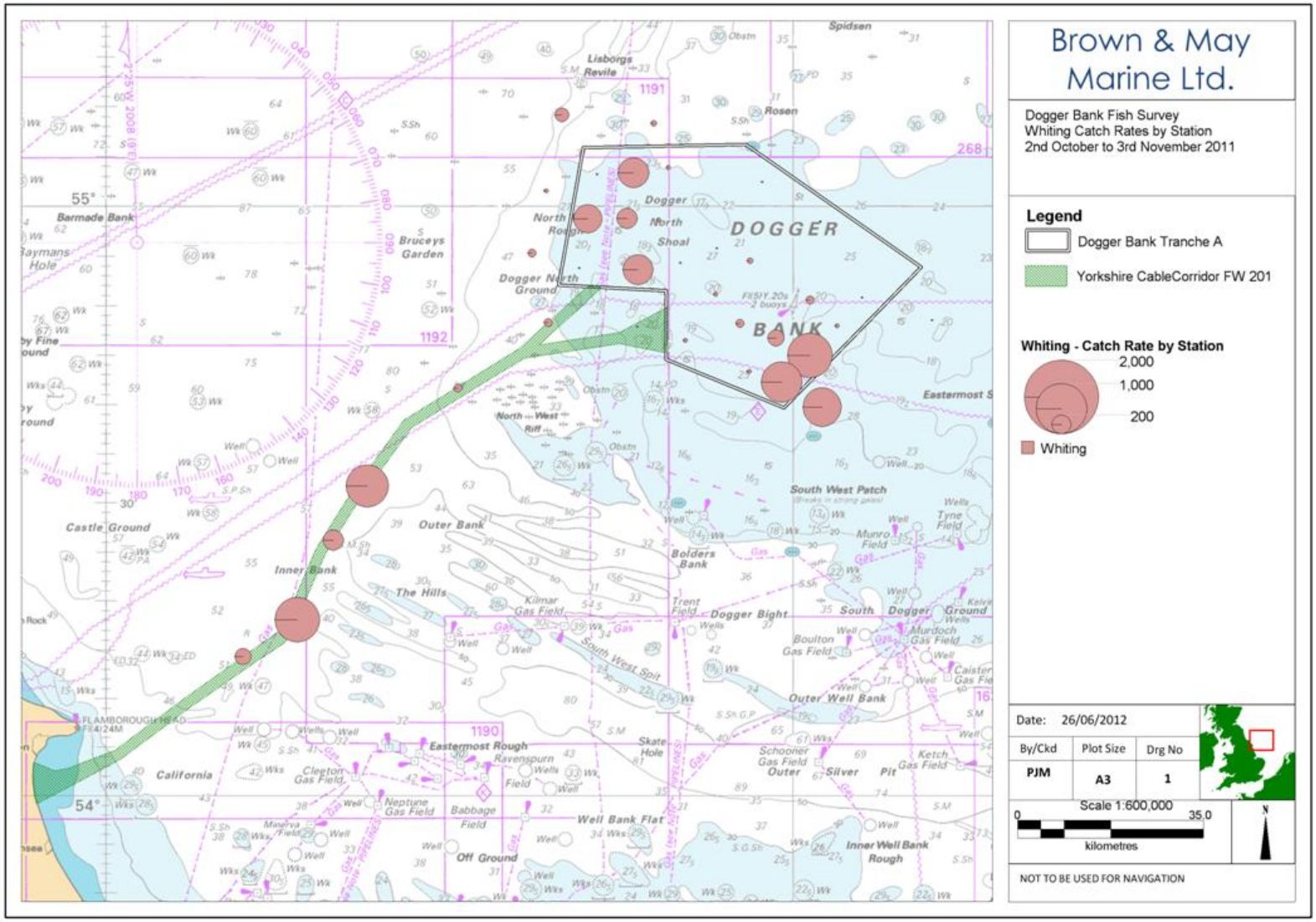


Figure 5.7 Spatial Distribution of Whiting (*M. merlangus*) in the Area of Tranche A

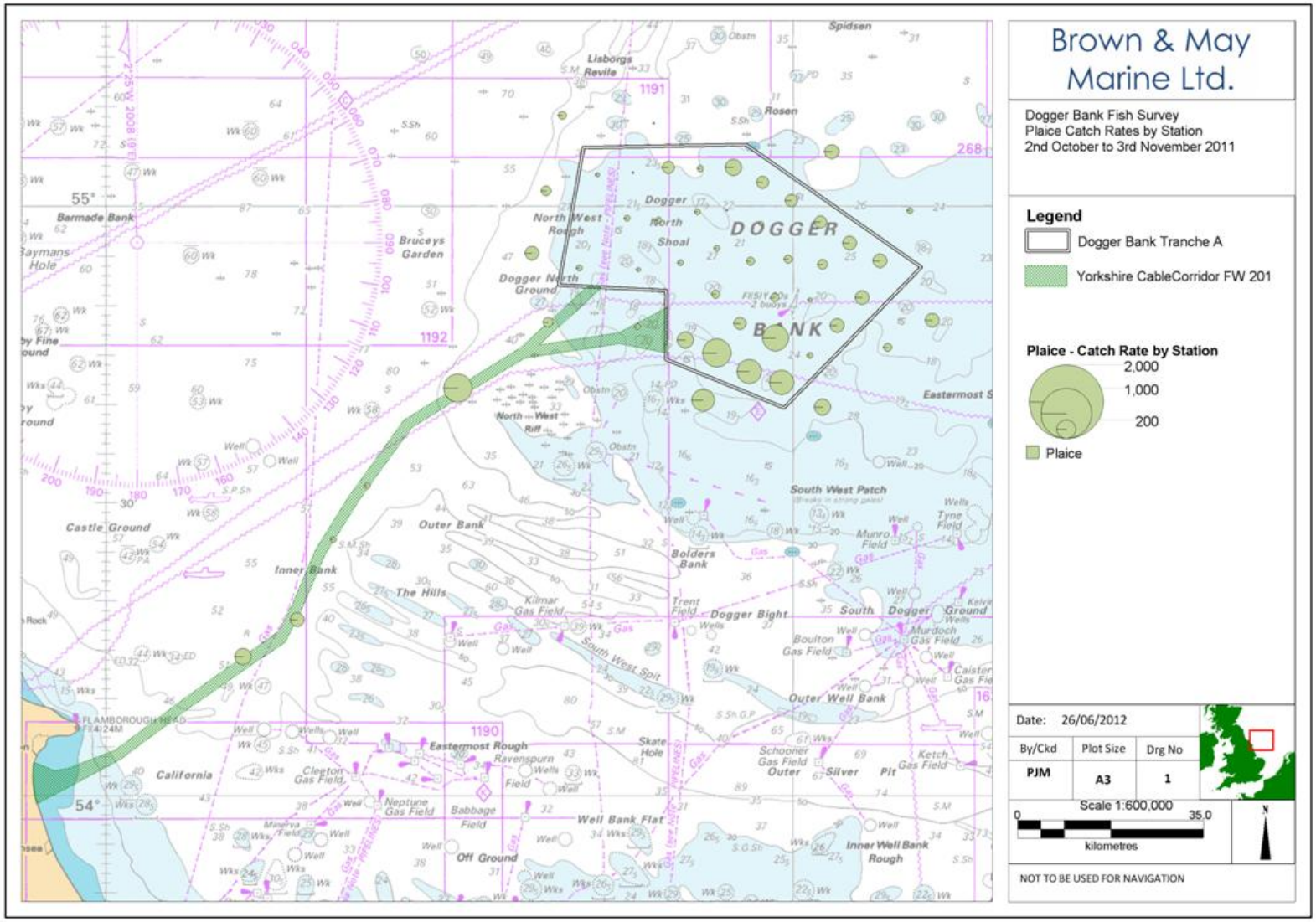


Figure 5.8 Spatial Distribution of Plaice (*P. platessa*) in the Area of Tranche A

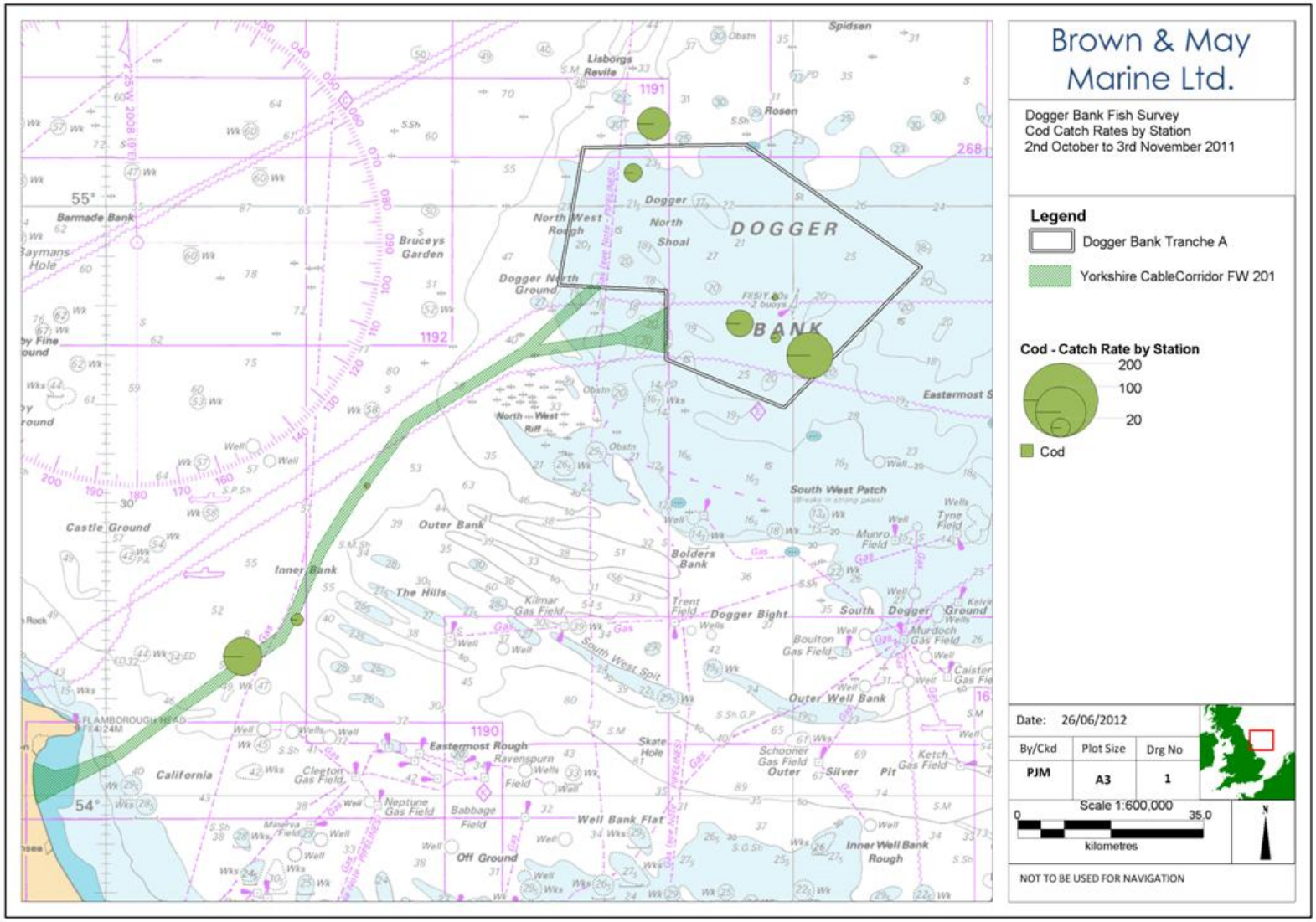


Figure 5.9 Spatial Distribution of Cod (*G. morhua*) in the Area of Tranche A

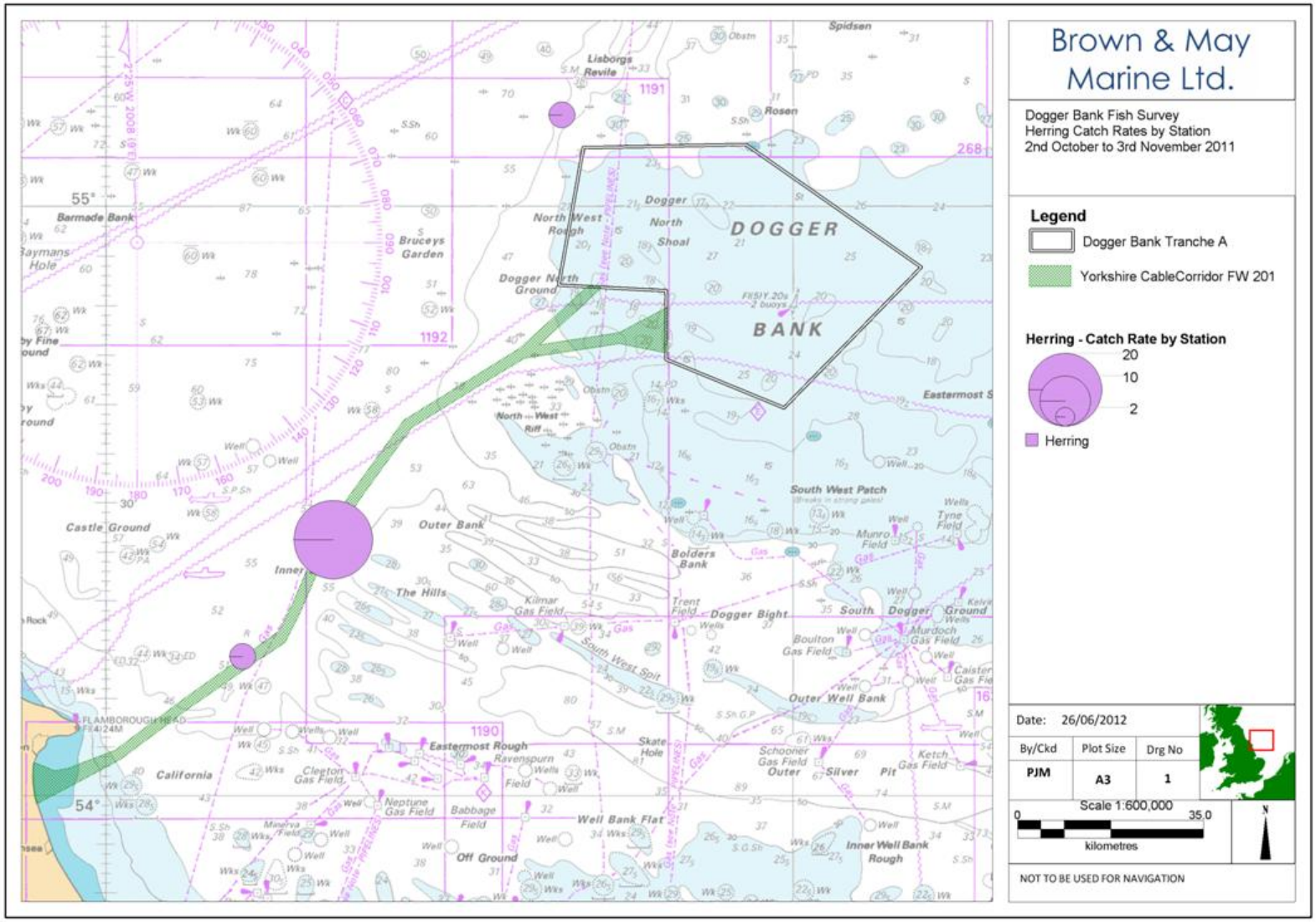


Figure 5.10 Spatial Distribution of Herring (*C. harengus*) in the Area of Tranche A

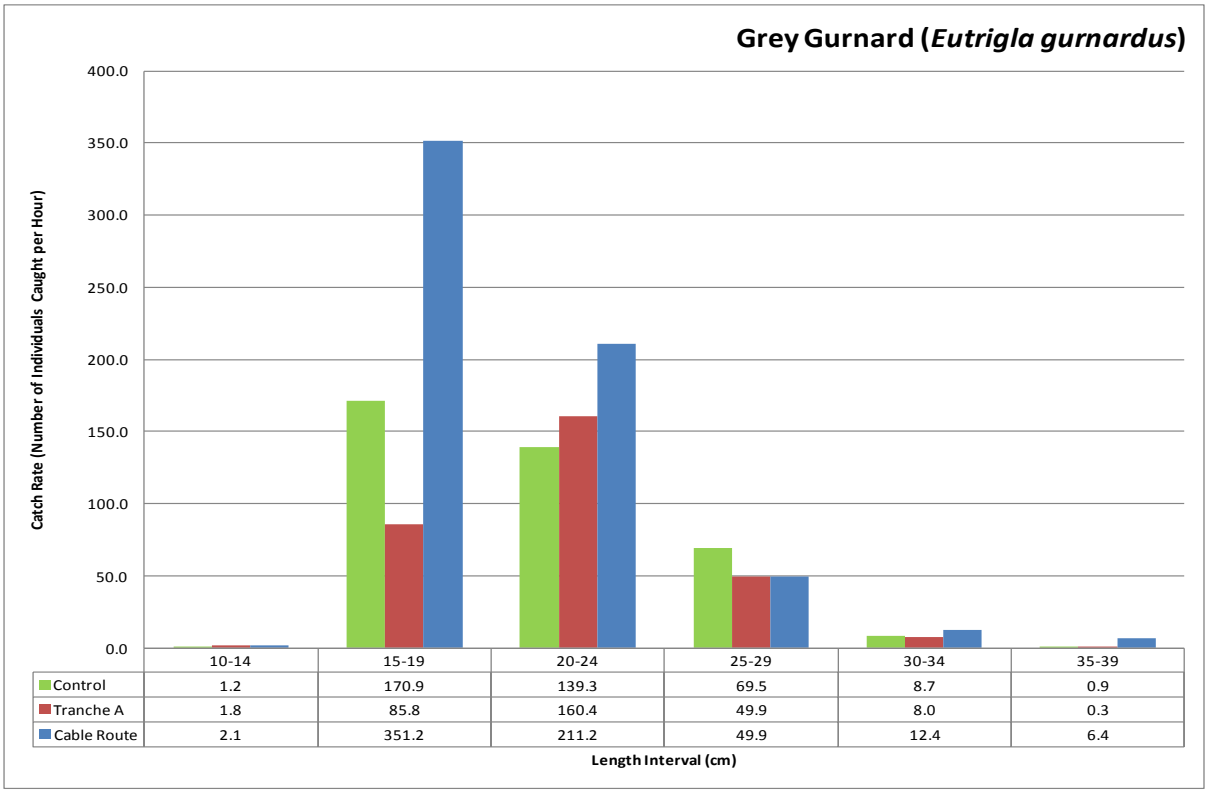
5.2 Length Distributions

The average length (cm) and length range of species caught, by sampling area (control, Tranche A and cable route stations), are given below in Table 5.2.

The length distributions of the most abundant species (>1,000 individuals) caught during the survey, expressed as the catch rate (number of individuals caught per hour) by length (cm) and by sampling area, are shown in Figure 5.11 to Figure 5.14 overleaf.

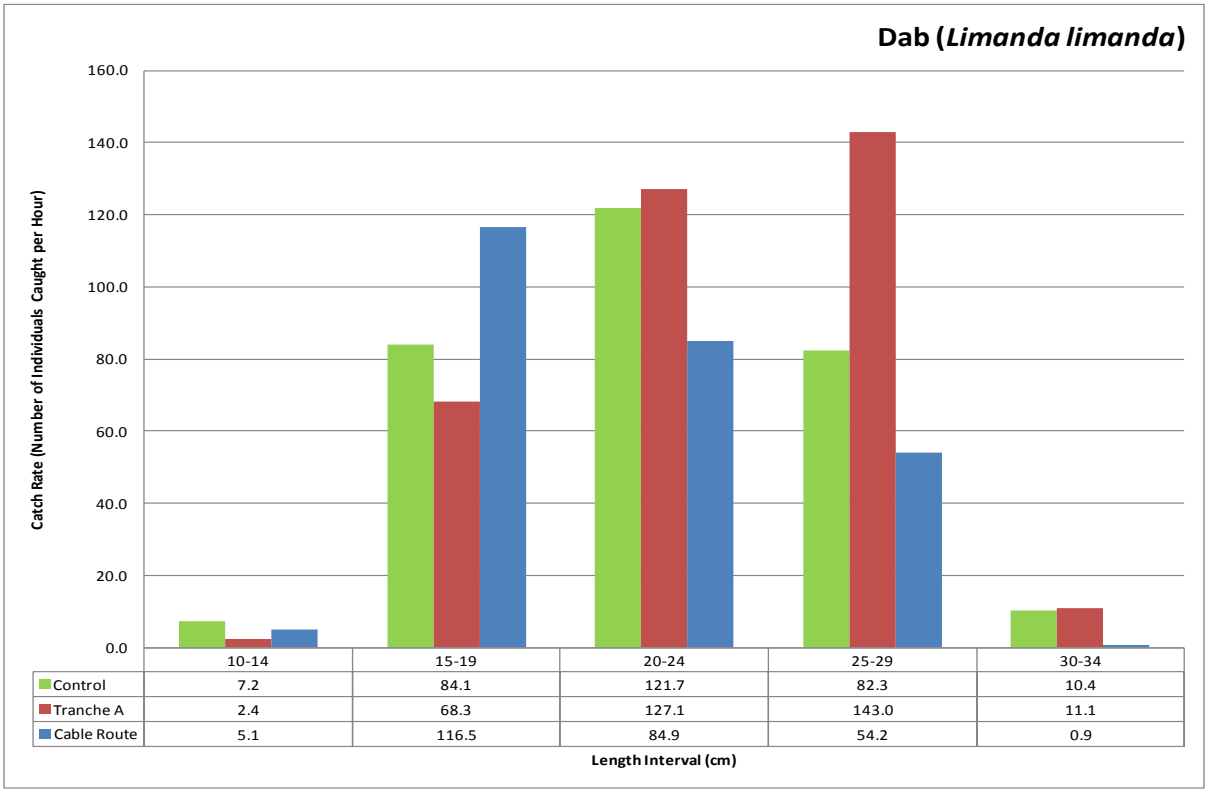
Table 5.2 Average Length and Length Ranges of Species Caught by Sampling Area

Species		Average Length (cm)			Length Range (cm)	
Common Name	Scientific Name	Control	Tranche A	Cable Route	Min.	Max.
Anglerfish	*Lophius piscatorius*	-	-	54.0	54.0	54.0
Brill	*Scophthalmus rhombus*	-	-	33.0	28.0	38.0
Bullrout	*Myoxocephalus scorpius*	17.8	19.5	-	13.0	26.0
Cod	*Gadus morhua*	39.9	38.0	38.5	28.0	60.0
Common Dragonet	*Callionymus lyra*	19.0	20.0	23.0	18.0	23.0
Dab	*Limanda limanda*	22.0	23.3	20.7	11.0	33.0
Edible Crab	*Cancer pagurus*	16.8	15.9	16.1	7.1	21.2
Greater Sandeel	*Hyperoplus lanceolatus*	-	20.0	-	20.0	20.0
Grey Gurnard	*Eutrigla gurnardus*	20.9	21.7	19.9	12.0	36.0
Haddock	*Melanogrammus aeglefinus*	37.0	31.7	33.8	27.0	42.0
Hake	*Merluccius merluccius*	44.0	-	-	44.0	44.0
Herring	*Clupea harengus*	27.5	-	26.9	23.5	30.0
Horse Mackerel	*Trachurus trachurus*	25.9	37.0	-	23.0	37.0
John Dory	*Zeus faber*	-	24.0	-	24.0	24.0
Lemon Sole	*Microstomus kitt*	25.3	24.9	25.5	15.0	36.0
Lesser Spotted Dogfish	*Scyliorhinus canicula*	63.0	61.3	-	53.0	72.0
Ling	*Molva molva*	47.5	-	-	37.0	58.0
Lobster	*Homarus gammarus*	-	-	10.6	9.3	13.6
Long-finned Squid	*Loligo forbesii*	18.6	17.2	11.7	2.0	41.0
Long Rough Dab	*Hippoglossoides platessoides*	21.0	-	21.0	18.0	24.0
Mackerel	*Scomber scombrus*	29.0	30.5	26.6	18.0	38.0
Plaice	*Pleuronectes platessa*	27.5	28.0	25.2	16.0	51.0
Poor Cod	*Trisopterus minutus*	15.0	-	15.3	14.0	18.0
Queen Scallop	*Aequipecten opercularis*	7.0	6.5	6.9	0.7	8.6
Red Gurnard	*Aspitrigla cuculus*	25.0	-	-	25.0	25.0
Red Mullet	*Mullus surmuletus*	-	-	24.0	24.0	24.0
Smooth Sandeel	*Gymnammodytes semisquamatus*	-	20.1	-	18.0	22.5
Spotted Ray	*Raja montagui*	52.0	52.4	44.6	24.0	64.0
Sprat	*Sprattus sprattus*	-	13.0	13.8	12.0	15.0
Spurdog	*Squalus acanthias*	-	87.0	-	87.0	87.0
Starry Ray	*Amblyraja radiata*	35.0	36.0	42.5	25.0	44.0
Starry Smoothhound	*Mustelus asterias*	-	-	72.3	55.0	95.0
Turbot	*Psetta maxima*	49.0	-	36.0	36.0	49.0
Velvet Crab	*Necora puber*	7.1	7.0	5.8	5.4	8.8
Whiting	*Merlangius merlangus*	24.2	23.7	25.4	17	38



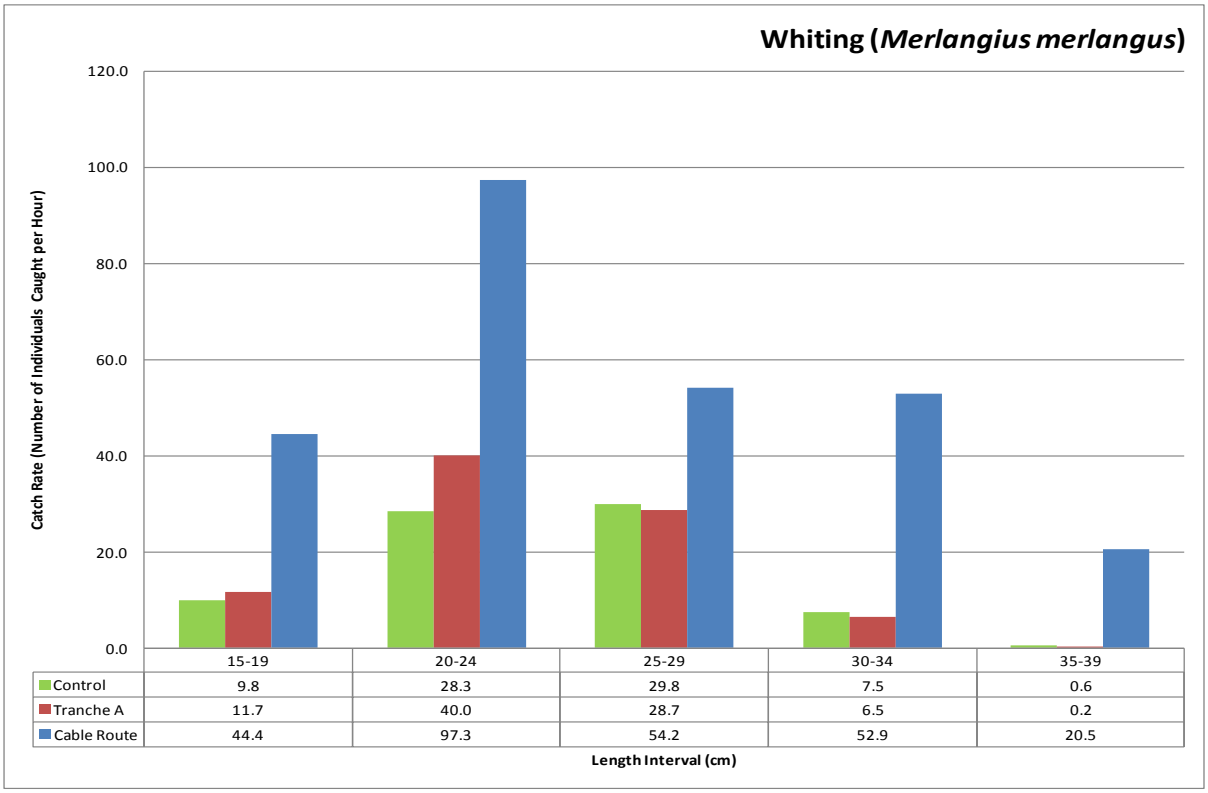
	10-14	15-19	20-24	25-29	30-34	35-39
Control	1.2	170.9	139.3	69.5	8.7	0.9
Tranche A	1.8	85.8	160.4	49.9	8.0	0.3
Cable Route	2.1	351.2	211.2	49.9	12.4	6.4

Figure 5.11 Grey Gurnard (*E. gurnardus*) Length Distribution by Sampling Area



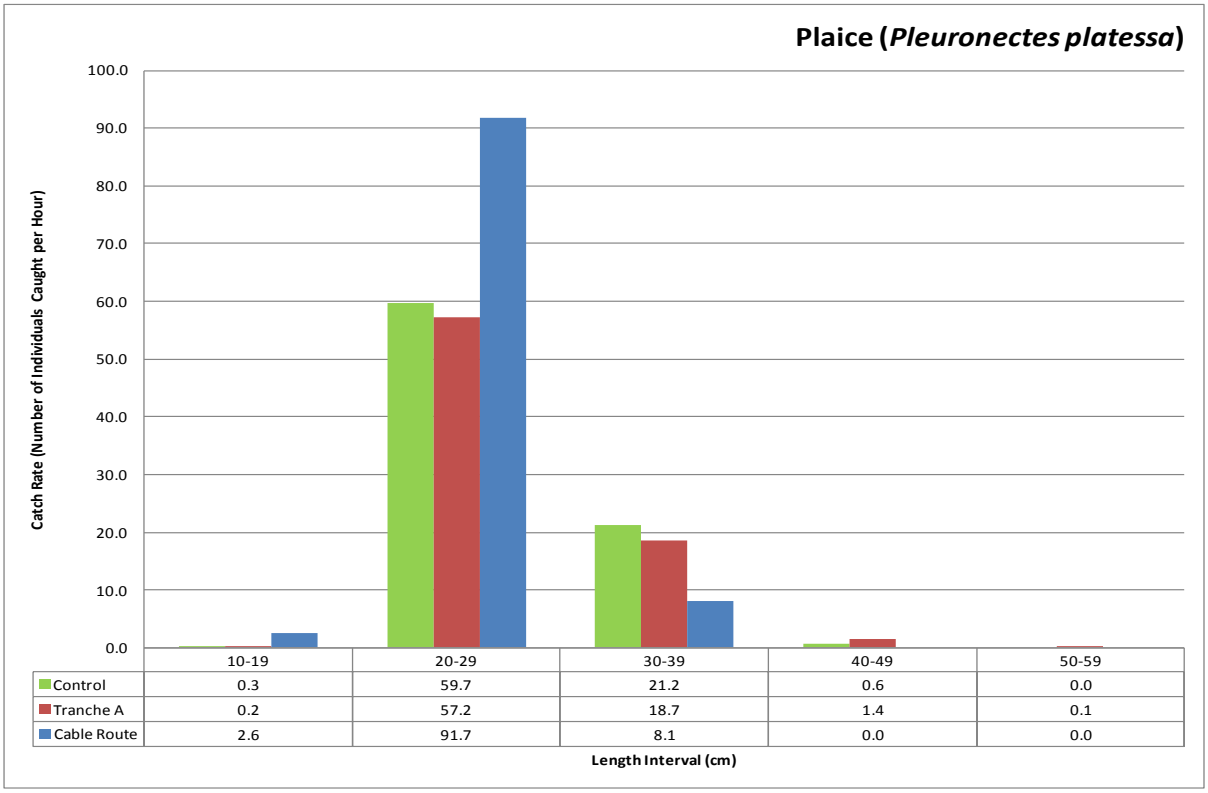
	10-14	15-19	20-24	25-29	30-34
Control	7.2	84.1	121.7	82.3	10.4
Tranche A	2.4	68.3	127.1	143.0	11.1
Cable Route	5.1	116.5	84.9	54.2	0.9

Figure 5.12 Dab (*L. limanda*) Length Distribution by Sampling Area



	15-19	20-24	25-29	30-34	35-39
Control	9.8	28.3	29.8	7.5	0.6
Tranche A	11.7	40.0	28.7	6.5	0.2
Cable Route	44.4	97.3	54.2	52.9	20.5

Figure 5.13 Whiting (*M. merlangus*) Length Distribution by Sampling Area



	10-19	20-29	30-39	40-49	50-59
Control	0.3	59.7	21.2	0.6	0.0
Tranche A	0.2	57.2	18.7	1.4	0.1
Cable Route	2.6	91.7	8.1	0.0	0.0

Figure 5.14 Plaice (*P. platessa*) Length Distribution by Sampling Area

5.3 Minimum Landing Sizes

Minimum landing sizes (MLS) for fish and shellfish species are set by the EC under Regulation No. 850/98 (Annex XII).

Table 5.3 shows the twelve species caught for which a MLS has been set, and denotes their presence or absence by sampling area (control, Tranche A and cable route).

Table 5.3 MLS Set by EC

Species		EC MLS (cm)	Presence		
Common Name	Scientific Name		Control	Tranche A	Cable
Cod	*Gadus morhua*	35	✓	✓	✓
Haddock	*Melanogrammus aeglefinus*	30	✓	✓	✓
Hake	*Merluccius merluccius*	27	✓		
Herring	*Clupea harengus*	20	✓		✓
Horse Mackerel	*Trachurus trachurus*	15	✓	✓	
Ling	*Molva molva*	63	✓		
Mackerel	*Scomber scombrus*	30	✓	✓	✓
Plaice	*Pleuronectes platessa*	27	✓	✓	✓
Whiting	*Merlangius merlangus*	27	✓	✓	✓
Edible Crab	*Cancer pagurus*	13	✓	✓	✓
Lobster	*Homarus gammarus*	8.7			✓
Queen Scallop	*Aequipecten opercularis*	4	✓	✓	✓

The percentage of individuals caught above and below their set MLS by species is shown in Figure 5.15 (control), Figure 5.16 (Tranche A) and Figure 5.17 (cable route).

The percentage of individuals above and below the MLS was approximately 50:50 for the *P. platessa* caught at the control stations and within Tranche A, whereas along the cable route the majority of the *P. platessa* were below the MLS (70.0%).

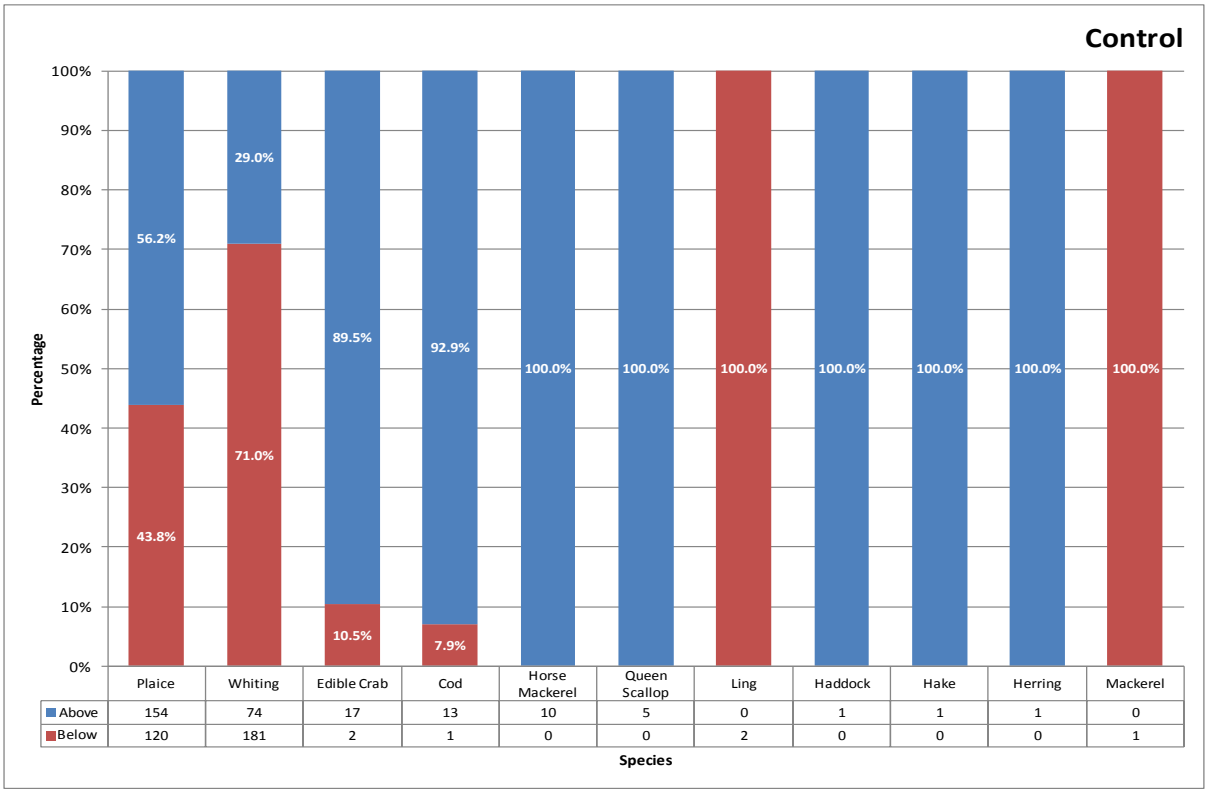
Most of the *M. merlangus* caught at the control stations and within Tranche A were below the MLS (control 71.0%, Tranche A 74.2%), whereas along the cable route the percentage of individuals caught above and below the MLS was approximately 50:50.

The majority of the edible crab (*Cancer pagurus*; control 89.5%, Tranche A 80.9%, cable route 91.7%), *G. morhua* (92.9%, 82.6% and 62.5%), haddock (*Melanogrammus aeglefinus*; 100.0%, 80.0% and 80.0%) and all of the queen scallop caught in all sampling areas were above the set MLS.

Ten horse mackerel (*Trachurus trachurus*) were found at the control stations and one within Tranche A, all of which were above the set MLS. One *C. harengus* was caught at the control stations, and eight along the cable route, all of which were above the MLS.

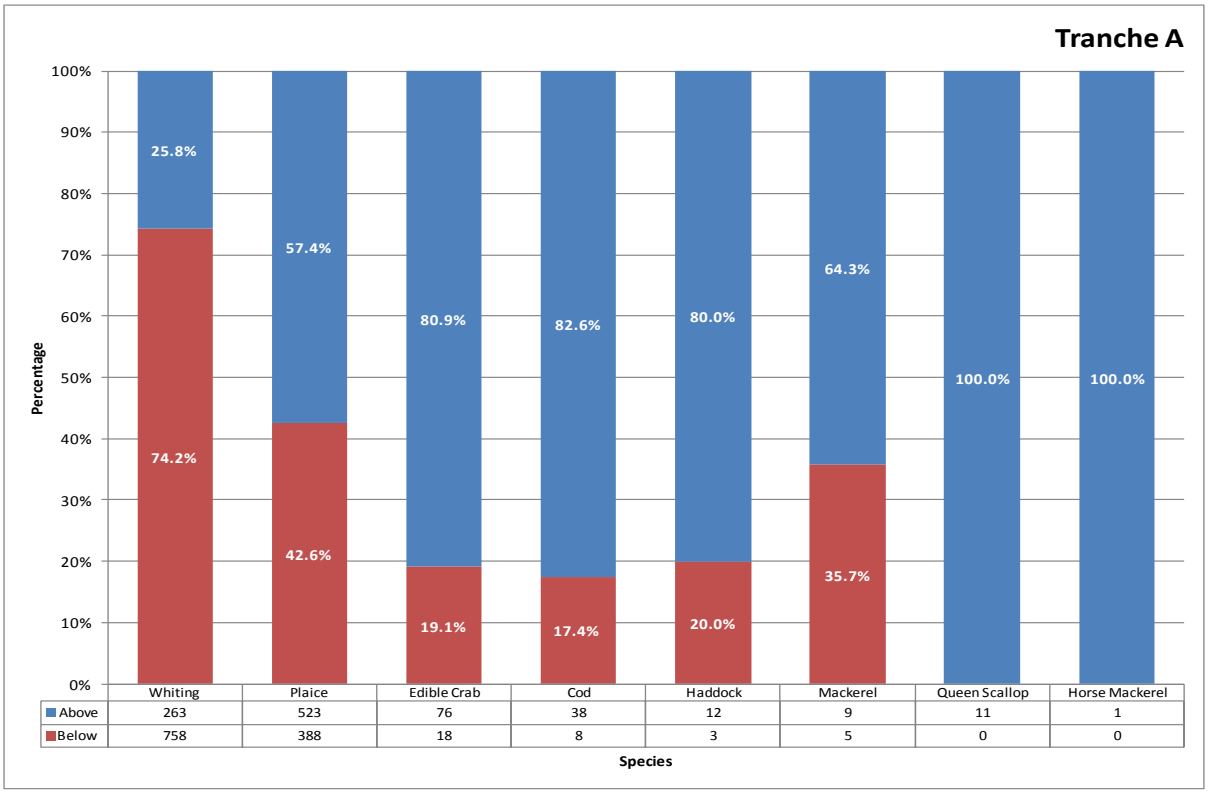
One *S. scombrus* was found at the control stations, and was above the set MLS. A greater proportion of the *S. scombrus* caught within Tranche A were above the MLS (64.3%), whereas along the cable route the majority of which were below the MLS (70.0%).

All other species were caught in relatively low numbers.



	Plaice	Whiting	Edible Crab	Cod	Horse Mackerel	Queen Scallop	Ling	Haddock	Hake	Herring	Mackerel
Above	154	74	17	13	10	5	0	1	1	1	0
Below	120	181	2	1	0	0	2	0	0	0	1

Figure 5.15 Percentage of the Catch Above and Below the MLS by Species at the Control Stations



	Whiting	Plaice	Edible Crab	Cod	Haddock	Mackerel	Queen Scallop	Horse Mackerel
Above	263	523	76	38	12	9	11	1
Below	758	388	18	8	3	5	0	0

Figure 5.16 Percentage of the Catch Above and Below the MLS by Species within Tranche A

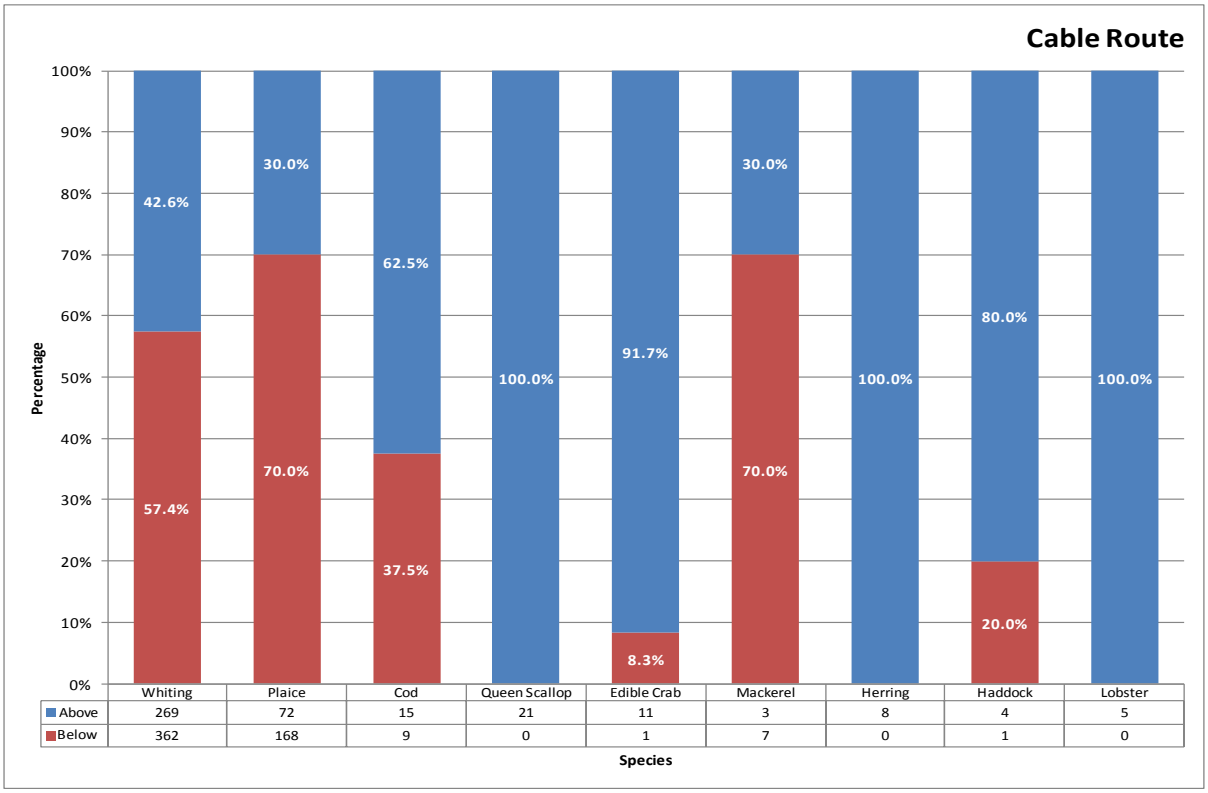


Figure 5.17 Percentage of the Catch Above and Below the MLS by Species at Stations along the Cable Route

5.4 Sex Ratios

The sex ratios of the four most abundant species caught during the survey are shown in Figure 5.18 (Tranche A), Figure 5.19 (control stations) and Figure 5.20 (cable route). It should be noted that Cefas were unable to confidently determine the sex of a number of immature individuals, and as such they have been categorised as 'unsexed'.

Overall, a greater proportion of the catch in all sampling areas were female (control 55.8%, Tranche A 72.6%, cable route 45.4%).

A greater proportion of the sexed *E. gurnardus* caught in all sampling areas were female (control 39.8%, Tranche A 60.9%, cable route 32.7%).

The majority of the *L. limanda* caught in all sampling areas were female (control 70.5%, Tranche A 85.0%, cable route 65.1%).

A greater proportion of the *P. platessa* (control 71.5%, Tranche A 78.9%) and *M. merlangus* (control 61.6%, Tranche A 57.6%)caught at the control stations and within Tranche A were female, whereas along the cable route the sex ratio was approximately 50:50.

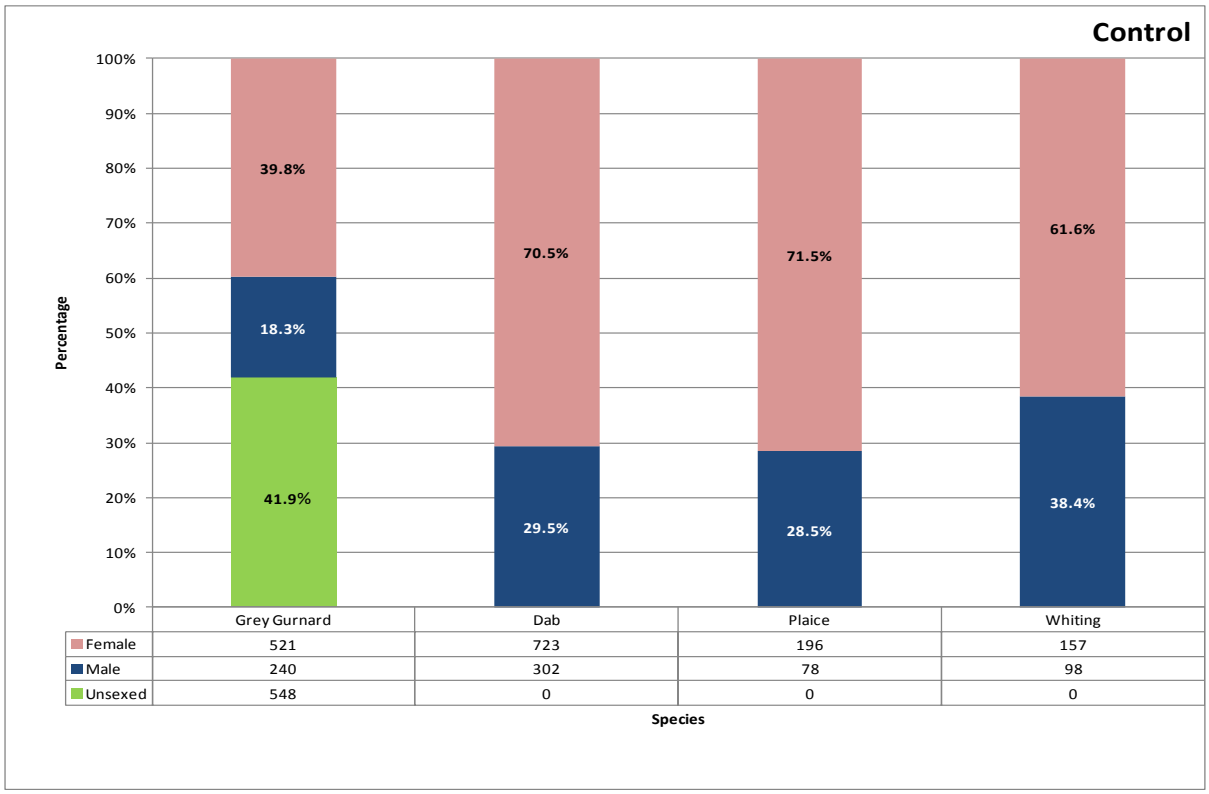


Figure 5.18 Sex Ratio by Species at the Control Stations

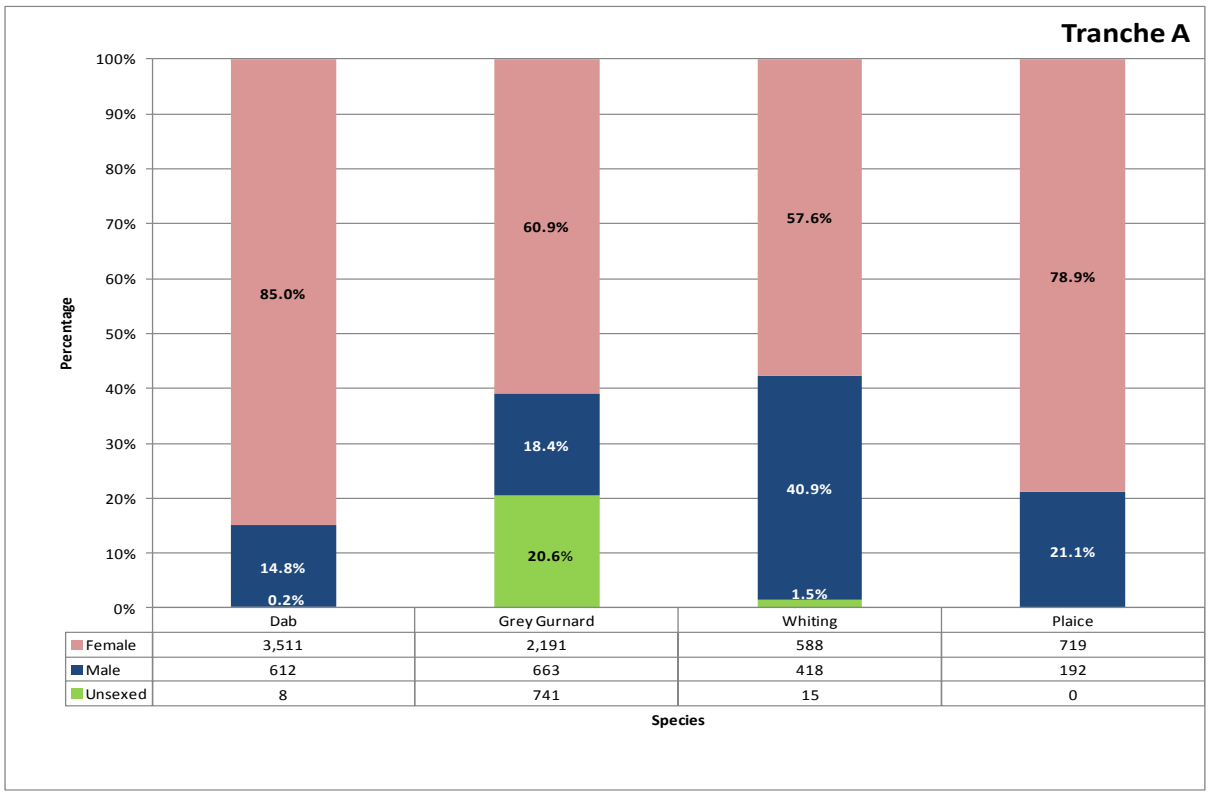


Figure 5.19 Sex Ratio by Species within Tranche A

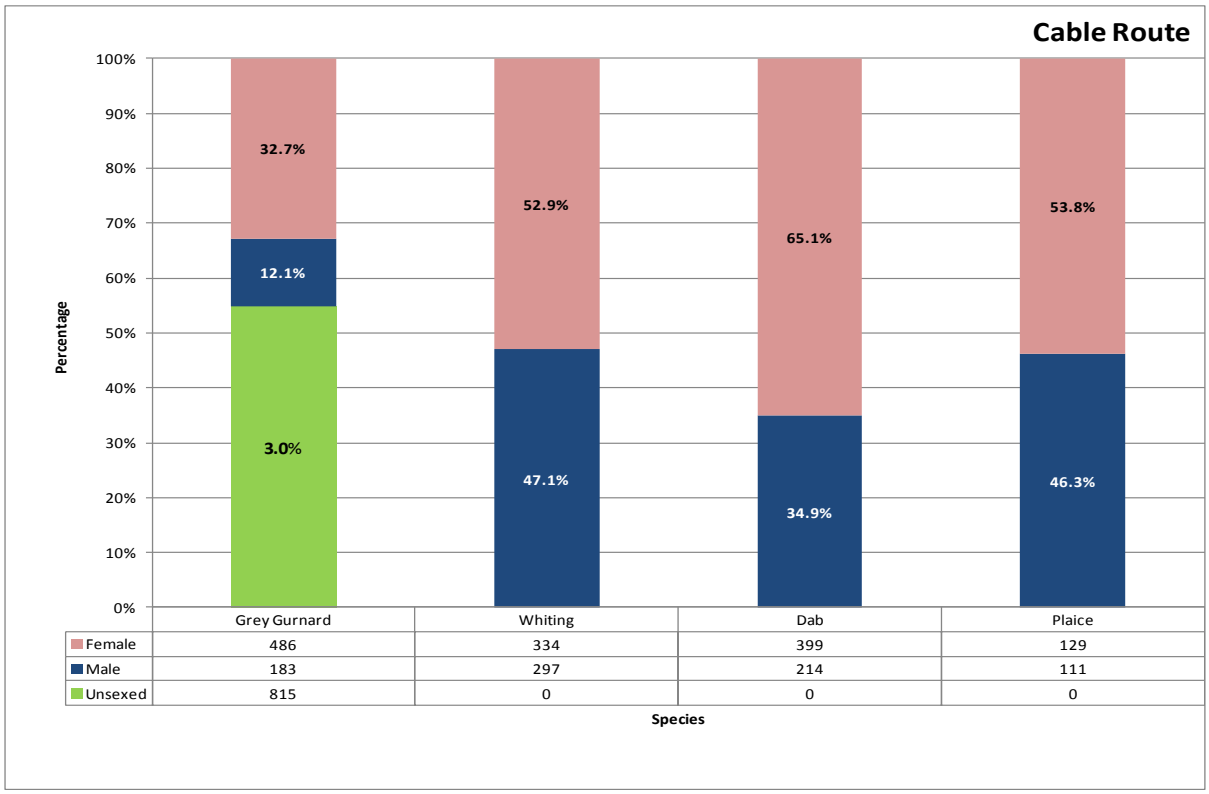


Figure 5.20 Sex Ratio by Species at Stations along the Cable Route

5.5 Spawning Condition

The spawning condition, sex and length range (nearest cm below) of the most abundant species caught during the survey (>1,000) are given in Table 5.4 to Table 5.7. The spawning condition, sex and length ranges of *G. morhua* and *C. harengus* are also given in Table 5.8 and Table 5.9 respectively.

Where a stage of maturity was not recorded for a species it has not been included in the following tables. It should be noted that Cefas were unable to confidently determine the sex of a number of immature individuals, and as such they have been categorised as 'unsexed'.

One maturing female *H. lanceolatus* and 21 *G. semisquamatus* were found within Tranche A, it should be noted however that the sex and spawning condition of the *G. semisquamatus* could not be confidently determined by Precision Marine Surveys Ltd. (PMSL).

A greater proportion of the *E. gurnardus* caught at the control stations (65.4%) and along the cable route were immature (88.8%), whereas within Tranche A the highest proportion is represented by both maturing females (41.2%) and immature fish (41.1%).

Spent females represented the greatest proportion of the *L. limanda* caught at the control stations (51.8%) and along the cable route (53.2%), whereas within Tranche A maturing fish (50.2%) and spent females (43.3%) accounted for the highest proportion of the catch.

The greatest proportion of the *M. merlangus* (control 58.4%, Tranche A 53.7%, cable route 54.5%) and *G. morhua* (78.6%, 91.3%, 83.3%) found in all sampling areas were immature fish

Maturing fish represented the highest proportion of the *P. platessa* caught at the control stations (56.2%) and within Tranche A (47.4%), whereas along the cable route maturing males accounted for the greatest proportion (44.2%).

One 'early ripening' female *C. harengus* was caught at the control stations, and the majority of those caught along the cable route were 'ripening' males and females.

Table 5.4 Grey Gurnard (*E. gurnardus*) Spawning Condition

Grey Gurnard								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	175	513	348	1,036	16.2%	14	28
	Maturing	236	1,481	54	1,771	27.7%	16	34
	Hyaline	0	8	0	8	0.1%	28	29
	Spent	110	189	84	383	6.0%	20	36
Male	Immature	133	223	155	511	8.0%	15	32
	Maturing	88	398	20	506	7.9%	16	32
	Spent	19	42	8	69	1.1%	19	30
Unsexed	Immature	548	741	815	2,104	32.9%	12	24

Table 5.5 Dab (*L. limanda*) Spawning Condition

Dab								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	29	135	17	181	3.1%	12	28
	Maturing	163	1,577	56	1,796	31.1%	13	32
	Hyaline	0	11	0	11	0.2%	19	26
	Spent	531	1,788	326	2,645	45.8%	14	33
Male	Immature	3	24	2	29	0.5%	11	20
	Maturing	246	498	175	919	15.9%	13	29
	Spent	53	90	37	180	3.1%	15	27
Unsexed	Immature	0	8	0	8	0.1%	17	21

Table 5.6 Whiting (*M. merlangus*) Spawning Condition

Whiting								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	84	288	125	497	26.1%	17	27
	Maturing	10	112	182	304	15.9%	18	38
	Spent	63	188	27	278	14.6%	19	35
Male	Immature	65	260	219	544	28.5%	17	30
	Maturing	28	74	66	168	8.8%	20	33
	Spent	5	84	12	101	5.3%	25	31
Unsexed	Immature	0	15	0	15	0.8%	17	23

Table 5.7 Plaice (*P. platessa*) Spawning Condition

Plaice								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	45	186	40	271	19.0%	17	30
	Maturing	81	256	34	371	26.0%	20	51
	Spent	70	277	55	402	28.2%	21	46
Male	Immature	0	9	3	12	0.8%	20	25
	Maturing	73	176	106	355	24.9%	16	32
	Spent	5	7	2	14	1.0%	20	30

Table 5.8 Cod (*G. morhua*) Spawning Condition

Cod								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	Immature	6	25	5	36	42.9%	31	47
	Maturing	3	2	4	9	10.7%	38	60
Male	Immature	5	17	11	33	39.3%	28	46
	Maturing	0	2	0	2	2.4%	35	35
Unsexed	Immature	0	0	4	4	4.8%	32	37

Table 5.9 Herring (*C. harengus*) Spawning Condition

Herring								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable			Min.	Max.
Female	3 - Early Ripening	1	0	1	2	22.2%	25.0	27.5
	4 - Ripening	0	0	3	3	33.3%	26.5	30.0
	5 - Late Ripening	0	0	1	1	11.1%	28.5	28.5
Male	4 - Ripening	0	0	3	3	33.3%	23.5	27.5

6.0 Beam Trawl Results

6.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) by fish species and by sampling area are given in Table 6.1 below and are illustrated in Figure 5.1Figure 6.1. The catch rate of fish species by station and by sampling area (control, Tranche A, cable route and inshore) are shown in Figure 6.2 to Figure 6.5 respectively.

A total of 29 species of fish were caught, ten of which were found at the control stations, 22 within Tranche A, 14 along the cable route and 11 species at the inshore stations.

Overall, *B. luteum* was the most abundant species caught (857 individuals), the majority of which were found in Tranche A (627), followed by *L. limanda* (463), *A. marinus* (283), and then *P. pictus* (215).

B. luteum was the most prevalent species at the control stations (107.2/hr) and within Tranche A (106.2/hr), whereas *L. limanda* were most abundant along the cable route (60.0/hr) and in the inshore areas (67.2/hr).

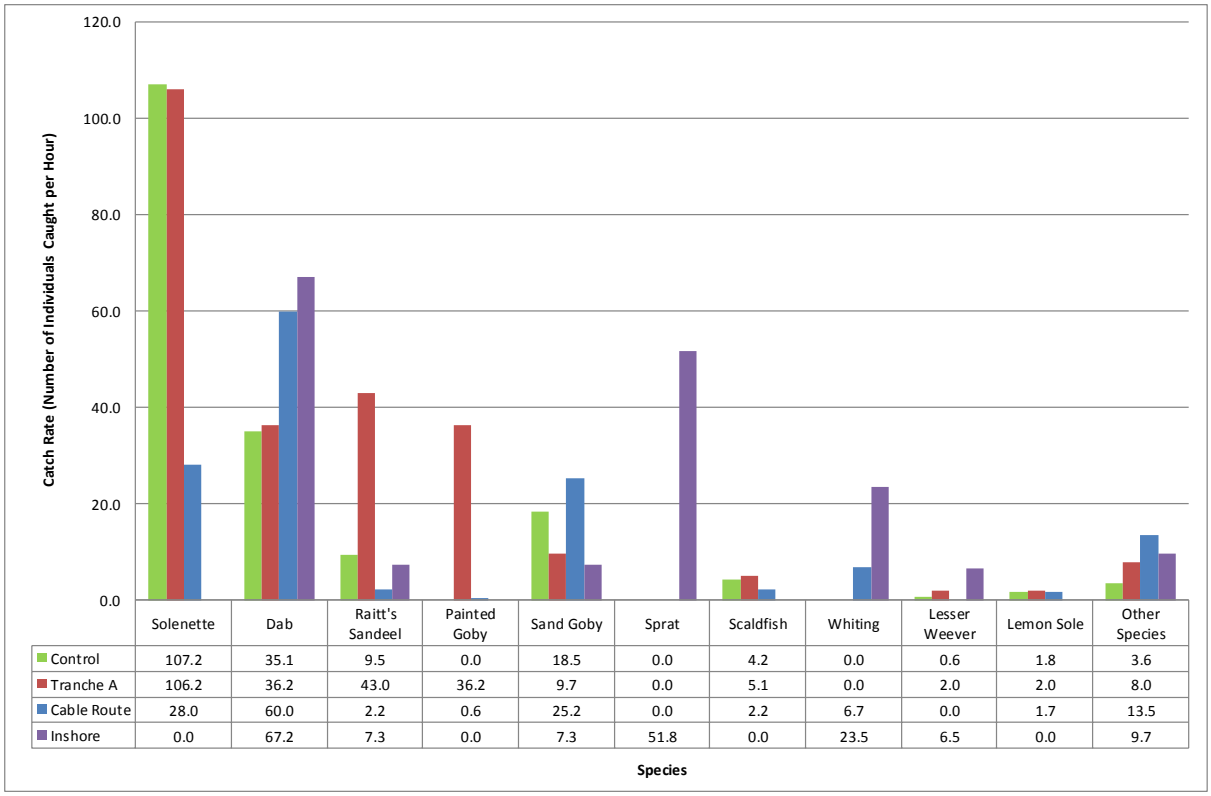
P. platessa were found in low numbers in all sampling areas, with the greatest catch rate recorded along the cable route (5.0/hr). *M. merlangus* were found along the cable route and in the inshore areas, with the greatest catch rate recorded along the cable route (23.5/hr). Six *G. semisquamatus* were found within the wind farm at a catch rate of 1.0/hr.

Overall, catch rates were greater within Tranche A (248.4/hr) than at the control stations (180.5/hr), in the inshore areas (173.4/hr) and along the cable route (140.1/hr).

Table 6.1 Number of Individuals Caught and the Catch Rate by Fish Species and Sampling Area

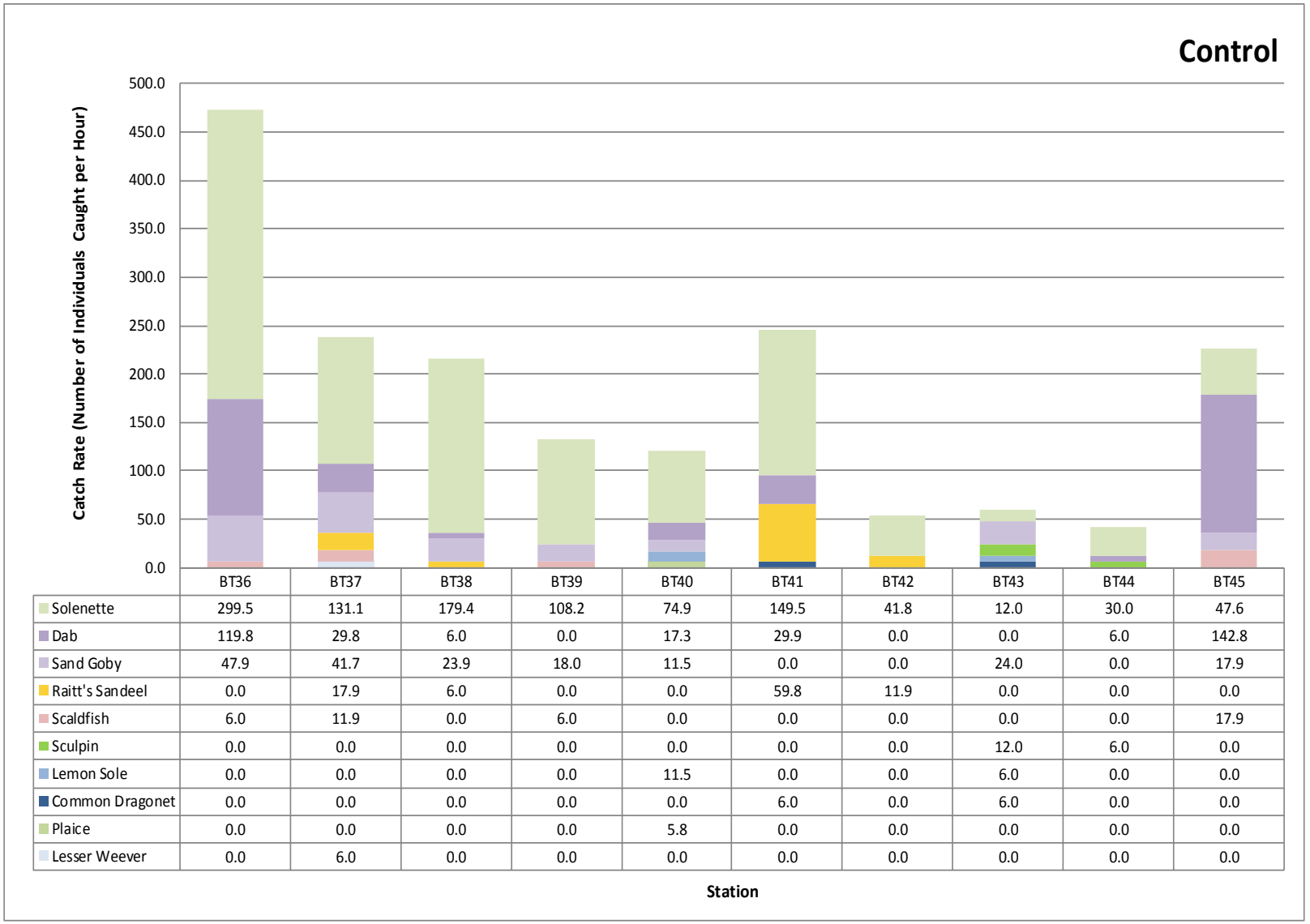
Species		Number of Individuals Caught					Catch Rate (Individuals Caught per Hour)			
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Total	Control	Tranche A	Cable Route	Inshore
Solenette	*Buglossidium luteum*	180	627	50	0	857	107.2	106.2	28.0	0.0
Dab	*Limanda limanda*	59	214	107	83	463	35.1	36.2	60.0	67.2
Raitt's Sandeel	*Ammodytes marinus*	16	254	4	9	283	9.5	43.0	2.2	7.3
Painted Goby	*Pomatoschistus pictus*	0	214	1	0	215	0.0	36.2	0.6	0.0
Sand Goby	*Pomatoschistus minutus*	31	57	45	9	142	18.5	9.7	25.2	7.3
Sprat	*Sprattus sprattus*	0	0	0	64	64	0.0	0.0	0.0	51.8
Scaldfish	*Arnoglossus laterna*	7	30	4	0	41	4.2	5.1	2.2	0.0
Whiting	*Merlangius merlangus*	0	0	12	29	41	0.0	0.0	6.7	23.5
Lesser Weever	*Echiichthys vipera*	1	12	0	8	21	0.6	2.0	0.0	6.5
Lemon Sole	*Microstomus kitt*	3	12	3	0	18	1.8	2.0	1.7	0.0
Plaice	*Pleuronectes platessa*	1	2	9	3	15	0.6	0.3	5.0	2.4
Common Dragonet	*Callionymus lyra*	2	10	1	0	13	1.2	1.7	0.6	0.0
Dover Sole	*Solea solea*	0	0	8	3	11	0.0	0.0	4.5	2.4
Pogge	*Agonus cataphractus*	0	10	0	0	10	0.0	1.7	0.0	0.0
Sculpin juv.	*Cottidae sp.*	3	4	0	0	7	1.8	0.7	0.0	0.0
Smooth Sandeel	*Gymnammodytes semisquamatus*	0	6	0	0	6	0.0	1.0	0.0	0.0
Grey Gurnard	*Eutrigla gurnardus*	0	4	0	0	4	0.0	0.7	0.0	0.0
Poor Cod	*Trisopterus minutus*	0	0	4	0	4	0.0	0.0	2.2	0.0
Bullrout	*Myoxocephalus scorpius*	0	1	1	1	3	0.0	0.2	0.6	0.8
Lesser Sandeel	*Ammodytes tobianus*	0	0	0	3	3	0.0	0.0	0.0	2.4
Long-Spined Sea Scorpion	*Taurulus bubalis*	0	2	0	0	2	0.0	0.3	0.0	0.0
Megrim	*Lepidorhombus whiffiagonis*	0	2	0	0	2	0.0	0.3	0.0	0.0
Transparent Goby	*Aphia minuta*	0	0	0	2	2	0.0	0.0	0.0	1.6
Two-spotted Clingfish	*Diplecogaster bimaculata*	0	2	0	0	2	0.0	0.3	0.0	0.0
Butterfish	*Pholis gunnellus*	0	1	0	0	1	0.0	0.2	0.0	0.0

Species		Number of Individuals Caught					Catch Rate (Individuals Caught per Hour)			
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Total	Control	Tranche A	Cable Route	Inshore
Gadoid juv.	*Gadidae sp.*	0	1	0	0	1	0.0	0.2	0.0	0.0
Goldsinny	*Ctenolabrus rupestris*	0	1	0	0	1	0.0	0.2	0.0	0.0
Nilson's pipefish	*Syngnathus rostellatus*	0	1	0	0	1	0.0	0.2	0.0	0.0
Turbot	*Psetta maximus*	0	0	1	0	1	0.0	0.0	0.6	0.0



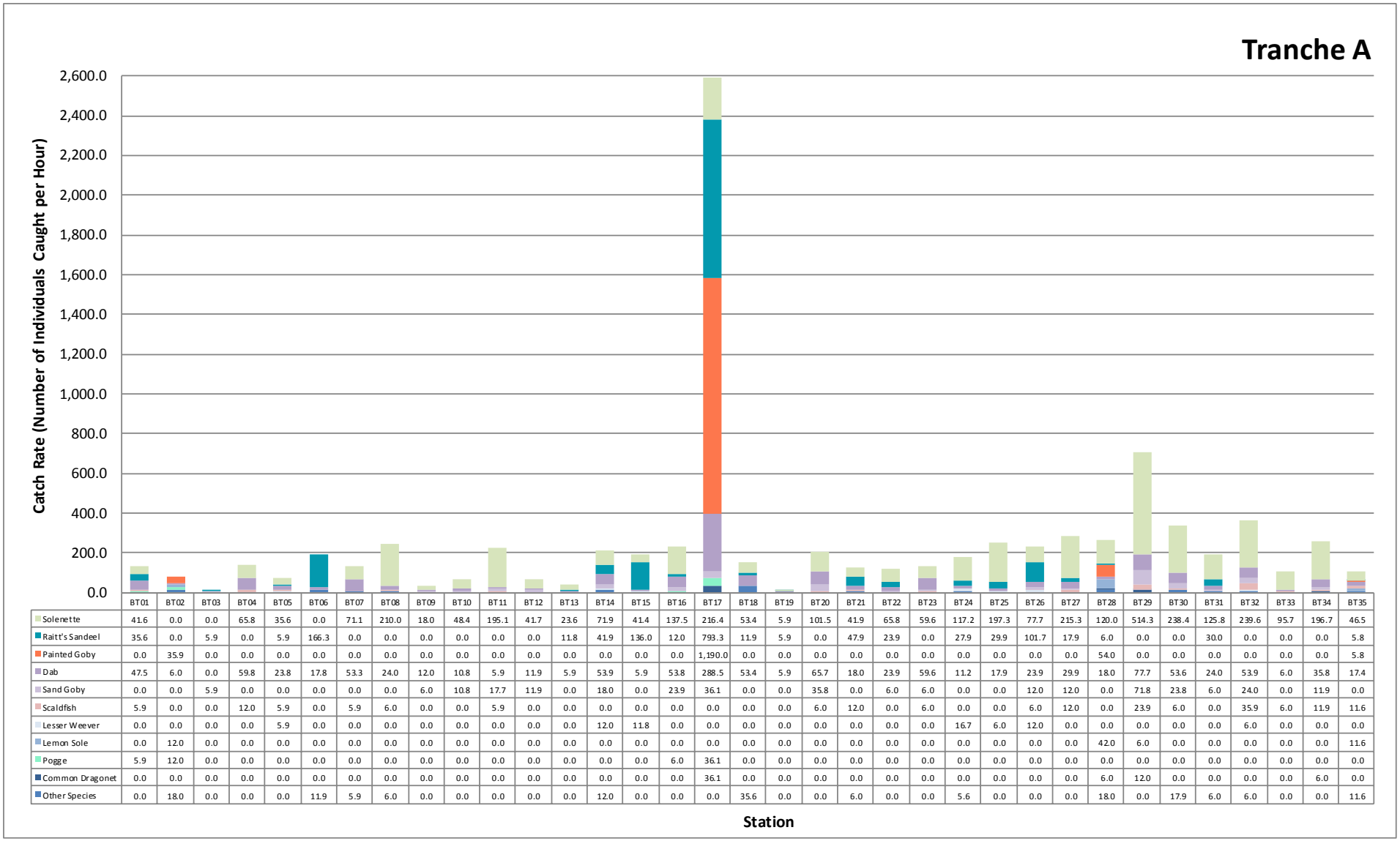
	Solenette	Dab	Raitt's Sandeel	Painted Goby	Sand Goby	Sprat	Scaldfish	Whiting	Lesser Weever	Lemon Sole	Other Species
Control	107.2	35.1	9.5	0.0	18.5	0.0	4.2	0.0	0.6	1.8	3.6
Tranche A	106.2	36.2	43.0	36.2	9.7	0.0	5.1	0.0	2.0	2.0	8.0
Cable Route	28.0	60.0	2.2	0.6	25.2	0.0	2.2	6.7	0.0	1.7	13.5
Inshore	0.0	67.2	7.3	0.0	7.3	51.8	0.0	23.5	6.5	0.0	9.7

Figure 6.1 Catch Rates by Fish Species and Sampling Area



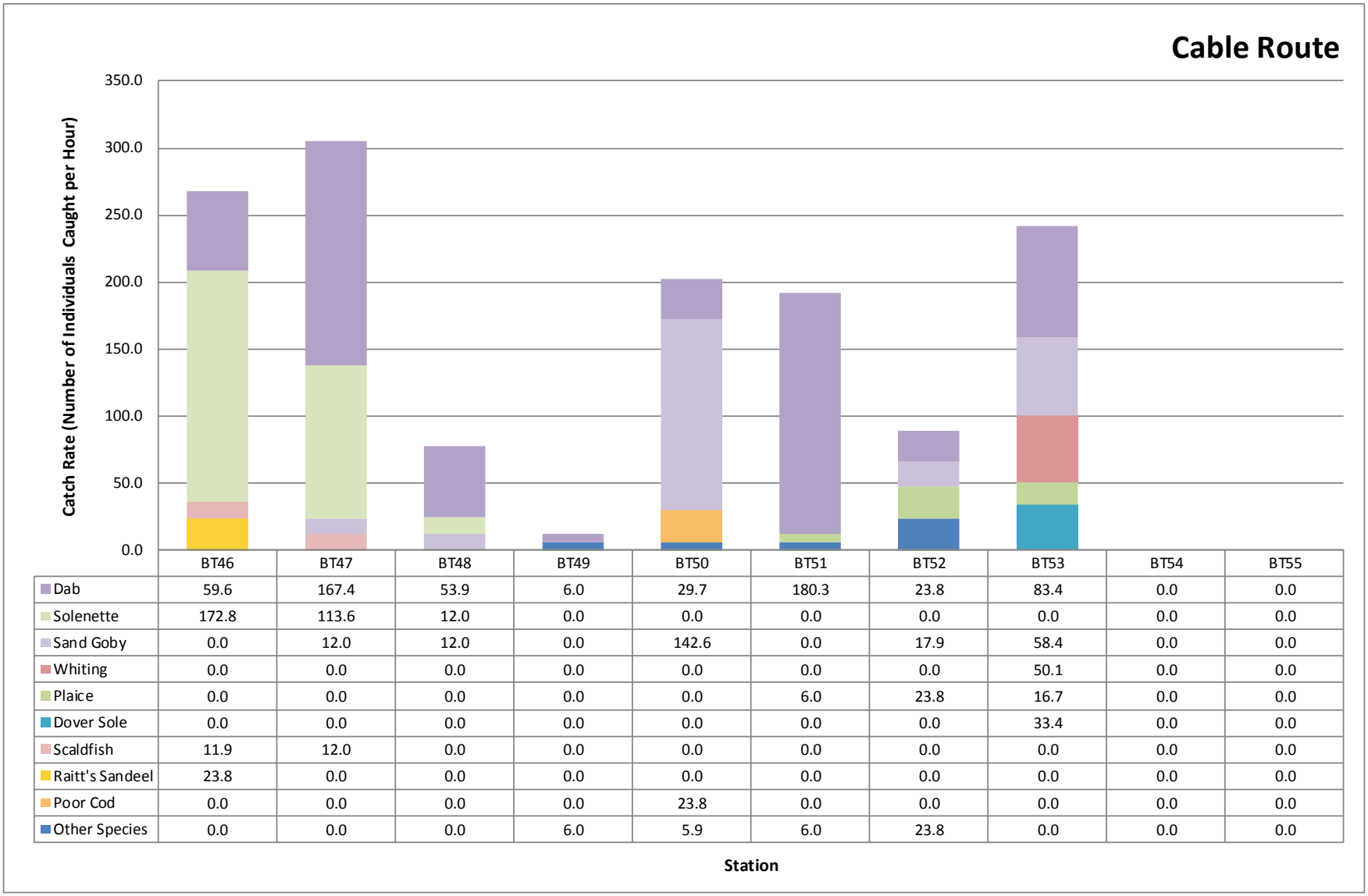
	BT36	BT37	BT38	BT39	BT40	BT41	BT42	BT43	BT44	BT45
Solenette	299.5	131.1	179.4	108.2	74.9	149.5	41.8	12.0	30.0	47.6
Dab	119.8	29.8	6.0	0.0	17.3	29.9	0.0	0.0	6.0	142.8
Sand Goby	47.9	41.7	23.9	18.0	11.5	0.0	0.0	24.0	0.0	17.9
Raitt's Sandeel	0.0	17.9	6.0	0.0	0.0	59.8	11.9	0.0	0.0	0.0
Scaldfish	6.0	11.9	0.0	6.0	0.0	0.0	0.0	0.0	0.0	17.9
Sculpin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	6.0	0.0
Lemon Sole	0.0	0.0	0.0	0.0	11.5	0.0	0.0	6.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	6.0	0.0	6.0	0.0	0.0
Plaice	0.0	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0
Lesser Weever	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.2 Catch Rate by Species and Station at Control Stations



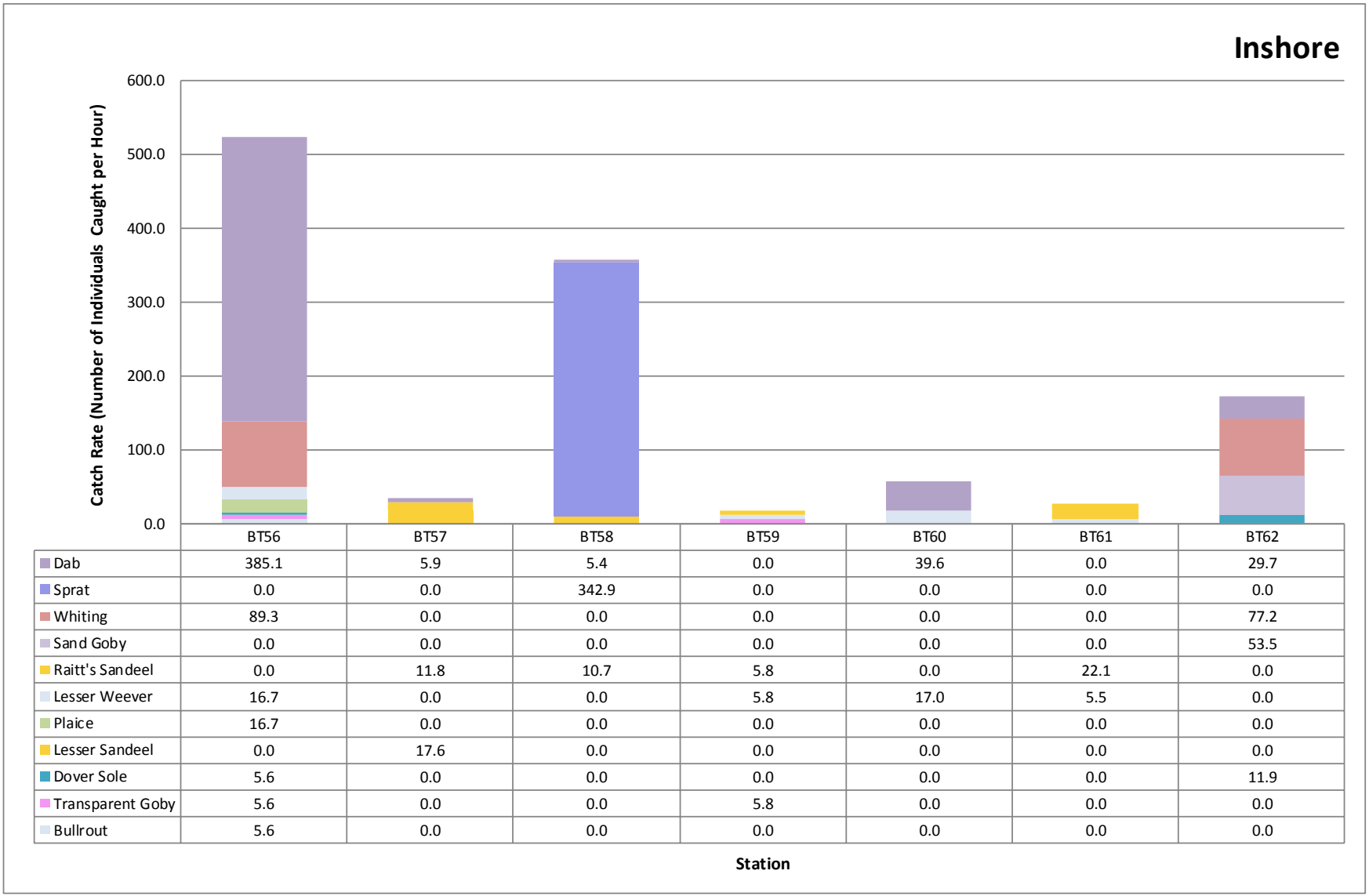
	BT01	BT02	BT03	BT04	BT05	BT06	BT07	BT08	BT09	BT10	BT11	BT12	BT13	BT14	BT15	BT16	BT17	BT18	BT19	BT20	BT21	BT22	BT23	BT24	BT25	BT26	BT27	BT28	BT29	BT30	BT31	BT32	BT33	BT34	BT35
Solenette	41.6	0.0	0.0	65.8	35.6	0.0	71.1	210.0	18.0	48.4	195.1	41.7	23.6	71.9	41.4	137.5	216.4	53.4	5.9	101.5	41.9	65.8	59.6	117.2	197.3	77.7	215.3	120.0	514.3	238.4	125.8	239.6	95.7	196.7	46.5
Raitt's Sandeel	35.6	0.0	5.9	0.0	5.9	166.3	0.0	0.0	0.0	0.0	0.0	0.0	11.8	41.9	136.0	12.0	793.3	11.9	5.9	0.0	47.9	23.9	0.0	27.9	29.9	101.7	17.9	6.0	0.0	0.0	30.0	0.0	0.0	0.0	5.8
Painted Goby	0.0	35.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,190.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
Dab	47.5	6.0	0.0	59.8	23.8	17.8	53.3	24.0	12.0	10.8	5.9	11.9	5.9	53.9	5.9	53.8	288.5	53.4	5.9	65.7	18.0	23.9	59.6	11.2	17.9	23.9	29.9	18.0	77.7	53.6	24.0	53.9	6.0	35.8	17.4
Sand Goby	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	6.0	10.8	17.7	11.9	0.0	18.0	0.0	23.9	36.1	0.0	0.0	35.8	0.0	6.0	6.0	0.0	0.0	12.0	12.0	0.0	71.8	23.8	6.0	24.0	0.0	11.9	0.0
Scaldfish	5.9	0.0	0.0	12.0	5.9	0.0	5.9	6.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	12.0	0.0	6.0	0.0	0.0	6.0	12.0	0.0	23.9	6.0	0.0	35.9	6.0	11.9	11.6
Lesser Weever	0.0	0.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	6.0	12.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
Lemon Sole	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.0	6.0	0.0	0.0	0.0	0.0	0.0	11.6
Pogge	5.9	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	12.0	0.0	0.0	0.0	0.0	6.0	0.0
Other Species	0.0	18.0	0.0	0.0	0.0	11.9	5.9	6.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	35.6	0.0	0.0	6.0	0.0	0.0	5.6	0.0	0.0	0.0	18.0	0.0	17.9	6.0	6.0	0.0	0.0	11.6

Figure 6.3 Catch Rate by Species and Station within Tranche A



	BT46	BT47	BT48	BT49	BT50	BT51	BT52	BT53	BT54	BT55
Dab	59.6	167.4	53.9	6.0	29.7	180.3	23.8	83.4	0.0	0.0
Solenette	172.8	113.6	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sand Goby	0.0	12.0	12.0	0.0	142.6	0.0	17.9	58.4	0.0	0.0
Whiting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.1	0.0	0.0
Plaice	0.0	0.0	0.0	0.0	0.0	6.0	23.8	16.7	0.0	0.0
Dover Sole	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.4	0.0	0.0
Scaldfish	11.9	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raitt's Sandeel	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poor Cod	0.0	0.0	0.0	0.0	23.8	0.0	0.0	0.0	0.0	0.0
Other Species	0.0	0.0	0.0	6.0	5.9	6.0	23.8	0.0	0.0	0.0

Figure 6.4 Catch Rate by Species and Station along the Cable Route



	BT56	BT57	BT58	BT59	BT60	BT61	BT62
Dab	385.1	5.9	5.4	0.0	39.6	0.0	29.7
Sprat	0.0	0.0	342.9	0.0	0.0	0.0	0.0
Whiting	89.3	0.0	0.0	0.0	0.0	0.0	77.2
Sand Goby	0.0	0.0	0.0	0.0	0.0	0.0	53.5
Raitt's Sandeel	0.0	11.8	10.7	5.8	0.0	22.1	0.0
Lesser Weever	16.7	0.0	0.0	5.8	17.0	5.5	0.0
Plaice	16.7	0.0	0.0	0.0	0.0	0.0	0.0
Lesser Sandeel	0.0	17.6	0.0	0.0	0.0	0.0	0.0
Dover Sole	5.6	0.0	0.0	0.0	0.0	0.0	11.9
Transparent Goby	5.6	0.0	0.0	5.8	0.0	0.0	0.0
Bullrout	5.6	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.5 Catch Rate by Species and Station at Inshore Stations

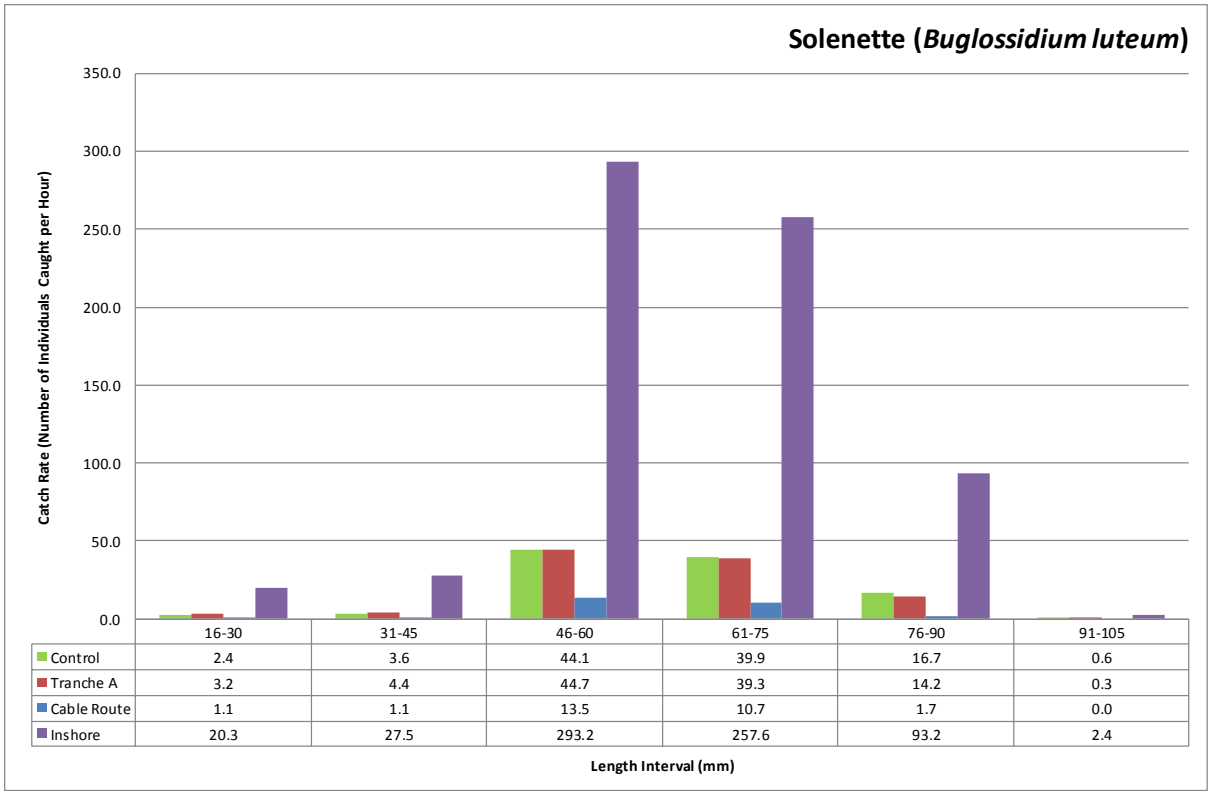
6.2 Length Distributions

The average length (mm) and length range of the fish species caught by sampling area (control, Tranche A, cable route and inshore) given in Table 6.2 below.

The length distributions of the six most abundant species (>50 individuals) caught during the survey, expressed as the catch rate (number of individuals caught per hour) by length (mm) and by sampling area, are shown in Figure 6.6 to Figure 6.11 below.

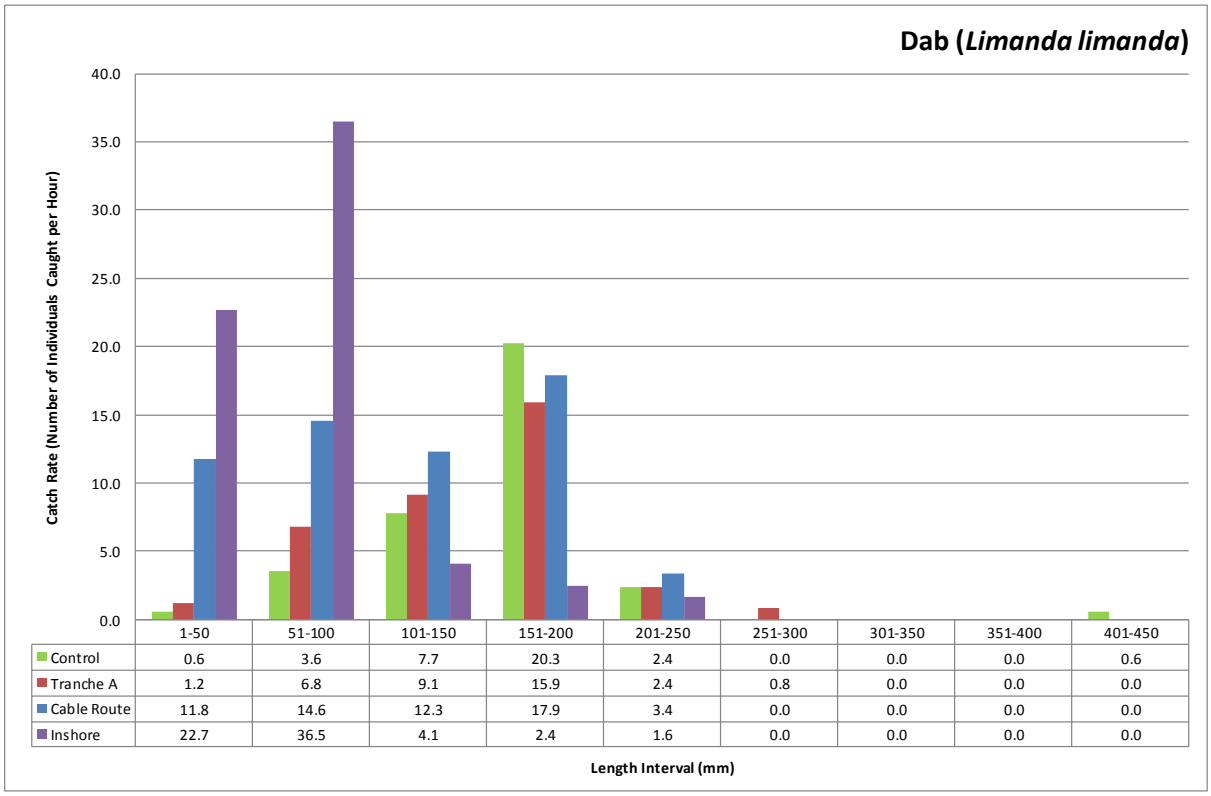
Table 6.2 Average Length and Length Range of Fish Species Caught by Sampling Area

Species		Average Length (mm)				Length Range (mm)	
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Min.	Max.
Bullrout	*Myoxocephalus scorpius*	0.0	180.0	210.0	80.0	80	210
Butterfish	*Pholis gunnellus*	0.0	220.0	0.0	0.0	220	220
Common Dragonet	*Callionymus lyra*	87.5	71.0	130.0	0.0	45	135
Dab	*Limanda limanda*	170.9	152.0	133.1	94.8	20	440
Dover Sole	*Solea solea*	0.0	0.0	113.3	120.0	95	135
Gadoid juv.	*Gadidae sp.*	0.0	25.0	0.0	0.0	25	25
Goldsinny	*Ctenolabrus rupestris*	0.0	145.0	0.0	0.0	145	145
Grey Gurnard	*Eutrigla gurnardus*	0.0	205.0	0.0	0.0	180	230
Lemon Sole	*Microstomus kitt*	183.3	210.0	183.3	0.0	100	270
Lesser Sandeel	*Ammodytes tobianus*	0.0	0.0	0.0	136.7	125	155
Lesser Weever	*Echiichthys vipera*	0.0	0.0	0.0	100.6	75	120
Long-Spined Sea Scorpion	*Taurulus bubalis*	0.0	115.0	0.0	0.0	100	130
Megrim	*Lepidorhombus whiffiagonis*	0.0	25.0	0.0	0.0	20	30
Nilson's pipefish	*Syngnathus rostellatus*	0.0	80.0	0.0	0.0	80	80
Painted Goby	*Pomatoschistus pictus*	0.0	30.5	30.0	0.0	15	45
Plaice	*Pleuronectes platessa*	230.0	240.0	153.9	95.0	40	250
Pogge	*Agonus cataphractus*	0.0	59.0	0.0	0.0	40	140
Poor Cod	*Trisopterus minutus*	0.0	0.0	61.7	0.0	50	80
Raitt's Sandeel	*Ammodytes marinus*	132.5	122.1	123.3	138.8	40	180
Sand Goby	*Pomatoschistus minutus*	36.7	40.2	34.7	40.0	20	55
Scaldfish	*Arnoglossus laterna*	65.0	73.9	70.0	0.0	20	110
Sculpin juv.	*Cottidae sp.*	20.0	20.0	0.0	0.0	15	25
Smooth Sandeel	*Gymnammodytes semisquamatus*	0.0	199.0	0.0	0.0	185	215
Solenette	*Buglossidium luteum*	64.6	62.6	60.0	0.0	25	95
Sprat	*Sprattus sprattus*	0.0	0.0	0.0	50.0	35	65
Transparent Goby	*Aphia minuta*	0.0	0.0	0.0	22.5	15	30
Turbot	*Psetta maximus*	0.0	0.0	360.0	0.0	360	360
Two-spotted Clingfish	*Diplecogaster bimaculata*	0.0	25.0	0.0	0.0	25	25
Whiting	*Merlangius merlangus*	0.0	0.0	217.2	213.3	130	340



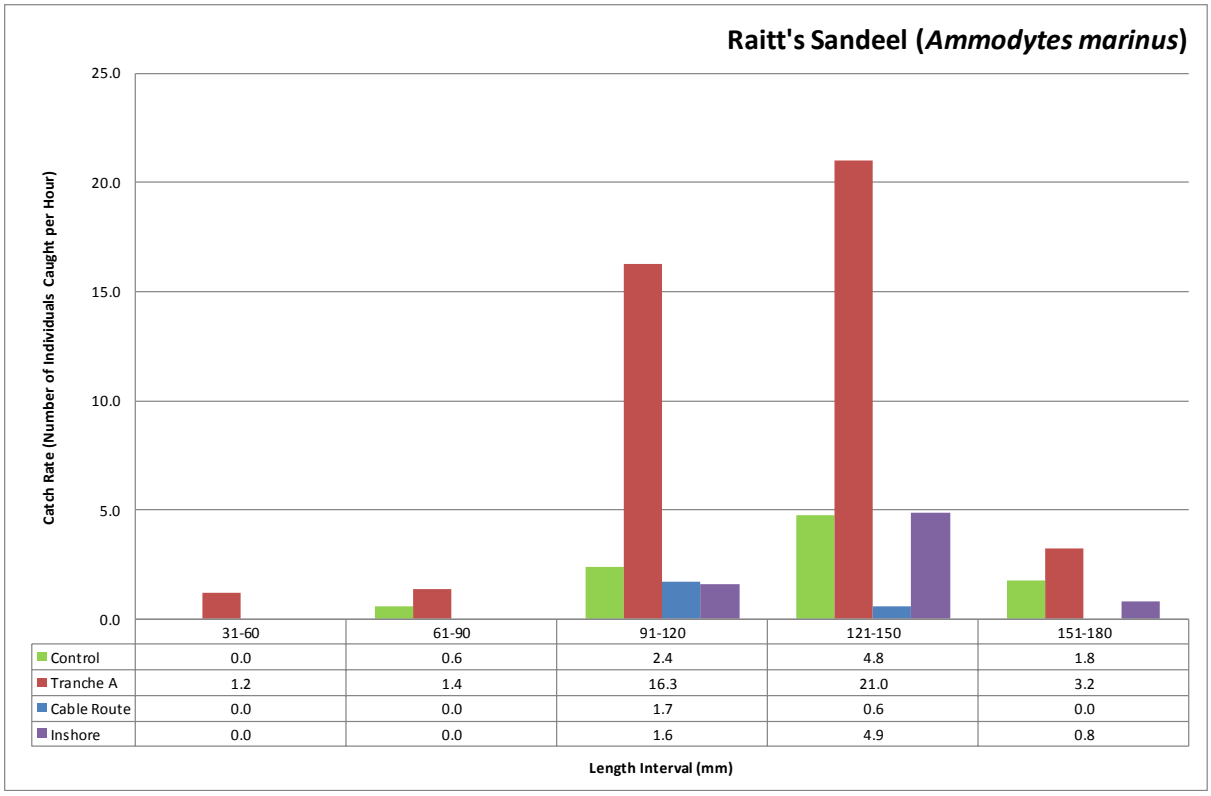
	16-30	31-45	46-60	61-75	76-90	91-105
Control	2.4	3.6	44.1	39.9	16.7	0.6
Tranche A	3.2	4.4	44.7	39.3	14.2	0.3
Cable Route	1.1	1.1	13.5	10.7	1.7	0.0
Inshore	20.3	27.5	293.2	257.6	93.2	2.4

Figure 6.6 Solenette (*B. luteum*) Length Distribution by Sampling Area



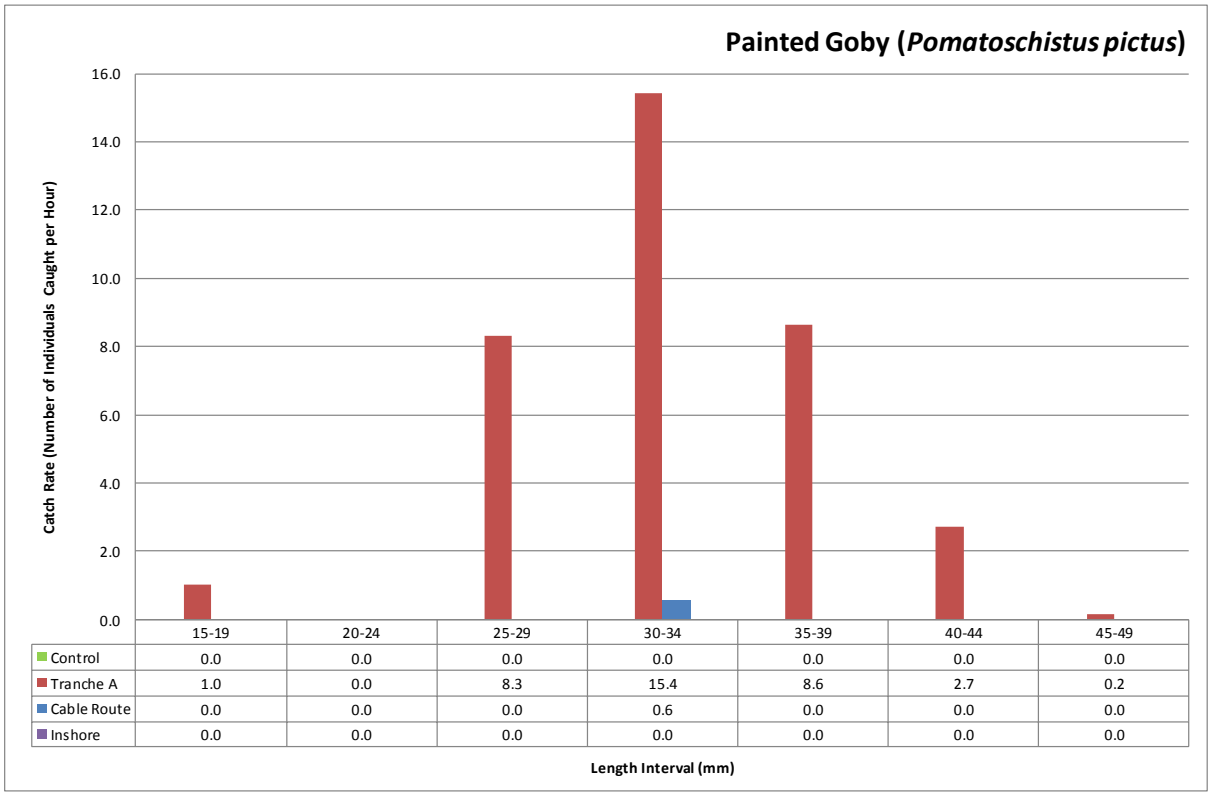
	1-50	51-100	101-150	151-200	201-250	251-300	301-350	351-400	401-450
Control	0.6	3.6	7.7	20.3	2.4	0.0	0.0	0.0	0.6
Tranche A	1.2	6.8	9.1	15.9	2.4	0.8	0.0	0.0	0.0
Cable Route	11.8	14.6	12.3	17.9	3.4	0.0	0.0	0.0	0.0
Inshore	22.7	36.5	4.1	2.4	1.6	0.0	0.0	0.0	0.0

Figure 6.7 Dab (*L. limanda*) Length Distribution by Sampling Area



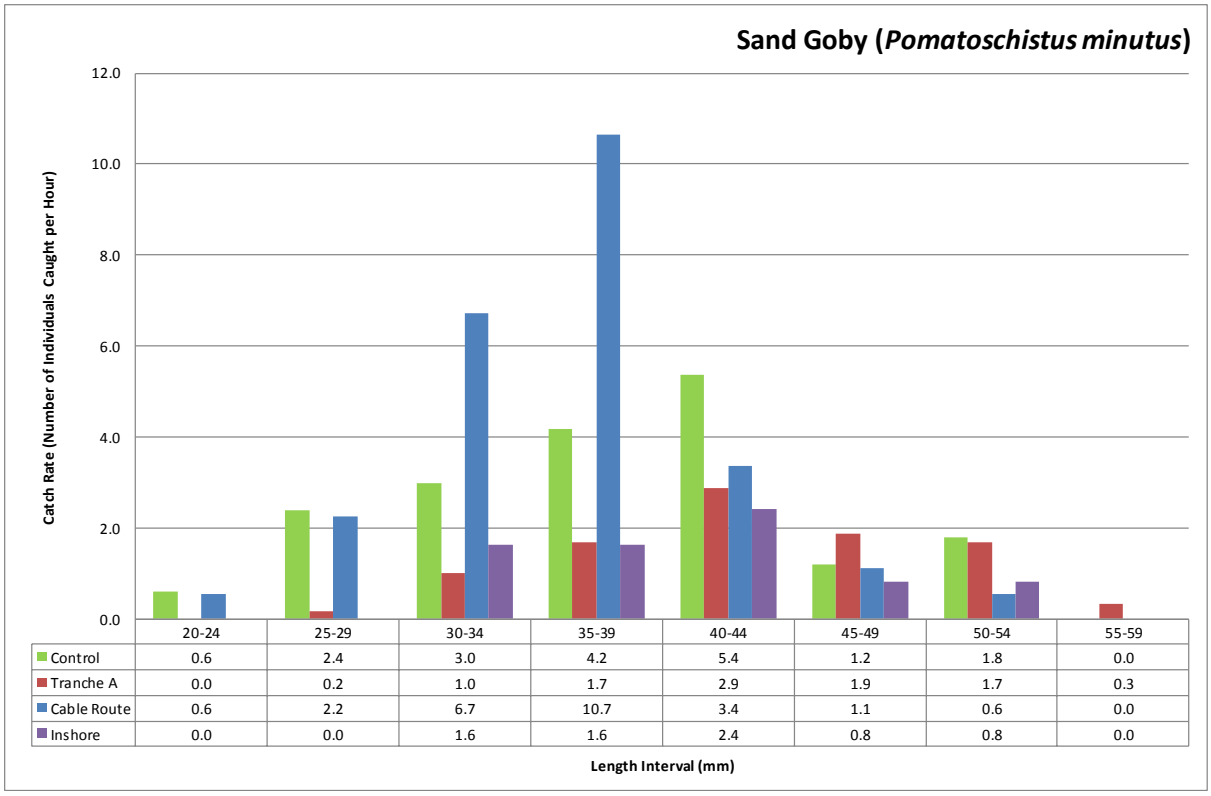
	31-60	61-90	91-120	121-150	151-180
Control	0.0	0.6	2.4	4.8	1.8
Tranche A	1.2	1.4	16.3	21.0	3.2
Cable Route	0.0	0.0	1.7	0.6	0.0
Inshore	0.0	0.0	1.6	4.9	0.8

Figure 6.8 Raitt's Sandeel (*A. marinus*) Length Distribution by Sampling Area



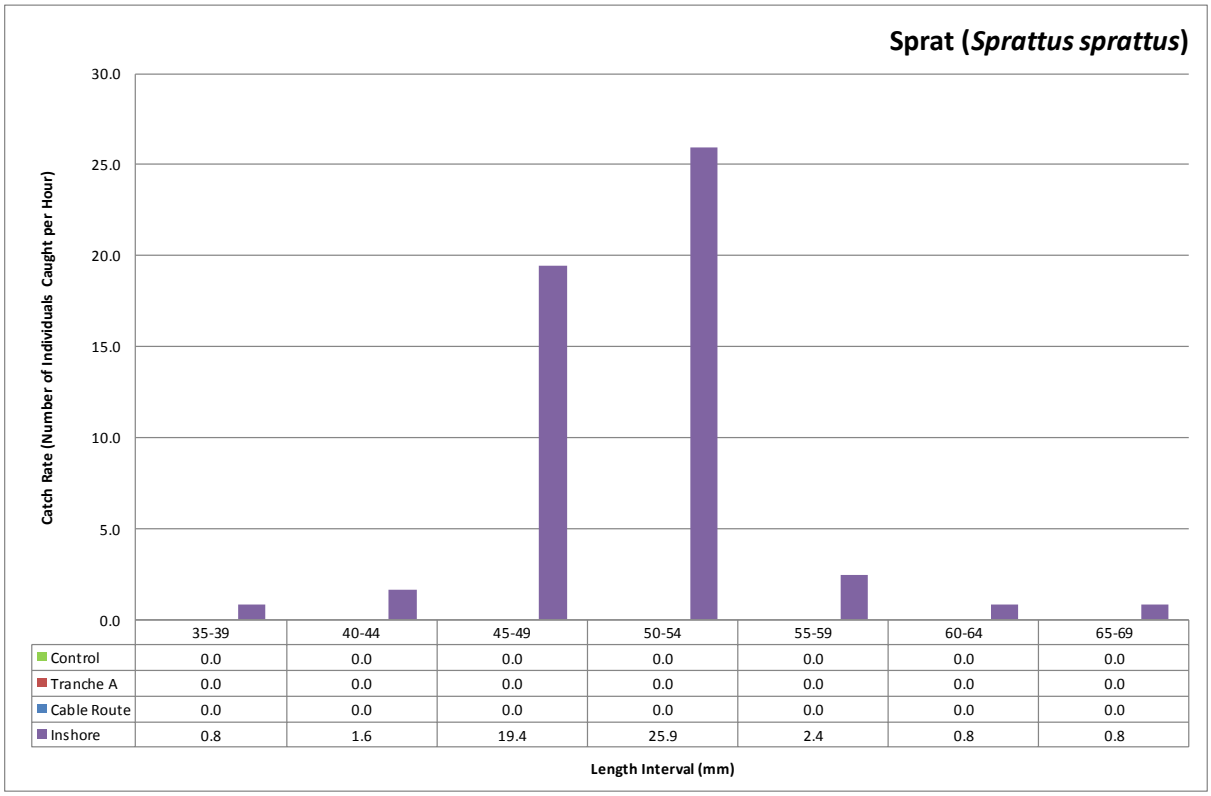
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tranche A	1.0	0.0	8.3	15.4	8.6	2.7	0.2
Cable Route	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Inshore	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.9 Painted Goby (*P. pictus*) Length Distribution by Sampling Area



	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Control	0.6	2.4	3.0	4.2	5.4	1.2	1.8	0.0
Tranche A	0.0	0.2	1.0	1.7	2.9	1.9	1.7	0.3
Cable Route	0.6	2.2	6.7	10.7	3.4	1.1	0.6	0.0
Inshore	0.0	0.0	1.6	1.6	2.4	0.8	0.8	0.0

Figure 6.10 Sand Goby (*P. minutus*) Length Distribution by Sampling Area



	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tranche A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cable Route	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inshore	0.8	1.6	19.4	25.9	2.4	0.8	0.8

Figure 6.11 Sprat (*S. sprattus*) Length Distribution by Sampling Area

7.0 Appendix

7.1 Appendix 1 – Health and Safety

7.1.1 Personnel

Brown and May Marine (BMM) staff protocol followed the standard health and safety protocol outlined in the BMM "Offshore Operational Procedures for Surveys using Commercial Fishing Vessels".

All BMM staff have completed a Sea Survival course approved by the Maritime and Coastguard Agency, meeting the requirements laid down in: **STCW 95 Regulation VI/1 para 2.1.1 and STCW Code section A- VI/1** before boarding any vessel conducting works for the company. Employees are also required to have valid medical certificates (ENG1 or ML5), Seafish Safety Awareness, Seafish Basic First Aid and Seafish Basic Firefighting certificates before participating in offshore works.

7.1.2 Vessel Induction

Before boarding the survey team were shown how to safely board and disembark the vessel. Prior to departure the skipper briefed the BMM staff on the whereabouts of the safety equipment, including the life raft, emergency flares and fire extinguishers, and also the location of the emergency muster point. The safe deck areas, man-overboard procedures and emergency alarms were also discussed. The survey team were warned about the possible hazards, such as slippery decks and obstructions whilst aboard. The BMM staff were briefed about trawling operations and the need to keep clear of all winch's when operational. All hazards were assessed prior to the survey in the BMM health and safety risk assessment.

7.1.3 Daily Safety Checks

The condition of the life jackets, EPIRB's, and life raft were inspected daily. Also checked were the survey team working areas, including the fish room and the wheelhouse to ensure these areas were clear of hazards such as clutter and obstructions.

7.1.4 Post Trip Survey review

Upon completion of the survey a "Post Trip Survey Review" was filed, see Table 7.1 overleaf.

Table 7.1 Post Trip Survey Review

Project: Dogger Bank Oct/Nov 2011	**Vessel:** Jubilee Spirit
Surveyors: Lucy Shuff, Alexandria Winrow-Giffin	**Skipper:** Ross Crookes
Survey Area: Dogger Bank	**Total Time at Sea:** 20 Days
Dates at Sea: 02/10/2011 - 06/10/2011, 20/10/2011 - 03/11/11	

	Comments	Actions
Did vessel comply with pre trip safety audits?	Yes	N/A
Skipper and crew attitude to safety?	Good	N/A
Vessel machinery failures?	Radar broke down	Engineer fixed when in port
Safety equipment failures?	None	N/A
Accidents?	None	N/A
Injuries?	None	N/A

Dogger Bank Offshore Wind Farm

Tranche A

Adult and Juvenile Fish Characterisation Survey

2nd to 20th April 2012

Undertaken by
Brown and May Marine Ltd

Ref	Issue Date	Issue Type	Author	Checked	Approved
DBTAOB03	11/09/2012	FINAL	LS	LS/JK	SJA

Contents

Figures

Tables

1.0 Summary

1.1 Otter Trawl

A total of 28 species were caught; 21 within Tranche A, 17 at the control stations and 22 species along the cable route. Overall, grey gurnard (*Eutrigla gurnardus*) was the most abundant species caught, followed by dab (*Limanda limanda*) and then plaice (*Pleuronectes platessa*). *E. gurnardus* had the highest catch rate at the control stations and along the cable route, whereas *L. limanda* accounted for the greatest catch rate within Tranche A.

The highest catch rate for all species combined was recorded at control station OT44, with *E. gurnardus* and *L. limanda* accounting for the majority of the catch. Overall, the total catch rate was higher along the cable route than at the control stations and within Tranche A.

P. platessa were found in all sampling areas, with the greatest catch rate recorded at the control stations. Whiting (*Merlangius merlangus*) were found in all sampling areas, with the highest total catch rate recorded along the cable route. Raitt's sandeel (*Ammodytes marinus*) were found at the control stations and within Tranche A in low numbers. Herring (*Clupea harengus*) were found in low numbers in Tranche A and along the cable route. Cod (*Gadus morhua*) were caught in all sampling areas in low numbers, with the highest total catch rate found along the cable route.

The percentage of individuals above and below the MLS was approximately even for the *P. platessa* caught along the cable route, whereas at the control stations and within Tranche A the majority of which were above the MLS. Most of the *M. merlangus* caught at the control stations and within Tranche A were below the MLS, whereas along the cable route the percentage of individuals caught above and below the MLS was approximately even. All other species were found in comparatively lower numbers.

The majority of the *E. gurnardus* caught at the control stations and within Tranche A were female, whereas along the cable route a greater proportion of the catch was male. Most of the *L. limanda* caught in all sampling areas were female. The majority of the *P. platessa* caught at the control stations (83.8%) and within Tranche A (85.3%) were female, whereas along the cable route the sex ratio was approximately even. Most of the *M. merlangus* caught at the control stations were female, whereas within Tranche A and along the cable route the sex ratio was approximately even.

The majority of the *E. gurnardus* and *M. merlangus* found in all sampling areas were maturing individuals. Most of the *L. limanda* and *P. platessa* caught in all sampling areas were spent individuals. One male 'recovering spent' *C. harengus* was caught within Tranche A, and the greatest proportion of those caught along the cable route were 'early spent' and 'late spent' females, and 'ripe' males. All of the *G. morhua* caught in all sampling areas were immature males and females.

1.2 Beam Trawl

A total of 28 species of fish were caught, ten of which were found at the control stations, 18 within Tranche A, 16 along the cable route and 12 species at the inshore stations. Overall, Solenette (*Buglossidium luteum*) was the most abundant species caught, the majority of which were found in Tranche A, followed by *L. limanda*, and then sand goby (*Pomatoschistus minutus*).

The station with the greatest total catch rate was BT04 within Tranche A, with *L. limanda* and *B. luteum* representing 97.4% of the catch. Overall, catch rates were greater within Tranche A than at the control stations, along the cable route and at the inshore stations.

A. marinus were found at the control stations, within Tranche A and at the inshore stations. Smooth sandeel (*Gymnammodytes semisquamatus*) were found only in Tranche A. One greater sandeel

(*Hyperoplus lanceolatus*) and one lesser sandeel (*Ammodytes tobianus*) were found at inshore station BT59. One juvenile sandeel (Ammodytidae sp.) was found at control station BT43. *P. platessa* were found in low numbers in all sampling areas. *M. merlangus* were found at the control stations and along the cable route in low numbers. One *G. morhua* was found along the cable route at station BT52.

2.0 Introduction

The following report details the findings of the spring 2012 adult and juvenile fish characterisation survey, undertaken within and adjacent to Tranche A of the planned Dogger Bank offshore wind farm and along the proposed cable route between the 2nd and 20th April.

The survey methodology, vessel and sampling gear detailed were agreed in consultation with Cefas and the Marine Management Organisation (MMO). A dispensation from the MMO for the Provisions of Council Regulation 850/98 to catch and retain undersize fish for scientific research and 43/2009 specifically related to days at sea was obtained prior to commencement of this survey. A summary of the health and safety performance of the survey is provided in Appendix 1.

The aim of the survey was to establish the abundance and composition of adult and juvenile fish species within the area of the Dogger Bank. It should be noted that *P. platessa*, Ammodytidae sp., *G. morhua*, *M. merlangus* and *C. harengus* have been defined as species of importance in the area.

It should be noted that all trawls at stations 53, 54 and 55 along the cable route were omitted from the otter trawl survey due to the presence of a high density of static gear in the area. The beam trawls at these stations were included in PMSL's inshore survey, as a smaller vessel was considered more appropriate to trawl the area. These trawls however will be analysed as cable route stations, due to their original inclusion in the offshore survey, and their location within the cable corridor.

3.0 Scope of Works

The proposed scope of works for the April 2012 adult and juvenile fish characterisation survey replicates that of the August 2011 survey, and is detailed below and illustrated in Figure 3.1 overleaf.

- **Otter Trawl**
  - 35 tows of approximately 20 minutes duration within Tranche A, ten control tows in adjacent areas and ten tows along the cable route were undertaken

- **Otter Trawl Sample Analysis**
  - Number of individuals and catch rate by species
  - Average length and length distribution by species
    - Finfish & sharks (except *C. harengus* & sprat; *Sprattus sprattus*): individual lengths (nearest cm below)
    - *C. harengus* & *S. sprattus*: individual lengths (nearest ½ cm below)
    - Rays: individual length and wing-width (nearest cm below)
  - Sex ratio by species
  - Spawning condition
    - Finfish species (except *C. harengus* & Mackerel (*Scombrus scombrus*) Cefas Standard Maturity Key - Five Stage
    - *C. harengus*: Cefas Maturity Key – Nine Stage
    - *S. scombrus*: Cefas Maturity Key – Six Stage
    - Ray and shark species: Cefas Standard Elasmobranch Maturity Key- Four Stage

- **Beam Trawl**
  - 35 tows of approximately ten minutes duration within Tranche A, ten control tows in adjacent areas, ten tows along the cable route (at the same locations as the otter trawls) and seven tows in the inshore areas

- **Beam Trawl Sample Analysis**
  - Number of individuals and catch rate by fish species
  - Average length and length distribution (nearest mm below) for fish species

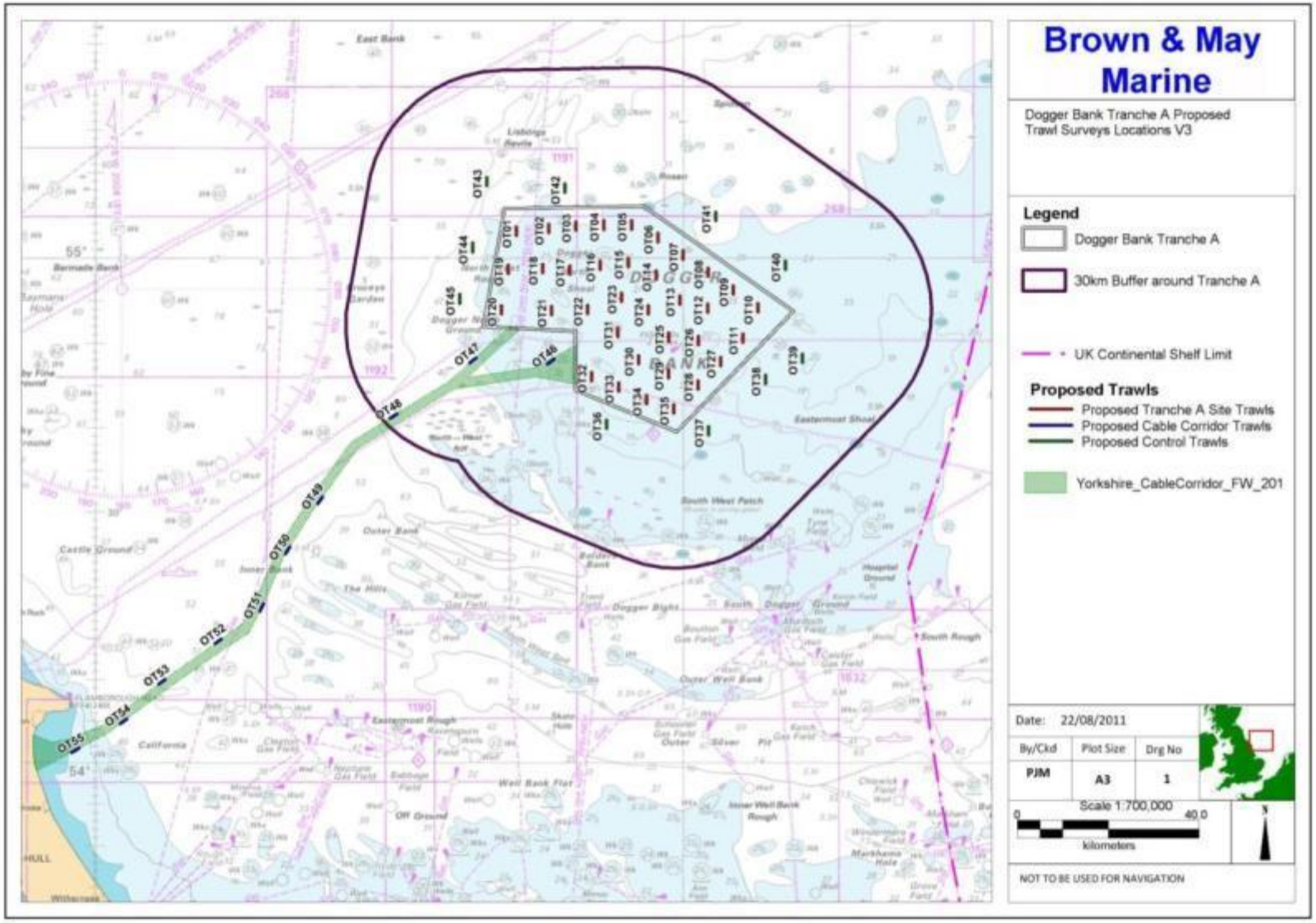


Figure 3.1 Proposed Trawl Locations

4.0 Methodology

4.1 Survey Vessel

The vessel chartered for the survey (Figure 4.1), the “Jubilee Spirit”, is a Grimsby-based commercial trawler whose skipper has experience of fishing on the Dogger Bank and of otter and beam trawl surveys. The specifications of the vessel are given below in Table 4.1.

Figure 4.1 Survey Vessel "Jubilee Spirit"

Table 4.1 Survey Vessel Specifications

Survey Vessel Specifications	
Length	21.2m
Beam	6.9m
Draft	2.3m
Main engine	Caterpillar Type 340TA 475 BHP
Gearbox	Hydraulic 6: reduction
Propeller	4 Blade Manganese Bronze Fixed Pitch 1.7m diameter
GPS	2-Furuno GP80
Plotters	Sodena Plotter with Electronic Charts
Sounder	Furuno Daylight Viewing

4.2 Sampling Gear

4.2.1 Commercial Otter Trawl

A commercial otter trawl (Figure 4.2) with a 130mm mesh cod-end was used for sampling; the specifications of which are given in Table 4.2 below.

Figure 4.2 Otter Trawl Used

Table 4.2 Otter Trawl Specifications

Otter Trawl Specifications	
Towing Warp	18mm, 6x19+1
Depth: Payout Ratio	5:1
Trawl Doors	Perfect B 84
Net	130mm mesh cod-end, square mesh panel 7m from cod-end on top
Ground line length	45.7m
Footrope	Rock-hopper with 6 to 8 inch bobbins
Est. Headline height	2.4m
Distance between doors (est.)	51m

4.2.2 Scientific Beam Trawl

A 2m scientific beam trawl (Figure 4.3) was used for juvenile fish sampling; the specifications of which are given in Table 4.3 below.

Figure 4.3 Beam Trawl Used

Table 4.3 Beam Trawl Specifications

Beam Trawl Specifications	
Beam width	2m
Headline height	55cm
Shoe length	77cm
Shoe width	15cm
Cod-end liner	5mm

4.3 Positioning and Navigation

The position of the vessel was tracked at all times using a Garmin GPSMap 278 with an EGNOS differential connected to an external Garmin GA30 antenna. Trawl start times and positions were taken when the winch stopped paying out the gear. Similarly, trawl end times and positions were taken when hauling of the gear commenced.

4.4 Sampling Operations

The survey was undertaken from the 2nd to the 20th April 2012. A summarised log of events is given in Table 4.4 below.

It should be noted that a number of weather days were incurred, and the vessels hydraulic system failed on the 6th April whilst hauling the otter trawl at station OT04. The vessel returned to Scarborough on the 7th April, and the hydraulic system was fixed by an engineer. The survey was able to continue on the 7th April, when the vessel returned to Dogger Bank.

The beam trawl at station BT42 was abandoned as the net sustained severe damage due to rough ground. The otter trawl at station OT50 was shortened as a large object was caught in the net, the net sustained severe damage and required extensive repair. The warp parted during the otter trawl at station OT51 as the trawl door came fast. This tow was repeated five days later, as no sample was obtained initially.

Table 4.4 Summarised Log of Events

Monday 2nd April 2012
Mobilise survey
Weather day in port
Tuesday 3rd April 2012
Weather day in port
Wednesday 4th April 2012
Weather day in port
Overnight aboard vessel
Thursday 5th April 2012
Depart Scarborough at 1345 hrs
Overnight steam to Dogger Bank
Overnight at sea
Friday 6th April 2012
Otter Trawls: OT43, OT01, OT02, OT42, OT03
Beam Trawls: BT43, BT01, BT02, BT03
Beam trawl net severely damaged at BT42 due to rough ground. Tow abandoned.
Hydraulics failed when hauling otter trawl at OT04. Unable to haul gear for approximately 2 hours.
Steam to Scarborough overnight in order to fix hydraulics
Overnight at sea
Saturday 7th April 2012
Arrive into Scarborough at 0630 hrs
Engineer called out to fix hydraulics at 0800 hrs
Depart Scarborough at 1900, return to survey site
Overnight at sea
Sunday 8th April 2012
Otter Trawls: OT44, OT19, OT18, OT17, OT16, OT04, OT05
Beam Trawls: BT44, BT19, BT18, BT17, BT16, BT04, BT05
Overnight at sea

Monday 9th April 2012
Otter Trawls: OT06, OT15, OT23, OT22, OT21, OT20
Beam Trawls: BT06, BT15, BT23, BT22, BT21, BT20
Steam to Scarborough overnight
Overnight at sea
Tuesday 10th April 2012
Arrive Scarborough 0530
Samples landed and transported to BMM
Depart Scarborough 2100, return to Dogger Bank
Overnight at sea
Wednesday 11th April 2012
Otter Trawls: OT46, OT32, OT36, OT33, OT30, OT31, OT24
Beam Trawls: BT46, BT32, BT36, BT33, BT30, BT31, BT24
Overnight at sea
Thursday 12th April 2012
Otter Trawls: OT14, OT07, OT13, OT25, OT29, OT34, OT35
Beam Trawls: BT14, BT07, BT13, BT25, BT29, BT34, BT35
Overnight at sea
Friday 13th April 2012
Otter Trawls: OT41, OT08, OT12, OT26, OT27, OT28, OT37
Beam Trawls: BT41, BT08, BT12, BT26, BT27, BT28, BT37
Overnight at sea
Saturday 14th April 2012
Otter Trawls: OT45, OT47, OT48, OT49, OT50
Beam Trawls: BT45, BT47, BT48, BT49, BT50
Otter trawl shortened, and net damaged at station OT50
5-fathom extension warp parted at station OT51, no sample obtained
Return to Scarborough due to worsening weather conditions
Overnight at sea
Sunday 15th April 2012
Continue steaming to Scarborough. Arrive into Scarborough at 0900
Remain in port due to poor weather conditions
Monday 16th April 2012
Samples landed and transported to BMM
Weather day in port
Tuesday 17th April 2012
Weather day in port
Overnight aboard vessel
Wednesday 18th April 2012
Weather day in port
Overnight aboard vessel
Thursday 19th April 2012
Depart Scarborough at 0400, steam to survey area
Otter Trawls: OT52, OT51
Beam Trawls: BT52, BT51
Overnight at sea
Friday 20th April 2012
Otter Trawls: OT38, OT39, OT11, OT10, OT09, OT40
Beam Trawls: BT38, BT39, BT11, BT10, BT09, BT40
Remain at sea to begin Tranche B survey
Overnight at sea

4.5 Otter Trawl Sampling

The whole catch from each otter trawl was retained where possible. Sub-sampling occurred when large (>2 boxes) homogenous samples were obtained. The samples were then boxed, labelled, photographed, iced and stored at +2°C before transportation to Cefas (Lowestoft) for analysis in the middle and at the end of the survey, in line with the agreed scope of works.

The start and end times, co-ordinates and the duration of each otter trawl are given in Table 4.5 (control, Tranche A and cable route tows highlighted green, red and blue respectively). The vessel tracks whilst towing the otter trawl are illustrated in Figure 4.4 overleaf.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.5 Start and End Times, Co-ordinates and Duration of each Otter Trawl

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT01	06/04/2012	08:53:03	6,103,364.8	399,955.7	31.9	09:13:04	6,101,821.6	399,855.8	32.3	20:01
OT02		10:29:56	6,102,969.2	406,716.5	30.6	10:49:55	6,101,222.9	406,773.5	29.2	19:59
OT03		14:20:45	6,101,465.1	412,724.9	33.0	14:40:44	6,102,787.0	412,848.3	31.4	19:59
OT04	08/04/2012	16:03:22	6,102,322.7	418,932.8	30.8	16:23:24	6,103,845.5	419,029.8	32.5	20:02
OT05		17:36:36	6,101,869.0	425,062.3	32.3	17:56:36	6,103,496.6	425,403.7	29.2	20:00
OT06	09/04/2012	06:39:04	6,099,207.4	430,642.1	27.2	06:59:02	6,100,724.9	430,618.4	32.1	19:58
OT07	12/04/2012	08:24:46	6,095,060.6	435,980.4	26.8	08:44:47	6,096,750.6	436,179.6	28.3	20:01
OT08	13/04/2012	09:07:18	6,091,202.6	441,477.4	27.2	09:27:19	6,092,653.3	441,453.2	29.4	20:01
OT09	20/04/2012	14:22:16	6,087,268.9	446,788.4	26.6	14:42:19	6,088,964.6	446,671.9	27.0	20:03
OT10		12:45:42	6,083,358.5	452,196.5	25.9	13:05:43	6,085,080.6	452,244.8	26.4	20:01
OT11		10:57:23	6,078,469.8	448,727.8	23.3	11:17:22	6,077,076.0	448,633.3	22.6	19:59
OT12	13/04/2012	10:57:24	6,083,383.6	441,484.5	25.5	11:17:27	6,084,900.0	441,257.8	26.1	20:03
OT13	12/04/2012	10:15:54	6,086,724.9	435,261.9	25.3	10:35:54	6,084,850.0	435,229.4	24.4	20:00
OT14		06:40:35	6,090,609.4	430,204.5	25.2	07:00:35	6,092,319.9	430,116.9	26.4	20:00
OT15	09/04/2012	08:46:31	6,095,743.8	424,136.3	25.5	09:06:32	6,094,150.5	424,112.9	25.2	20:01
OT16	08/04/2012	14:17:58	6,093,112.9	418,853.7	26.6	14:38:00	6,094,666.2	418,752.7	27.5	20:02
OT17		12:35:47	6,093,817.5	411,261.9	27.9	12:55:56	6,092,258.5	411,209.0	25.7	20:09
OT18		10:58:50	6,095,013.0	405,461.0	30.6	11:18:51	6,093,609.2	405,267.5	30.8	20:01
OT19		08:49:49	6,094,668.7	397,983.3	29.5	09:11:32	6,093,461.8	397,977.6	29.2	21:43
OT20	09/04/2012	16:17:40	6,083,512.7	396,202.8	29.4	16:37:40	6,085,008.9	396,164.6	29.2	20:00
OT21		14:24:40	6,083,115.1	406,978.1	29.5	14:44:41	6,084,933.2	407,075.7	28.3	20:01
OT22		12:28:27	6,085,523.3	415,049.3	25.0	12:48:28	6,084,047.0	415,006.1	25.2	20:01
OT23		10:42:54	6,088,403.4	422,457.5	25.2	11:02:56	6,087,057.3	422,355.3	24.6	20:02
OT24	11/04/2012	17:10:31	6,083,266.6	428,236.4	23.3	17:30:31	6,084,903.8	428,313.7	23.3	20:00
OT25	12/04/2012	12:05:33	6,078,672.0	432,661.3	23.1	12:25:35	6,076,999.4	432,786.7	25.3	20:02
OT26	13/04/2012	12:36:38	6,078,381.5	439,243.6	22.4	12:56:43	6,076,730.4	439,120.7	21.5	20:05
OT27		14:11:09	6,073,378.4	443,958.6	22.2	14:31:10	6,071,725.7	444,026.7	22.2	20:01
OT28		15:46:31	6,068,289.6	438,845.1	32.1	16:06:32	6,066,510.0	438,946.5	29.0	20:01
OT29	12/04/2012	13:44:23	6,071,252.1	432,424.9	32.5	14:04:26	6,069,718.2	432,380.9	29.9	20:03
OT30	11/04/2012	13:44:47	6,073,936.7	425,748.4	28.6	14:04:47	6,072,381.4	425,901.4	27.9	20:00
OT31		15:27:51	6,080,450.1	421,467.3	25.5	15:47:53	6,078,722.9	421,429.7	24.4	20:02
OT32		08:33:24	6,068,792.8	415,694.0	27.0	08:53:24	6,070,564.3	415,801.2	27.5	20:00
OT33		12:02:12	6,068,106.5	421,556.0	25.9	12:22:14	6,066,434.4	421,494.7	26.3	20:02

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT34	12/04/2012	15:23:59	6,065,652.5	427,431.8	27.9	15:44:00	6,064,104.9	427,374.6	28.6	20:01
OT35		17:02:29	6,063,207.7	433,479.1	30.3	17:22:31	6,061,566.7	433,596.8	27.7	20:02
OT36	11/04/2012	10:15:17	6,060,217.5	418,748.2	24.2	10:35:21	6,058,365.2	418,875.4	23.5	20:04
OT37	13/04/2012	17:30:13	6,058,290.6	441,069.0	27.0	17:50:16	6,056,766.9	441,141.7	23.7	20:03
OT38	20/04/2012	06:32:28	6,067,318.4	453,481.0	21.9	06:52:35	6,069,072.0	453,700.0	21.7	20:07
OT39		08:37:38	6,072,728.7	461,750.7	23.1	08:57:40	6,074,573.2	461,959.8	23.5	20:02
OT40		16:33:02	6,092,759.6	458,346.1	29.2	16:53:11	6,094,459.3	458,484.5	28.8	20:09
OT41	13/04/2012	06:43:01	6,103,360.9	443,224.5	32.7	07:03:01	6,104,766.4	443,249.2	33.6	20:00
OT42	06/04/2012	12:22:57	6,109,158.5	410,409.4	36.7	12:42:58	6,110,524.7	410,524.6	41.6	20:01
OT43		06:34:46	6,112,093.6	393,765.9	45.3	06:54:54	6,113,881.7	393,807.2	48.6	20:08
OT44	08/04/2012	06:32:53	6,097,259.5	390,216.1	41.8	06:52:54	6,099,128.5	390,285.2	43.8	20:01
OT45	14/04/2012	06:49:54	6,086,119.5	387,135.9	41.8	07:10:00	6,087,515.4	387,270.3	42.4	20:06
OT46	11/04/2012	06:45:13	6,072,322.5	405,841.9	25.9	07:05:42	6,073,531.8	407,159.4	29.5	20:29
OT47	14/04/2012	08:56:51	6,074,307.6	390,385.4	39.2	09:16:59	6,072,998.2	388,968.2	37.8	20:08
OT48		11:38:42	6,062,585.8	372,880.3	49.3	11:58:44	6,061,951.7	371,267.7	57.0	20:02
OT49		15:07:10	6,045,911.3	356,241.1	64.7	15:27:11	6,044,521.5	355,424.3	61.4	20:01
OT50		17:12:57	6,034,763.4	348,593.5	59.7	17:23:32	6,034,181.9	348,166.5	64.1	10:35
OT51	19/04/2012	14:32:21	6,019,808.4	341,358.7	64.7	14:52:28	6,020,933.6	342,213.5	62.1	20:07
OT52		12:12:25	6,013,058.6	330,588.5	61.2	12:32:28	6,013,731.9	332,014.4	58.4	20:03

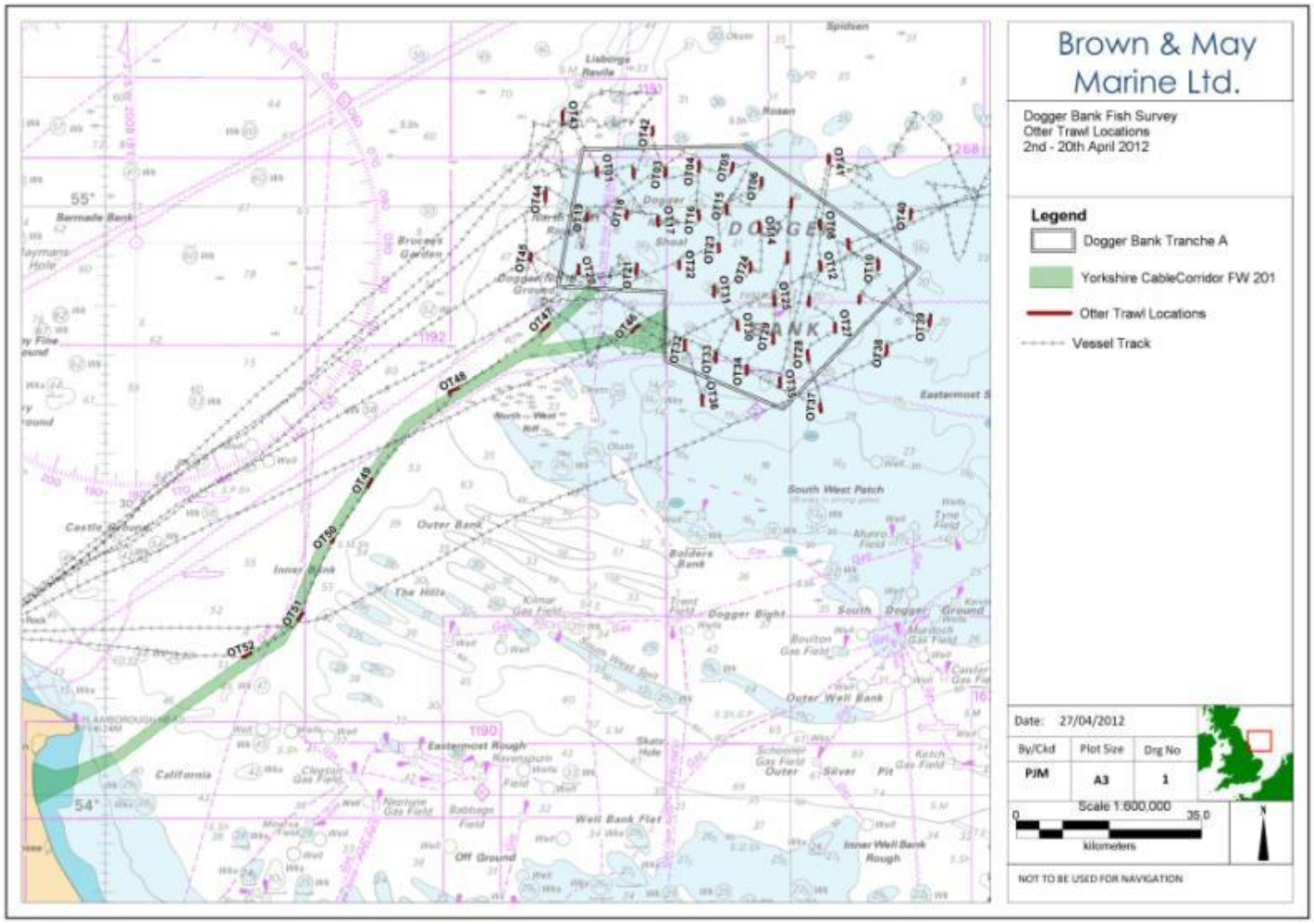


Figure 4.4 Otter Trawl Tow Tracks

4.6 Beam Trawl Sampling

All fish caught in the beam trawl were retained, placed in plastic pots, labelled and photographed. Large fish that could not be retained within the sample pots were identified and measured on board and returned to the sea. Sub-sampling was applied when large (> 4 litres) homogenous samples were obtained. Samples were fixed at the end of every day using a 4% seawater buffered formalin solution before being transported to Precision Marine Surveys Ltd. (PMSL) at the end of the survey to be identified, counted and measured.

The start and end times, co-ordinates and the duration of each beam trawl are given in Table 4.6 (control, Tranche A, cable route and inshore tows highlighted green, red, blue and purple respectively). The vessel tracks whilst towing the beam trawl are illustrated in Figure 4.5.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.6 Start and End Times, Co-ordinates and Duration of each Beam Trawl

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT01	06/04/2012	09:32:43	6,101,532.4	400,084.5	30.8	09:42:41	6,101,901.8	400,210.8	31.0	09:58
BT02		11:08:55	6,100,796.6	406,917.4	29.2	11:19:00	6,101,123.6	406,908.0	30.6	10:05
BT03		15:02:57	6,102,274.4	412,779.7	33.2	15:12:58	6,101,390.3	412,698.6	33.8	10:01
BT04	08/04/2012	16:41:42	6,103,869.7	418,955.9	32.5	16:51:43	6,103,436.0	419,196.2	32.1	10:01
BT05		18:15:30	6,103,474.1	425,491.5	28.6	18:25:30	6,103,034.7	425,460.6	28.8	10:00
BT06	09/04/2012	07:20:57	6,100,267.1	430,726.8	28.8	07:30:59	6,099,819.9	430,992.6	30.1	10:02
BT07	12/04/2012	09:03:01	6,096,886.1	436,205.5	27.7	09:12:57	6,096,440.5	436,305.2	27.5	09:56
BT08	13/04/2012	09:47:01	6,092,518.7	441,553.1	30.3	09:57:01	6,091,899.5	441,614.9	29.2	10:00
BT09	20/04/2012	15:00:31	6,089,018.4	446,729.2	27.9	15:10:32	6,088,619.1	446,778.3	26.6	10:01
BT10		13:27:41	6,085,194.3	452,026.7	26.4	13:37:39	6,084,827.6	452,103.2	26.3	09:58
BT11		11:39:01	6,077,320.6	448,723.6	23.5	11:49:04	6,077,992.7	448,643.7	22.4	10:03
BT12	13/04/2012	11:35:14	6,084,930.6	441,566.1	25.2	11:45:13	6,084,429.5	441,662.6	25.3	09:59
BT13	12/04/2012	10:56:51	6,085,126.7	435,316.2	23.7	11:06:52	6,085,565.3	435,321.8	25.0	10:01
BT14		07:17:32	6,092,329.2	430,162.5	25.9	07:27:33	6,091,619.1	430,099.7	25.5	10:01
BT15	09/04/2012	09:26:31	6,094,198.7	424,162.6	25.5	09:36:33	6,094,700.2	424,211.4	25.0	10:02
BT16	08/04/2012	14:56:20	6,094,744.1	418,904.0	27.2	15:06:27	6,094,248.5	418,933.4	27.9	10:07
BT17		13:14:42	6,092,334.7	411,102.8	25.9	13:24:45	6,092,885.2	411,055.0	26.3	10:03
BT18		11:39:27	6,093,623.3	405,326.1	30.8	11:49:24	6,094,421.3	405,281.5	30.5	09:57
BT19		09:43:35	6,094,546.7	397,961.5	28.6	09:53:40	6,095,297.5	398,004.3	29.9	10:05
BT20	09/04/2012	17:00:11	6,084,917.8	396,163.1	29.2	17:10:13	6,084,270.5	396,170.9	29.2	10:02
BT21		15:05:09	6,084,961.9	407,057.1	27.9	15:15:09	6,084,525.6	407,031.5	27.5	10:00
BT22		13:09:56	6,084,275.2	414,895.2	25.2	13:19:56	6,084,929.6	414,802.1	24.8	10:00
BT23		11:20:00	6,087,286.4	422,426.7	24.6	11:30:02	6,088,112.1	422,257.2	24.1	10:02
BT24	11/04/2012	17:49:42	6,085,040.9	428,206.5	23.5	17:59:43	6,084,452.9	428,284.2	24.1	10:01
BT25	12/04/2012	12:45:41	6,077,092.3	432,709.8	24.6	12:55:47	6,077,622.6	432,618.6	24.1	10:06
BT26	13/04/2012	13:13:35	6,076,431.0	439,246.5	21.0	13:23:35	6,076,817.9	439,225.5	21.5	10:00

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM31N		Depth (m)	Time (GMT)	UTM31N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT27	13/04/2012	14:49:24	6,071,436.6	444,012.0	21.7	14:59:25	6,071,801.4	443,898.1	22.2	10:01
BT28		16:24:40	6,066,384.8	438,817.2	28.8	16:34:41	6,066,665.3	438,854.6	29.0	10:01
BT29	12/04/2012	14:23:06	6,069,560.6	432,388.0	29.5	14:33:07	6,069,965.5	432,308.2	29.9	10:01
BT30	11/04/2012	14:21:57	6,072,609.0	425,827.7	29.2	14:31:57	6,073,236.9	425,679.0	28.6	10:00
BT31		16:04:11	6,078,680.3	421,332.7	24.6	16:14:12	6,079,166.7	421,270.9	23.3	10:01
BT32		09:10:35	6,070,384.8	415,897.6	27.9	09:20:36	6,069,806.7	415,916.1	30.1	10:01
BT33		12:39:17	6,066,388.5	421,555.5	25.9	12:49:17	6,067,047.0	421,463.3	26.1	10:00
BT34	12/04/2012	16:01:53	6,064,034.6	427,101.9	29.9	16:11:57	6,064,730.4	427,166.2	28.8	10:04
BT35		17:43:22	6,061,562.0	433,380.4	27.4	17:53:23	6,061,993.1	433,372.1	29.4	10:01
BT36	11/04/2012	10:53:40	6,058,509.8	419,013.0	23.3	11:03:45	6,059,105.9	419,022.0	23.5	10:05
BT37	13/04/2012	18:07:40	6,056,717.9	440,995.8	24.8	18:17:43	6,057,215.3	440,893.8	24.8	10:03
BT38	20/04/2012	07:11:37	6,069,551.8	453,685.7	22.4	07:21:36	6,069,287.2	453,575.8	21.7	09:59
BT39		09:21:05	6,073,957.2	461,776.1	23.1	09:31:10	6,073,704.5	461,672.9	23.0	10:05
BT40		17:11:04	6,094,429.8	458,516.4	28.8	17:21:04	6,094,050.0	458,584.0	28.8	10:00
BT41	13/04/2012	07:30:08	6,104,326.5	443,519.2	31.7	07:40:08	6,103,674.2	443,634.7	33.9	10:00
BT42	06/04/2012	13:00:41	6,110,400.6	410,514.0	40.7	13:10:42	6,109,744.9	410,482.9	38.5	10:01
BT43		07:26:38	6,113,556.2	394,016.6	46.4	07:36:34	6,114,025.7	394,275.9	45.8	09:56
BT44	08/04/2012	07:18:23	6,099,672.2	390,368.7	44.2	07:28:23	6,099,417.1	390,453.9	42.7	10:00
BT45	14/04/2012	07:32:09	6,087,460.4	387,253.7	42.4	07:42:11	6,086,746.5	387,330.7	42.0	10:02
BT46	11/04/2012	07:22:45	6,073,486.1	407,613.4	26.8	07:32:45	6,073,202.5	407,422.7	26.6	10:00
BT47	14/04/2012	09:43:38	6,073,226.5	389,458.5	39.4	09:53:40	6,072,656.7	389,018.9	37.0	10:02
BT48		12:42:01	6,061,692.4	371,722.4	54.6	12:52:03	6,061,055.3	371,445.3	55.5	10:02
BT49		15:50:14	6,044,812.4	355,205.1	62.7	16:00:15	6,045,111.5	355,410.9	63.0	10:01
BT50		17:48:57	6,034,397.1	348,168.5	65.0	17:58:58	6,034,597.5	348,359.3	61.6	10:01
BT51	19/04/2012	15:14:10	6,020,476.2	341,867.9	65.2	15:24:16	6,019,902.5	341,639.5	64.3	10:06
BT52		12:56:25	6,013,551.3	331,775.4	58.4	13:06:26	6,013,108.9	331,269.8	62.8	10:01
BT53	26/03/2012	13:54:00	6,006,112.5	319,337.3	54.0	14:05:00	6005456.52	319070.76	55.17	11:22
BT54		16:44:00	5,993,963.6	304,882.0	36.0	16:57:00	5994019.06	305635.93	39.01	12:05
BT55		17:32:00	5,992,734.4	299,575.8	21.4	17:42:00	5993304.93	299610.32	22.25	10:16
BT56		09:12:00	5,988,289.2	290,944.9	14.1	09:22:00	5987753.58	290754.42	14.19	10:23
BT57		11:54:00	5,994,273.6	294,960.7	7.3	12:05:00	5993652.31	294523.33	5.57	11:06
BT58		10:14:00	5,989,253.4	312,283.3	10.5	10:25:00	5,990,138.0	311,713.5	9.84	11:12
BT59		12:32:00	5,998,207.4	298,799.8	8.2	12:46:00	5997486.95	298156.98	7.62	10:00
BT60		10:52:00	5,986,947.9	295,916.6	11.8	11:02:00	5986338.85	295998.18	12.19	10:00
BT61		15:17:00	5,997,512.7	311,216.5	46.3	15:27:00	5997241.66	309630.27	46.03	10:43
BT62		14:39:00	6,001,029.7	314,969.0	51.2	14:49:00	6000350.22	314550.22	52.12	10:16

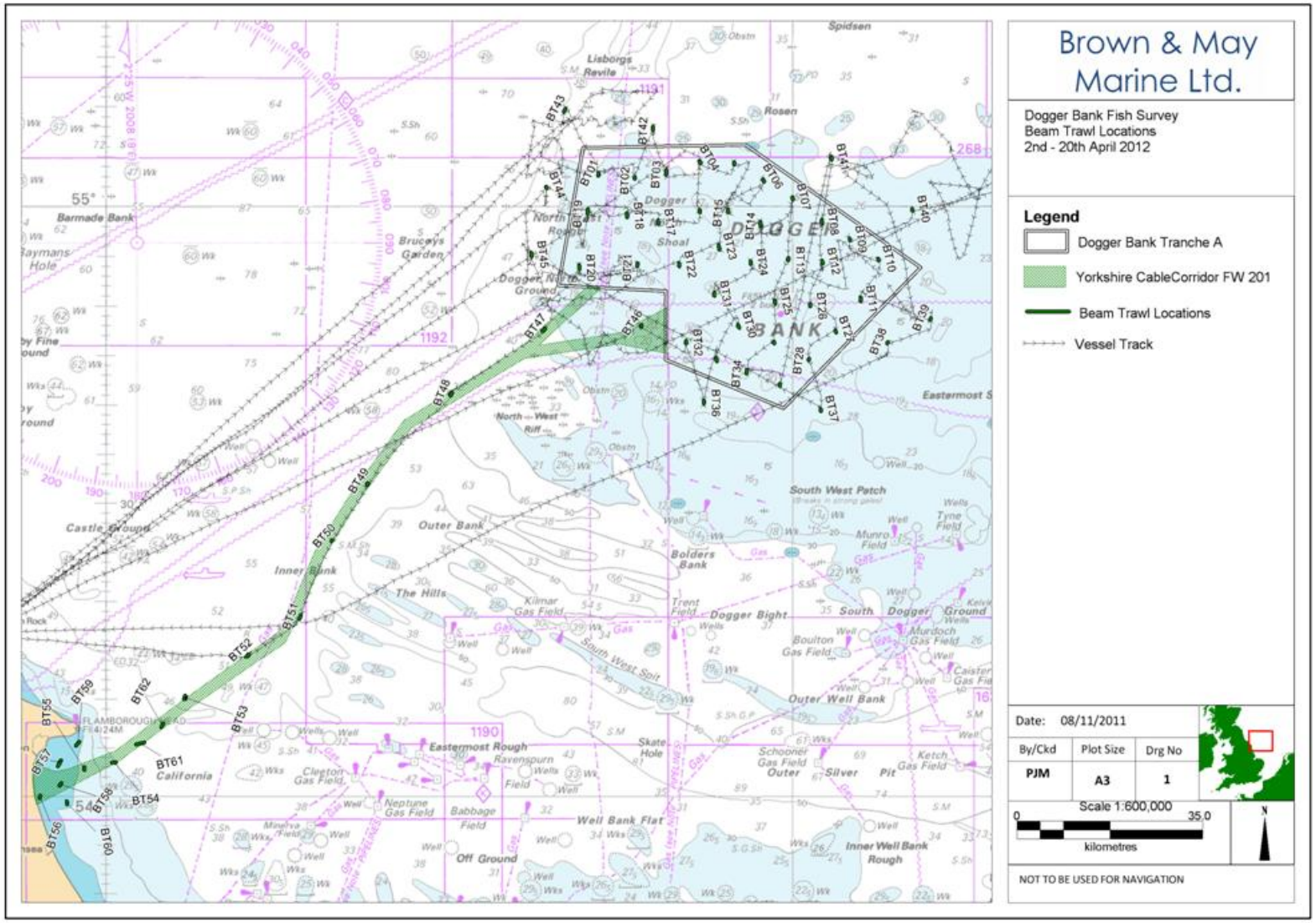


Figure 4.5 Beam Trawl Tow Tracks

5.0 Otter Trawl Results

5.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) for fish species at the control stations, in Tranche A, and along the cable route are given in Table 5.1 and are illustrated in Figure 5.1. The catch rates by station and by sampling area are illustrated in Figure 5.2, Figure 5.3 and Figure 5.4 for control, Tranche A and cable route stations respectively.

Spatial distribution plots for the most abundant species are given in Figure 5.5 to Figure 5.8; the spatial distributions for the additional key species are also given in Figure 5.9 to Figure 5.11.

Spatial plots show the percentage distribution by catch rate of *E. gurnardus*, *L. limanda*, *P. platessa*, *M. merlangus*, Raitt's sandeel (*Ammodytes marinus*), *C. harengus* and *G. morhua*. The circle size corresponds to the catch rate i.e. larger circles indicate greater catch rates.

A total of 28 species were caught; 21 within Tranche A, 17 at the control stations and 22 species along the cable route. Overall, *E. gurnardus* was the most abundant species caught, followed by *L. limanda* and then *P. platessa*.

E. gurnardus had the highest catch rate at the control stations (293.3 individuals per hour) and along the cable route (315.9/hr), whereas *L. limanda* accounted for the greatest catch rate within Tranche A (185.2/hr).

The highest catch rate for all species combined was recorded at control station OT44 (3,405.2/hr), followed by station OT13 within Tranche A (1,617.0/hr), with *E. gurnardus* and *L. limanda* accounting for the majority of the catch at both stations (72.2% at OT44, 92.0% at OT13). *E. gurnardus, L. limanda* and *P. platessa* represented the greatest proportion of the catch at most sampling stations.

P. platessa were caught in all sampling areas, with the greatest catch rate recorded at the control stations (186.6/hr), however station OT09 within Tranche A had the highest catch rate for this species (574.6/hr).

M. merlangus were recorded in all sampling areas, with the greatest total catch rate recorded along the cable route (273.9/hr). It was found however that the highest catch rate for this species was at station OT28 (830.3/hr) within Tranche A.

A. marinus were found at the control stations (3.6/hr) and within Tranche A (0.6/hr) in low numbers. The station with the greatest catch rate for this species was control station OT44 (21.0/hr).

C. harengus were recorded in low numbers in Tranche A (0.1/hr) and along the cable route (6.4/hr). The highest catch rate for this species was found at station OT51 (38.8/hr) along the cable route.

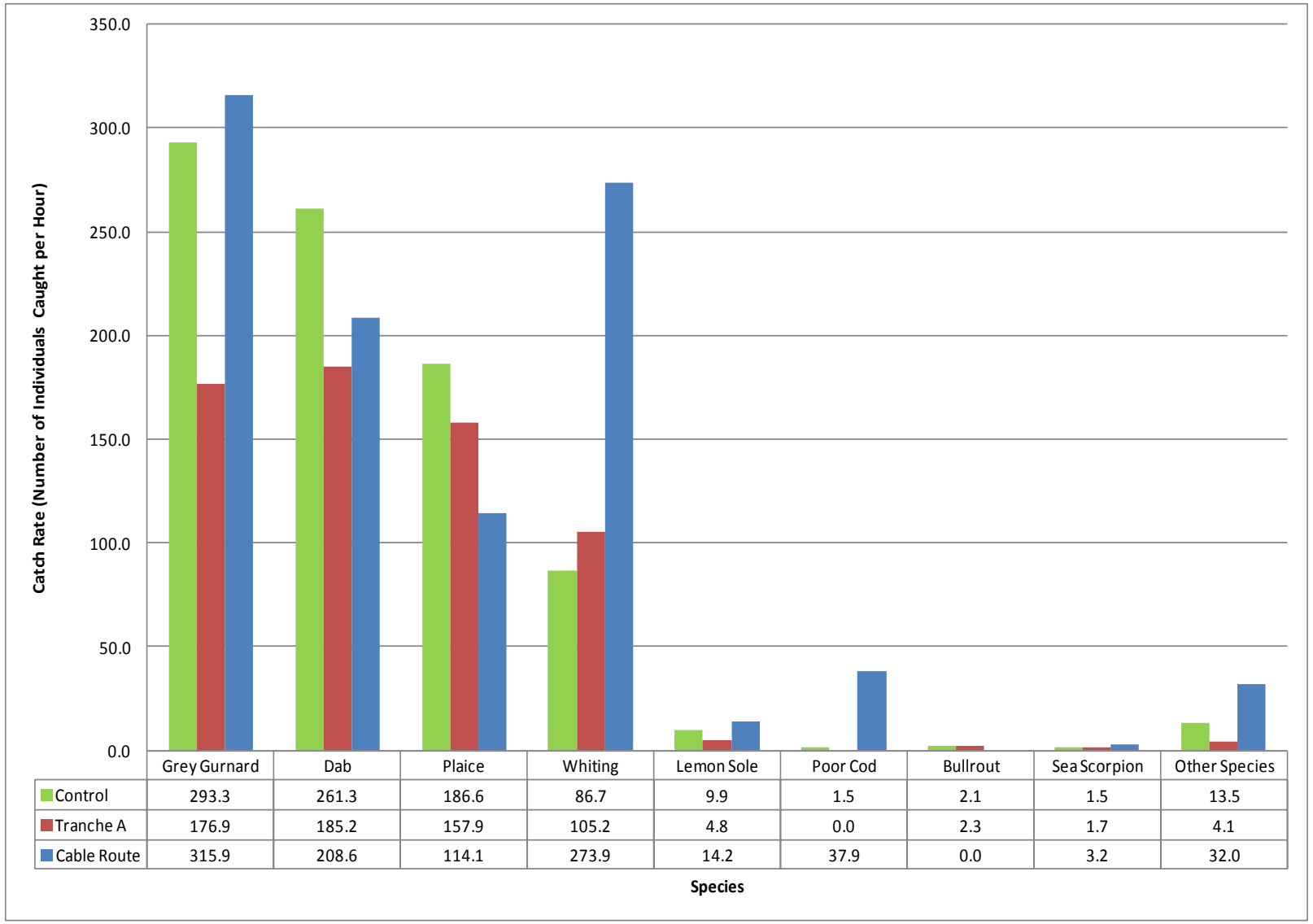
G. morhua were caught in all sampling areas in low numbers, with the highest total catch rate found along the cable route (2.7/hr). The greatest catch for this species was recorded at station OT52 (15.0/hr) along the cable route.

Overall, the total catch rate was higher along the cable route (999.9/hr) than at the control stations (856.3/hr) and within Tranche A (638.2/hr).

Table 5.1 Total Numbers of Individuals Caught and Catch Rate for Fish Species by Sampling Area

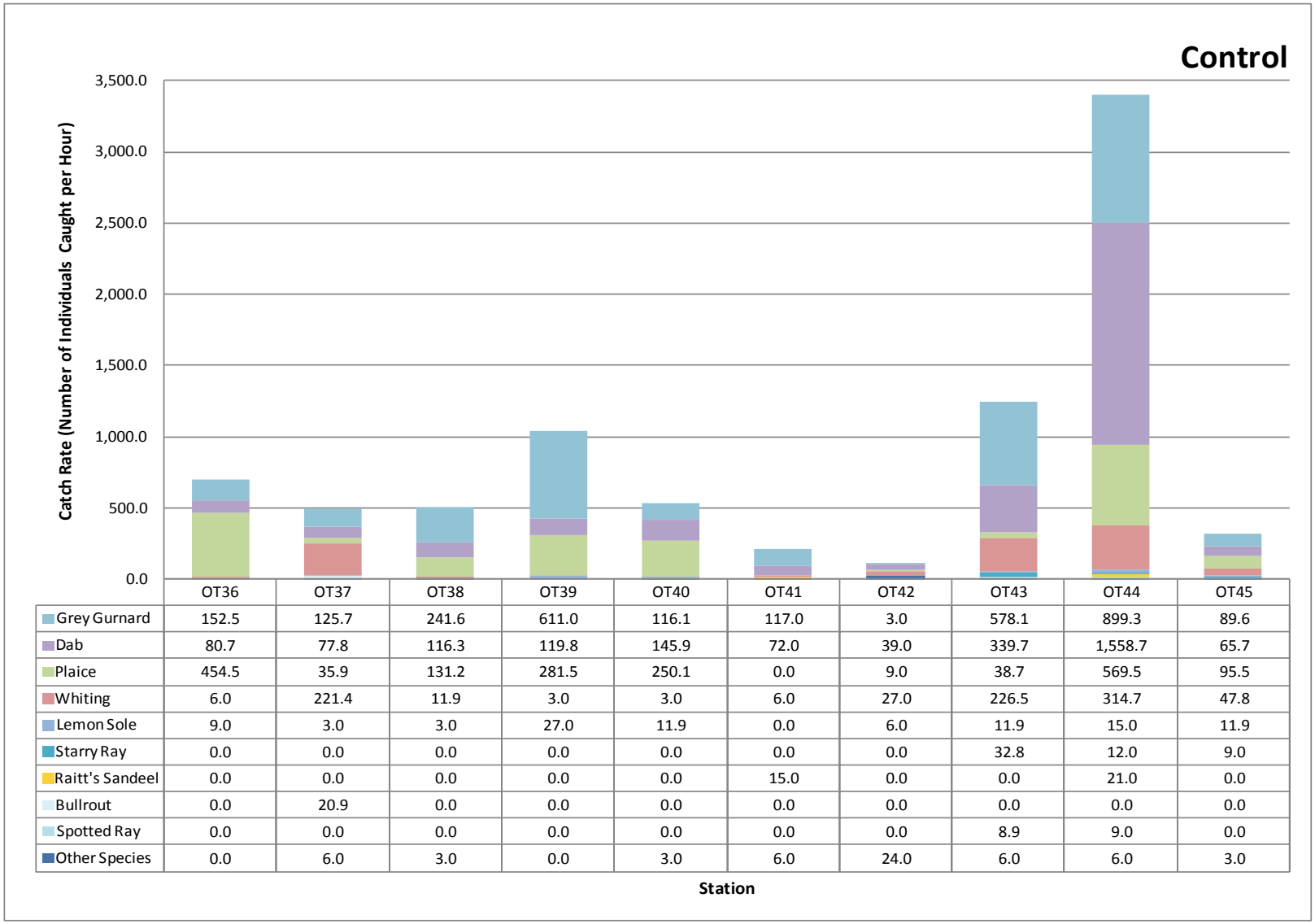
Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable Route	Total	Control	Tranche A	Cable Route
Grey Gurnard	*Eutrigla gurnardus*	981	2,071	692	3,744	293.3	176.9	315.9
Dab	*Limanda limanda*	874	2,168	457	3,499	261.3	185.2	208.6
Plaice	*Pleuronectes platessa*	624	1,849	250	2,723	186.6	157.9	114.1
Whiting	*Merlangius merlangus*	290	1,232	600	2,122	86.7	105.2	273.9
Lemon Sole	*Microstomus kitt*	33	56	31	120	9.9	4.8	14.2
Poor Cod	*Trisopterus minutus*	5	0	83	88	1.5	0.0	37.9
Bullrout	*Myoxocephalus scorpius*	7	27	0	34	2.1	2.3	0.0
Sea Scorpion	*Taurulus bubalis*	5	20	7	32	1.5	1.7	3.2
Haddock	*Melanogrammus aeglefinus*	3	1	24	28	0.9	0.1	11.0
Starry Ray	*Raja radiata*	18	2	1	21	5.4	0.2	0.5
Raitt's Sandeel	*Ammodytes marinus*	12	7	0	19	3.6	0.6	0.0
Herring	*Clupea harengus*	0	1	14	15	0.0	0.1	6.4
Lesser Weever	*Echiichthys vipera*	2	11	2	15	0.6	0.9	0.9
Cod	*Gadus morhua*	1	7	6	14	0.3	0.6	2.7
Spotted Ray	*Raja montagui*	6	2	4	12	1.8	0.2	1.8
Common Dragonet	*Callionymus lyra*	0	5	3	8	0.0	0.4	1.4
Lumpsucker	*Cyclopterus lumpus*	0	7	0	7	0.0	0.6	0.0
Bib	*Trisopterus luscus*	0	0	5	5	0.0	0.0	2.3
Red Gurnard	*Aspitrigla cuculus*	0	0	3	3	0.0	0.0	1.4
Sprat	*Sprattus sprattus*	1	1	1	3	0.3	0.1	0.5
John Dory	*Zeus faber*	0	1	1	2	0.0	0.1	0.5
Lesser Spotted Dogfish	*Scyliorhinus canicula*	1	1	0	2	0.3	0.1	0.0
Starry Smoothound	*Mustelus asterias*	0	0	2	2	0.0	0.0	0.9
Thornback Ray	*Raja clavata*	1	0	1	2	0.3	0.0	0.5

Species		Number of Individuals Caught				Catch Rate (Number of Individuals Caught per Hour)		
Common Name	Scientific Name	Control	Tranche A	Cable Route	Total	Control	Tranche A	Cable Route
Tub Gurnard	*Trigla lucerna*	0	0	2	2	0.0	0.0	0.9
Cuckoo Ray	*Raja naevus*	0	0	1	1	0.0	0.0	0.5
Flounder	*Platichthys flesus*	0	1	0	1	0.0	0.1	0.0
Horse Mackerel	*Trachurus trachurus*	0	1	0	1	0.0	0.1	0.0



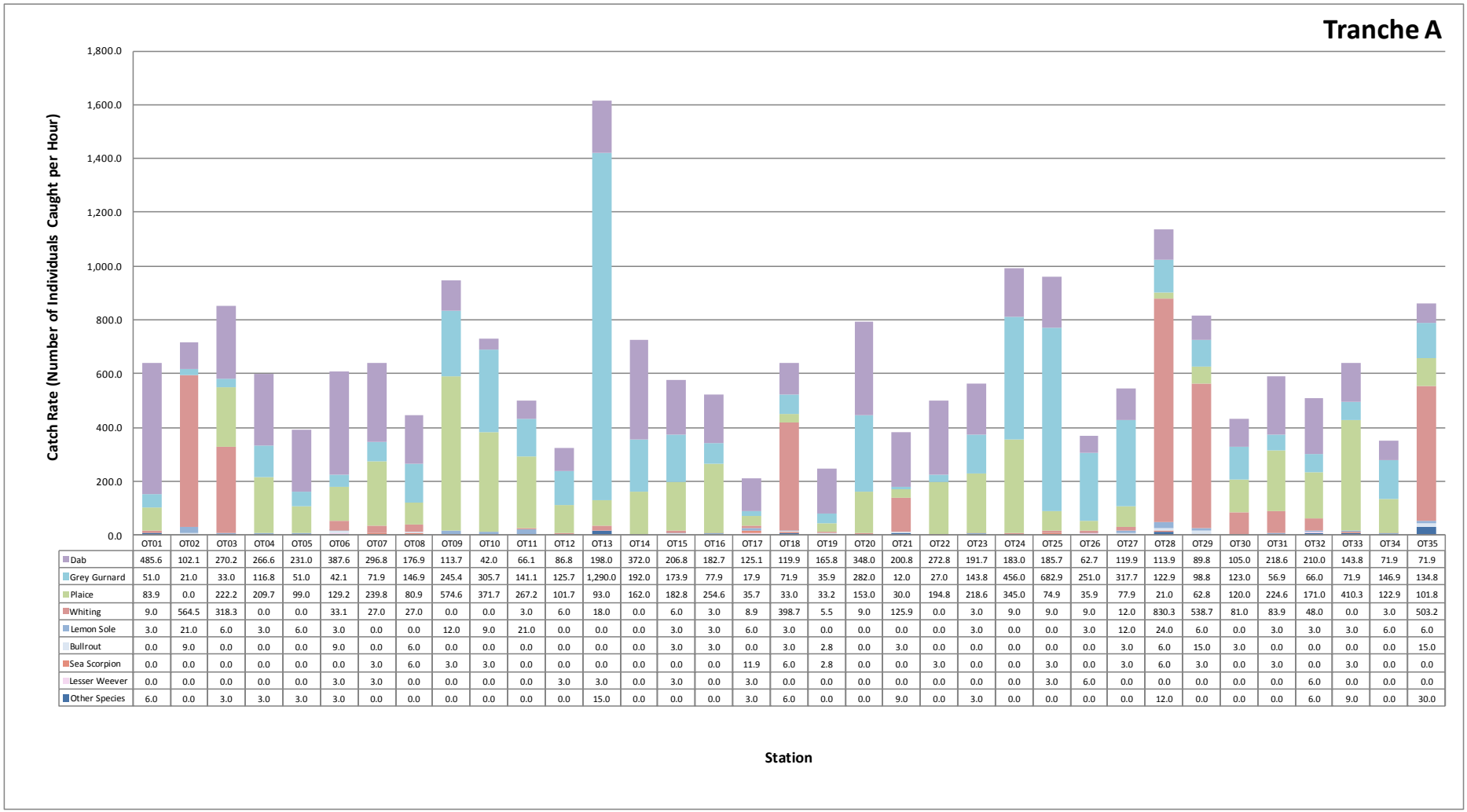
	Grey Gurnard	Dab	Plaice	Whiting	Lemon Sole	Poor Cod	Bullrout	Sea Scorpion	Other Species
Control	293.3	261.3	186.6	86.7	9.9	1.5	2.1	1.5	13.5
Tranche A	176.9	185.2	157.9	105.2	4.8	0.0	2.3	1.7	4.1
Cable Route	315.9	208.6	114.1	273.9	14.2	37.9	0.0	3.2	32.0

Figure 5.1 Catch Rate by Species and Sampling Area



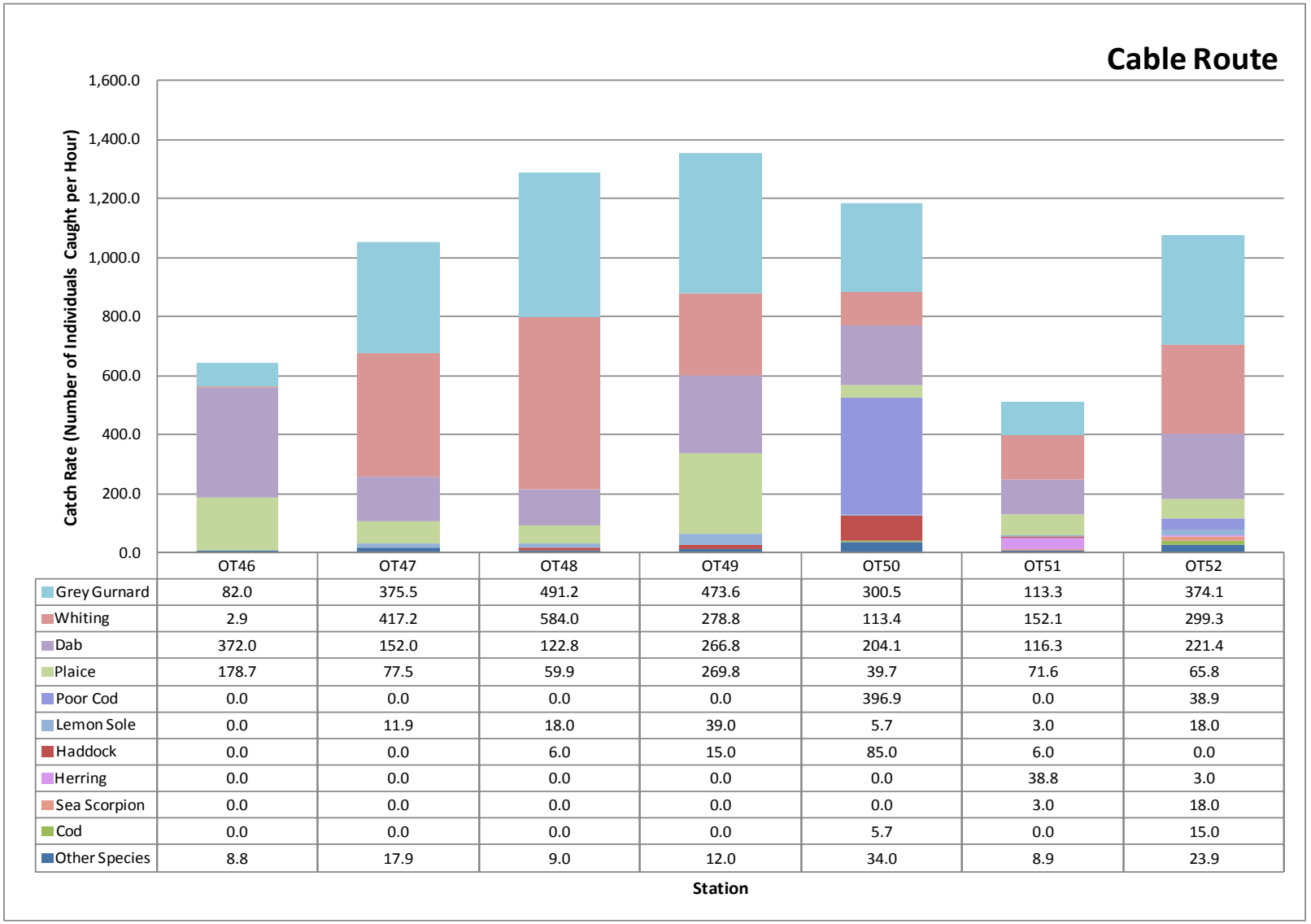
	OT36	OT37	OT38	OT39	OT40	OT41	OT42	OT43	OT44	OT45
Grey Gurnard	152.5	125.7	241.6	611.0	116.1	117.0	3.0	578.1	899.3	89.6
Dab	80.7	77.8	116.3	119.8	145.9	72.0	39.0	339.7	1,558.7	65.7
Plaice	454.5	35.9	131.2	281.5	250.1	0.0	9.0	38.7	569.5	95.5
Whiting	6.0	221.4	11.9	3.0	3.0	6.0	27.0	226.5	314.7	47.8
Lemon Sole	9.0	3.0	3.0	27.0	11.9	0.0	6.0	11.9	15.0	11.9
Starry Ray	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.8	12.0	9.0
Raitt's Sandeel	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	21.0	0.0
Bullrout	0.0	20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spotted Ray	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	9.0	0.0
Other Species	0.0	6.0	3.0	0.0	3.0	6.0	24.0	6.0	6.0	3.0

Figure 5.2 Catch Rate by Species and Station at Control Stations



	OT01	OT02	OT03	OT04	OT05	OT06	OT07	OT08	OT09	OT10	OT11	OT12	OT13	OT14	OT15	OT16	OT17	OT18	OT19	OT20	OT21	OT22	OT23	OT24	OT25	OT26	OT27	OT28	OT29	OT30	OT31	OT32	OT33	OT34	OT35
Dab	485.6	102.1	270.2	266.6	231.0	387.6	296.8	176.9	113.7	42.0	66.1	86.8	198.0	372.0	206.8	182.7	125.1	119.9	165.8	348.0	200.8	272.8	191.7	183.0	185.7	62.7	119.9	113.9	89.8	105.0	218.6	210.0	143.8	71.9	71.9
Grey Gurnard	51.0	21.0	33.0	116.8	51.0	42.1	71.9	146.9	245.4	305.7	141.1	125.7	1,290.0	192.0	173.9	77.9	17.9	71.9	35.9	282.0	12.0	27.0	143.8	456.0	682.9	251.0	317.7	122.9	98.8	123.0	56.9	66.0	71.9	146.9	134.8
Plaice	83.9	0.0	222.2	209.7	99.0	129.2	239.8	80.9	574.6	371.7	267.2	101.7	93.0	162.0	182.8	254.6	35.7	33.0	33.2	153.0	30.0	194.8	218.6	345.0	74.9	35.9	77.9	21.0	62.8	120.0	224.6	171.0	410.3	122.9	101.8
Whiting	9.0	564.5	318.3	0.0	0.0	33.1	27.0	27.0	0.0	0.0	3.0	6.0	18.0	0.0	6.0	3.0	8.9	398.7	5.5	9.0	125.9	0.0	3.0	9.0	9.0	9.0	12.0	830.3	538.7	81.0	83.9	48.0	0.0	3.0	503.2
Lemon Sole	3.0	21.0	6.0	3.0	6.0	3.0	0.0	0.0	12.0	9.0	21.0	0.0	0.0	0.0	3.0	3.0	6.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	12.0	24.0	6.0	0.0	3.0	3.0	3.0	6.0	6.0
Bullrout	0.0	9.0	0.0	0.0	0.0	9.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	3.0	2.8	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3.0	6.0	15.0	3.0	0.0	0.0	0.0	0.0	15.0
Sea Scorpion	0.0	0.0	0.0	0.0	0.0	0.0	3.0	6.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	6.0	2.8	0.0	0.0	3.0	0.0	0.0	3.0	0.0	3.0	6.0	3.0	0.0	3.0	0.0	3.0	0.0	0.0
Lesser Weever	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	6.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
Other Species	6.0	0.0	3.0	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	3.0	6.0	0.0	0.0	9.0	0.0	3.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	6.0	9.0	0.0	30.0

Figure 5.3 Catch Rate by Species and Station within Tranche A



	OT46	OT47	OT48	OT49	OT50	OT51	OT52
Grey Gurnard	82.0	375.5	491.2	473.6	300.5	113.3	374.1
Whiting	2.9	417.2	584.0	278.8	113.4	152.1	299.3
Dab	372.0	152.0	122.8	266.8	204.1	116.3	221.4
Plaice	178.7	77.5	59.9	269.8	39.7	71.6	65.8
Poor Cod	0.0	0.0	0.0	0.0	396.9	0.0	38.9
Lemon Sole	0.0	11.9	18.0	39.0	5.7	3.0	18.0
Haddock	0.0	0.0	6.0	15.0	85.0	6.0	0.0
Herring	0.0	0.0	0.0	0.0	0.0	38.8	3.0
Sea Scorpion	0.0	0.0	0.0	0.0	0.0	3.0	18.0
Cod	0.0	0.0	0.0	0.0	5.7	0.0	15.0
Other Species	8.8	17.9	9.0	12.0	34.0	8.9	23.9

Figure 5.4 Catch Rate by Species and Station along the Cable Route

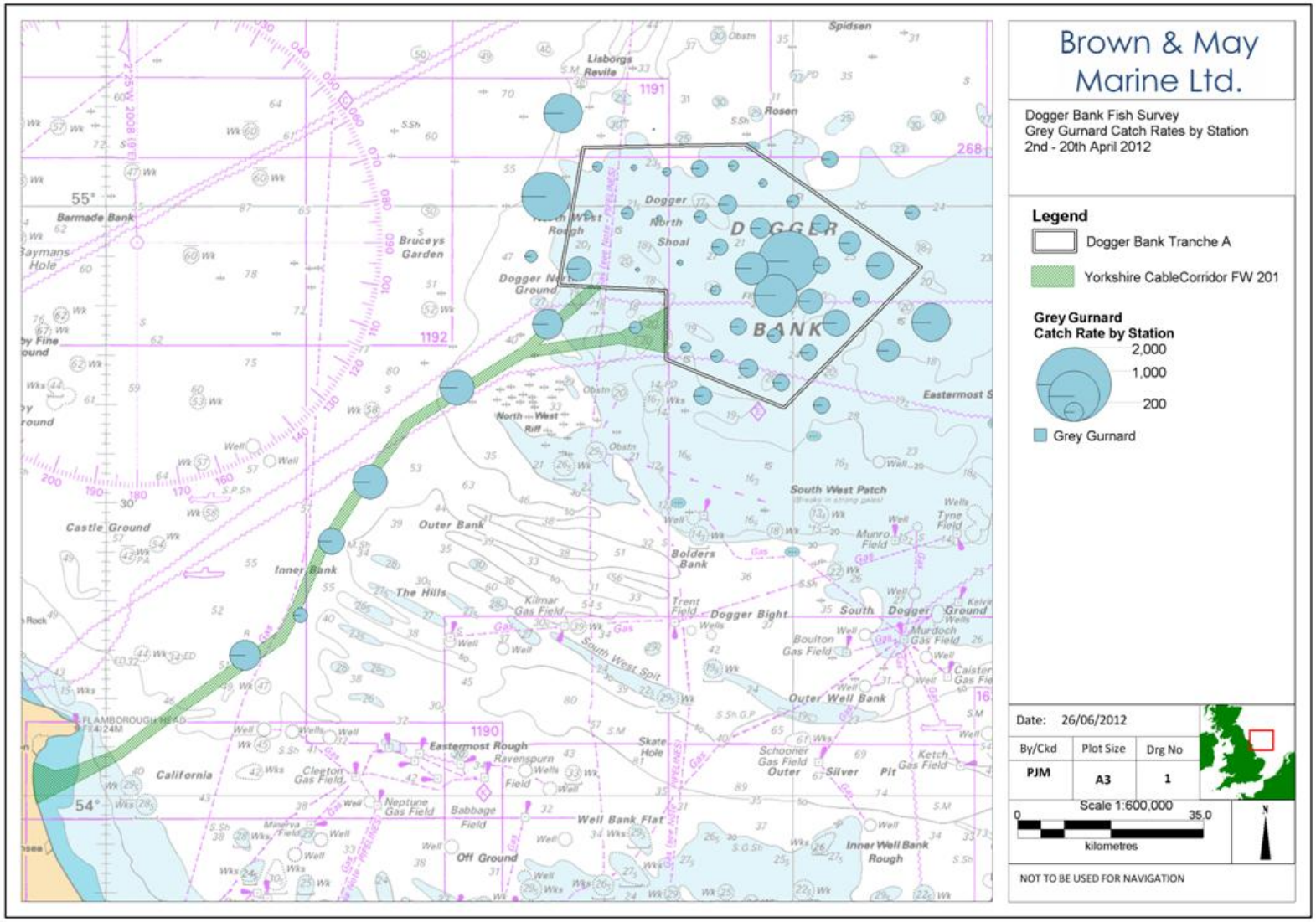


Figure 5.5 Spatial Distribution of Grey Gurnard (*E. gurnardus*) in the Area of Tranche A

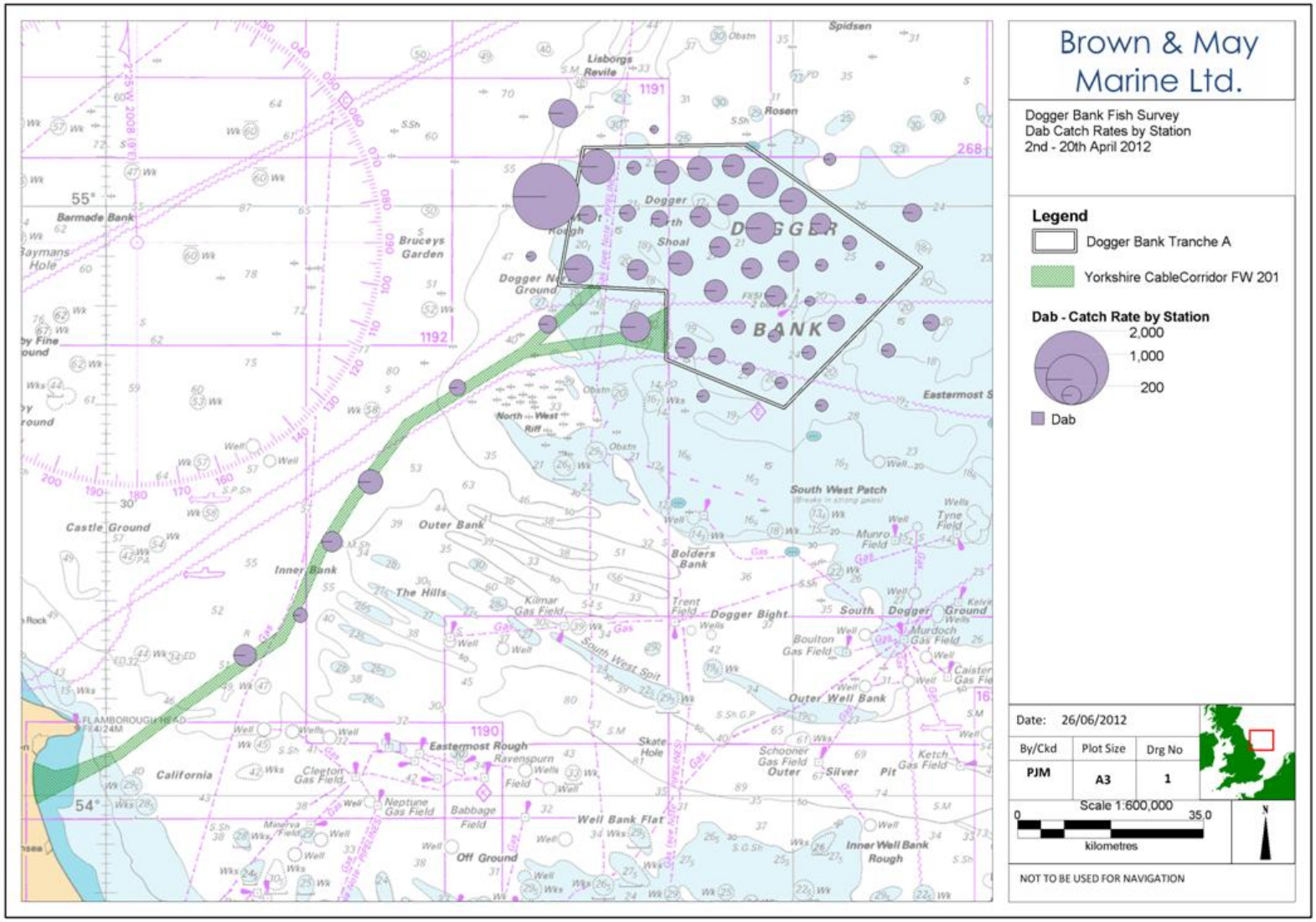


Figure 5.6 Spatial Distribution of Dab (*L. limanda*) in the Area of Tranche A

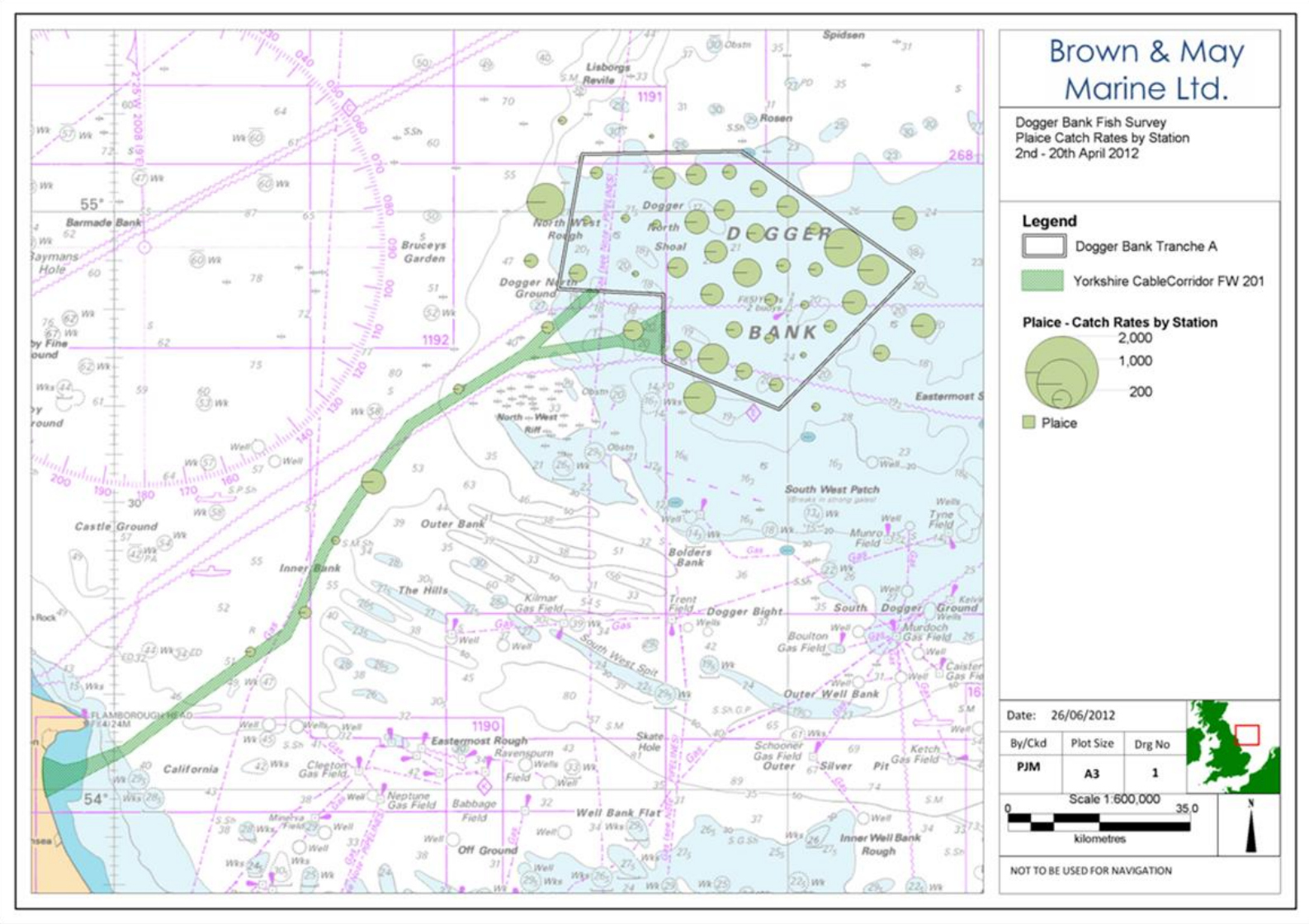


Figure 5.7 Spatial Distribution of Plaice (*P. platessa*) in the Area of Tranche A

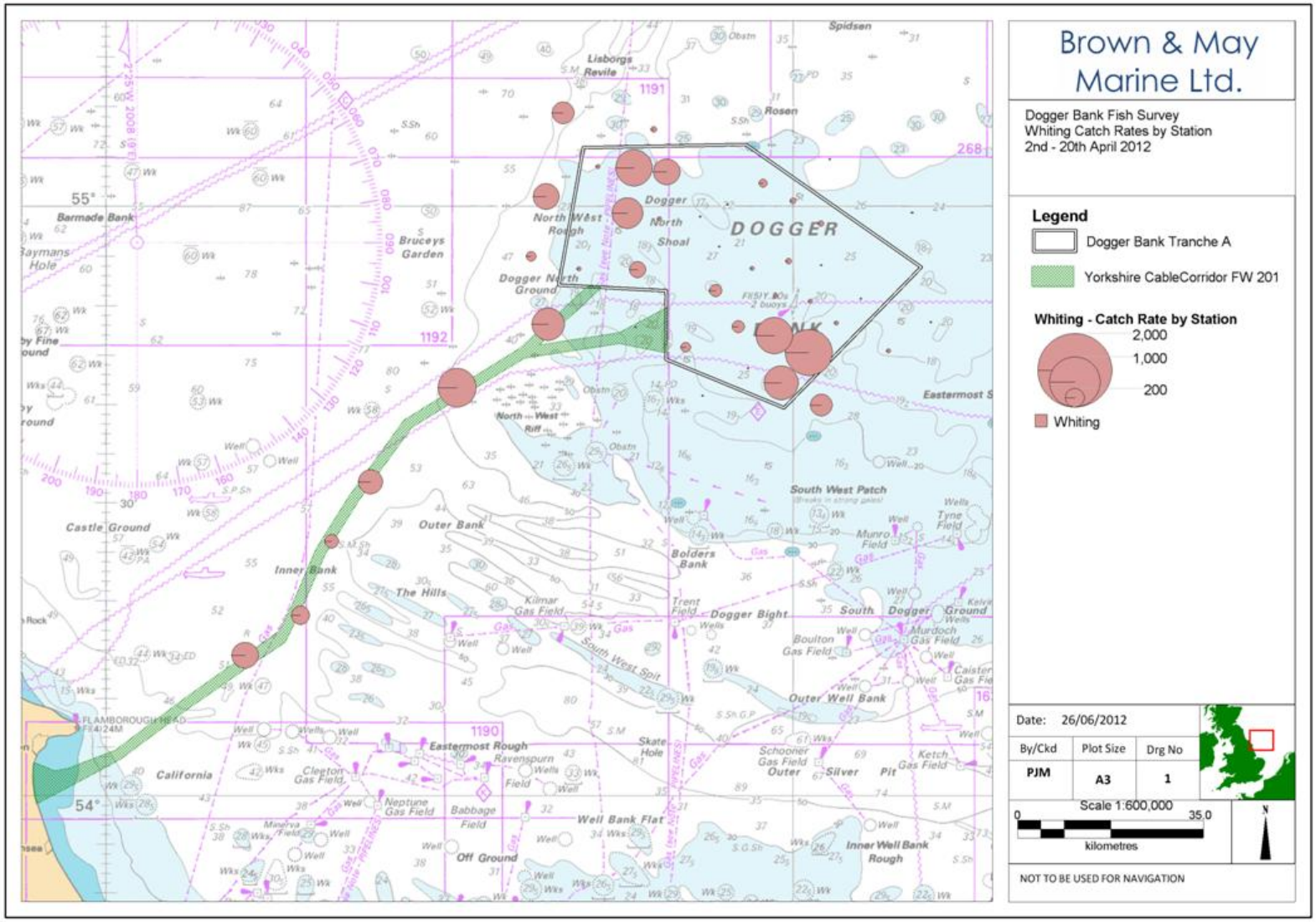


Figure 5.8 Spatial Distribution of Whiting (*M. merlangus*) in the Area of Tranche A

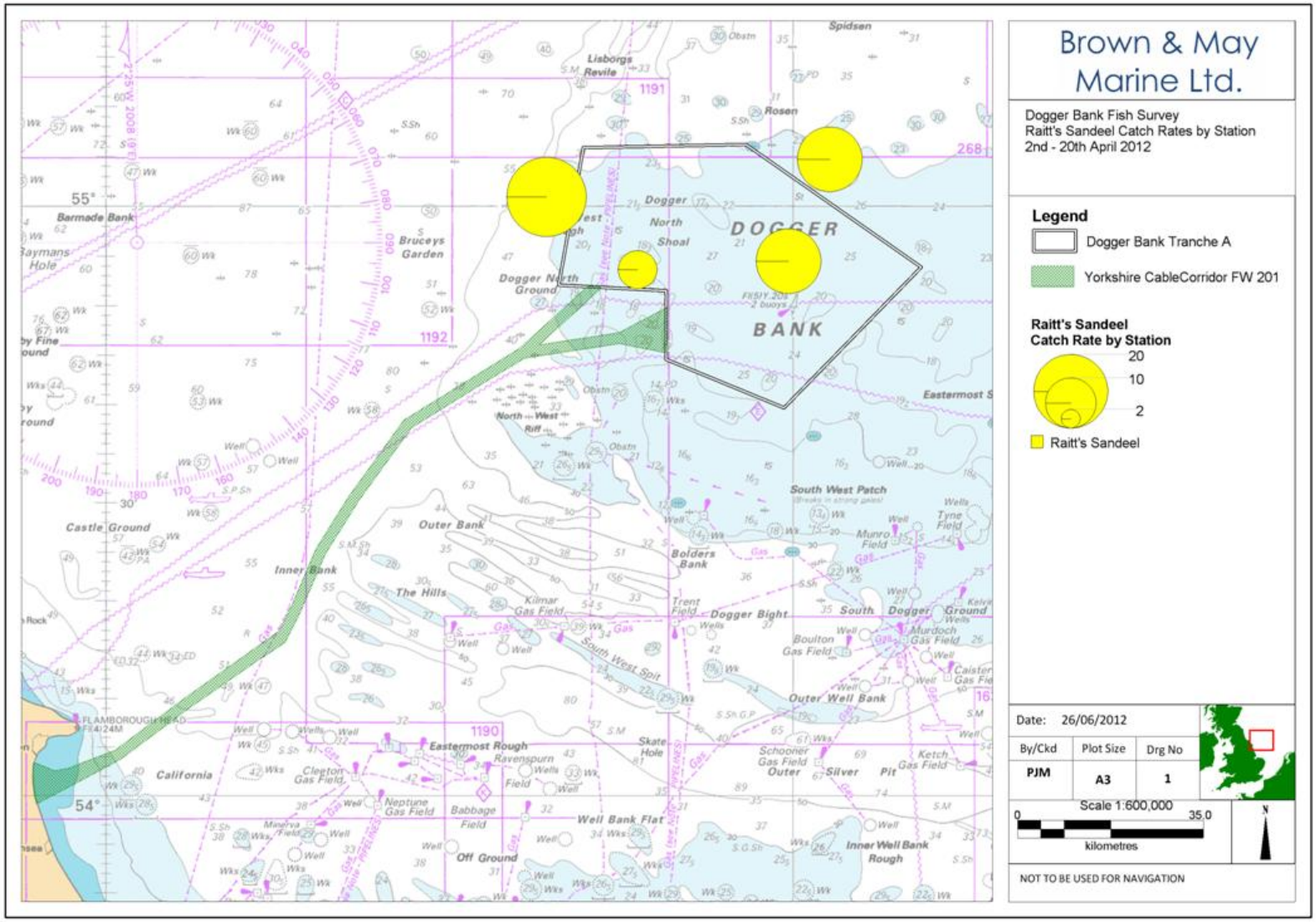


Figure 5.9 Spatial Distribution of Raitt's Sandeel (A. marinus) in the Area of Tranche A

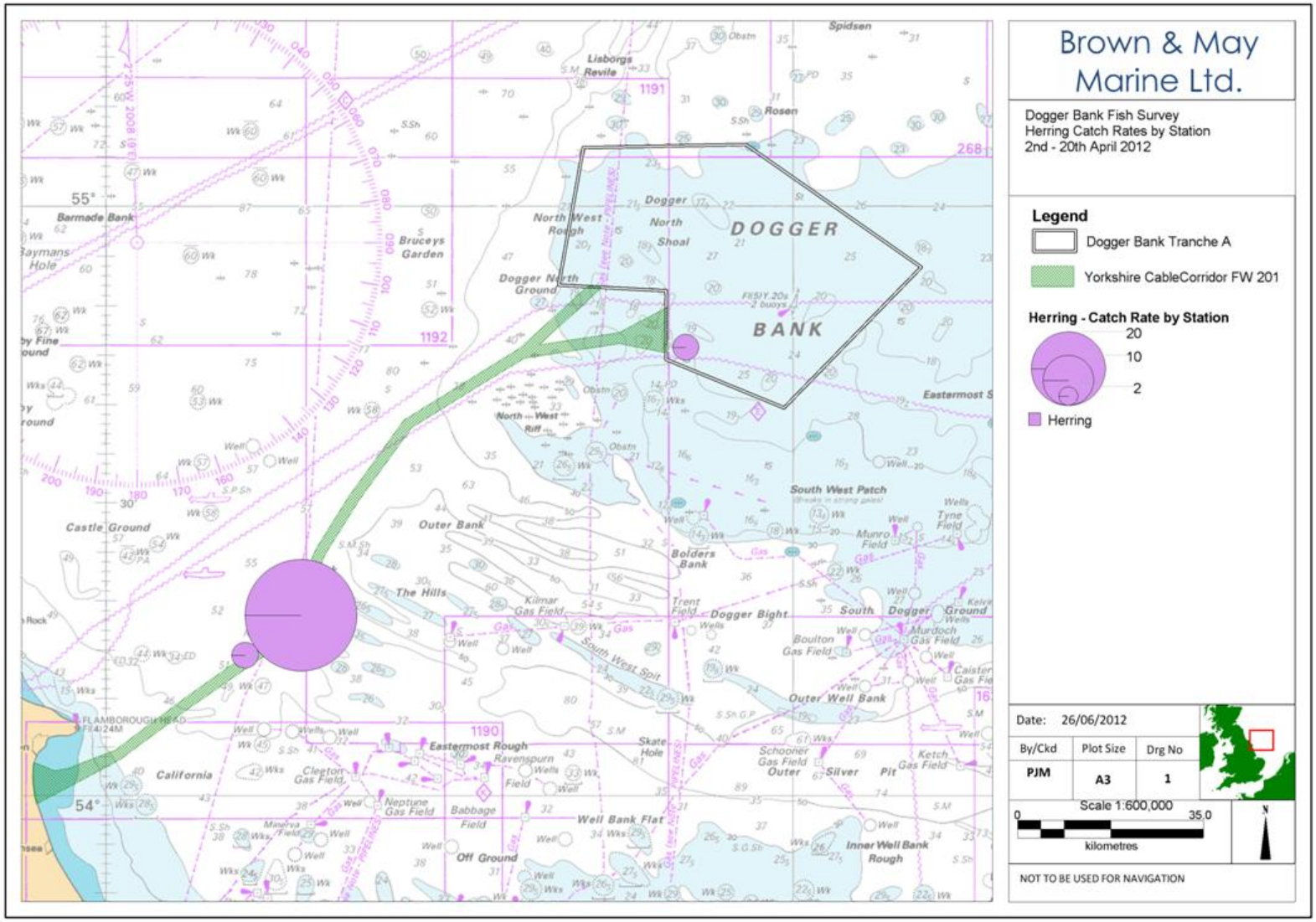


Figure 5.10 Spatial Distribution of Herring (*C. harengus*) in the Area of Tranche A

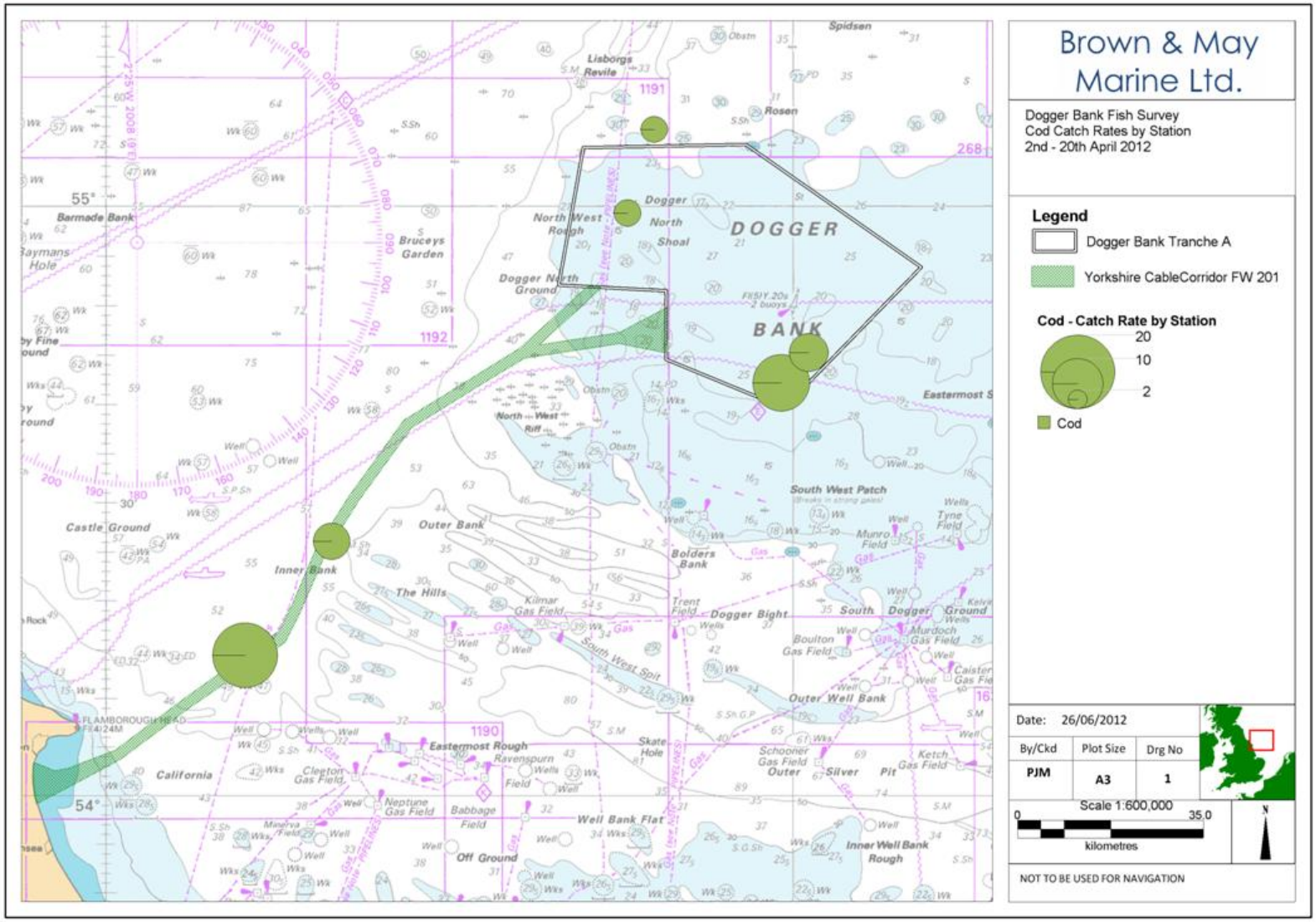


Figure 5.11 Spatial Distribution of Cod (*G. morhua*) in the Area of Tranche A

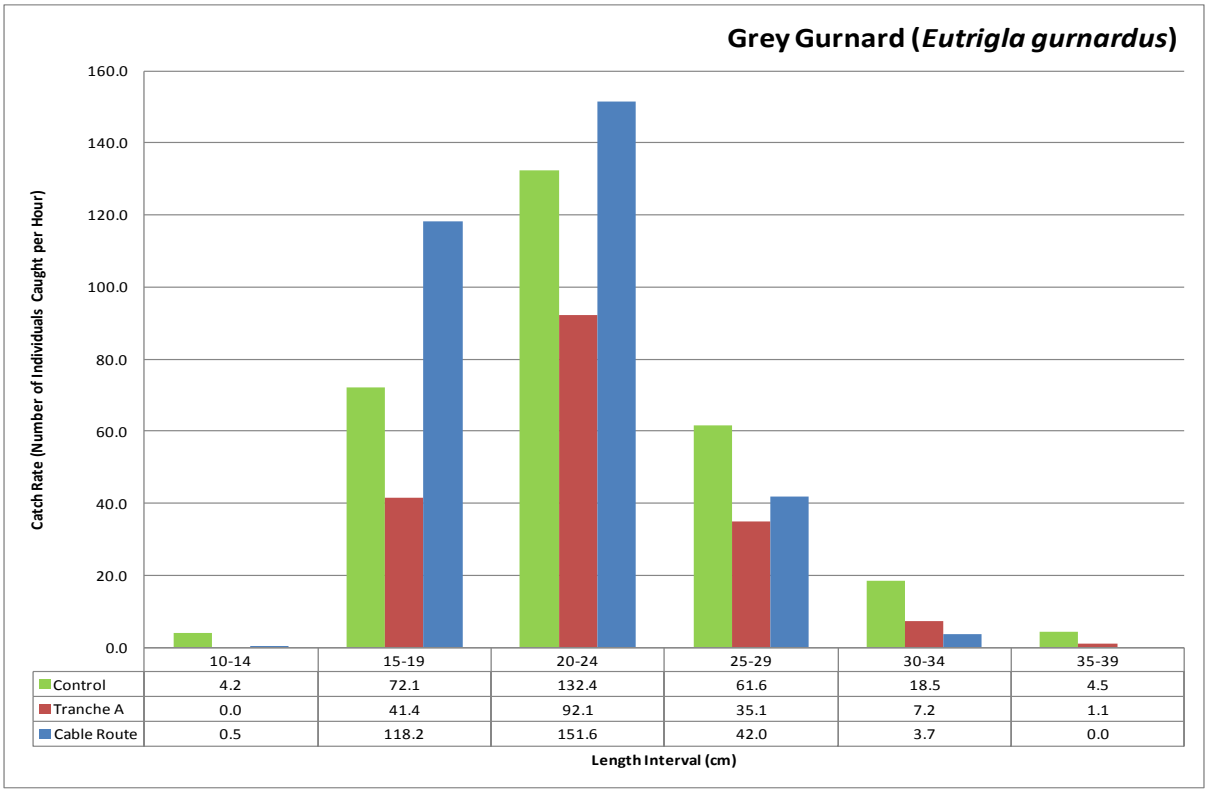
5.2 Length Distributions

The average length (cm) and length range for fish species caught by sampling area (control, Tranche A and cable route stations) are given below in Table 5.2.

The length distributions of the most abundant species caught during the survey (>2,000 individuals), expressed as the catch rate (number of individuals caught per hour) by length (cm) and by sampling area, are shown in Figure 5.12 to Figure 5.15 overleaf.

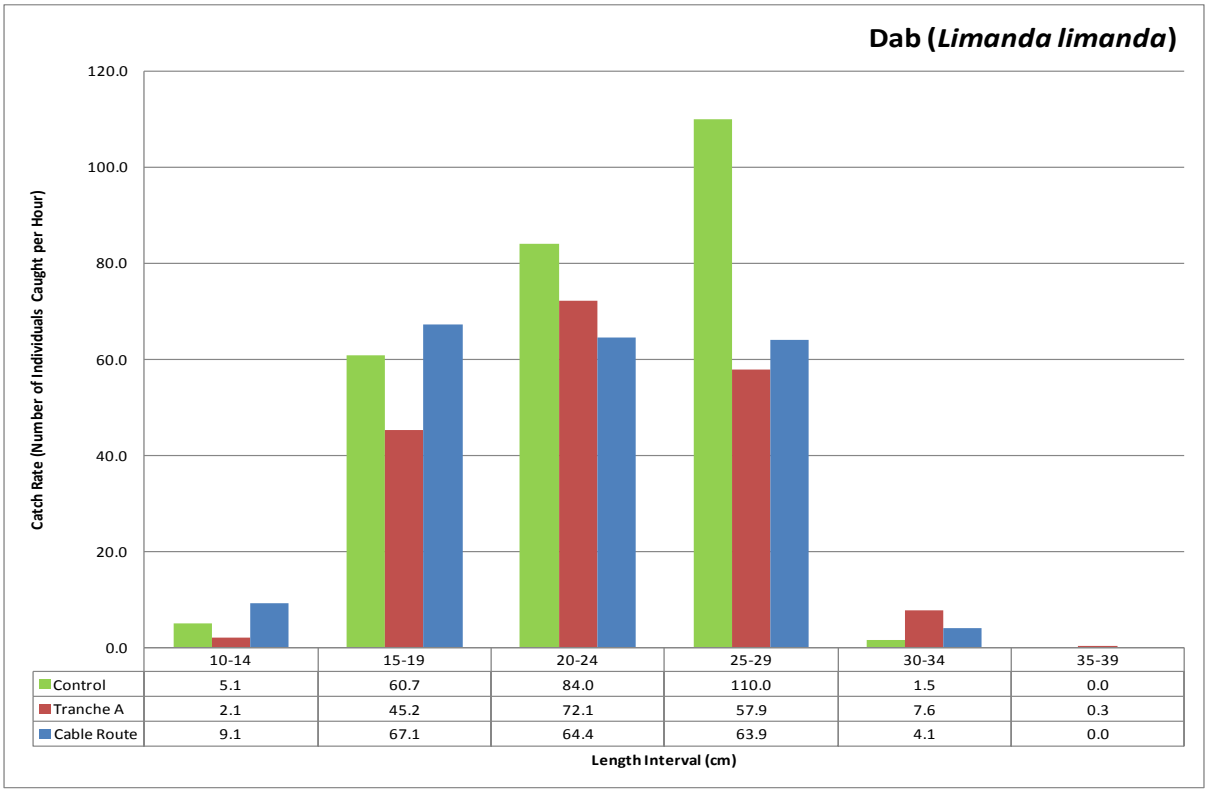
Table 5.2 Average Length and Length Ranges of Species Caught by Sampling Area

Species		Average Length (cm)			Length Range (cm)	
Common Name	Scientific Name	Control	Tranche A	Cable Route	Min.	Max.
Bib	*Trisopterus luscus*	-	-	24.4	22.0	27.0
Bullrout	*Myoxocephalus scorpius*	19.3	19.0	-	16.0	23.0
Cod	*Gadus morhua*	27.0	29.1	34.7	19.0	44.0
Common Dragonet	*Callionymus lyra*	-	22.8	20.0	18.0	25.0
Cuckoo Ray	*Raja naevus*	-	-	52.0	52.0	52.0
Dab	*Limanda limanda*	23.0	22.6	21.7	12.0	36.0
Flounder	*Platichthys flesus*	-	30.0	-	30.0	30.0
Grey Gurnard	*Eutrigla gurnardus*	22.7	22.4	20.9	13.0	38.0
Haddock	*Melanogrammus aeglefinus*	29.3	30.0	38.5	26.0	44.0
Herring	*Clupea harengus*	-	24.5	24.1	20.0	28.5
Horse Mackerel	*Trachurus trachurus*	-	29.0	-	29.0	29.0
John Dory	*Zeus faber*	-	32.0	16.0	16.0	32.0
Lemon Sole	*Microstomus kitt*	25.1	25.2	27.1	19.0	34.0
Lesser Spotted Dogfish	*Scyliorhinus canicula*	60.0	71.0	-	60.0	71.0
Lumpsucker	*Cyclopterus lumpus*	-	28.9	-	23.0	38.0
Plaice	*Pleuronectes platessa*	28.8	28.4	27.4	14.0	50.0
Poor Cod	*Trisopterus minutus*	15.6	-	19.0	13.0	23.0
Raitt's Sandeel	*Ammodytes marinus*	13.1	11.0	-	8.5	16.0
Red Gurnard	*Aspitrigla cuculus*	-	-	24.0	19.0	28.0
Sea Scorpion	*Taurulus bubalis*	20.8	20.2	16.3	13.0	25.0
Spotted Ray	*Raja montagui*	37.5	41.0	49.0	31.0	58.0
Sprat	*Sprattus sprattus*	10.0	14.5	10.0	10.0	14.5
Starry Ray	*Raja radiata*	34.7	37.0	26.0	19.0	43.0
Starry Smoothound	*Mustelus asterias*	-	-	50.5	47.0	54.0
Thornback Ray	*Raja clavata*	41.0	-	43.0	41.0	43.0
Tub Gurnard	*Trigla lucerna*	-	-	27.0	25.0	29.0
Whiting	*Merlangius merlangus*	25.0	24.4	26.7	15.0	43.0



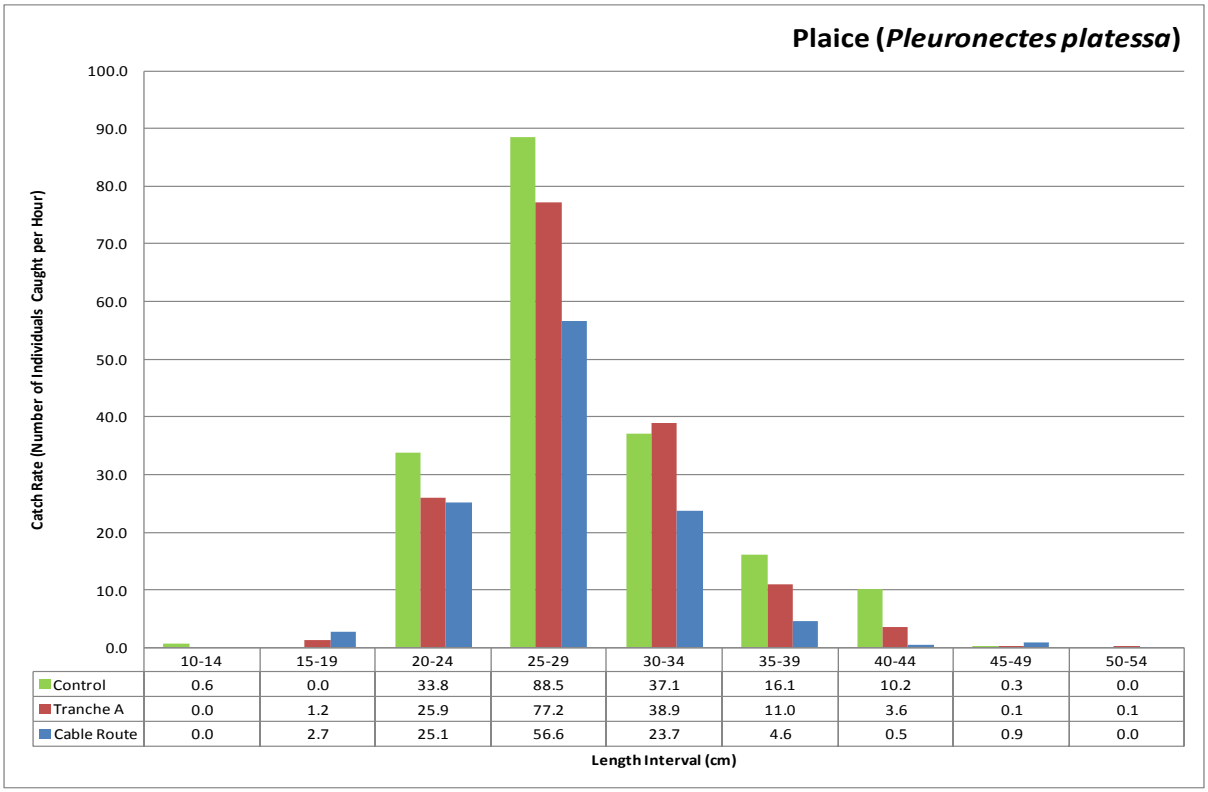
	10-14	15-19	20-24	25-29	30-34	35-39
Control	4.2	72.1	132.4	61.6	18.5	4.5
Tranche A	0.0	41.4	92.1	35.1	7.2	1.1
Cable Route	0.5	118.2	151.6	42.0	3.7	0.0

Figure 5.12 Grey Gurnard (*E. gurnardus*) Length Distribution by Sampling Area



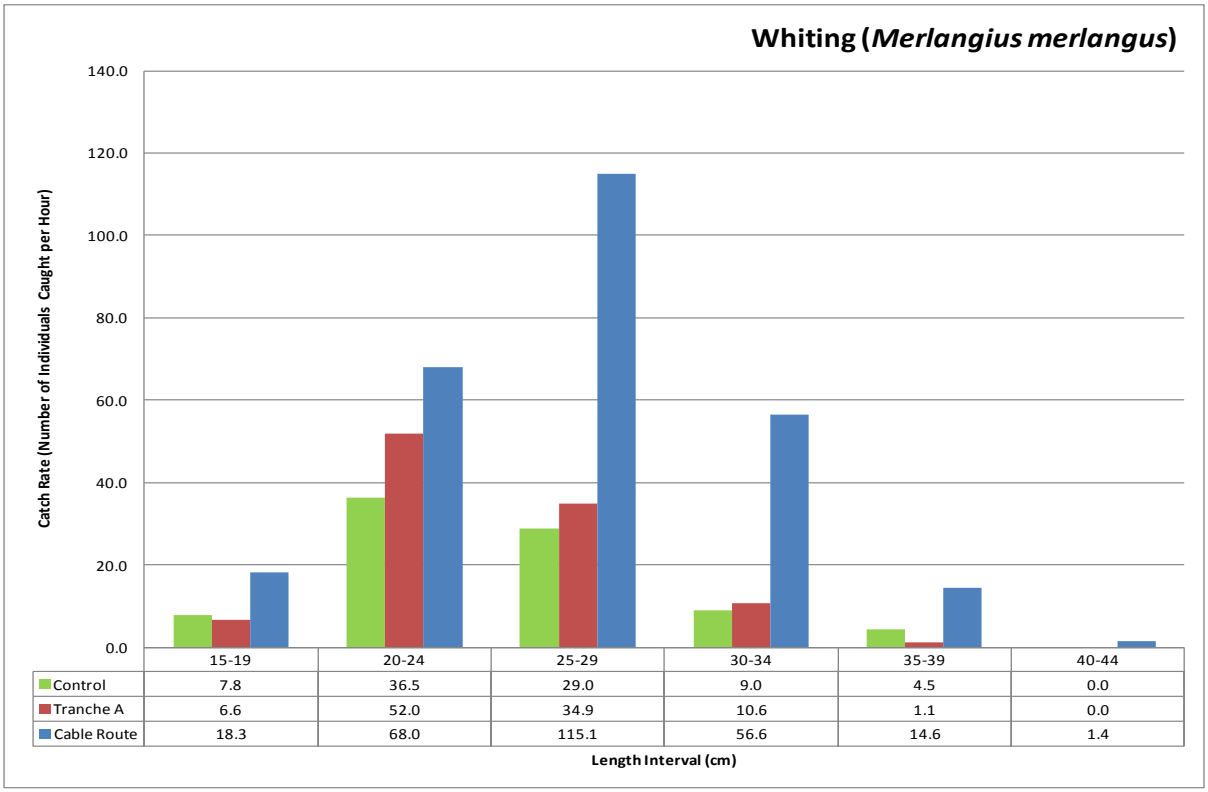
	10-14	15-19	20-24	25-29	30-34	35-39
Control	5.1	60.7	84.0	110.0	1.5	0.0
Tranche A	2.1	45.2	72.1	57.9	7.6	0.3
Cable Route	9.1	67.1	64.4	63.9	4.1	0.0

Figure 5.13 Dab (*L. limanda*) Length Distribution by Sampling Area



	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Control	0.6	0.0	33.8	88.5	37.1	16.1	10.2	0.3	0.0
Tranche A	0.0	1.2	25.9	77.2	38.9	11.0	3.6	0.1	0.1
Cable Route	0.0	2.7	25.1	56.6	23.7	4.6	0.5	0.9	0.0

Figure 5.14 Plaice (*P. platessa*) Length Distribution by Sampling Area



	15-19	20-24	25-29	30-34	35-39	40-44
Control	7.8	36.5	29.0	9.0	4.5	0.0
Tranche A	6.6	52.0	34.9	10.6	1.1	0.0
Cable Route	18.3	68.0	115.1	56.6	14.6	1.4

Figure 5.15 Whiting (*M. merlangus*) Length Distribution by Sampling Area

5.3 Minimum Landing Sizes

Minimum landing sizes (MLS) for fish and shellfish species are set by the EC under Regulation No. 850/98 (Annex XII).

Table 5.3 shows the six species of fish caught for which a MLS has been set, and denotes their presence or absence by sampling area (control, Tranche A and cable route).

Table 5.3 MLS Set by EC

Species		EC MLS (cm)	Presence		
Common Name	Scientific Name		Control	Tranche A	Cable Route
Cod	*Gadus morhua*	35	✓	✓	✓
Haddock	*Melanogrammus aeglefinus*	30	✓	✓	✓
Herring	*Clupea harengus*	20		✓	✓
Horse Mackerel	*Trachurus trachurus*	15		✓	
Plaice	*Pleuronectes platessa*	27	✓	✓	✓
Whiting	*Merlangius merlangus*	27	✓	✓	✓

The percentage of individuals caught above and below their set MLS by species is shown in Figure 5.16 (control), Figure 5.17 (Tranche A) and Figure 5.18 (cable route).

The percentage of individuals above and below the MLS was approximately even for the *P. platessa* caught along the cable route, whereas at the control stations and within Tranche A the majority of which were above the MLS (control 67.0%, Tranche A 62.9%).

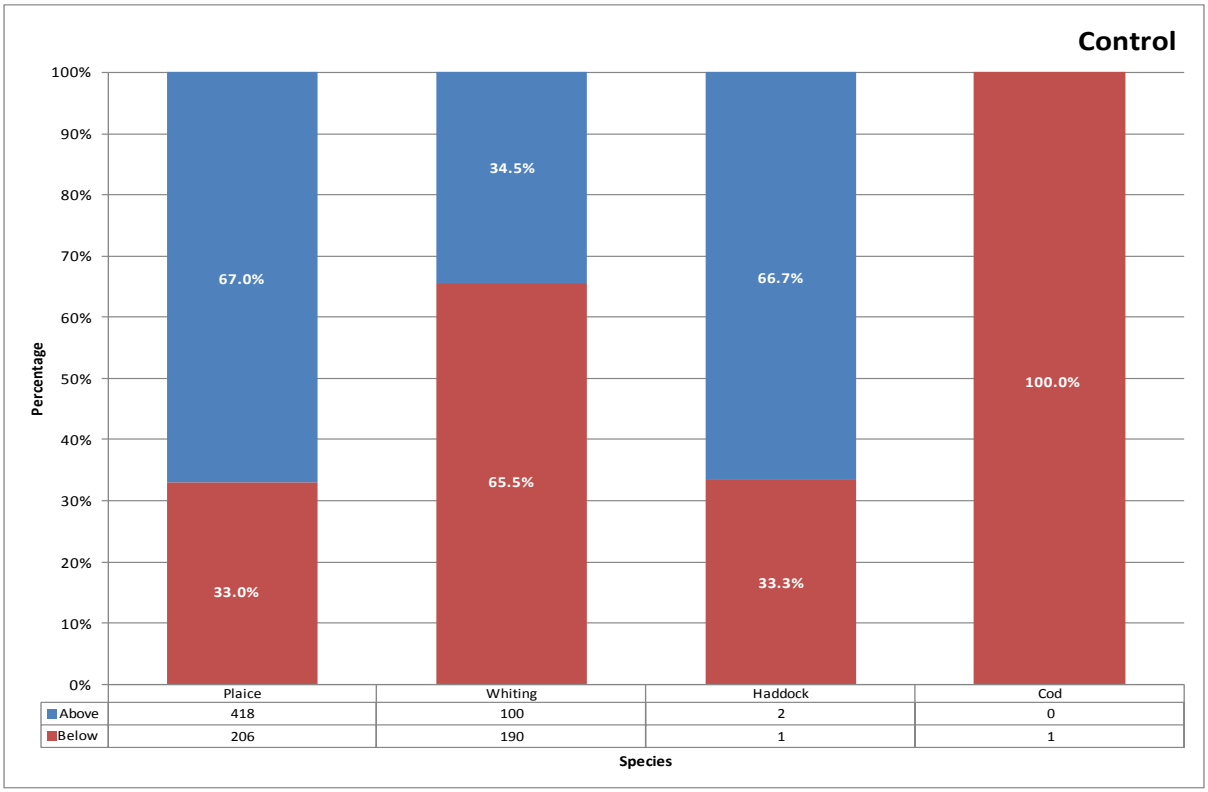
Most of the *M. merlangus* caught at the control stations and within Tranche A were below the MLS (control 65.5%, Tranche A 72.3%), whereas along the cable route the percentage of individuals caught above and below the MLS was approximately even.

The majority of the haddock (*Melanogrammus aeglefinus*) caught at the control stations (66.7%), Tranche A (100.0%) and along the cable route (95.8%) were above the MLS.

One *C. harengus* was found in Tranche A, and 14 along the cable route, all of which were above the set MLS.

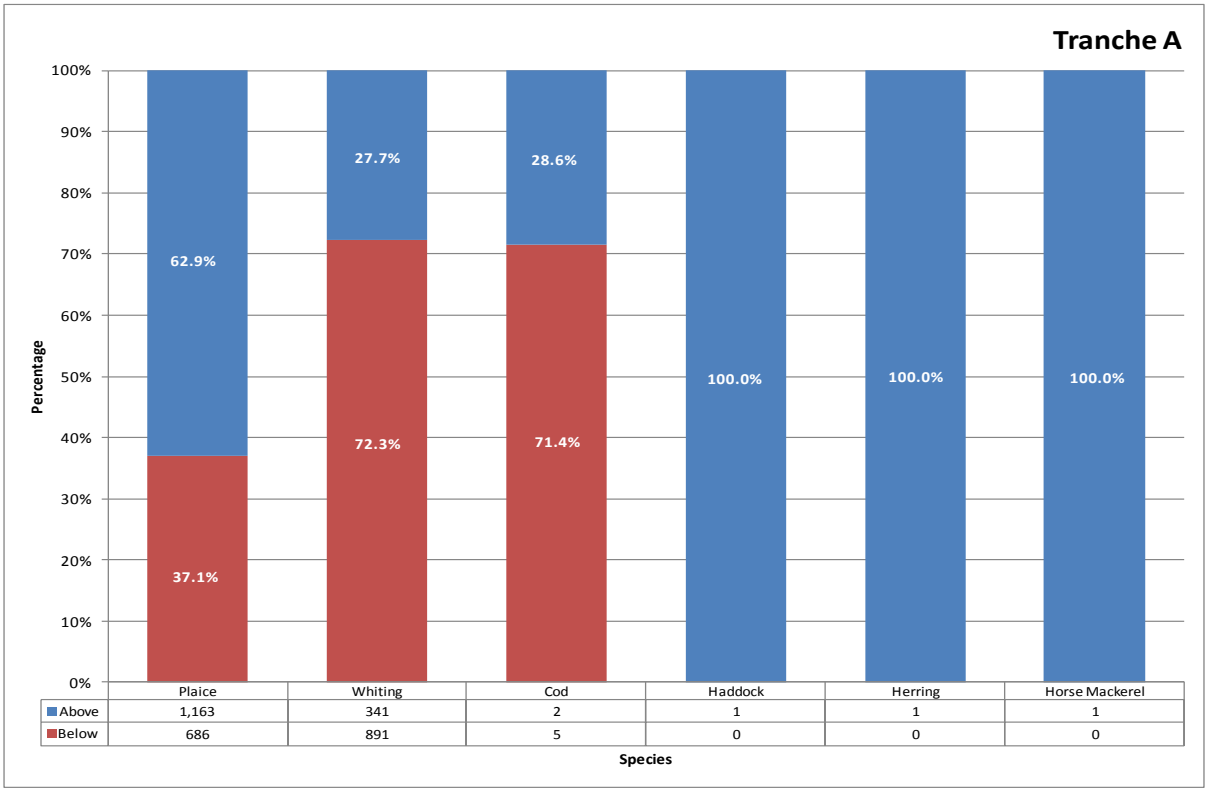
One *G. morhua* was found at the control stations, and was below the MLS. The majority of those found in Tranche A were below the MLS (71.4%), whereas most of those found along the cable route were above the MLS (66.7%).

One horse mackerel (*Trachurus trachurus*) was found in Tranche A, and was above the MLS.



	Plaice	Whiting	Haddock	Cod
Above	418	100	2	0
Below	206	190	1	1

Figure 5.16 Percentage of the Catch Above and Below the MLS by Species at the Control Stations



	Plaice	Whiting	Cod	Haddock	Herring	Horse Mackerel
Above	1,163	341	2	1	1	1
Below	686	891	5	0	0	0

Figure 5.17 Percentage of the Catch Above and Below the MLS by Species within Tranche A

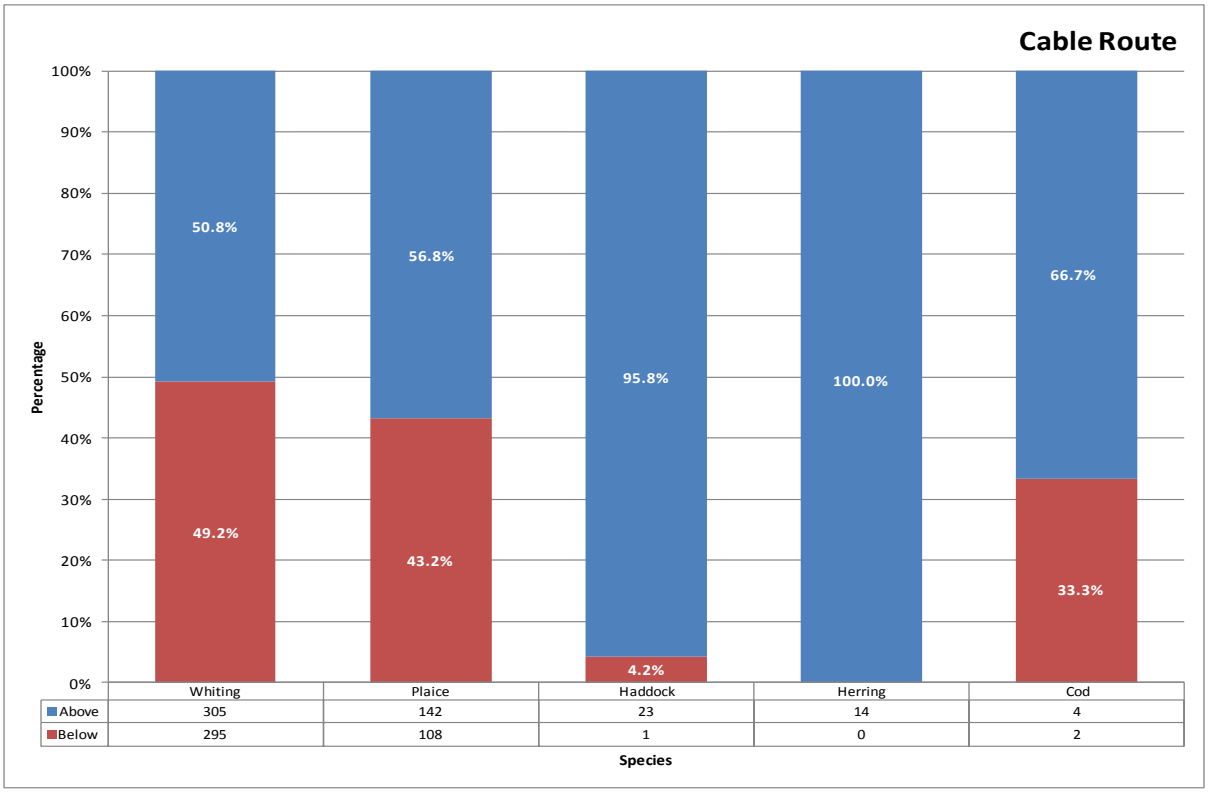


Figure 5.18 Percentage of the Catch Above and Below the MLS by Species at Stations along the Cable Route

5.4 Sex Ratios

The sex ratios of the most abundant species caught during the survey (>2,000 individuals) are shown in Figure 5.19 (control), Figure 5.20 (Tranche A) and Figure 5.21 (cable route). It should be noted that Cefas were unable to confidently determine the sex of a number of immature individuals, and as such they have been categorised as 'unsexed'.

Overall, the majority of the catch, for the most abundant species, at the control stations and within Tranche A were female (control 72.7%, Tranche A 73.6%), whereas the sex ratio along the cable route was approximately even.

The majority of the *E. gurnardus* caught at the control stations and within Tranche A were female (control 62.7%, Tranche A 67.8%), whereas along the cable route a greater proportion of the catch was male (59.4%).

The majority of the *L. limanda* caught in all sampling areas were female (control 77.6%, Tranche A 78.6%, cable route 70.7%).

The majority of the *P. platessa* caught at the control stations (83.8%) and within Tranche A (85.3%) were female, whereas along the cable route the sex ratio was approximately even.

Most of the *M. merlangus* caught at the control stations were female (67.9%), whereas within Tranche A and along the cable route the sex ratio was approximately even.

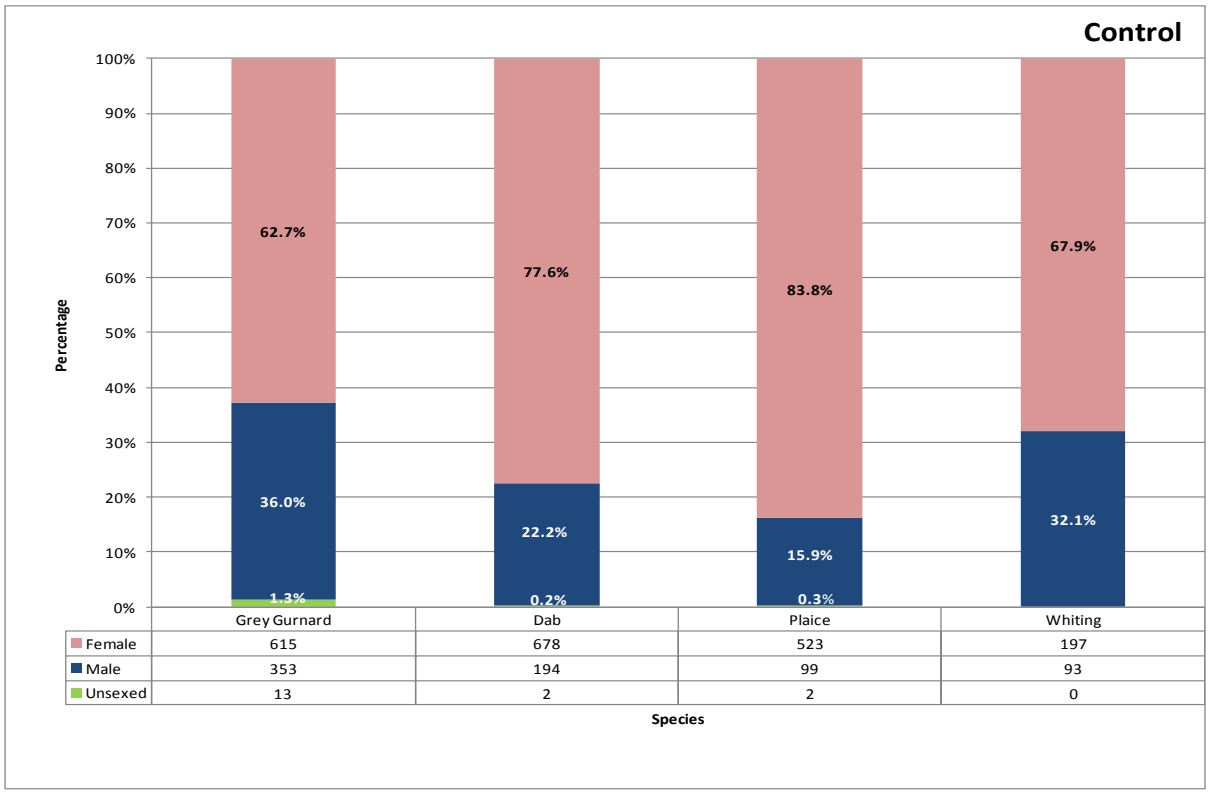


Figure 5.19 Sex Ratio by Species at the Control Stations

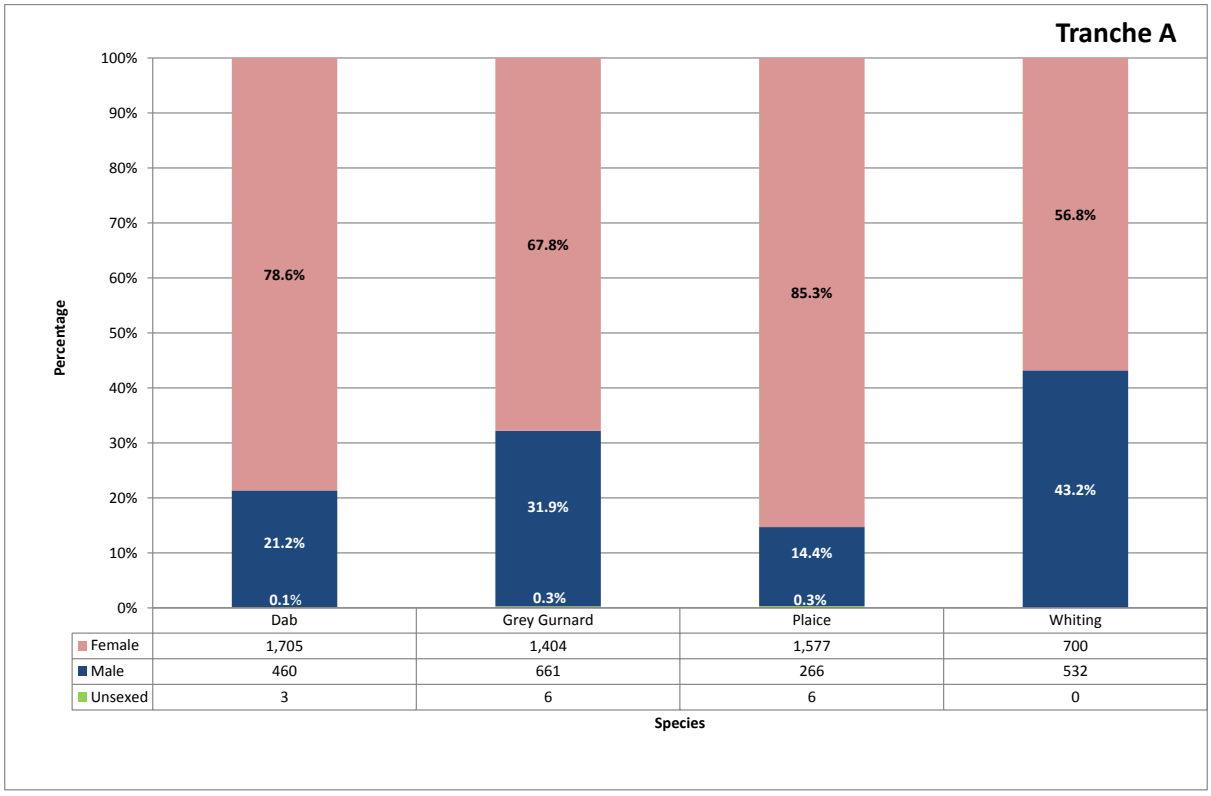


Figure 5.20 Sex Ratio by Species within Tranche A

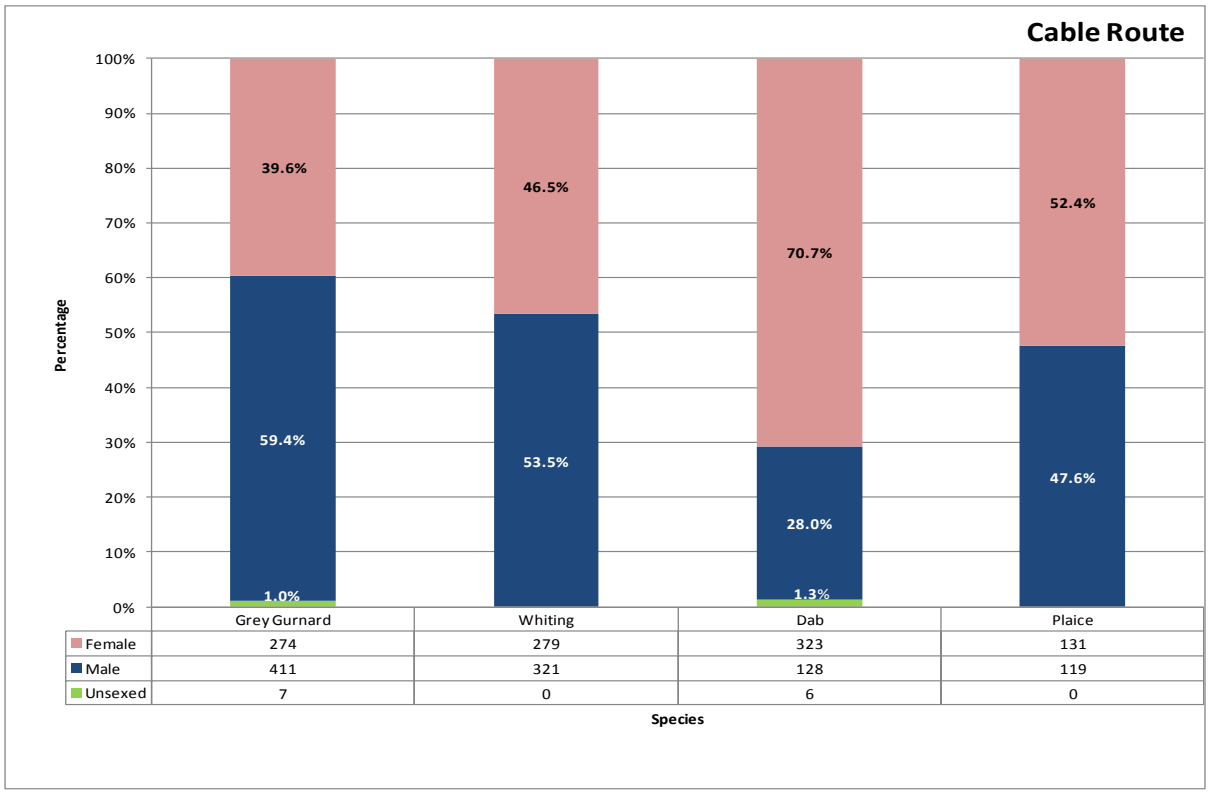


Figure 5.21 Sex Ratio by Species at Stations along the Cable Route

5.5 Spawning Condition

The spawning condition, sex and length range (nearest cm below) for the most abundant species caught during the survey (>2,000 individuals) are given below in Table 5.4 to Table 5.7. The spawning condition, sex and length range for *C. harengus* and *G. morhua* are also given in Table 5.8 and Table 5.9 respectively.

Where a stage of maturity was not recorded for a species it has not been included in the following tables. It should be noted that Cefas were unable to confidently determine the sex of a number of immature individuals, and as such they have been categorised as 'unsexed'.

A total of 19 *A. marinus* were found within Tranche A. It should be noted however that the sex and spawning condition of these individuals could not be confidently determined by PMSL.

The majority of the *E. gurnardus* (control 88.9%, Tranche A 87.2%, cable route 83.1%) and *M. merlangus* (63.4%, 58.7%, 61.0%) found in all sampling areas were maturing individuals.

Most of the *L. limanda* (control 90.8%, Tranche A 87.7%, cable route 81.4%) and *P. platessa* (85.4%, 90.1%, 86.0%) caught in all sampling areas were spent individuals.

One male 'recovering spent' *C. harengus* was caught within Tranche A, and the greatest proportion of those caught along the cable route were 'early spent' and 'late spent' females (25.0% and 16.7% respectively), and 'ripe' males (41.7%). All of the *G. morhua* caught in all sampling areas were immature individuals, most of which were male (71.4%).

Table 5.4 Grey Gurnard (*E. gurnardus*) Spawning Condition

Grey Gurnard								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	Immature	32	21	0	53	1.4%	13	22
	Maturing	515	1,164	166	1,845	49.6%	15	37
	Hyaline	63	190	107	360	9.7%	17	38
	Running	0	1	0	1	0.0%	26	26
	Spent	5	28	1	34	0.9%	20	30
Male	Immature	6	19	5	30	0.8%	15	22
	Maturing	346	636	404	1,386	37.3%	15	32
	Spent	1	6	2	9	0.2%	17	34
Unsexed	Immature	0	0	1	1	0.03%	13	13

Table 5.5 Dab (*L. limanda*) Spawning Condition

Dab								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	Immature	10	19	8	37	1.1%	12	24
	Maturing	37	170	44	251	7.2%	15	32
	Hyaline	2	16	8	26	0.7%	20	31
	Running	1	0	0	1	0.0%	27	27
	Spent	628	1,500	263	2,391	68.5%	13	36
Male	Immature	12	11	5	28	0.8%	12	20
	Maturing	18	50	19	87	2.5%	14	29
	Spent	164	399	104	667	19.1%	13	28
Unsexed	Immature	0	1	0	1	0.0%	13	13

Table 5.6 Plaice (*P. platessa*) Spawning Condition

Plaice								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	Immature	22	79	9	110	4.1%	16	27
	Maturing	42	56	0	98	3.6%	21	33
	Spent	459	1,442	122	2,023	74.5%	18	50
Male	Immature	6	24	4	34	1.3%	14	26
	Maturing	21	24	22	67	2.5%	21	33
	Spent	72	218	93	383	14.1%	18	38

Table 5.7 Whiting (*M. merlangus*) Spawning Condition

Whiting								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	Immature	8	108	29	145	6.8%	15	25
	Maturing	155	474	193	822	38.7%	17	43
	Hyaline	11	39	36	86	4.1%	20	39
	Spent	23	79	21	123	5.8%	21	39
Male	Immature	41	174	50	265	12.5%	16	26
	Maturing	29	249	173	451	21.3%	18	36
	Spent	23	109	98	230	10.8%	20	37

Table 5.8 Herring (*C. harengus*) Spawning Condition

Herring								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	7.1 - Early Spent	0	0	3	3	23.1%	21.5	27.5
	7.2 - Late Spent	0	0	2	2	15.4%	23.5	28.5
Male	2 - Late Virgin	0	0	1	1	7.7%	20.0	20.0
	6 - Ripe	0	0	5	5	38.5%	22.5	25.5
	7.2 - Late Spent	0	0	1	1	7.7%	26.5	26.5
	8 - Recovering Spent	0	1	0	1	7.7%	24.5	24.5

Table 5.9 Cod (*G. morhua*) Spawning Condition

Cod								
Sex	Maturity	Individuals Caught			Total	% of Total Catch	Length Range (cm)	
		Control	Tranche A	Cable Route			Min.	Max.
Female	Immature	0	3	1	4	28.6%	24	44
Male	Immature	1	4	5	10	71.4%	19	43

6.0 Beam Trawl Results

6.1 Catch Rates and Species Distribution

The total number of individuals caught and the catch rate (number of individuals caught per hour) for fish species by sampling area are given in Table 6.1 below and are illustrated in Figure 6.1. The catch rate of fish species by sampling station are shown in Figure 6.2 to Figure 6.5 respectively.

A total of 28 species of fish were caught, ten of which were found at the control stations, 18 within Tranche A, 16 along the cable route and 12 species at the inshore stations.

Overall, *B. luteum* was the most abundant species caught (759 individuals), the majority of which were found in Tranche A (611), followed by *L. limanda* (601), and then *P. minutus* (92).

B. luteum and *L. limanda* were the most prevalent species at the control stations (69.5/hr). Within Tranche A *B. luteum* were the most abundant species (104.5/hr), whereas *L. limanda* were most abundant along the cable route (53.1/hr) and at the inshore stations (4.9/hr).

The station with the greatest total catch rate was BT04 within Tranche A (467.2/hr), with *L. limanda* and *B. luteum* representing 97.4% of the catch.

A. marinus were found at the control stations (5.4/hr), within Tranche A (4.3/hr) and at the inshore stations (4.1/hr). *G. semisquamatus* were found only in Tranche A at a catch rate of 5.6/hr. One *H. lanceolatus* and one *A. tobianus* were found at inshore station BT59. One juvenile sandeel (Ammodytidae sp.) was found at control station BT43.

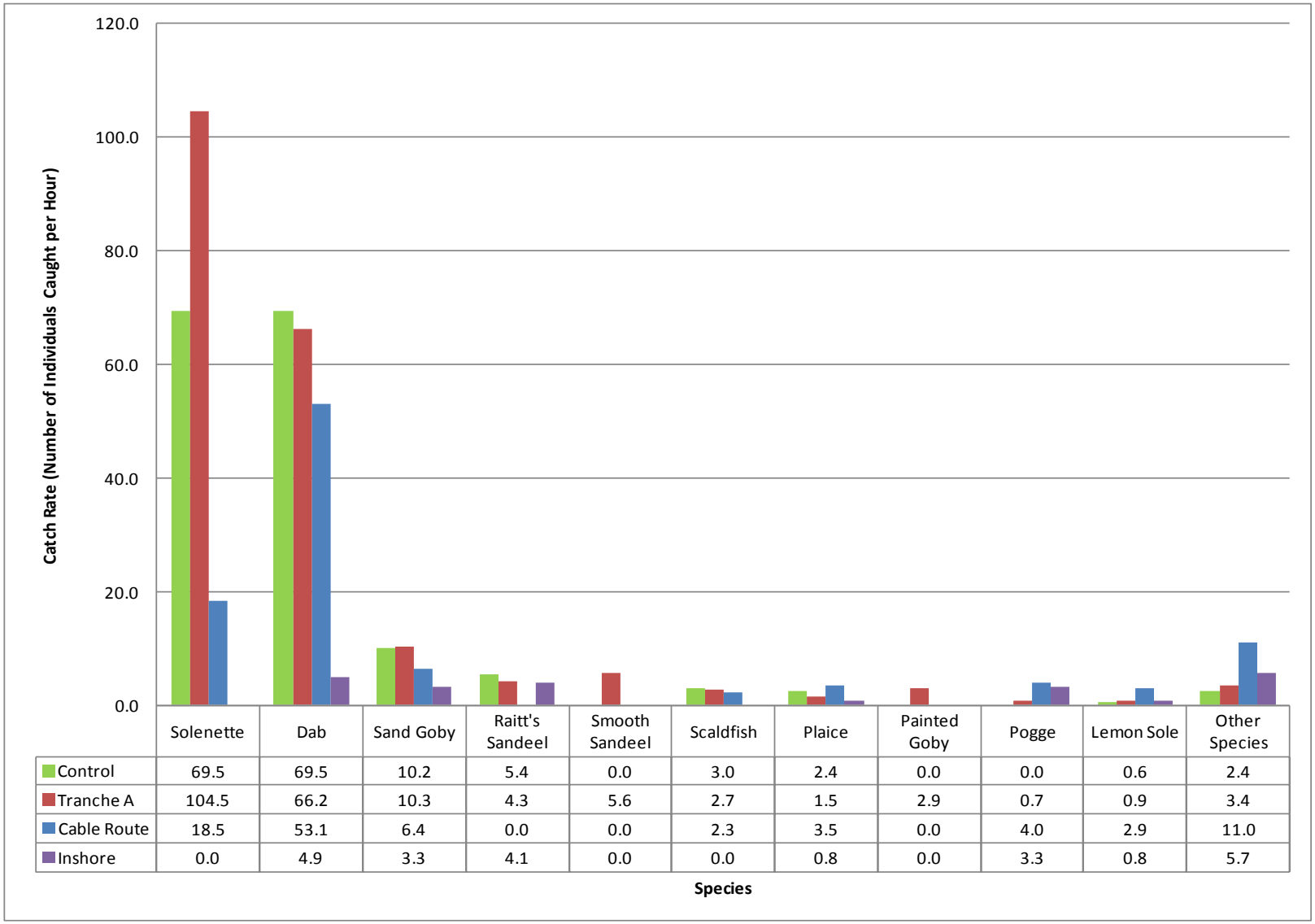
P. platessa were found in low numbers in all sampling areas, with the greatest catch rate recorded along the cable route (3.5/hr). *M. merlangus* were found at the control stations and along the cable route in low numbers, with the greatest catch rate recorded along the cable route (2.9/hr). One *G. morhua* was found along the cable route at station BT52.

Overall, catch rates were greater within Tranche A (203.1/hr) than at the control stations (162.9/hr), along the cable route (101.6/hr) and at the inshore stations (22.8/hr).

Table 6.1 Number of Individuals Caught and the Catch Rate for Fish Species by Sampling Area

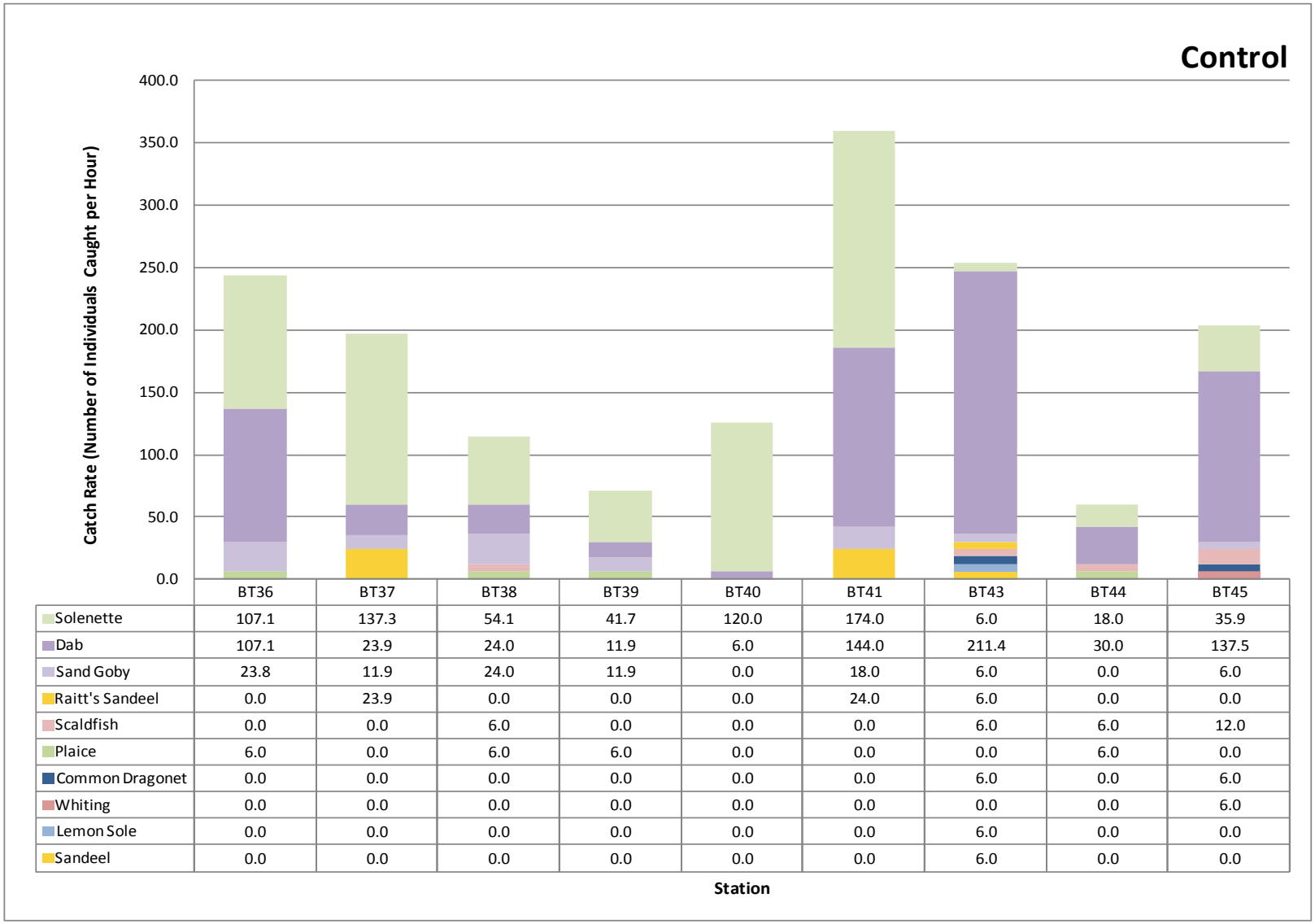
Species		Number of Individuals Caught					Catch Rate (Number of Individuals Caught per Hour)			
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Total	Control	Tranche A	Cable Route	Inshore
Solenette	*Buglossidium luteum*	116	611	32	0	759	69.5	104.5	18.5	0.0
Dab	*Limanda limanda*	116	387	92	6	601	69.5	66.2	53.1	4.9
Sand Goby	*Pomatoschistus minutus*	17	60	11	4	92	10.2	10.3	6.4	3.3
Raitt's Sandeel	*Ammodytes marinus*	9	25	0	5	39	5.4	4.3	0.0	4.1
Smooth Sandeel	*Gymnammodytes semisquamatus*	0	33	0	0	33	0.0	5.6	0.0	0.0
Scaldfish	*Arnoglossus laterna*	5	16	4	0	25	3.0	2.7	2.3	0.0
Plaice	*Pleuronectes platessa*	4	9	6	1	20	2.4	1.5	3.5	0.8
Painted Goby	*Pomatoschistus pictus*	0	17	0	0	17	0.0	2.9	0.0	0.0
Pogge	*Agonus cataphractus*	0	4	7	4	15	0.0	0.7	4.0	3.3
Lemon Sole	*Microstomus kitt*	1	5	5	1	12	0.6	0.9	2.9	0.8
Common Dragonet	*Callionymus lyra*	2	3	3	0	8	1.2	0.5	1.7	0.0
Lesser Weever	*Echiichthys vipera*	0	5	0	1	6	0.0	0.9	0.0	0.8
Whiting	*Merlangius merlangus*	1	0	5	0	6	0.6	0.0	2.9	0.0
Bib	*Trisopterus luscus*	0	0	3	1	4	0.0	0.0	1.7	0.8
Dragonet	*Callionymus sp.*	0	4	0	0	4	0.0	0.7	0.0	0.0
Poor Cod	*Trisopterus minutus*	0	0	3	1	4	0.0	0.0	1.7	0.8
Megrim	*Lepidorhombus whiffiagonis*	0	0	1	2	3	0.0	0.0	0.6	1.6
Reticulated Dragonet	*Callionymus reticulatus*	0	3	0	0	3	0.0	0.5	0.0	0.0
Goby	Gobiidae sp.	0	1	1	0	2	0.0	0.2	0.6	0.0
Nilson's Pipefish	*Syngnathus rostellatus*	0	2	0	0	2	0.0	0.3	0.0	0.0
Cod	*Gadus morhua*	0	0	1	0	1	0.0	0.0	0.6	0.0
Goldsinny	*Ctenolabrus rupestris*	0	1	0	0	1	0.0	0.2	0.0	0.0
Greater Sandeel	*Hyperoplus lanceolatus*	0	0	0	1	1	0.0	0.0	0.0	0.8

Species		Number of Individuals Caught					Catch Rate (Number of Individuals Caught per Hour)			
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Total	Control	Tranche A	Cable Route	Inshore
Grey Gurnard	*Eutrigla gurnardus*	0	0	1	0	1	0.0	0.0	0.6	0.0
Sandeel	Ammodytidae sp.	1	0	0	0	1	0.6	0.0	0.0	0.0
Lesser Sandeel	*Ammodytes tobianus*	0	0	0	1	1	0.0	0.0	0.0	0.8
Sea Snail	*Liparis liparis*	0	0	1	0	1	0.0	0.0	0.6	0.0
Spotted Dragonet	*Callionymus maculatus*	0	1	0	0	1	0.0	0.2	0.0	0.0



	Solenette	Dab	Sand Goby	Raitt's Sandeel	Smooth Sandeel	Scaldfish	Plaice	Painted Goby	Pogge	Lemon Sole	Other Species
Control	69.5	69.5	10.2	5.4	0.0	3.0	2.4	0.0	0.0	0.6	2.4
Tranche A	104.5	66.2	10.3	4.3	5.6	2.7	1.5	2.9	0.7	0.9	3.4
Cable Route	18.5	53.1	6.4	0.0	0.0	2.3	3.5	0.0	4.0	2.9	11.0
Inshore	0.0	4.9	3.3	4.1	0.0	0.0	0.8	0.0	3.3	0.8	5.7

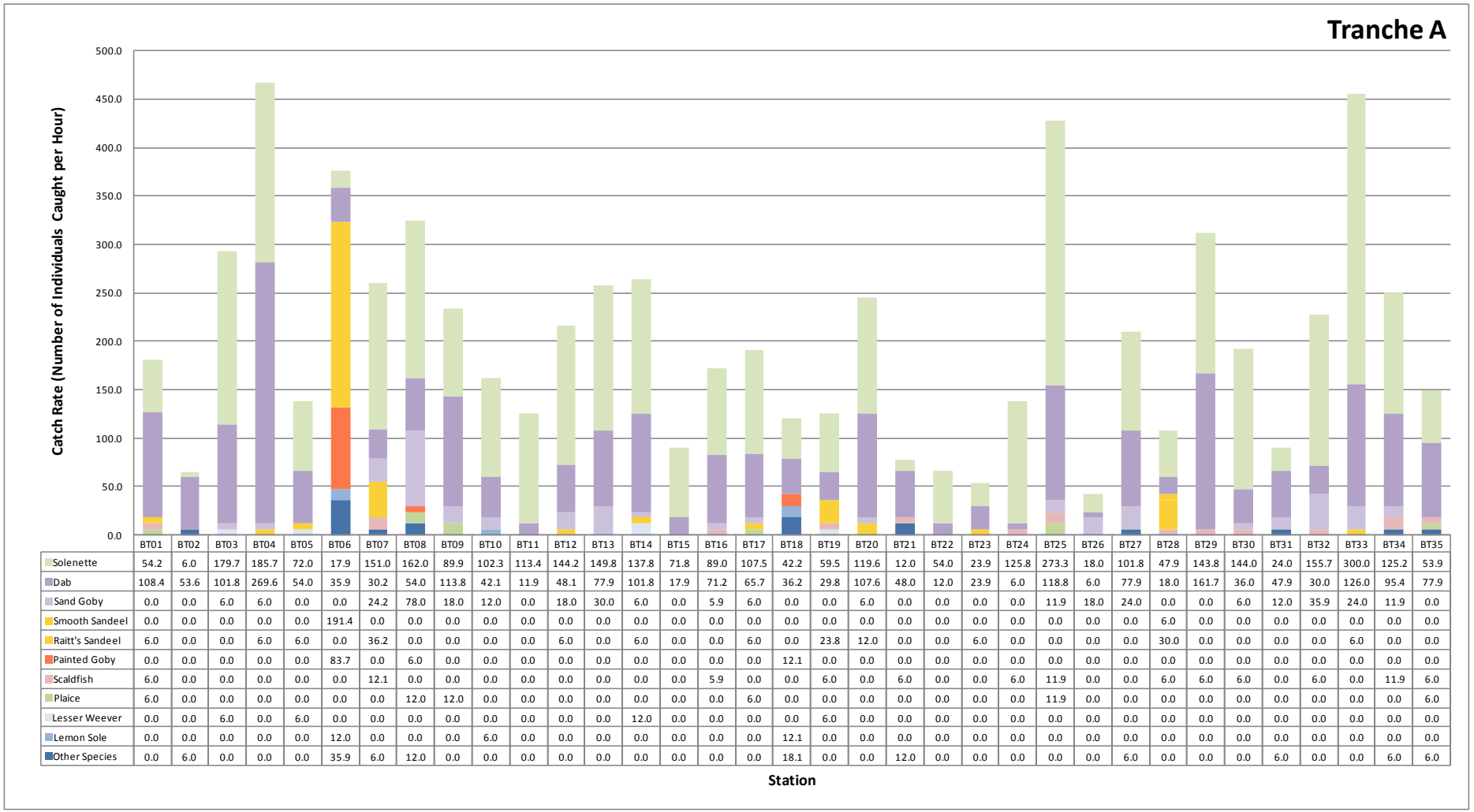
Figure 6.1 Catch Rates for Fish Species by Sampling Area



	BT36	BT37	BT38	BT39	BT40	BT41	BT43	BT44	BT45
Solenette	107.1	137.3	54.1	41.7	120.0	174.0	6.0	18.0	35.9
Dab	107.1	23.9	24.0	11.9	6.0	144.0	211.4	30.0	137.5
Sand Goby	23.8	11.9	24.0	11.9	0.0	18.0	6.0	0.0	6.0
Raitt's Sandeel	0.0	23.9	0.0	0.0	0.0	24.0	6.0	0.0	0.0
Scaldfish	0.0	0.0	6.0	0.0	0.0	0.0	6.0	6.0	12.0
Plaice	6.0	0.0	6.0	6.0	0.0	0.0	0.0	6.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	6.0
Whiting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
Lemon Sole	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0
Sandeel	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0

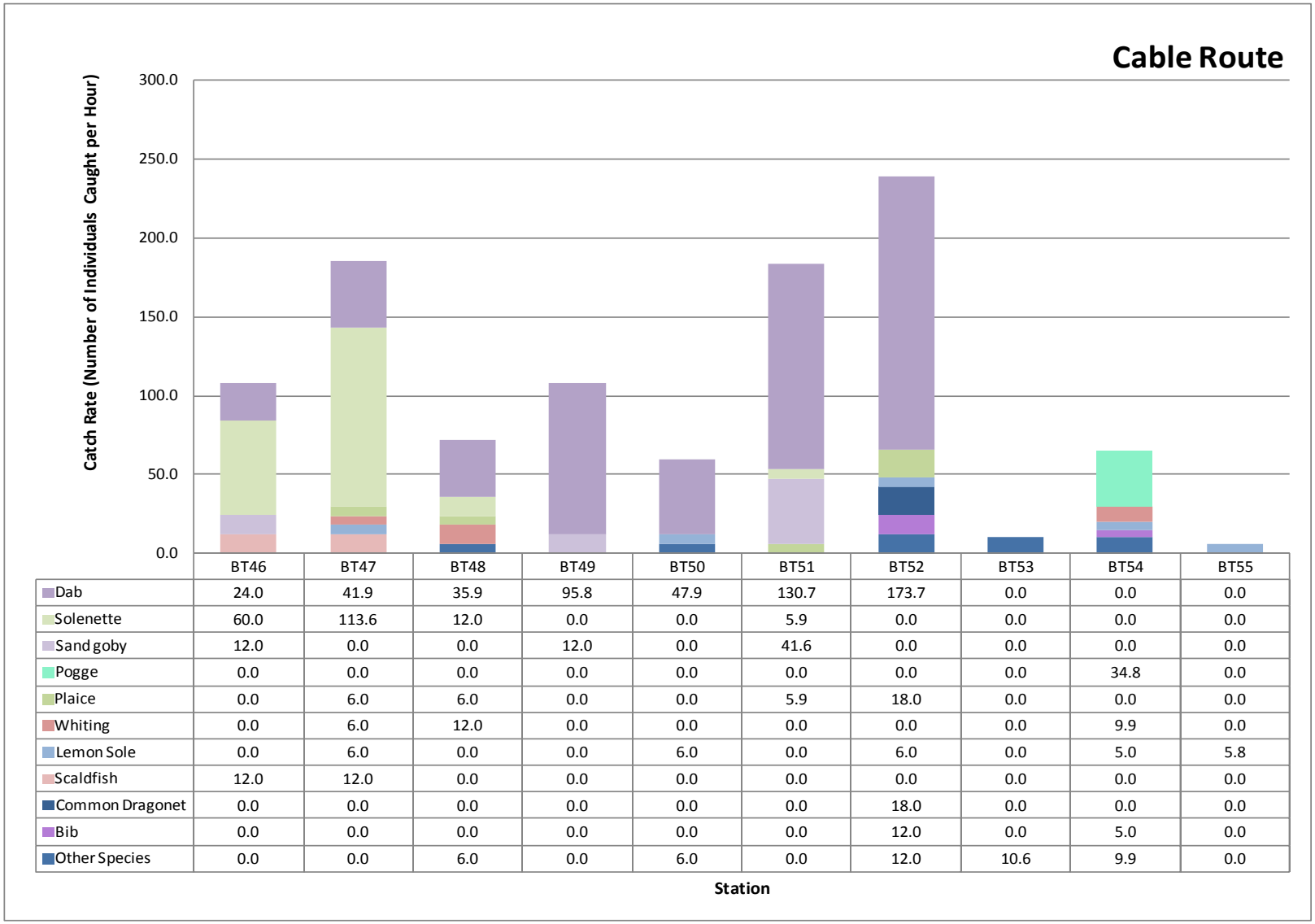
Station

Figure 6.2 Catch Rates for Fish Species by Station at Control Stations



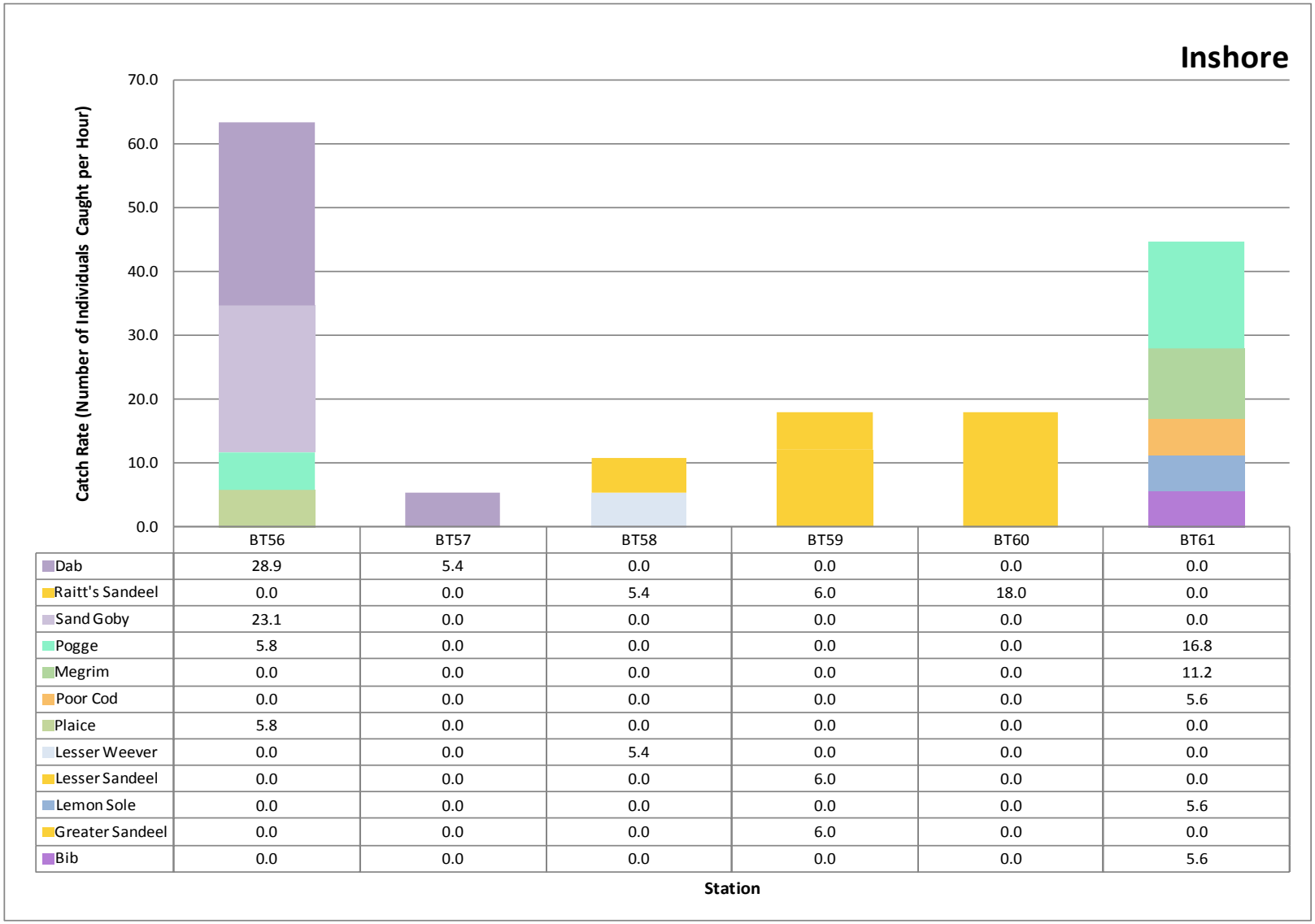
	BT01	BT02	BT03	BT04	BT05	BT06	BT07	BT08	BT09	BT10	BT11	BT12	BT13	BT14	BT15	BT16	BT17	BT18	BT19	BT20	BT21	BT22	BT23	BT24	BT25	BT26	BT27	BT28	BT29	BT30	BT31	BT32	BT33	BT34	BT35
Solenette	54.2	6.0	179.7	185.7	72.0	17.9	151.0	162.0	89.9	102.3	113.4	144.2	149.8	137.8	71.8	89.0	107.5	42.2	59.5	119.6	12.0	54.0	23.9	125.8	273.3	18.0	101.8	47.9	143.8	144.0	24.0	155.7	300.0	125.2	53.9
Dab	108.4	53.6	101.8	269.6	54.0	35.9	30.2	54.0	113.8	42.1	11.9	48.1	77.9	101.8	17.9	71.2	65.7	36.2	29.8	107.6	48.0	12.0	23.9	6.0	118.8	6.0	77.9	18.0	161.7	36.0	47.9	30.0	126.0	95.4	77.9
Sand Goby	0.0	0.0	6.0	6.0	0.0	0.0	24.2	78.0	18.0	12.0	0.0	18.0	30.0	6.0	0.0	5.9	6.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	11.9	18.0	24.0	0.0	0.0	6.0	12.0	35.9	24.0	11.9	0.0
Smooth Sandeel	0.0	0.0	0.0	0.0	0.0	191.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raitt's Sandeel	6.0	0.0	0.0	6.0	6.0	0.0	36.2	0.0	0.0	0.0	0.0	6.0	0.0	6.0	0.0	0.0	6.0	0.0	23.8	12.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0
Painted Goby	0.0	0.0	0.0	0.0	0.0	83.7	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scaldfish	6.0	0.0	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0	6.0	0.0	6.0	0.0	0.0	6.0	11.9	0.0	0.0	6.0	6.0	6.0	0.0	6.0	0.0	11.9	6.0
Plaice	6.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
Lesser Weever	0.0	0.0	6.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lemon Sole	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Species	0.0	6.0	0.0	0.0	0.0	35.9	6.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	6.0	0.0	0.0	6.0	6.0

Figure 6.3 Catch Rates for Fish Species by Station within Tranche A



	BT46	BT47	BT48	BT49	BT50	BT51	BT52	BT53	BT54	BT55
Dab	24.0	41.9	35.9	95.8	47.9	130.7	173.7	0.0	0.0	0.0
Solenette	60.0	113.6	12.0	0.0	0.0	5.9	0.0	0.0	0.0	0.0
Sand goby	12.0	0.0	0.0	12.0	0.0	41.6	0.0	0.0	0.0	0.0
Pogge	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.8	0.0
Plaice	0.0	6.0	6.0	0.0	0.0	5.9	18.0	0.0	0.0	0.0
Whiting	0.0	6.0	12.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0
Lemon Sole	0.0	6.0	0.0	0.0	6.0	0.0	6.0	0.0	5.0	5.8
Scaldfish	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Dragonet	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0
Bib	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	5.0	0.0
Other Species	0.0	0.0	6.0	0.0	6.0	0.0	12.0	10.6	9.9	0.0

Figure 6.4 Catch Rates for Fish Species by Station along the Cable Route



	BT56	BT57	BT58	BT59	BT60	BT61
Dab	28.9	5.4	0.0	0.0	0.0	0.0
Raitt's Sandeel	0.0	0.0	5.4	6.0	18.0	0.0
Sand Goby	23.1	0.0	0.0	0.0	0.0	0.0
Pogge	5.8	0.0	0.0	0.0	0.0	16.8
Megrim	0.0	0.0	0.0	0.0	0.0	11.2
Poor Cod	0.0	0.0	0.0	0.0	0.0	5.6
Plaice	5.8	0.0	0.0	0.0	0.0	0.0
Lesser Weever	0.0	0.0	5.4	0.0	0.0	0.0
Lesser Sandeel	0.0	0.0	0.0	6.0	0.0	0.0
Lemon Sole	0.0	0.0	0.0	0.0	0.0	5.6
Greater Sandeel	0.0	0.0	0.0	6.0	0.0	0.0
Bib	0.0	0.0	0.0	0.0	0.0	5.6

Figure 6.5 Catch Rates for Fish Species by Station at Inshore Stations

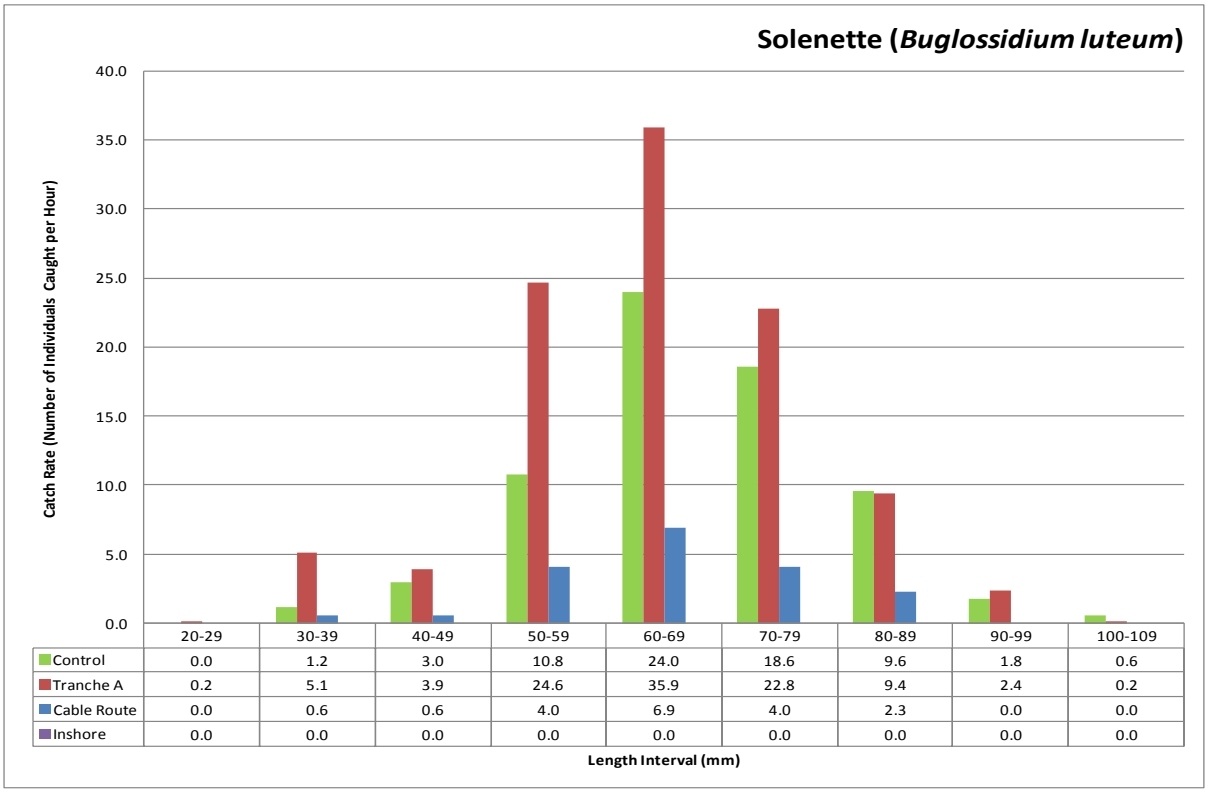
6.2 Length Distributions

The average length (mm) and length range for fish species caught by sampling area (control, Tranche A, cable route and inshore) is given in Table 6.2 below.

The length distributions of the five most abundant species caught during the survey (>30 individuals), expressed as the catch rate (number of individuals caught per hour) by length (mm) and by sampling area, are shown in Figure 6.6 to Figure 6.10 below.

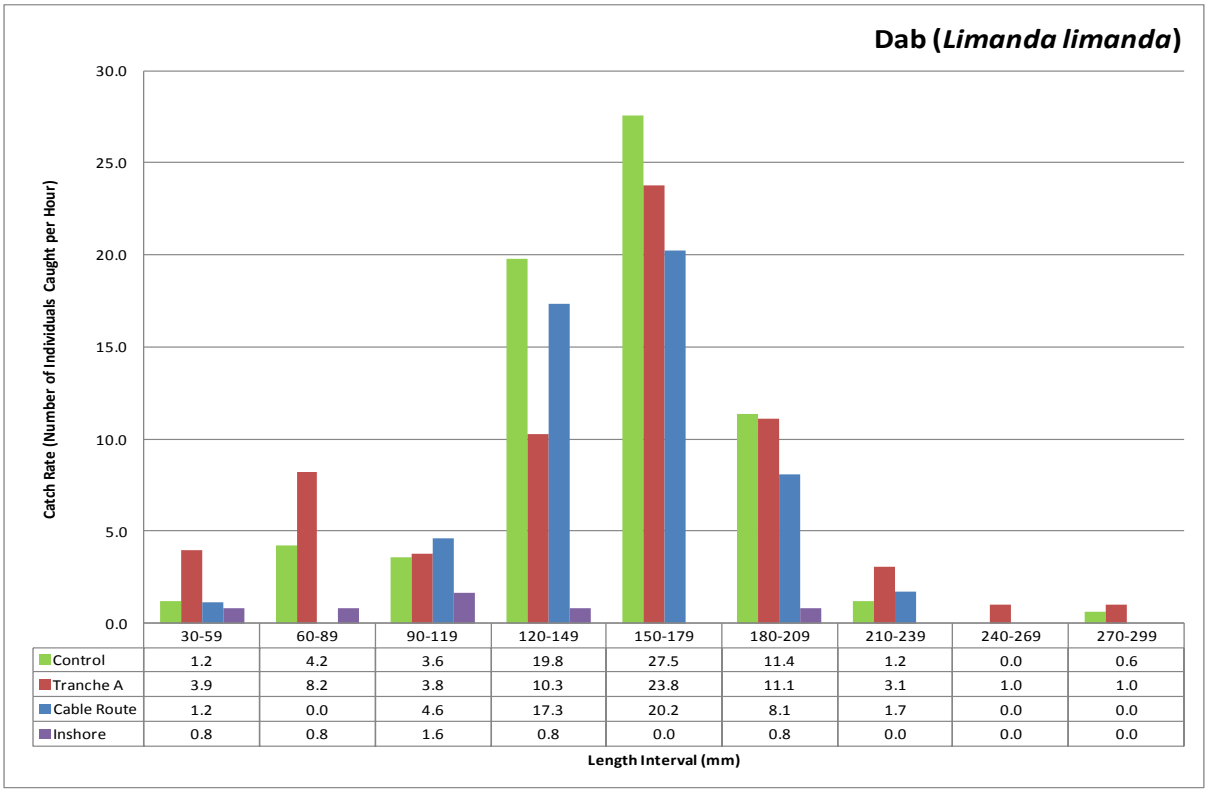
Table 6.2 Average Length and Length Range for Fish Species Caught by Sampling Area

Species		Average Length (mm)				Length Range (mm)	
Common Name	Scientific Name	Control	Tranche A	Cable Route	Inshore	Min.	Max.
Bib	*Trisopterus luscus*	-	-	176.7	175.0	130	230
Cod	*Gadus morhua*	-	-	230.0	-	230	230
Common Dragonet	*Callionymus lyra*	165.0	160.0	156.7	-	120	230
Dab	*Limanda limanda*	149.3	148.8	150.6	116.0	30	290
Dragonet	*Callionymus sp.*	-	58.3	-	-	55	60
Goby	Gobiidae sp.	-	30.0	25.0	-	25	30
Goldsinny	*Ctenolabrus rupestris*	-	100.0	-	-	100	100
Greater Sandeel	*Hyperoplus lanceolatus*	-	-	-	270.0	270	270
Grey Gurnard	*Eutrigla gurnardus*	-	-	240.0	-	240	240
Lemon Sole	*Microstomus kitt*	170.0	200.0	184.0	135.0	110	260
Lesser Sandeel	*Ammodytes tobianus*	-	-	-	100.0	100	100
Megrim	*Lepidorhombus whiffiagonis*	-	-	70.0	62.5	60	70
Nilson's Pipefish	*Syngnathus rostellatus*	-	92.5	-	-	85	100
Painted Goby	*Pomatoschistus pictus*	-	34.2	-	-	30	40
Plaice	*Pleuronectes platessa*	207.5	232.2	200.0	75.0	75	300
Pogge	*Agonus cataphractus*	-	61.7	87.1	83.8	35	130
Poor Cod	*Trisopterus minutus*	-	-	151.7	115.0	115	185
Raitt's Sandeel	*Ammodytes marinus*	125.0	125.7	-	138.0	100	165
Reticulated Dragonet	*Callionymus reticulatus*	-	100.0	-	-	85	115
Sand Goby	*Pomatoschistus minutus*	42.9	46.7	41.0	51.3	30	60
Sandeel	Ammodytidae sp.	35.0	-	-	-	35	35
Scaldfish	*Arnoglossus laterna*	94.0	83.9	101.3	-	40	115
Sea Snail	*Liparis liparis*	-	-	90.0	-	90	90
Smooth Sandeel	*Gymnammodytes semisquamatus*	-	187.5	-	-	120	230
Solenette	*Buglossidium luteum*	67.1	63.2	63.0	-	20	105
Spotted Dragonet	*Callionymus maculatus*	-	120.0	-	-	120	120
Whiting	*Merlangius merlangus*	190.0	-	214.0	-	170	330



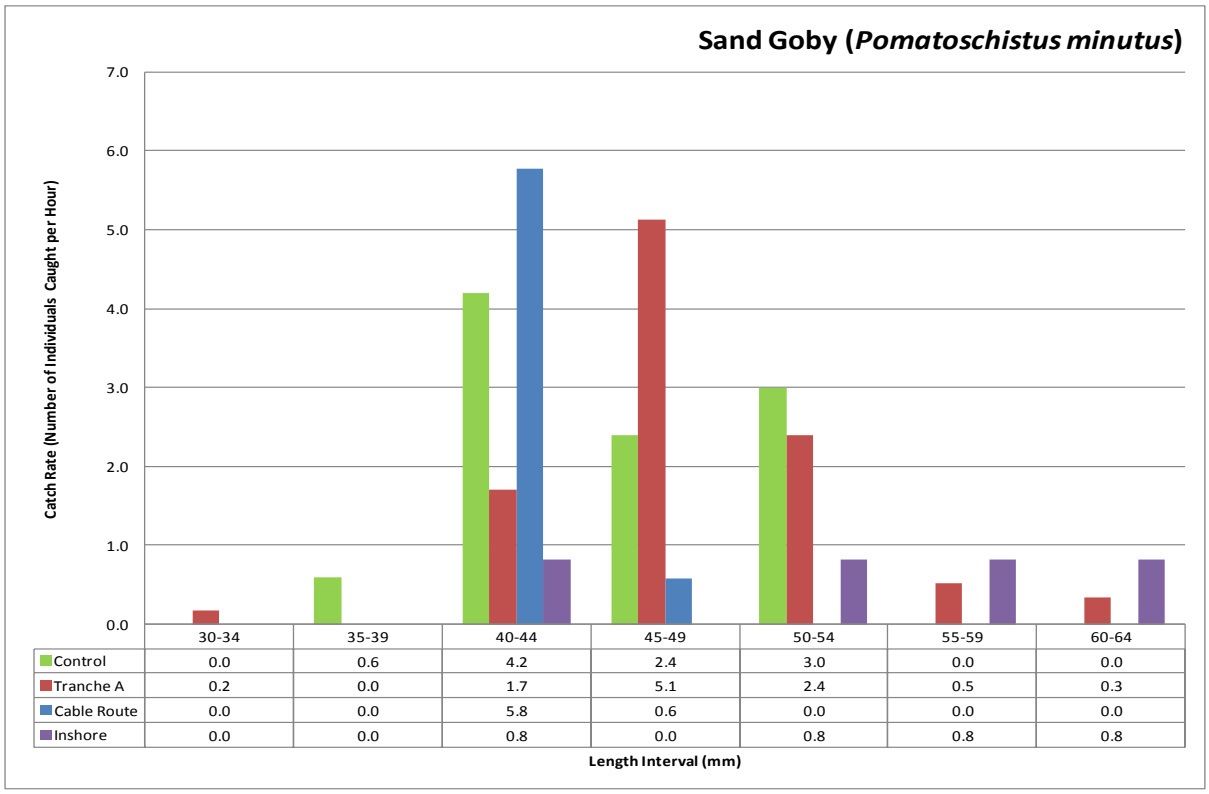
	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109
Control	0.0	1.2	3.0	10.8	24.0	18.6	9.6	1.8	0.6
Tranche A	0.2	5.1	3.9	24.6	35.9	22.8	9.4	2.4	0.2
Cable Route	0.0	0.6	0.6	4.0	6.9	4.0	2.3	0.0	0.0
Inshore	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.6 Solenette (*B. luteum*) Length Distribution by Sampling Area



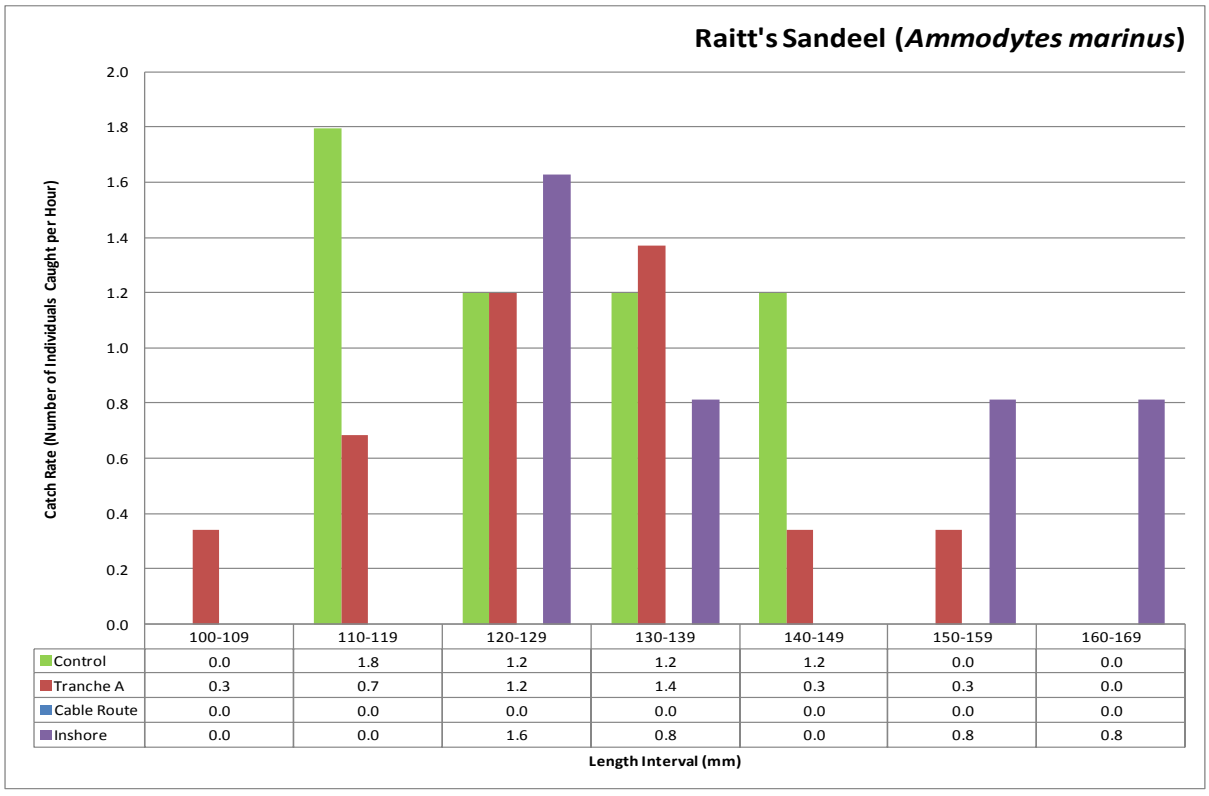
	30-59	60-89	90-119	120-149	150-179	180-209	210-239	240-269	270-299
Control	1.2	4.2	3.6	19.8	27.5	11.4	1.2	0.0	0.6
Tranche A	3.9	8.2	3.8	10.3	23.8	11.1	3.1	1.0	1.0
Cable Route	1.2	0.0	4.6	17.3	20.2	8.1	1.7	0.0	0.0
Inshore	0.8	0.8	1.6	0.8	0.0	0.8	0.0	0.0	0.0

Figure 6.7 Dab (*L. limanda*) Length Distribution by Sampling Area



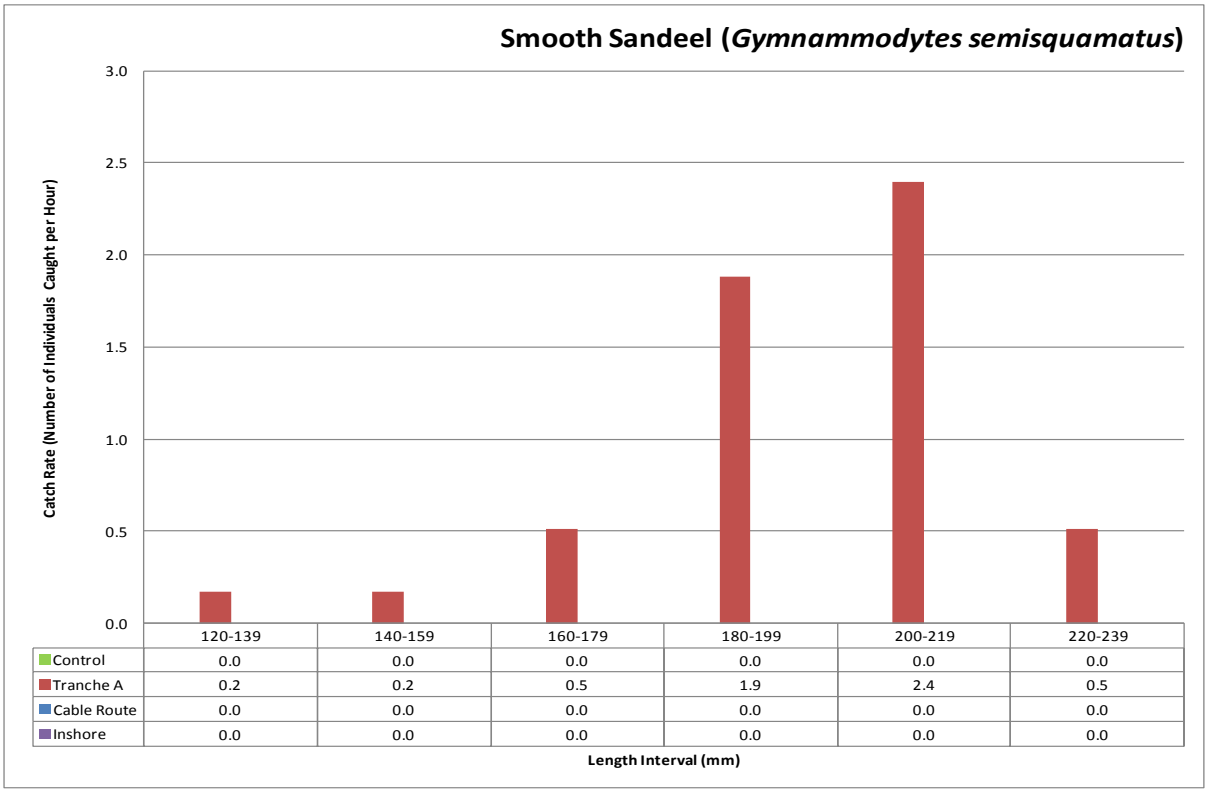
	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Control	0.0	0.6	4.2	2.4	3.0	0.0	0.0
Tranche A	0.2	0.0	1.7	5.1	2.4	0.5	0.3
Cable Route	0.0	0.0	5.8	0.6	0.0	0.0	0.0
Inshore	0.0	0.0	0.8	0.0	0.8	0.8	0.8

Figure 6.8 Sand Goby (*P. minutus*) Length Distribution by Sampling Area



	100-109	110-119	120-129	130-139	140-149	150-159	160-169
Control	0.0	1.8	1.2	1.2	1.2	0.0	0.0
Tranche A	0.3	0.7	1.2	1.4	0.3	0.3	0.0
Cable Route	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inshore	0.0	0.0	1.6	0.8	0.0	0.8	0.8

Figure 6.9 Raitt's Sandeel (*A. marinus*) Length Distribution by Sampling Area



	120-139	140-159	160-179	180-199	200-219	220-239
Control	0.0	0.0	0.0	0.0	0.0	0.0
Tranche A	0.2	0.2	0.5	1.9	2.4	0.5
Cable Route	0.0	0.0	0.0	0.0	0.0	0.0
Inshore	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6.10 Smooth Sandeel (*G. semisquamatus*) Length Distribution by Sampling Area

7.0 Appendix

7.1 Appendix 1 – Health and Safety

7.1.1 Personnel

Brown and May Marine (BMM) staff protocol followed the standard health and safety protocol outlined in the BMM "Offshore Operational Procedures for Surveys using Commercial Fishing Vessels".

All BMM staff have completed a Sea Survival course approved by the Maritime and Coastguard Agency, meeting the requirements laid down in: **STCW 95 Regulation VI/1 para 2.1.1 and STCW Code section A- VI/1** before boarding any vessel conducting works for the company. Employees are also required to have valid medical certificates (ENG1 or ML5), Seafish Safety Awareness, Seafish Basic First Aid and Seafish Basic Fire Fighting and Fire Prevention certificates before participating in offshore works.

7.1.2 Vessel Induction

Before boarding the survey team were shown how to safely board and disembark the vessel. Prior to departure the skipper briefed the BMM staff on the whereabouts of the safety equipment, including the life raft, emergency flares and fire extinguishers, and also the location of the emergency muster point. The safe deck areas, man-overboard procedures and emergency alarms were also discussed. The survey team were warned about the possible hazards, such as slippery decks and obstructions whilst aboard. The BMM staff were briefed about trawling operations and the need to keep clear of all winch's when operational. All hazards were assessed prior to the survey in the BMM health and safety risk assessment.

7.1.3 Daily Safety Checks

The condition of the life jackets, EPIRB's, and life raft were inspected daily. Also checked were the survey team working areas, including the fish room and the wheelhouse to ensure these areas were clear of hazards such as clutter and obstructions.

7.1.4 Post Trip Survey review

Upon completion of the survey a "Post Trip Survey Review" was filed, see Table 7.1 below.

Table 7.1 Post Trip Survey Review

Project: Dogger Bank April 2012	**Vessel:** Jubilee Spirit
Surveyors: Lucy Shuff, Alex Winrow-Giffin	**Skipper:** Ross Crookes
Survey Area: Dogger Bank	**Total Time at Sea:** 19 Days
Dates at Sea: 02/04/2012 – 20/04/2012	

	Comments	Actions
Did vessel comply with pre trip safety audits?	Yes	N/A
Skipper and crew attitude to safety?	Good	N/A
Vessel machinery failures?	Hydraulic system failed on 07/04/2012	Returned to port, engineer called out to fix
Safety equipment failures?	None	N/A
Accidents?	Crewman cut hand on knife when cleaning damaged hydraulic pipe.	Crewman attended A&E on return to port for treatment
Injuries?	See above	See above