Final Report

North Sea Whitefish Survey: 2009

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Executive summary

Following an initial attempt at initiating the North Sea Whitefish (NSW) survey during September and October 2008, which was abandoned because of poor weather then, the survey was rescheduled to June and/or July 2009.

Fishing operations began on 3 June and were completed after four fishing trips on 29 July. Each of the specified fishing grounds was visited and 18 tows were completed on hard and soft substratum. Length distributions from cod, haddock, whiting, saithe and plaice, and the volume of the catch of all other species, were recorded. Otoliths were collected from the largest cod, haddock and whiting for age determination at Cefas. The survey otoliths were then combined with those from the Cefas ICES (IBTS) third-quarter survey which was conducted immediately after the FSP survey, in order to provide full coverage of the length distributions caught during the survey.

The preliminary survey results were encouraging; the NSW recording a good range of ages for all target species in all of the areas surveyed, with variations across the North Sea that will allow the testing of a number of questions related to substratum, gear and spatial distribution of the target species.

Throughout the survey area, catch rates of the target gadoid species were higher on hard ground than on soft. The differences in catch rates may result from substratum preferences or differences in gear catchability, but at this early stage in the series, neither of these possibilities can be tested. Overall, the age structure recorded on soft ground was similar to that on hard. In most of the areas surveyed, differences in age distribution appear to be related to the area of fishing rather than the substratum fished.

When compared at an overall North Sea scale, the relative indices at age of cod, haddock and whiting abundance from the NSW and IBTSq3 surveys were similar. Catches of older fish were more frequent and showed less noise in the NSW data than in the IBTSq3, particularly for cod. In addition, differences in the relative catch rates of older whiting between the two surveys will require particular attention as the time-series develops.

The results indicate the potential for a time-series based on commercial vessels, derived across the areas surveyed. Such a series could be used to follow the development of the stock dynamics of key North Sea species and to investigate the dynamics of each on soft and hard substrata as population abundance changes over time.

Provenance

The Fisheries Science Partnership (FSP) was established between the UK Department for Environment, Food and Rural Affairs (Defra, which provided the funding), the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and the National Federation of Fishermen's Organisations (NFFO) in 2003, and continued with the objective, *inter alia*, of enabling the fishing industry to demonstrate the results of commercial fishing in a number of priority fishing areas nominated by the NFFO. To do this, fishing vessels are chartered to fish commercially to obtain new data on catch rate and size distribution of target species, and in some cases on bycatch species. Charter of suitable fishing vessels is arranged through an open tendering procedure, and workplans are developed in line with the agreed and commissioned project, between Cefas and the vessel skippers and managers. Cefas deploys seagoing staff to record raw data that are subsequently returned to the laboratory at Lowestoft for input and analysis. Cefas acknowledges the help of the NFFO and skippers during the conduct of these studies. The data and results are the intellectual property of the vessel skippers, Cefas and Defra.

Background

The North Sea whitefish (NSW) survey is designed to provide a time-series of information on commercial vessel catch per unit effort from representative fishing grounds within the North Sea. Each year, data gathered by the survey will be supplied to the ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, initially for evaluating comparative catch rates at age, for example against research vessel catches, and when the time-series is of sufficient length, to support the estimation of stock trends.

The vessel will use a combination of traditional English fishing gears appropriate to hard and soft ground in order to provide information on comparative catch rates. The tows will be distributed over sub-areas defined to provide information on catch rate, size/age composition and species catch composition from as many different locations as feasible, given time and cost constraints, within the area where the fishery takes place, and not necessarily at constant locations each year. The size of the whole catch is recorded, but detailed measurements are made of the catches of cod, whiting and haddock, and of plaice if resources permit.

Survey design

The survey is meant to cover representative fishing grounds within a large part of the North Sea (53°30'N – 62°N, 0° – 7°E) during June and/or July. Figure 1 shows the selected fishing grounds divided into 10' longitude × 10' latitude rectangles. To obtain as much information as possible from the core fishing grounds, the 10' × 10' rectangles were classified, by the fishing skipper, according to two seabed types during the initial survey; hard ground, with potentially the highest catch rates of cod and where a Whitby Jet type of

trawl would be used, and soft seabed over which a scraper type trawl would be used. Steaming and fishing time considerations restricted fishing within each ground to nine hard and nine soft tows with the specified gear type. The 10’ × 10’ rectangles selected for fishing with a particular gear type will be retained for future surveys, after discussion and agreement as to their relative merits.

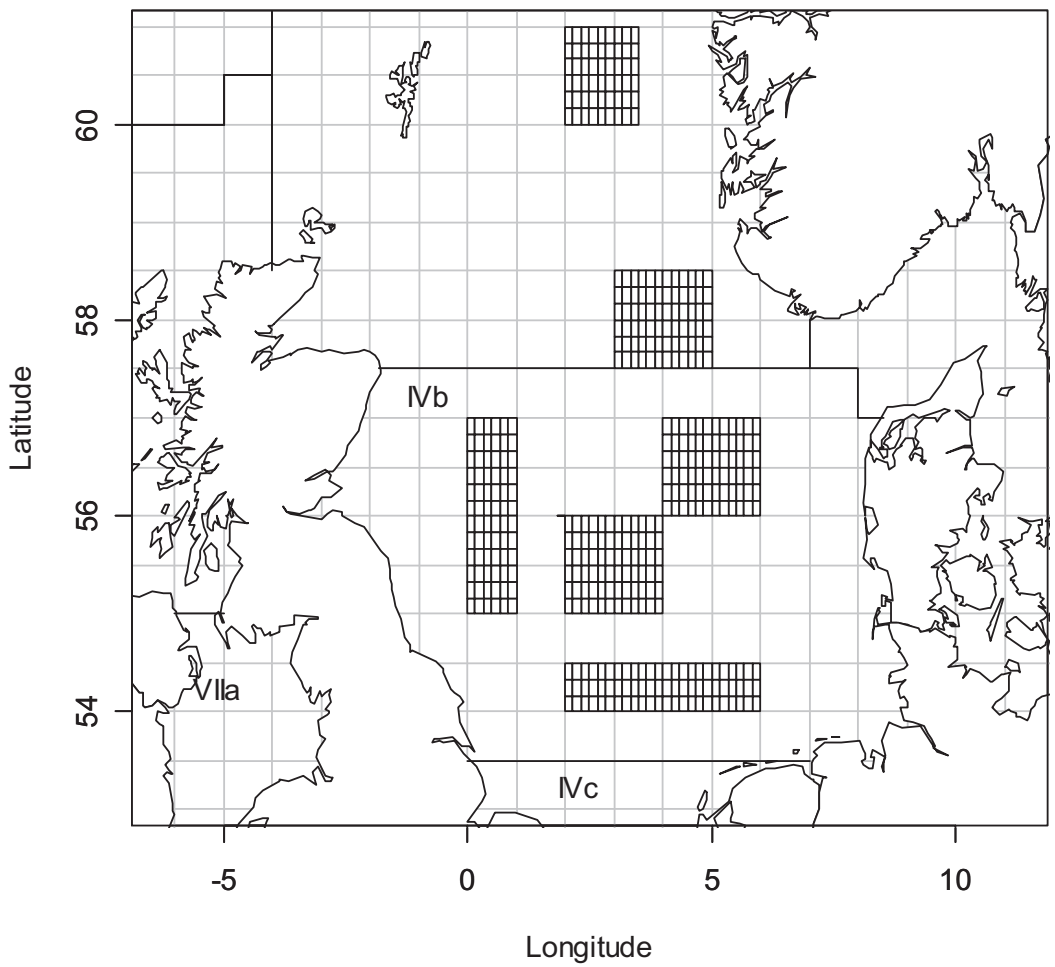

Figure 1. Map of the six representative fishing grounds within which fishing is required, in each year of the survey, on hard and soft substratum.

Real Time Closures

Tow length was specified as 2 h in the design of the survey protocol (Annex B). However, during June and July a number of Real Time Closed areas (RTC) were specified as part of the Scottish Conservation Credits Scheme for cod, within areas that the NSW survey was required to fish. In order to avoid any controversy while operating within the closed areas, but also to maintain the survey objectives, it was agreed in discussion that tow length would be shortened to 1 h with the gear fishing in the appropriate configuration. This

precluded the criticism that the survey avoided areas in which cod were abundant. In reality, the areas specified during the survey reopened by the time the vessel reached the areas designated. However, the agreed protocol will be maintained in future.

The 2009 survey

Following an initial attempt to initiate the survey during September and October 2008, which was abandoned owing to the poor weather then, the first survey of the initial three-year time-series was rescheduled to June and/or July 2009.

Fishing operations began on 3 June and were completed after four fishing trips on 29 July. The skipper's report from the survey is presented as Annex A. The vessel used for the survey was the Allegiance, a trawler operating of Peterhead and skippered by Danny Normandale. Its grt was 145t, length overall 18.26m, and 309 bhp.

Each of the specified fishing grounds was visited and a total of 18 tows was completed on hard and soft substratum. Two-hour fishing tows were conducted with each gear type by night and day, with appropriate breaks for the Cefas observers. Tow direction and speed were specified by the fishing skipper on the basis of experience with the conditions within each ground; tow positions from the 2009 survey are plotted on Figure 2. Tows that resulted in damaged gear or which came fast on the seabed were repeated in the same area.

Length distributions of cod, haddock, whiting, saithe and plaice, and the volume of the catch of all other species, were recorded. Otoliths were collected from the largest cod, haddock and whiting for age determination at Cefas. The survey otoliths were then combined with those from the IBTS third quarter survey which was conducted immediately after the FSP survey, in order to provide full coverage of the length distributions caught, but at the same time keeping age reading costs to the minimum necessary within the budgeted allocation to the project.

As required, at the end of each fishing trip, EU logbook sheets were submitted to the appropriate fisheries agency, annotated to indicate that the catches were not required to count directly against quota.

Map of ALLEGIANCE 1/09 Station positions

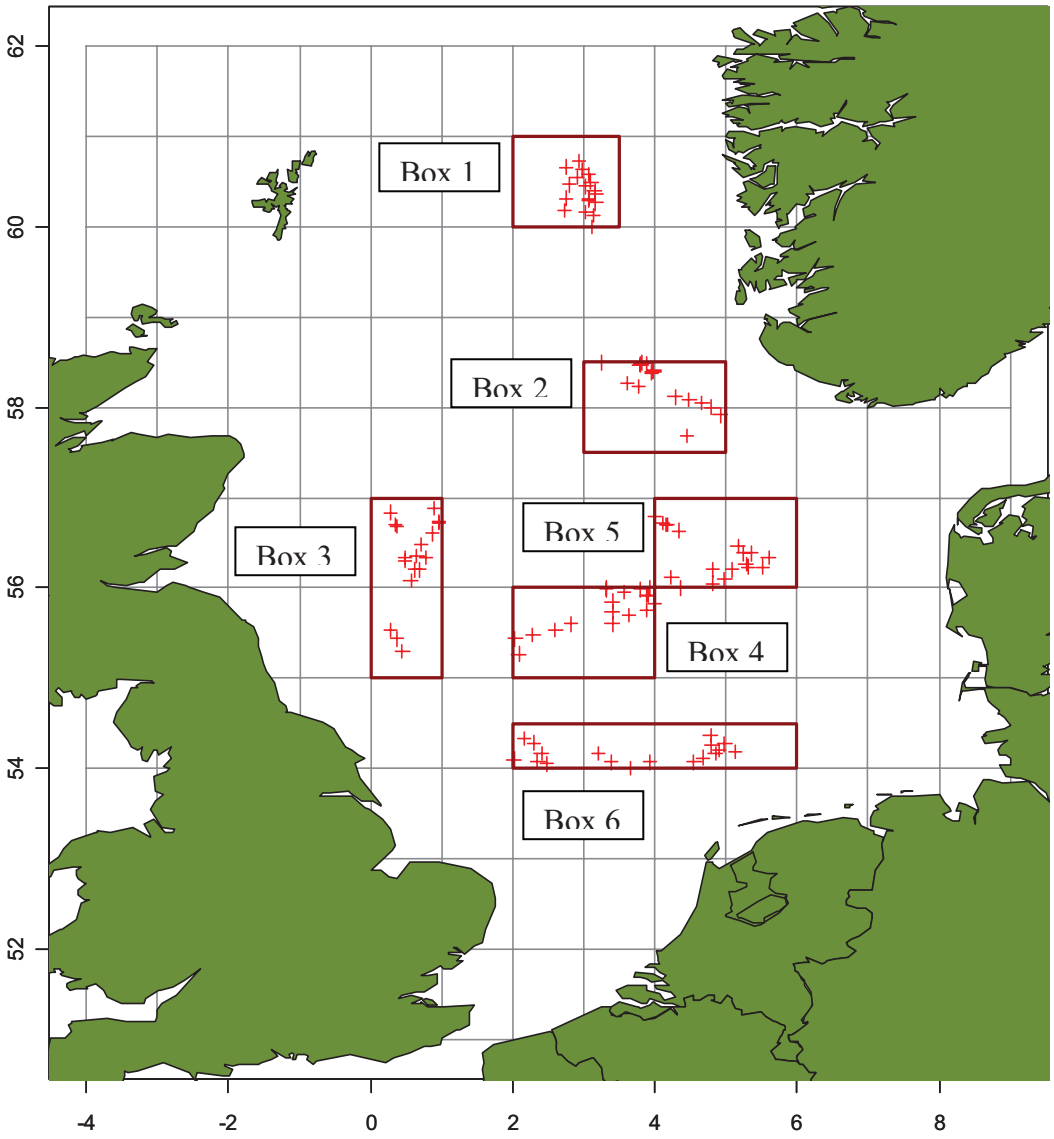

Figure 2. Starting positions of the 2009 North Sea Whitefish (NSW) survey fishing stations.

Results

Table 1 presents the survey total catch weight by species and category for the main commercial species. Estimates were derived from raised observer length sampling and a length–weight relationship, so they approximate the landings recorded within the vessel logbook. Tables 2–4 present, for each area and substratum, the average catch rates per hour by age of the target species, i.e. cod, haddock and whiting, respectively.

Table 1. North Sea Whitefish survey total catch weight by species and category for the main commercial species. The estimates are derived from raised observer length sampling and a length/weight relationship, so approximate the landings recorded in the vessel's logbook.

	Weight (kg)			Percentage	
Species	Total	Retained	Discarded	Retained	Discarded
Cod	6 819	5 641	1178	83%	17%
Haddock	2 095	1 752	342	84%	16%
Whiting	4 227	2 114	2114	50%	50%
Saithe	1 799	913	886	51%	49%
Plaice	7 056	5 145	1911	73%	27%
Hake	493	253	240	51%	49%
Lemon sole	1 710	340	1369	20%	80%
Ling	139	75	63	54%	46%
Monk	176	147	29	83%	17%
Witch	187	103	84	55%	45%
Dab	7350	0	7350	0%	100%
Norway pout	241	0	241	0%	100%

Cod

The age of the cod caught ranged from 0 to 9 years, with the majority of fish aged 1–4 (Table 2). Older fish were taken predominantly in the north on hard and soft substrata and almost exclusively on hard ground in the south. Juveniles dominated in the south on the hard ground. Overall, cod catch rates were approximately three times higher on hard ground than on soft, but the ratio was much larger in the south. The magnitude of the differences reflects not only the distribution of cod on the substratum but also the catchability of the gear type used to fish that substratum.

Although there were differences in the absolute catch rates on hard and soft ground types, Figure 3 demonstrates that the relative strength of the year classes caught was generally independent of substratum type. Catch distributions at age on the northern and western grounds (1–3) were highly consistent between substrata. On the southern grounds, the distributions were consistent at the younger ages at which cod were more abundant, but at older ages (4+), fish were scarce so comparisons were infleunced by noise in the

catch rates. Older fish were mainly caught on hard ground in areas 4 and 6 in the south.

Figure 4 presents the preliminary 2009 North Sea International Bottom Trawl Survey quarter 3 (IBTSq3) average cod catch rates at ages 0–6+ for the areas surrounding and containing the grounds surveyed by the NSW survey. At the youngest ages, comparison between results is complicated by the three different gear types used; the IBTS gear deploys smaller mesh with a liner and is designed primarily as a gear to catch young fish. Therefore, when compared with the NSW survey, catches of cod aged 0, 1 and possibly 2 would be expected to be higher relative to older fish, as seen when Figures 3 and 4 are compared, for instance age 1 compared with age 2 in areas 2 and 3. It will be a number of years before changes in year-class strength from year to year can be used to make direct comparisons, but it is clear from the trends presented that both surveys caught a wide range of ages in areas 1 and 2, but with different age distributions. In the other areas, cod aged 1 and 2 dominated both sets of catch rates, but it is noticeable that the NSW survey caught older fish where the IBTS recorded zeroes in the age distribution.

Figure 5 compares the catch rates derived for the whole of the North Sea from the IBTSq3 with those from the NSW (the estimates for each age are plotted relative to the catch rate for age 2 to allow comparison). When derived across all ages, the IBTSq3 survey index has similar coverage to that of the NSW survey. The figure demonstrates the expected difference in gear selectivity at the youngest two ages at least, with the IBTS catching relatively more cod aged 0 and 1; at older ages, relative to age 2, the NSW survey showed a greater rate of decline in age classes at ages 3–6+.

Haddock

The age of haddock caught ranged from 0 to 12, with most fish aged 1–4 (Table 3, Figure 6). As expected from the known distribution of the species, most of the catches were recorded in the northern North Sea on the grounds 1–4, with very low catch rates in the south from area 6.

There was a substantial difference between catch rates on hard and soft ground, in the ratio 20 : 1 in all areas apart from area 3, where the ratio averaged 4 : 1 (Figure 6). The difference in catch rates may result from substratum preferences or differences in gear catchability, but at this stage cannot be distinguished. Overall, the age structure recorded on soft ground was similar to that on hard, indicating that habitat preference or gear catchability does not differ with age between substratum type. Differences in age distribution appear to be related to the area of fishing rather than the substratum fished.

Figure 7 presents the preliminary 2009 IBTSq3 survey average haddock catch rates at ages 0–6+ for the areas surrounding and containing the grounds surveyed by the NSW survey. At the youngest ages, the IBTS gear has smaller mesh and higher selection for young fish, so catches of ages 0, 1 and

2 are higher relative to the older ages; ages 2 and 4 dominate the distribution of the older ages, with low catch rates at 5 and above. Similarly low catch rates at the older ages are noted in the NSW catches, and the two age distributions are similar.

Figure 8 compares the catch rates derived from the whole of the North Sea during the IBTSq3 with those from the NSW. Age 0 has been removed from the plot because it was caught in very large numbers by the IBTSq3 but has low selection in commercial gear. The estimates for each age are plotted relative to the catch rate for age 3 to allow comparison. The figure illustrates the expected difference in gear selectivity at the youngest ages, with the IBTSq3 catching relatively more haddock aged 1 and 2. At older ages, relative to age 3, the correspondence between the IBTS and NSW is good.

Whiting

The age of the whiting caught during the survey ranged from 0 to 10, with the majority of fish aged 1–5 (Table 4, Figure 9). The best catch rates were on hard ground in fishing areas 4–6, in the south and east, where catch rates were dominated by ages 1 and 2. Catches in the north and west (areas 1–3) had a greater range of ages in the distribution, with dominance of ages 2–5.

There was a substantial difference between catch rates on hard and soft ground in the ratio 20 : 1 – 40 : 1 in the east (areas 4 and 5), 3 :1 – 4 : 1 in the northern areas 1 and 2, and comparable rates in areas 3 and 6 (Figure 9). The difference in catch rates may result from substratum preferences or differences in gear catchability, but at this stage they cannot be distinguished. As for cod and haddock, although the distributions of catch at age were substantial between areas, especially the northwest and south and east, within each area the relative age distributions on hard and soft substrata were similar.

Figure 10 presents the preliminary 2009 IBTSq3 survey average whiting catch rates of ages 0–6+ for the areas surrounding and containing the grounds surveyed by the NSW survey. At the youngest ages, the IBTS gear has smaller mesh and higher selection for young fish, so catches of ages 0 and 1 are higher relative to those of older ages. For the older ages, the distributions were similar between the IBTSq3 areas and the NSW, although the NSW caught higher proportions of whiting aged 4 and 5 years. Both surveys record the dominance of young fish in the south and east with a broader age range in the north and west.

Figure 11 compares the catch rates derived across the whole of the North Sea from the IBTSq3 and the NSW. The estimates for each age are plotted relative to the catch rate for age 2 to allow comparison. The figure illustrates the expected difference in gear selectivity at the youngest ages, with the IBTS catching relatively more whiting aged 0. At the other ages, a comparison of the IBTS and NSW results shows that, relative to age 2, the IBTS catches a greater proportion of younger fish and fewer older fish than the NSW. As the

time-series develops from the survey it will be possible to determine whether the differences in catch rates at age are related to gear catchability, substratum, or differences in the estimated rate of decline in abundance.

Plaice and saithe

The frequency distributions at length of plaice and saithe catches by area are shown in Figures 12 and 13. As would be expected from the known distribution of the stocks, plaice were caught primarily in south, areas 4–6 (Figure 12), and saithe only in the north in areas 1 and 2 (Figure 13). The length distributions for saithe are broadly similar on hard and soft ground, but for plaice there is a big difference in distributions at length caught by the two gear types on he hard and soft ground. Owing to the limited sampling time available, plaice and saithe otoliths were not taken during the 2009 NSW survey. As the time-series develops, however, age/length keys will be sought from other surveys conducted within the North Sea in the third quarter, in order to evaluate the potential of the data for use in the assessment process.

Discussion and conclusions

The preliminary survey results are encouraging. The NSW recorded a good range of ages for all target species in all areas surveyed, with variations across the North Sea that will allow testing of a number of questions related to substratum, gear and spatial distribution.

Throughout the survey area, catch rates of the target gadoid species were better on hard ground than on soft. The difference in catch rates may result from substratum preferences or differences in gear catchability, but at this early stage in the series, neither possibility can be tested. Overall, the age structure recorded on soft ground was similar to that on hard. In most of the areas surveyed, though, slight differences in age distribution appear to be related to the area of fishing rather than the substratum fished.

When compared at an overall North Sea scale, the relative indices at age of cod, haddock and whiting abundance at age from the NSW and IBTSq3 surveys were similar. Catches of older fish were more frequent and showed less noise in the NSW data than in the IBTSq3, particularly for cod. In addition, differences in the relative catch rates of older whiting between the two surveys will require particular attention as the time-series develops.

The results indicate the value in developing a time-series for gadoids based on a commercial vessel, derived across the areas surveyed. The series could be used to assess the development of stock dynamics of key North Sea species and to investigate the dynamics of each species on soft and hard substrata as population abundance changes over time. It could also provide valuable input to the debate on the dynamics of the stocks and survey practices.

Table 2. North Sea cod catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

Cod		Average number caught at age per hour													
Area	**Ground**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
1	Hard	0.00	1.10	5.06	0.73	1.18	0.40	0.14	0.10	0.01	0.00	0.00	0.00	0.00	8.71
1	Soft	0.00	1.54	6.57	0.77	1.07	0.19	0.12	0.03	0.02	0.00	0.00	0.00	0.00	10.29
2	Hard	0.00	2.19	14.52	3.55	1.87	0.24	0.23	0.18	0.06	0.03	0.00	0.00	0.00	22.86
2	Soft	0.00	1.89	11.84	3.27	2.16	0.38	0.19	0.00	0.00	0.00	0.00	0.00	0.00	19.72
3	Hard	0.06	3.02	1.63	0.31	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.17
3	Soft	0.10	9.44	12.73	2.11	1.15	0.16	0.03	0.00	0.00	0.00	0.00	0.00	0.00	25.73
4	Hard	0.56	159.27	15.15	4.06	4.15	0.72	0.62	0.41	0.20	0.00	0.00	0.00	0.00	185.13
4	Soft	0.00	2.47	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67
5	Hard	0.00	1.66	1.34	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.06
5	Soft	1.33	2.08	0.89	0.18	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.59
6	Hard	0.31	41.48	75.71	20.41	5.07	0.59	0.27	0.00	0.00	0.00	0.00	0.00	0.00	143.83
6	Soft	0.00	0.00	0.73	1.25	0.79	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	2.79

Mean	Hard	0.15	34.79	18.90	4.85	2.07	0.32	0.21	0.12	0.04	0.00	0.00	0.00	0.00
Mean	Soft	0.24	2.90	5.49	1.26	0.88	0.13	0.06	0.01	0.00	0.00	0.00	0.00	0.00
	Ratio	0.64	11.99	3.44	3.84	2.36	2.56	3.72	22.73	12.00				
Hard	Cum %	0%	57%	88%	95%	99%	99%	100%	100%	100%				
Soft	Cum %	2%	29%	79%	90%	98%	99%	100%	100%	100%				

Table 3. North Sea haddock catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

Haddock		Average number caught at age per hour													
Area	**Ground**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
1	Hard	0.02	1.08	9.87	10.89	20.43	1.45	0.99	0.17	0.42	0.68	0.41	0.04	0.03	46.47
1	Soft	0.01	0.12	0.55	0.48	0.96	0.07	0.04	0.07	0.04	0.05	0.08	0.01	0.01	2.48
2	Hard	0.00	0.43	2.76	8.32	15.86	1.70	1.32	0.00	0.63	0.97	0.38	0.00	0.06	32.43
2	Soft	0.00	0.04	0.13	0.38	0.83	0.08	0.07	0.00	0.03	0.04	0.04	0.02	0.01	1.66
3	Hard	0.16	6.37	13.95	9.22	15.79	0.27	0.18	0.00	0.08	0.17	0.03	0.00	0.00	46.22
3	Soft	0.02	0.80	3.96	3.54	7.36	0.19	0.16	0.00	0.09	0.10	0.00	0.00	0.00	16.23
4	Hard	0.11	5.05	11.22	11.99	23.27	0.98	0.86	0.00	0.57	0.48	0.20	0.00	0.02	54.76
4	Soft	0.00	0.34	0.53	0.50	0.96	0.03	0.03	0.00	0.03	0.02	0.00	0.00	0.00	2.44
5	Hard	0.00	0.21	2.73	4.40	8.12	0.32	0.37	0.00	0.26	0.24	0.07	0.00	0.02	16.74
5	Soft	0.00	0.00	0.04	0.13	0.18	0.03	0.01	0.00	0.01	0.02	0.01	0.00	0.00	0.44
6	Hard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Soft	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Mean	Hard	0.05	2.19	6.76	7.47	13.91	0.79	0.62	0.03	0.33	0.42	0.18	0.01	0.02	
Mean	Soft	0.00	0.22	0.87	0.84	1.72	0.07	0.05	0.01	0.03	0.04	0.02	0.00	0.00	
	Ratio	10.22	10.12	7.74	8.91	8.11	11.67	11.70	2.47	9.94	11.03	8.71	1.42	6.81	
Hard	Cum %	0%	7%	27%	50%	93%	95%	97%	97%	98%	99%	100%	100%	100%	
Soft	Cum %	0%	6%	28%	50%	94%	96%	97%	97%	98%	99%	100%	100%	100%	

Table 4. North Sea whiting catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

Whiting		Average number caught at age per hour													
Area	**Ground**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**
1	Hard	0.00	0.57	6.82	6.26	7.73	4.08	0.93	0.88	1.70	0.82	0.00	0.00	0.00	29.79
1	Soft	0.01	0.42	1.25	1.10	1.31	0.75	0.24	0.18	0.22	0.11	0.01	0.00	0.00	5.61
2	Hard	0.00	0.07	0.88	0.84	0.99	0.59	0.09	0.10	0.26	0.11	0.00	0.00	0.00	3.93
2	Soft	0.07	0.77	1.43	0.53	0.46	0.32	0.02	0.04	0.13	0.05	0.01	0.00	0.00	3.83
3	Hard	0.07	3.97	14.98	6.68	5.12	3.84	0.26	0.46	1.77	0.72	0.06	0.00	0.00	37.93
3	Soft	0.12	2.02	10.09	7.06	8.28	5.49	0.64	1.11	2.27	1.12	0.03	0.00	0.00	38.23
4	Hard	8.28	173.00	89.75	20.01	17.87	11.28	1.46	2.38	5.16	2.49	0.21	0.00	0.00	331.90
4	Soft	2.22	10.68	8.35	1.72	0.63	0.38	0.02	0.05	0.13	0.06	0.03	0.00	0.00	24.26
5	Hard	11.06	113.57	64.14	19.77	12.52	8.92	0.46	1.07	4.34	1.85	0.32	0.00	0.00	238.02
5	Soft	0.55	7.38	6.98	1.49	0.90	0.55	0.02	0.06	0.20	0.08	0.07	0.00	0.00	18.29
6	Hard	0.60	63.52	84.27	20.09	9.87	5.60	0.16	0.85	2.20	1.13	0.50	0.00	0.00	188.80
6	Soft	10.15	139.30	66.59	8.04	2.67	1.52	0.01	0.15	0.39	0.18	0.24	0.00	0.00	229.23
Mean	Hard	3.34	59.12	43.47	12.27	9.02	5.72	0.56	0.96	2.57	1.19	0.18	0.00	0.00	
Mean	Soft	2.19	26.76	15.78	3.32	2.37	1.50	0.16	0.27	0.56	0.27	0.06	0.00	0.00	
	Ratio	1.53	2.21	2.75	3.69	3.80	3.81	3.52	3.62	4.61	4.46	2.88			
Hard	Cum %	2%	45%	77%	85%	92%	96%	96%	97%	99%	100%	100%			
Soft	Cum %	4%	54%	84%	90%	95%	98%	98%	98%	99%	100%	100%			

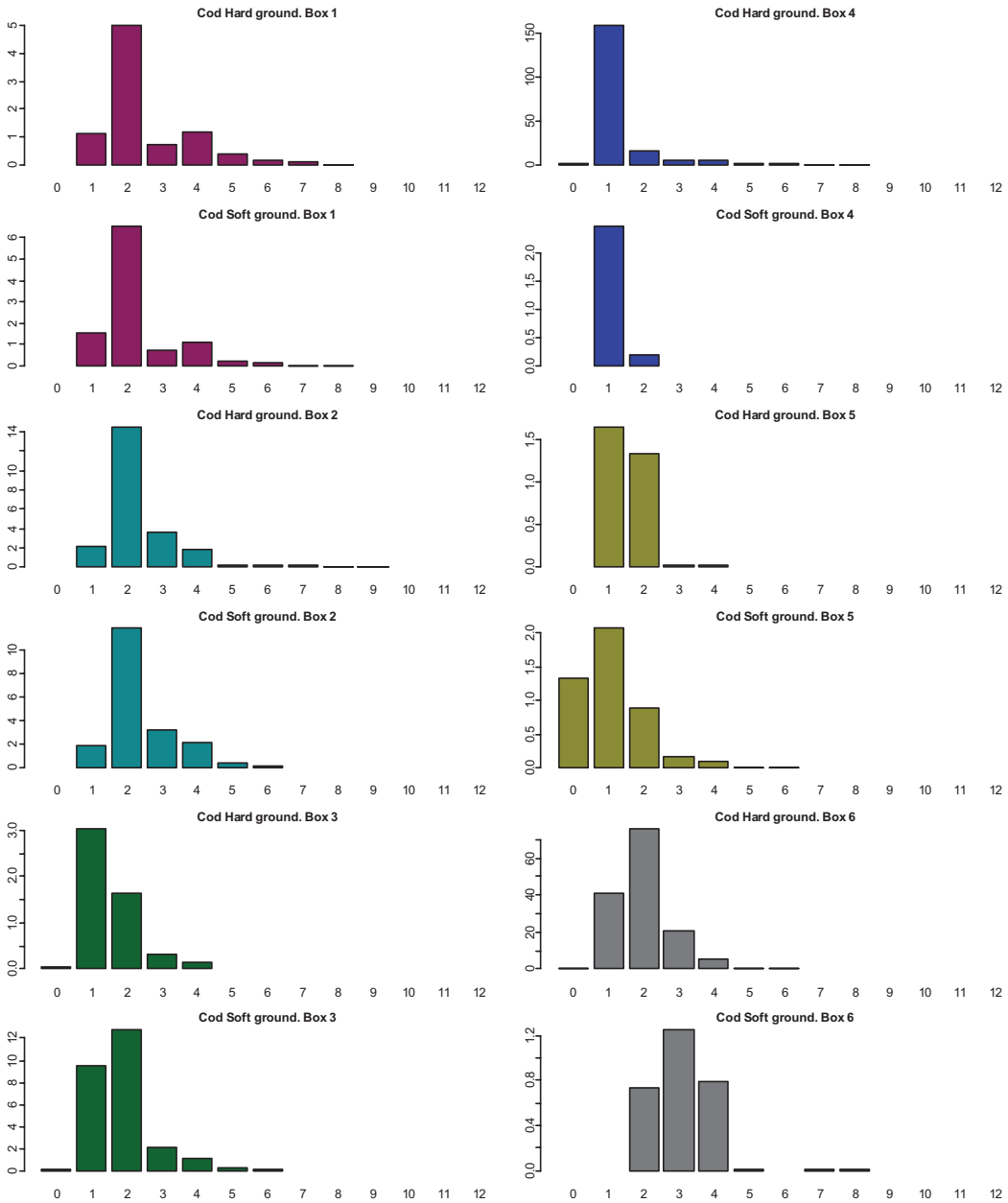

Figure 3. North Sea cod catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

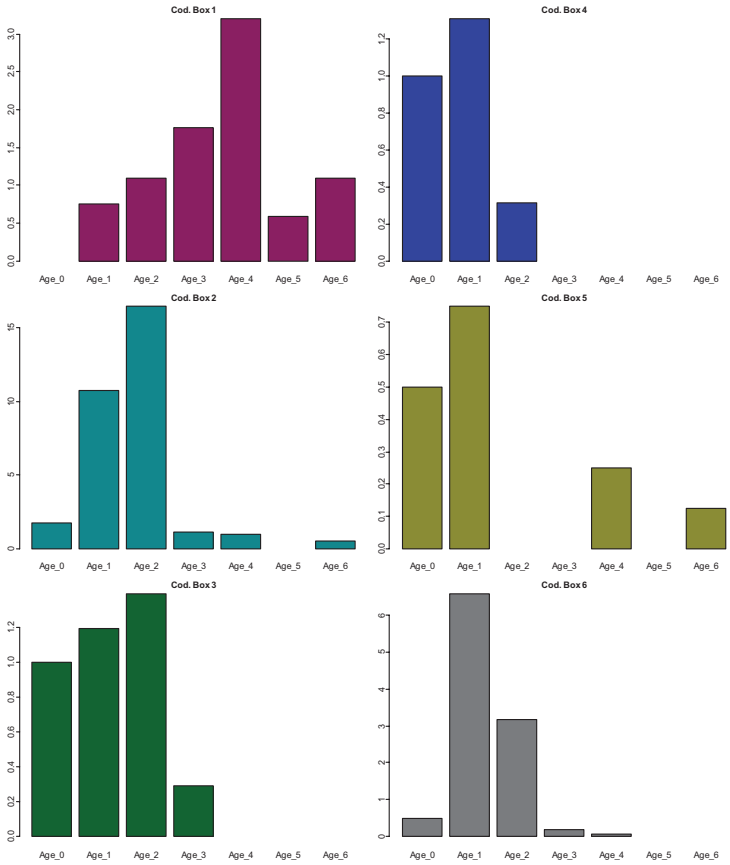

Figure 4. North Sea cod catch numbers per hour at age recorded by the ICES IBTS quarter three survey tows surrounding and within each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009 (age 6 is a plus group).

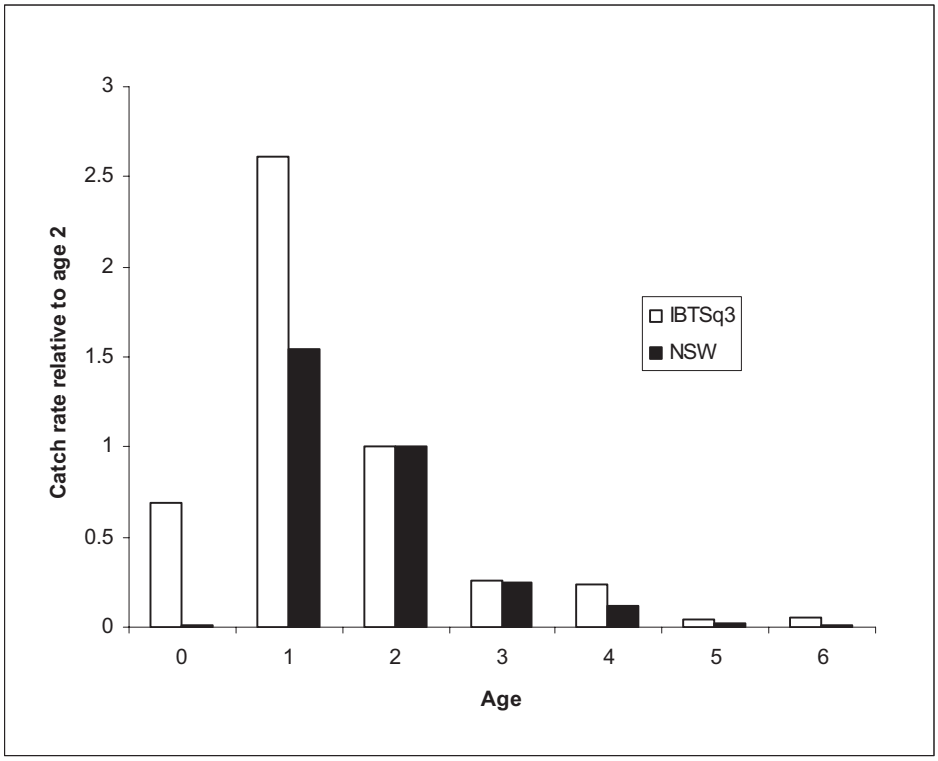

Figure 5. North Sea cod comparison of the relative (to age 2) catch numbers per hour at age recorded by the FSP NSW survey and the ICES IBTS quarter three survey across the whole of the North Sea.

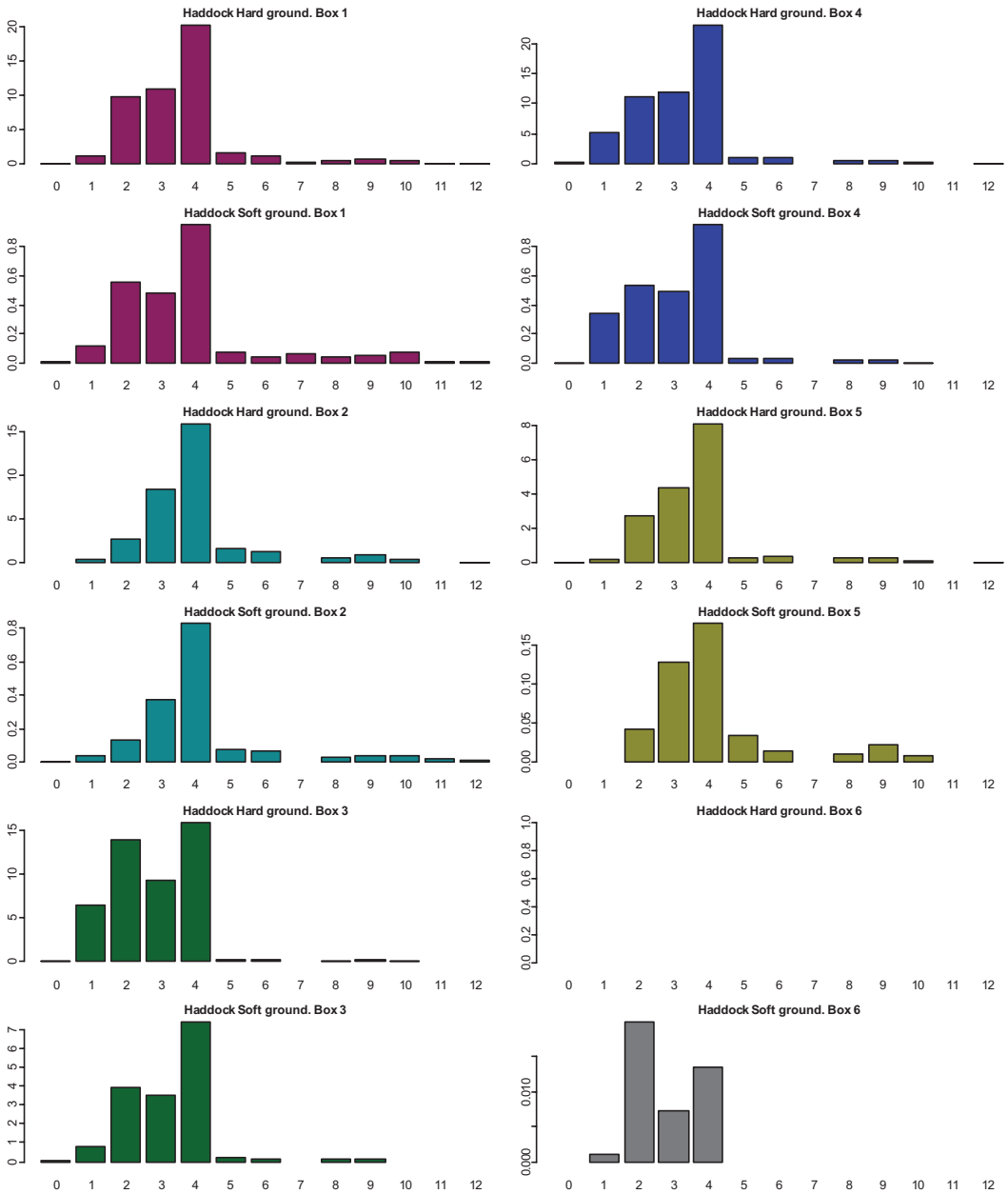

Figure 6. North Sea haddock catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

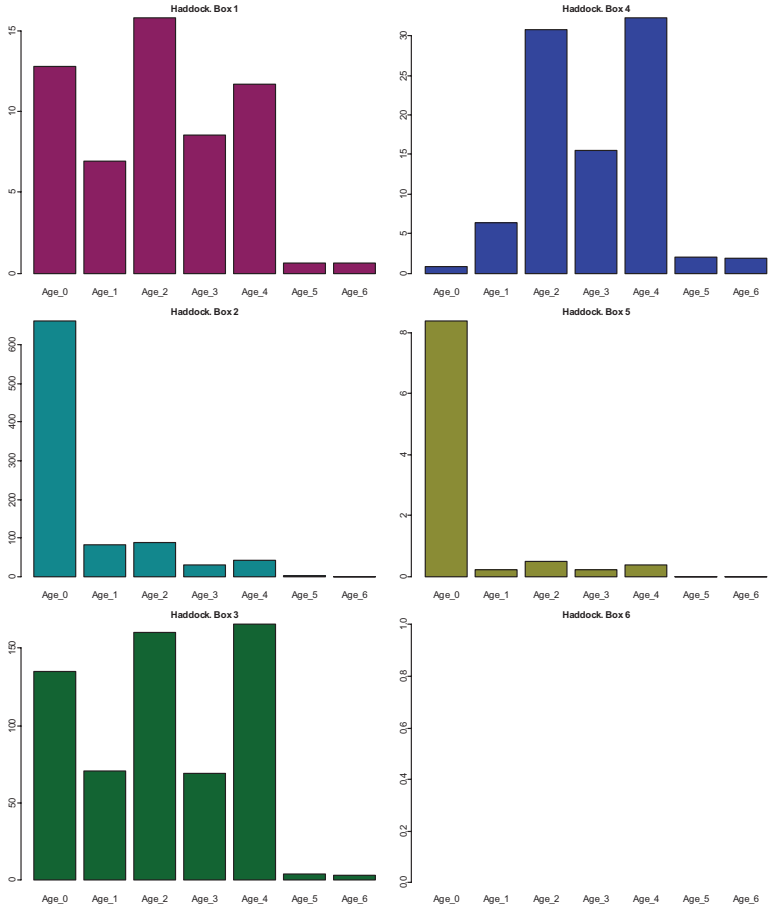

Figure 7. North Sea haddock catch numbers per hour at age recorded by the ICES IBTS quarter three survey tows surrounding and within each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009 (age 6 is a plus group).

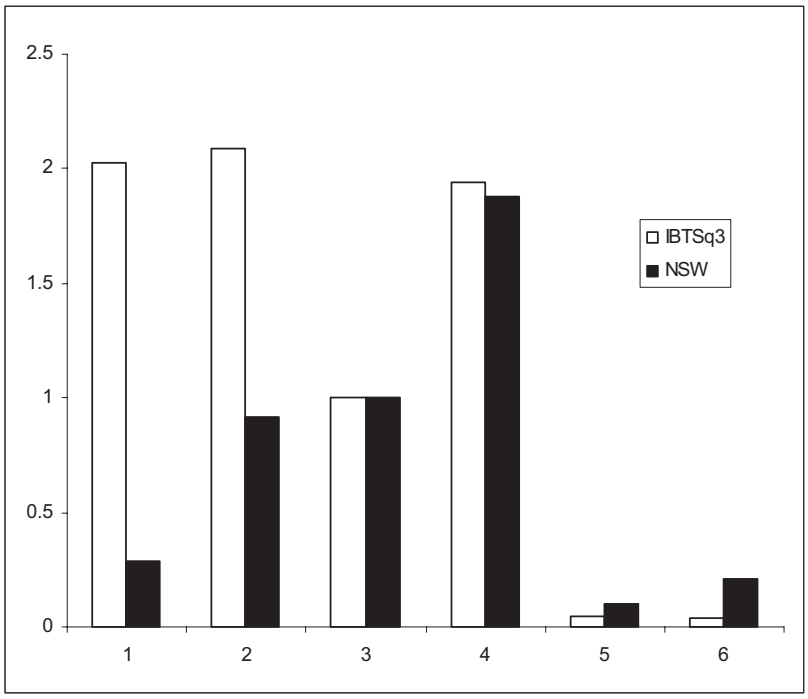

Figure 8. North Sea haddock comparison of the relative (to age 3) catch numbers per hour at age recorded by the FSP NSW survey and the ICES IBTS quarter three survey across the whole of the North Sea.

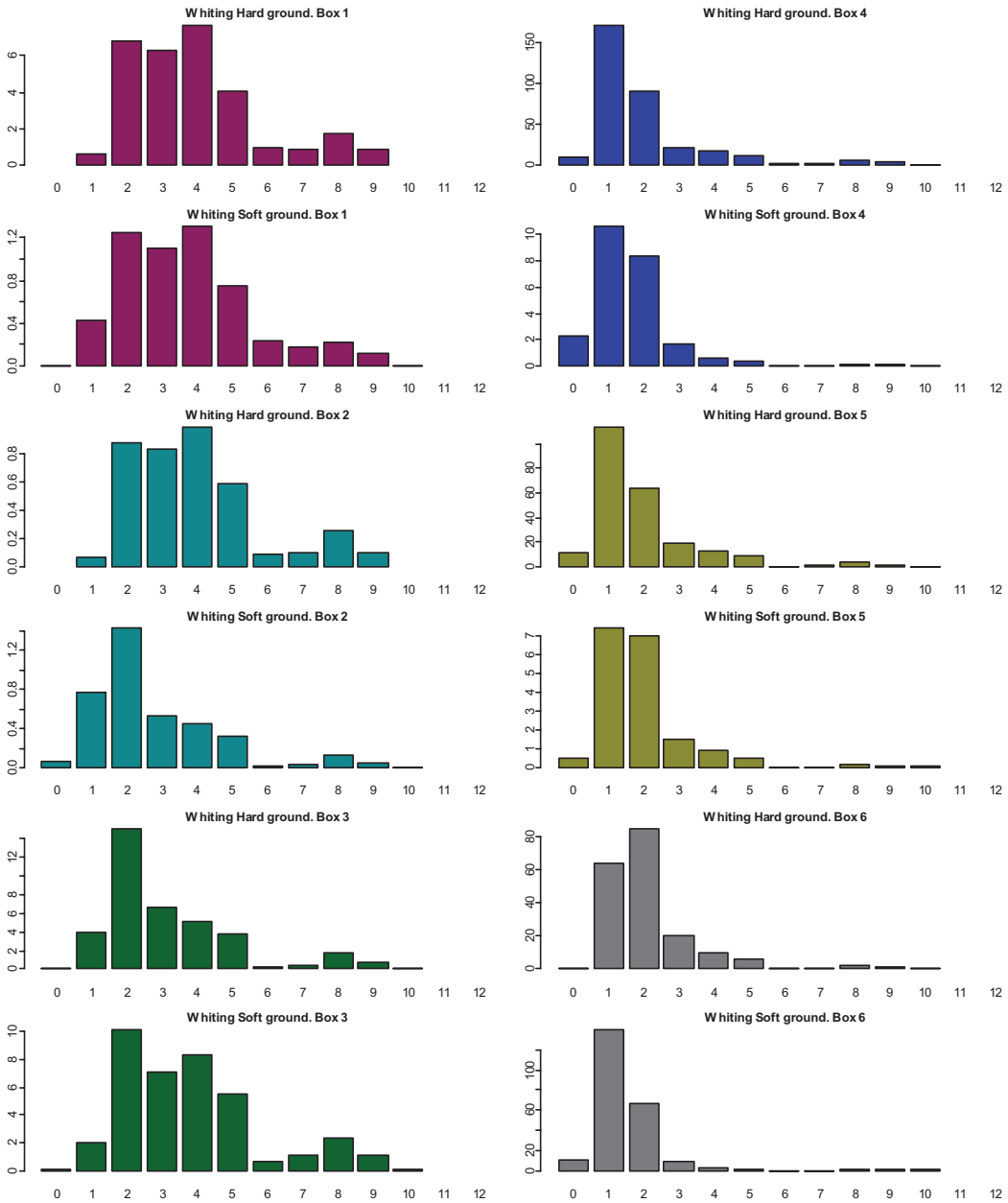

Figure 9. North Sea whiting catch numbers per hour at age recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009.

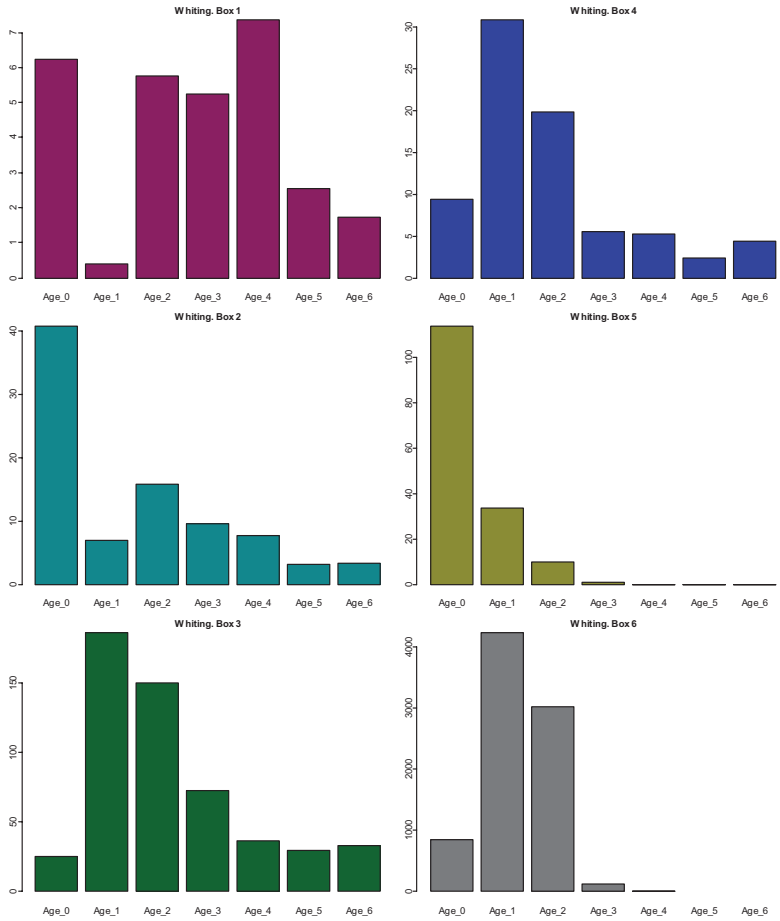

Figure 10. North Sea whiting catch numbers per hour at age recorded by the ICES IBTS quarter three survey tows surrounding and within each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009 (age 6 is a plus group).

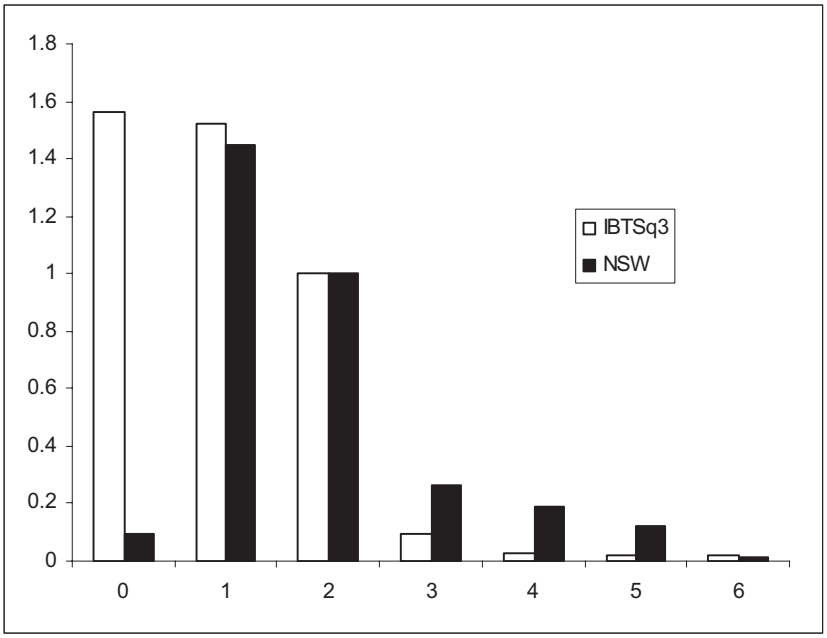

Figure 11. North Sea whiting comparison of the relative (to age 2) catch numbers per hour at age recorded by the FSP NSW survey and the ICES IBTS quarter three survey across the whole of the North Sea.

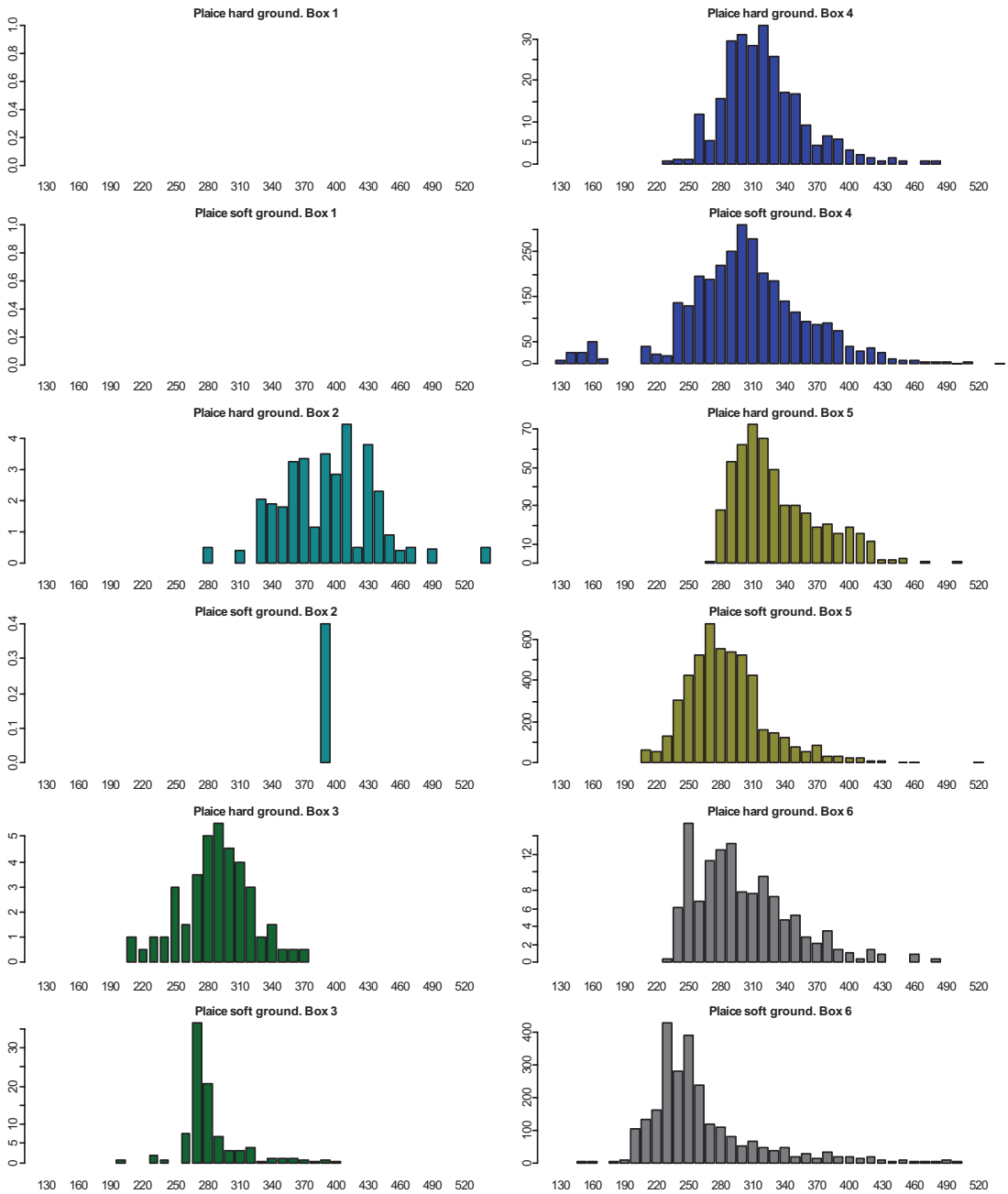

Figure 12. North Sea plaice - Catch numbers per hour at length recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009

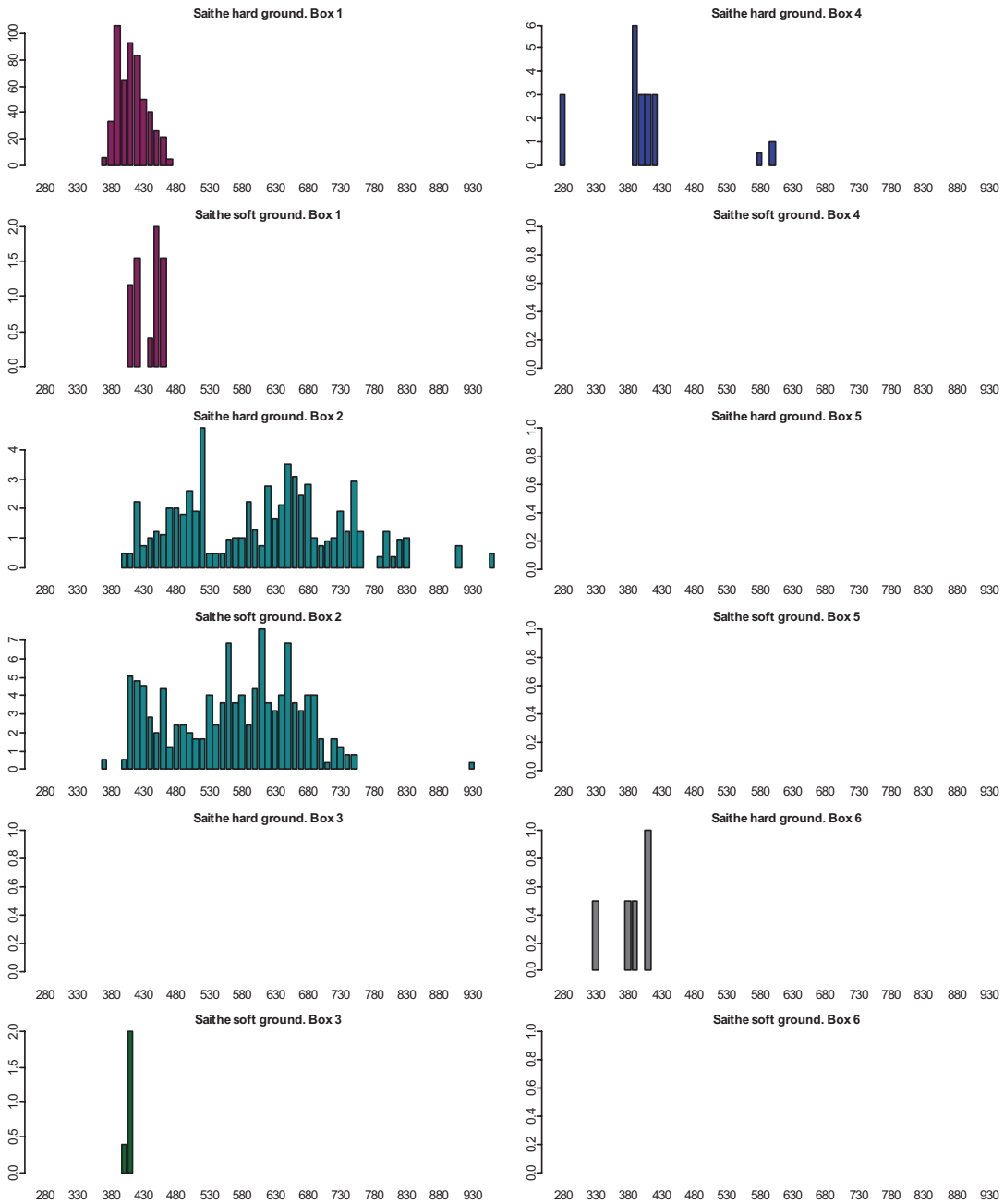

Figure 13. North Sea saithe - Catch numbers per hour at length recorded from nine hard and soft ground tows in each of the fishing areas surveyed by the North Sea Whitefish survey in June and July 2009

Annex A North Sea whitefish survey 2009 skippers report.

Allegiance Cefas survey June – July 2009

Danny Normandale

All scraper tows were of 2.5 hours duration and all hopper tows were two hours long.

Trip 1, Area 1

We sailed from Peterhead at 1600 hrs, with Grant Course on board as the Cefas observer. The weather was flat calm when we sailed, but by the following morning the weather was up to a force 6-7 northerly and this stayed with us for the rest of the trip.

We got to area 1 and shot the scraper trawl away and towed it north all that day and through the night until about 1300pm the following afternoon. We ended up catching 101 boxes of fish for the 9 short hauls, and this covered all the fine ground tows in area 1.

We started the hard ground tows about 1500 hrs and had 1 short haul for 15 boxes. We got the net aboard for the night and everybody had a good rest. At 0330 we started fishing again and towed south all day to the edge of the box. We did 4 tows that day for 46 boxes. About teatime the weather freshened to about northerly 8-9 so we got the net aboard and dodged north all night to the north end of the box.

We shot the net away at 0330 the following morning and towed south for 4 hauls and caught 169 boxes for the day. This completed all the hard ground tows in area 1 and gave us a total of 331 boxes for our trip.

I thought that this was a good trip in areas that I work for a good part of the year with my hopper net. I have not been round these areas with a scraper trawl before, but I think they have potential and I intend to give them another go with the scraper net now the survey has ended.

Trip 2, Area 5

We sailed from Peterhead at 1900 with Rob Forster aboard as the Cefas observer. We headed east to the Danish sector to start fishing in area 5. It was a long steam and took us 32 hrs to get there. We got shot about 0310 in the morning with the scraper trawl and the 1st haul was very heavy with 2 tight lifts of dabs coming aboard, totalling about 45-50 boxes of bulk but this only filling 7 boxes in the fish hold. I think this was mostly because we towed through the dark and it was very shallow water.

For the rest of the day we did another 5 tows and filled 25 boxes, giving us a total of 32 boxes for the day. We got it aboard and laid over night so everybody could get some rest. The following day we shot away the scraper trawl at 0530 and got the remaining 3 scraper trawls done, catching 16 boxes. By the end of all the scraper tows we had caught 48 boxes.

We then got the net aboard and steamed 30 mile SW taking us to an area of hard ground, we arrived about 1900hrs where we shot the hopper net away for the 1st tow. We managed 2 hauls before we got the net aboard for the night. At 0500 the following morning we did another 2 tows before steaming north 25 miles into the Norwegian sector. When we arrived we shot away the hopper net and completed the last 5 tows of area 5.

Every haul we did with the scraper net we got a big lift or more but it was always small dabs and gurnards. This gave us a total of 109 boxes below for the 18 tows we did in area 5.

Once area four was complete, we got the trawl stowed away and steamed north to start fishing in area 2.

Area 2

When we got to area 2 we shot the hopper net away on the hard ground and did 9 tows. We came fast quite a few times and lost any fish that was in the trawl and in front of the net. For these tows we caught 26 boxes. The weather was forecast to blow to NW 9, so we got the net aboard and started to make our way to Peterhead with 135 boxes aboard.

Trip 3, Area 2

We sailed from Peterhead at 2330, with Rob Philips (Shackles) aboard as the CEFAS observer. It was a long steam, again, at 26 hours. The weather forecast for the week was going to be fine and sunny. All the tows to be done in this area were to be with the scraper net.

We shot in the deep water in the Norwegian trench down to 90 fathoms and every haul we did we got about 10boxes of bulk and this produced some good shows of prawns. We did 9 short tows in the deep water for 60 boxes, and this completed area 2.

At around 2200 hours we got the trawl stowed away, then set off steaming west for 22 hours to area 3.

This was an area that I have never worked before but I thought the prawning side of it showed great potential, so I have since secured myself some Norwegian prawn quota so I can work this area and

also further my knowledge of the area for next years CEFAS survey.

We arrived at area 3 late the following evening and shot the scraper trawl away in a deep hole they call the Pair of Pants, one of the smaller holes in the Devils hole group. We managed 3 tows through the night until hauling time the following morning when we parted the port warp with 300 fathoms out. This took us about 2 hours to recover the trawl and get re-rigged for shooting. We did a further haul in same area for around 5 boxes, then shifted to the Ooze Hole further into the west, where we had 2 hauls then got it aboard and dodged about for the evening. After everybody had a good rest, we got shot again in the Ooze Hole near the south end and towed it SE to shorten the distance to the 95 mile hole. The last haul in the Ooze produced a tight lift prawns and fish.

We then steamed to the 95 mile hole when all the gear was aboard the boat. Once there, we had two more scraper tows which where both very good hauls with a mixture of fish and this completed all the scraper tows in area 3.

Late that evening we got the hopper net shot away on the hard ground where the results were very poor, but we carried on fishing through the night until late the following evening by which time we had done 6 tows for very little fish.

I decided to abandon the last 3 hauls and finish them off at a later date at the south end of the box, after completing area 4.

We landed 140 boxes of nice fish and prawns, but this was mainly caught by the scraper trawl as this was giving us 3 times the spread of the hopper net and much more ground contact.

Trip 4, Area 4

At 2000 hours we sailed from Peterhead, again with Rob Philips aboard as Cefas observer. My intention was to make for the very NE corner of the area, to spot where there's some hard ground that usually produces good results. About 30 mile short of the hard ground, I spoke to another skipper who was on a guard job there with his trawler and he informed me that a Danish boat had been getting a good fishing around him for the previous few days so we shot away our scraper trawl to see if there was anything to catch. We had 2 hauls towing east during the night and got 40 boxes of bulk. This took us to the area of hard ground and we filled around 15 boxes in the fish hold along the way. When daylight came up we shot away the hopper net onto the hard ground and towed it close to the Emden pipeline. We towed for 2 hours and when we hauled the net it was a very good haul consisting of 15 boxes cod and 35 boxes of whiting, so we shot the net straight back and continued in the same direction alongside the pipe for a further 2 hours. This haul was even better, consisting of 90 boxes of whiting.

Once all the fish was aboard, we got the net aboard and steamed west to another patch of hard ground with a pipe running over the top of it. This haul wasn't as good, only netting 5 boxes, so we laid overnight and waited for daylight. At 0500 we shot away the hopper net on the hard ground and got 47 boxes of whiting for two hours.

We shot away the scraper trawl and did 3 tows for the rest of the day, finishing about 2200 hours so everybody could have a sleep overnight again.

We started again at 0730 and had two hauls, but they weren't so good so we got the net aboard and steamed 45 miles into the south west to a hard patch of stones. We arrived there and got the trawl

shot at 0015 hours, and continued fishing right through until around 1700 hours and this finished off the survey for area 4.

We landed the catch into Peterhead, then sailed again as soon as we finished landing. The next trip was to be at the south end of the North sea so I intended to start that trip from Scarborough. While on route to there we steamed south for 18 hours to the south end of area 3 to finish off the last 3 hard ground tows which we did in a force 9 northerly. We caught very little due to the weather conditions, but did catch some very nice prawns. I will hopefully explore this area further before next year's trip.

On the whole, this trip was good, catching 276 boxes of mostly whiting, of which the bulk of the catch we caught in 4 hauls on the hard ground. This trip showed how efficient the hopper net can be in the right place, as opposed to the previous trip where the hopper net caught very little.

Trip 5, Area 6

We sailed from Scarborough at 0500 hours with Rob Philips aboard as the Cefas observer. We steamed east around 85 miles to the west end of the survey box. We got there at 1840 hours and shot away the scraper trawl, which came up 2.5 hrs later with a good haul of prawns and fish. The scraper net was stowed away for the evening and everybody got a sleep while we laid overnight.

As soon as it was light we shot away the hopper net on the hard ground and we towed it alongside the ketch pipeline. The 1st haul was poor catching 5 boxes of cod, but the following tow was a good haul, taking 33 boxes of cod. The next tow was the same amount of bulk (35-40) boxes, but it was mainly whiting.

The next tow we shot the scraper trawl and towed it SE all watch and there were 4 boxes of good plaice. This haul was intended to

shorten the distance to the Cleaver Bank, where we were going to shoot the hopper net the following morning.

We laid overnight and shot away the hopper net at 0700 but after 1 hour the net snagged and we had to haul. This haul had a good sign of cod, and produced 9 boxes of good sized fish. The net was shot away again, with similar results as the previous tow. We finished the day off with 2 more scraper tows, then got it aboard and dodged east all night to some more hard ground in the Dutch sector.

The hopper net was shot away at 0700, but this proved to be disappointing when we hauled as there was hardly a fish in the net. We shot away again, thinking it may get better the next haul, but this was very much the same.

I decided to shoot the scraper net away thinking we might get more with the extra 20 fathoms of spread, but these 2 tows were also very poor so we got the net aboard and set off to land our fish in Lauwersoog in Holland.

We landed 115 boxes of bonny fish.

There were some really good feed marks when we got into the Dutch sector, so I was expecting some very good hauls but with the strong tides and then the weather started to freshen, the fish must have come off the bottom to feed, so we didn't catch any of it.

It was at this point I thought we should go into land and wait for the tides to ease off, and the swell to die down.

While we where in the harbour taking clean fish boxes, a piston went through the side of the auxiliary engine, which meant that the boat had no electrics to sail with, so we hired in a generator set to

finish off the survey job. We sailed again from Lauwersoog and did the last few hauls with the generator aboard.

These last few hauls didn't produce much either, but there was still lots of tide running when we sailed, but I decided that we where better to get them done and out of the way, because I wasn't too confident in the generator set.

We finished them off and sailed to Peterhead.

Cefas Survey 2009 completed.

Danny Normandale

Annex B North Sea whitefish survey detailed operations plan.

FISHERIES SCIENCE PARTNERSHIP: FSP (2008-9) (7)

North Sea Whitefish survey: 1 June - 31 July 2009

Detailed Operation Plan (April 2009)

VESSEL

FV Allegiance S
Skipper: Danny Normandale

OBSERVERS

Grant Course, Robert Forster, Rob Phillips

DEPARTURE DATE AND LOCATION

1st June Peterhead

OBJECTIVE

The survey has been agreed between the NFFO and Cefas. It will cover representative fishing grounds within a large part of the North Sea from 53°30'N – 62°N, 0° - 7°E during June and or July. The vessel will use a combination of traditional English fishing gears to cover both hard and soft grounds. The whole catch will be recorded, but detailed measurements will be made of the catches of cod, whiting and haddock, and of plaice if resources permit.

FISHING GEAR

The fishing gear should be a Whitby Jet type whitefish otter trawl and a Jackson single scraper type trawl (gear details in tender document). Codend mesh size will be 80 mm.

AREA OF OPERATION and TOW POSITIONS

Fishing operations will be carried out on specified fishing grounds in the area 53°30'N – 62°N, 0° - 7°E (see attached chart). The tows will be distributed over sub-areas defined to provide information on catch rate, size/age composition and species catch composition from as many different locations as possible within the area where the fishery takes place, and not necessarily at locations identical to where tows were made in earlier FSP trips.

Annex 1 shows the survey sub-areas divided into 10-minute (longitude) x 10-minute (latitude) rectangles. To obtain as much information as possible from the core fishing areas, while ensuring that there is enough information from surrounding areas to allow the distribution pattern to be mapped adequately, the survey will be designed as follows. Each 10-minute by 10-minute rectangle is classified according to two seabed types:

1. Rectangles covering harder seabed types, with potentially the highest catch rates of cod, where the Whitby Jet trawl will be used;

2. A surrounding area of softer seabed in which catch rates of cod are expected to be lower than in the core area, where the Jackson Scraper trawl will be used.

Within each sub-area, nine hard and nine soft rectangles will be selected, and a tow with the specified gear type carried out in each on the appropriate seabed type. The rectangles selected for fishing will be retained for future surveys.

PERIOD OF SURVEY

The vessel will depart on 1 June. The duration of the trip will be 30 days of fishing. There will be a maximum of 10 days per trip and a maximum of two days between fishing trips in port to land fish, refuel and change scientist if necessary.

WORKING PATTERN

Tow duration (net on bottom): 2 h on average for the Whitby Jet trawl, 2.5 h on average for the Jackson Scraper trawl.

The observer, with help from the crew, must have adequate time to carry out the scientific work on a catch before the next catch is brought aboard.

The survey will take place during day and night.

The observer must have sufficient rest periods (up to 8 h per day in one or two periods).

All tows will form part of the survey (i.e. no unsampled tows should be made) and all must be sampled by the observer according to the sampling requirements provided to him.

The crew should be available to help the observer when requested to do so.

It is expected that some 130 tows will be carried out over the 30 days of fishing, depending on the weather.

SORTING AND RECORDING THE CATCH

It is important that the catches of cod, haddock, whiting and other commercial species be quantified as accurately as possible. The crew will be required to assist in sorting the catch as required by the observer as well as preparing any fish for sale on landing. Standard Cefas methods for sorting and measuring commercial fish catches at sea will be followed.

The entire catch should be available to the observer for sampling, and none should be discarded without being recorded. Generally, the catch will be sorted into three general categories:

1. Large and rare fish e.g. congers and skates, which may be landed or discarded, but which can be counted and measured (i.e. raising factor of 1.0).
2. The retained catch of other individuals of commercial species. The observer must be able to record the total number of boxes or baskets of retained fish of each species from each tow, and will carry out length measurements on either the whole catch (raising factor = 1.0) or a known sample of the catch (raising factor >1.0).
3. Discarded fish of commercial and non-commercial species, other than those in category (1). It is crucial that the total quantity of discarded fish is known, and that the observer can obtain a representative, random sample to be sorted to species and measured for length. This is best achieved by placing all the discarded fish in baskets, counting the baskets, and taking a random sample of the baskets for sorting and measuring. The raising factor is the total number of baskets of discarded fish divided by the number of baskets taken at random for sorting and measuring.

The observer will collect samples of large cod, haddock and whiting for age determination, and will remove both otoliths from each fish sampled where possible and record the cruise reference number, tow number, species, fish length, and (if possible) sex. Target numbers of otoliths will be:

Cod: 125 otoliths
Haddock: 125 otoliths
Whiting 125 otoliths

These are to be spread out over the entire area. Collections should be made across the length range of larger fish at each tow to supplement the otoliths taken by the autumn Cefas Endeavour survey. For cod, the sampling should aim for 10 otoliths per 5-cm length class from 60cm to 119cm with 5 at 120cm+, but no more than 3 otoliths per length class per sub area. For haddock, 10 otoliths per 2 cm length class are to be collected from 40 to 69 with 5 at 70cm+, but no

more than 3 otoliths per length class per sub area. For whiting from 37 to 69 with 5 at 70cm+, but no more than 3 otoliths per length class per sub area. The observer will maintain an otolith tally.

DATA TO BE RECORDED BY SKIPPER

The observer will provide recording sheets on which the skipper will record the following details for each tow:

Date
Tow number
Shooting and hauling times
Shooting and hauling positions (latitude and longitude)
Time and position at any significant change in tow direction
Other relevant information e.g. tidal state, weather conditions, seabed type (hard or soft)

The skipper should provide full details of the gear and its rigging. At the end of the survey, the skipper should provide an electronic copy of the tow tracks from the plotter.

DATA TO BE RECORDED BY OBSERVER

The observer must ensure that all catch compositions, length frequencies and raising factors are fully and correctly entered on the recording sheets, and that all bridge log sheets and biological sampling sheets are collated at the end of each sampling day.

Any significant deviations from the survey plan should be reported to Cefas by the observer.

CRUISE REPORT

The observers will maintain a diary of activities, including an electronic copy where possible, and a draft cruise report in standard Cefas format will be prepared for submission to Cefas immediately after the cruise. The cruise narrative should be written at sea and read and agreed by the skipper (the report will bear the sentence “seen in draft by skipper”).

Figure 1: Map of the six sub-areas within which sampling will be required, together with current information on the substrate. Further information on the rectangles without data is being collected and the map will be updated as the survey progresses.