FSS Survey Series No. 2007/01

Survey Report: Biological Sampling Survey 16-25 February 2007, Celtic Sea

by

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Keywords: Sexual maturity; Sex ratio, Maturity, Data Collection Regulation

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Abstract

The Biological Sampling Survey, took place on16-25 February in Celtic Sea on the Celtic Voyager. The survey is intended to address the requirements of the Data Collection Regulation 1639/2001. Information on growth, maturity and sex ratio (biological data) were collected for a range of commercially important species.

1 Introduction

The survey is intended to address the requirements of the Data Collection Regulation 1639/2001. Information on growth, maturity and sex ratio (biological data) were collected for a range of commercially important species. Ovary samples were collected to validate visual maturity staging. Samples of fish were collected for GMIT.

2 Materials and Methods

2.1 Scientific Personnel

Name	Service area/Affiliation	Role
Hans Gerritsen	MI-FSS	Scientist in Charge
Selene Hoey	MI-FSS	Scientist
Rob Bunn	MI-FSS	Scientist
Sean O'Connor	MI-FSS	Scientist
Clare Murray	GMIT	Student
Roisin O'Calaghan	GMIT	Student

2.2 Survey Plan

2.2.1 Area of operation

Celtic Sea, East of 10 degrees Longitude; VIIj and VIIg

2.2.2 Specific operations

Tows were selected from previous groundfish surveys. The aim was to achieve a good spatial coverage, representative of the survey area so spawning areas or areas of high abundance were not specifically targeted. Tows were ½ hour in duration and approximately 1.5nm long.

2.3 Equipment and system details and specifications

GOV net (V3) with the footrope tied down to one chainlink, no tickler chain. One spare net, no proper spare set of bridles.

2.4 Protocols used

2.4.1.1 Sorting

Sort catch by species mentioned in Table 1, other species can be discarded without weighing. Flatfish and rays are sorted by sex. If necessary, the fish will be sorted into size categories. All sorted samples are weighed, entered into the deckmaster database and labelled.

2.4.1.2 Biological sampling

Otoliths will be taken from all species in Table 1 except rays, however for ray species you still need to enter an otolith box number: there will be a sticker on each workstation with these 'virtual' otolith box numbers for the ray species. For all species, the sex and maturity stage will be determined and the round weight will be taken.

The sampling targets are set per station (not per stratum as previously). For the common species (whiting, haddock, plaice, herring) the sampling targets will be one per size class, for other species all fish will be taken for biological sampling (enter 'A' for the number of otoliths per size class) unless the catch is large.

2.4.1.3 Ovary sampling

Ovary samples will be taken for cod, haddock, whiting, hake, plaice and megrim. Ovary samples should be taken from the middle of the ovary with capacity solid displacement pipette as shown in Figure 1. A sample of 100 µl should be taken in all cases by sucking up tissue to the first blue line on the tube. Removal of samples with the pipette in near spent fish can be difficult and in these cases remove a small sample from the ovary lumen with scalpel and place in the tube noting the exception.

The sampling targets are 5 per stage for maturity stages 1, 4, 5 and 6 and 10 per stage for maturity stages 2, 3 and 7. We will try to spread out the sampling spatially, so don't take more than 2 ovary samples per maturity stage at each station.

2.4.1.4 Other sampling

- Nephrops samples will recorded using NEMESIS using standard protocol
- We'll freeze 50 snake pipefish if we catch them for Brendan O'H

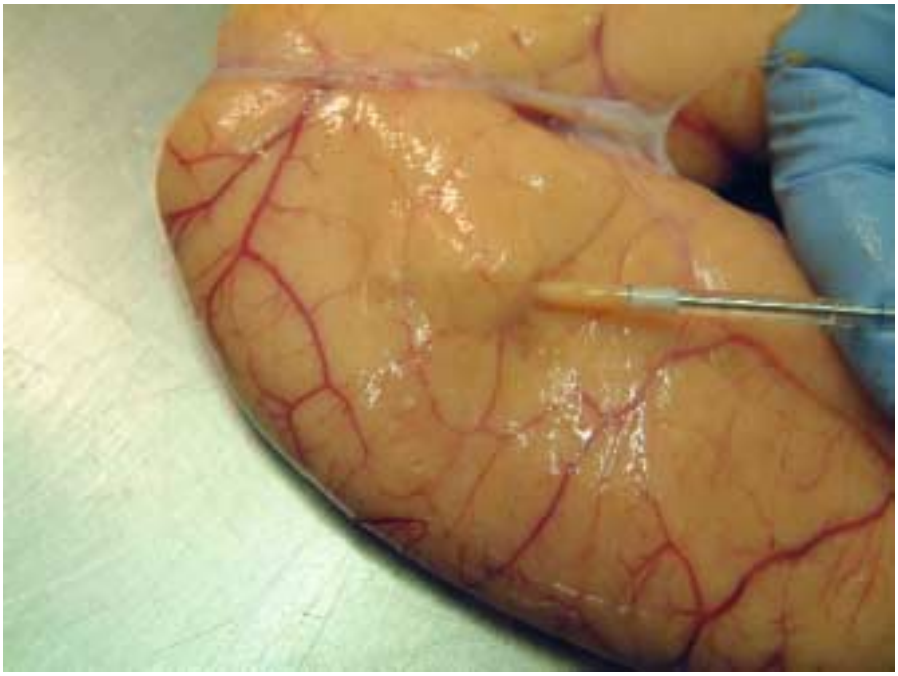

Figure 1. Sampling a cod ovary using a solid displacement pipette. The first and second blue lines on the pipette equate to 100 and 200 µl of tissue respectively

Table 1. Species to be sorted from the catch

	Species	Sex	Otolith numbers	Ovary samples
COD	Cod	U	100-149	Y
HAD	Haddock	U	150-199	Y
WHG	Whiting	U	200-249	Y
POK	Saithe (coalfish)	U	250-299	
HKE	Hake	U	900-949	Y
MON	Monkfish (white)	U	300-349	
WAF	Black bellied monk	U	350-399	
MEG	Megrim	M	400-449	Y
		F	450-499	
PLE	Plaice	M	500-549	Y
		F	550-599	
SOL	Sole	M	600-649	
		F	650-699	
HER	Herring	U	700-749	
WHB	Blue Whiting	U	750-749	
MAC	Mackerel	U	800-849	
HOM	Horse Mackerel	U	850-899	
BLR	Blonde Ray	M	See	
		F	work	
CUR	Cuckoo Ray	M	stations	
		F		
SDR	Spotted Ray	M	See	
		F	work	
THR	Thornback Ray	M	stations	
		F		

2.5 Analysis methods

All analyses were performed in the R environment

3 Results

3.1 Stations Completed

A total of 26 valid tows were completed. One tow took place during darkness. Due to the bad weather, the spatial coverage was incomplete. Figure 2 shows the station positions

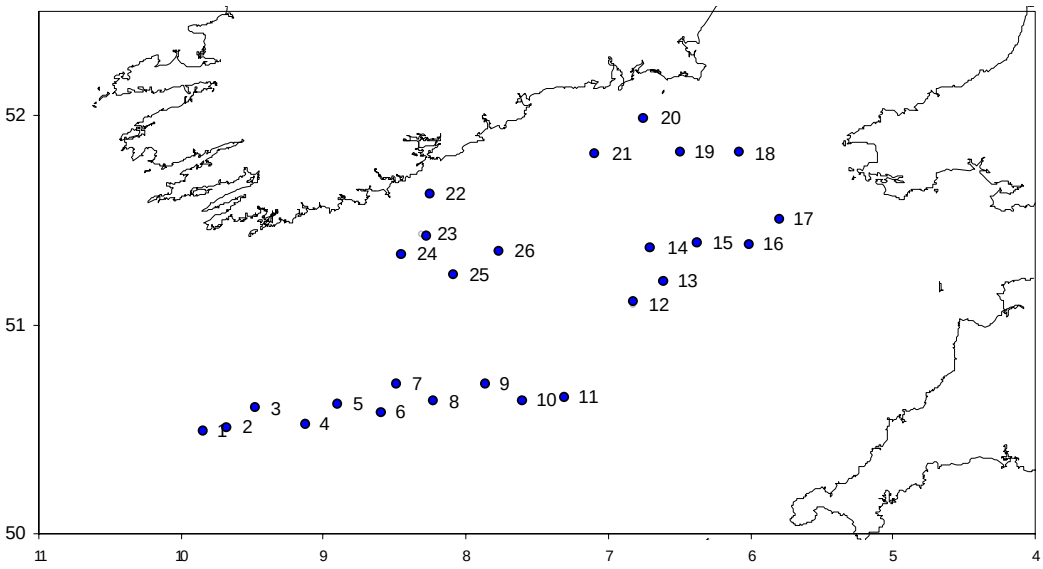

Figure 2. Station positions. The numbers refer to the haul numbers.

3.2 Sampling targets

The distribution of the catches is indicated in **Figure 3**. Catches were generally small, many of them filled only one or two baskets. Cod were caught in low numbers and were present in about 40% of the catches. Haddock were mainly caught on the Smalls fishing grounds. Herring were present in most catches in low numbers. Hake were caught on nearly every haul in fairly constant numbers. Horse mackerel were mainly caught in the eastern Celtic Sea and were mostly small. Mackerel were mainly caught on the offshore stations. Megrim were found on the western side of the survey area. Monkfish were present in nearly every haul, but in low numbers. Plaice were found towards the St George's channel. The only species of ray that was regularly caught was the spotted ray, mainly in the north-eastern side of the survey area. Whiting were only encountered in reasonable numbers on the Smalls and towards the St George's channel.

The sampling targets for biological samples were one fish per cm length class per haul, or one fish per half-centimetre for herring. Length distributions of the biological samples taken, are shown in **Figure 4** and **Figure 5**. Ovary samples were taken from selected species for validation of the macroscopically assigned maturity stages (using histology and image analysis techniques). The targets for these samples were 5 samples each for maturity stages 1, 4, 5 and 6 and ten samples each for maturity stages 2, 3 and 7 (these stages are more subjective). Ovary samples were taken from cod, haddock, whiting, hake, plaice and megrim.

The catch numbers, numbers measured, numbers of biological samples and the numbers of ovary samples are given in Table 2. Overall only an estimated 4551 fish of the target species were caught, 3416 were measured, 1155 biological samples were taken and 126 ovary samples were taken

Table 3. shows a breakdown of the maturity stages in the biological samples. These samples were collected on a length-stratified basis and are therefore not random samples from the population; however they give a reasonable reflection of the maturity stages available at the time of sampling. Of the mature fish, cod were either maturing or ripe, haddock were mostly maturing, as were whiting. Herring were mainly spent (resting). Some plaice might have been spent but indistinguishable from immature fish (sampling takes place too late in the season to reliably determine the maturity state of plaice). Megrim were mostly maturing, with no spawning or spent females.

Table 2. Catch numbers, number of fish measured, numbers sampled for biological parameters (weight, sex, maturity and age; rays were not aged) and numbers of ovary samples taken.

SPECIES	COMMON NAME	CAUGHT	MEASURED	SAMPLED	OVARIES
BLR	BLONDE RAY	8	8	8	-
COD	COD	25	25	24	14
CUR	CUCKOO RAY	5	5	5	-
HAD	HADDOCK	790	631	179	25
HER	HERRING	195	195	78	-
HKE	HAKE	526	526	184	17
HOM	HORSE MACKEREL	479	227	54	-
MAC	MACKEREL	60	60	31	-
MEG	MEGRIM	100	100	83	13
MON	ANGLERFISH	42	42	41	-
PLE	EUROPEAN PLAICE	349	349	103	33
SDR	SPOTTED RAY	99	99	91	-
SOL	SOLE	11	11	11	-
THR	THORNBACK RAY	2	2	2	-
WAF	BLACK-BELLIED	15	15	14	-
WHB	BLUE WHITING	156	156	44	
WHG	WHITING	1679	965	203	24
TOTAL		4541	3416	1155	122

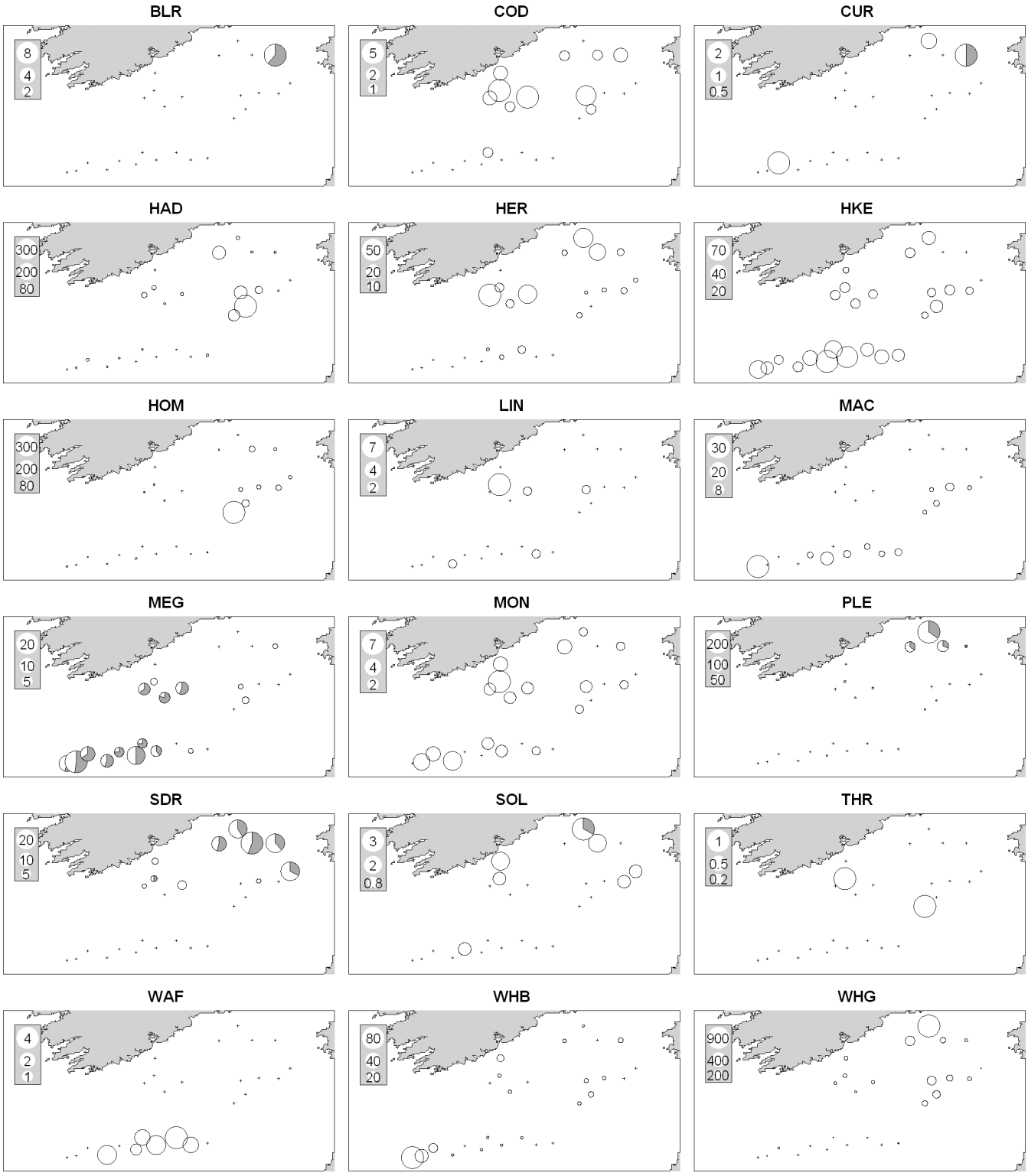

Figure 3. Catch numbers by station, represented by the size of the circles. Sex ratios are represented by pie charts for species of which the catch was sexed: the grey area represents the proportion of females, white for males.

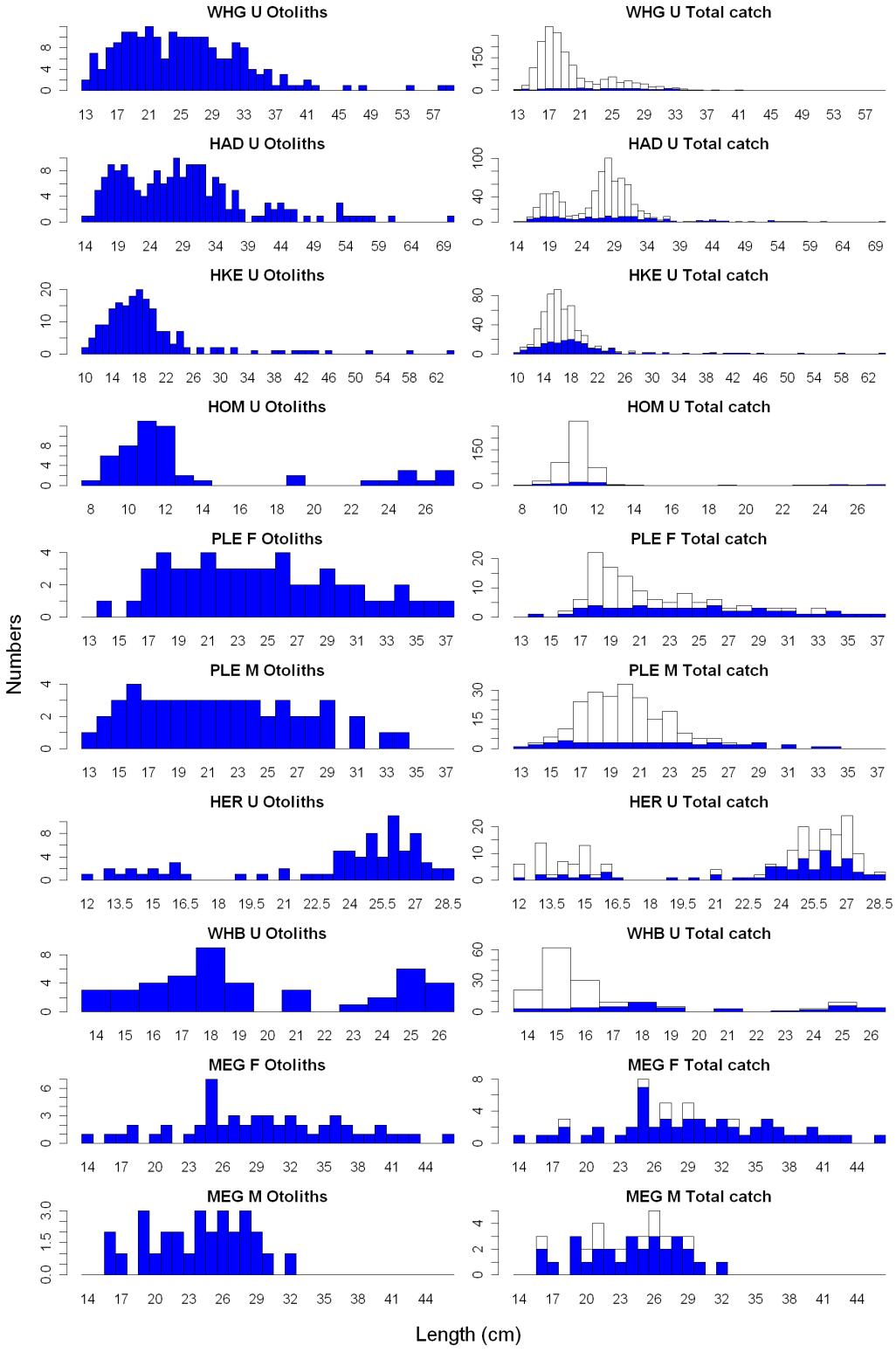

Figure 4. Size frequency of biological samples taken (blue) and total catch (white). The left-hand graphs show only the biological samples, the right-hand graphs show both the total catch and biological samples.

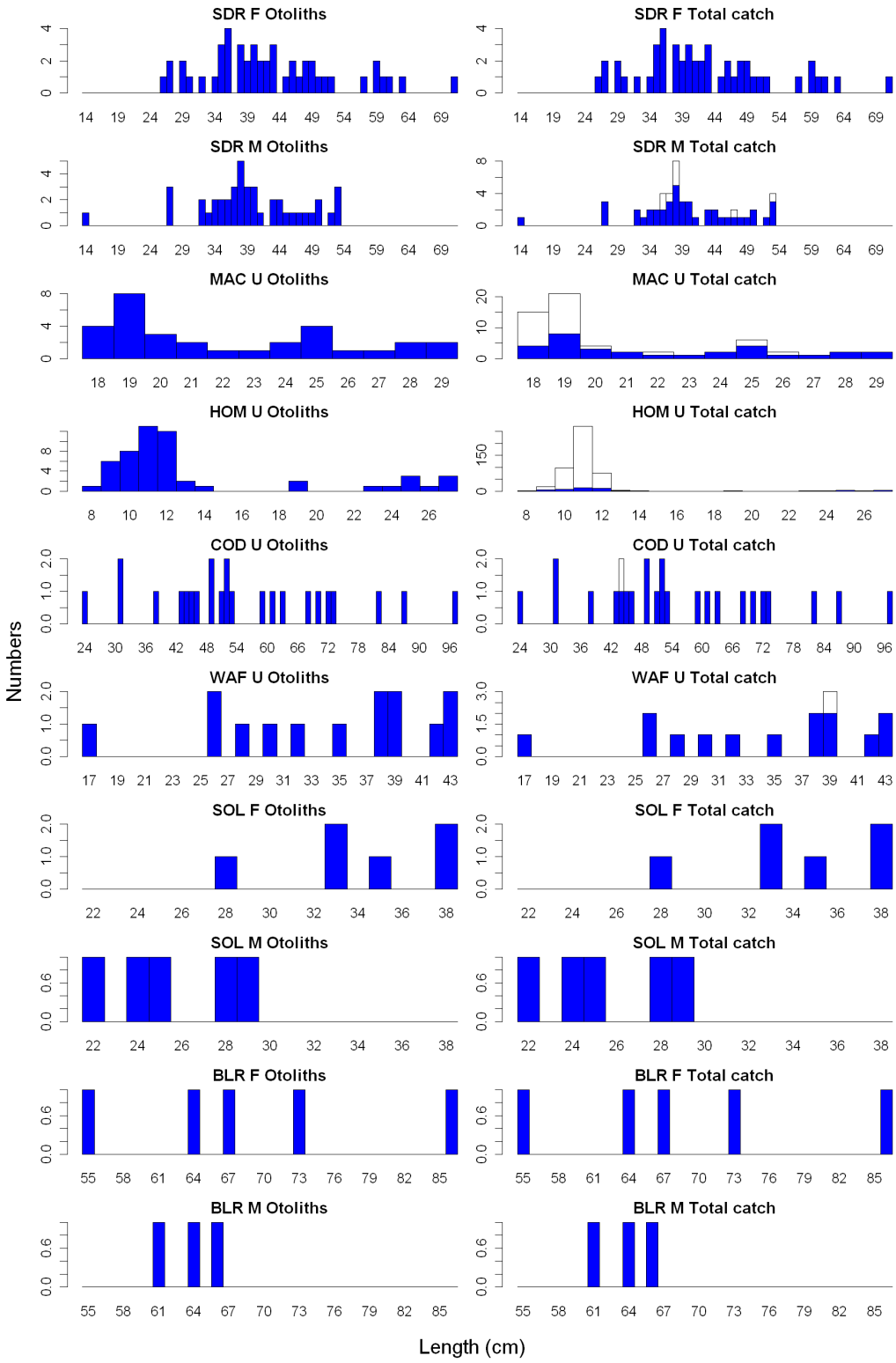

Figure 5. Size frequency of biological samples taken (blue) and total catch (white). The left-hand graphs show only the biological samples, the right-hand graphs show both the total catch and biological samples.

Table 3. Biological samples by sex (Female, Male and Unsexed) and maturity stage.

Species	Sex	Immature	Maturing	Ripe	Spent	Total
BLR	F	4	0	0	6	10
BLR	M	5	0	0	0	5
COD	F	17	16	11	0	44
COD	M	8	4	23	0	35
CUR	F	1	0	0	0	1
CUR	M	5	0	0	0	5
HAD	F	39	248	66	0	353
HAD	M	22	47	224	35	328
HAD	U	5	0	0	0	5
HER	F	5	4	0	226	235
HER	M	4	3	15	235	257
HER	U	5	0	0	0	5
HKE	F	61	7	5	0	73
HKE	M	44	4	16	21	85
HKE	U	85	0	0	0	85
HOM	F	4	8	0	9	21
HOM	M	0	8	0	7	15
HOM	U	44	0	0	0	44
MAC	F	16	0	0	25	41
MAC	M	11	0	0	0	11
MAC	U	6	0	0	0	6
MEG	F	21	156	0	0	177
MEG	M	6	63	46	7	122
MON	F	30	0	0	0	30
MON	M	21	0	0	14	35
MON	U	5	0	0	0	5
PLE	F	50	44	26	56	176
PLE	M	12	8	189	21	230
SDR	F	48	3	0	6	57
SDR	M	51	9	0	0	60
SOL	F	2	20	0	0	22
SOL	M	10	0	0	0	10
THR	M	2	0	0	0	2
WAF	F	11	0	0	0	11
WAF	M	9	0	0	0	9
WHB	F	13	44	37	0	94
WHB	M	10	27	5	0	42
WHG	F	26	339	15	0	380
WHG	M	16	283	81	7	387
WHG	U	1	0	0	0	1

4 Discussion and Conclusions

4.1 Problems encountered

Three days were lost due to bad weather. Five days were spent fishing. There was no significant gear damage. On one haul the trawl doors got crossed and two other occasions the starboard door fell over. The distance sensor in the starboard trawl door fits too tight and got slightly damaged during its removal. It is recommended that the pocket in which it sits is enlarged.

Acknowledgements

Thanks to Fergus O'Heir and the rest of the crew of the Celtic Voyager, the scientific staff, students and all others involved in this survey.

Appendix 1, Cruise Narrative

14 Feb	Mobilised in Galway
15 Feb	Scheduled departure of 3:00h delayed due to severe gales. Also the net drum had to be sent away for repairs. Net drum back in the afternoon.
16 Feb	Departed from Galway at 4:00h. Spent the day steaming south.
17 Feb	First station at 07:00h. Doors crossed on second tow. Completed 5 valid hauls.
18 Feb	Completed 6 valid hauls.
19 Feb	Large swell, not possible to fish. Held position on planned station.
20 Feb	Completed 6 valid hauls.
21 Feb	Completed 4 valid hauls, wind increasing to gale force again. Headed into Waterford, arrived 21:00.
22 Feb	Remained in Waterford, heavy swell in Celtic Sea
23 Feb	Left Waterford 18:00h.
24 Feb	Completed 5 hauls and arrived in Cork at 22:00h.
25 Feb	Demobilised & post-cruise meeting.