

NOT TO BE CITED WITHOUT PRIOR PERMISSION OF SCIENTIST-IN-CHARGE**CRUISE REPORT: CRUISE LF0793 DEMERSAL FISH SURVEY**

VESSEL: R.V. Lough Foyle (DANI)

DATES: 1 March - 14 March 1993

AREA OF OPERATION: Irish Sea (North); ICES Division VIIa

TYPE OF SURVEY: Otter trawl, acoustics, ichthyoplankton

**OBJECTIVES**

1. Obtain information on spatial patterns of abundance of different size- and age-classes of demersal fish in the northern Irish Sea during Spring;
2. Obtain indices of abundance of juvenile fish for use in future stock assessments, and to evaluate the utility of a Spring survey for providing indices of abundance of adult gadoids;
3. To examine catch-rates in relation to the abundance and vertical distribution of targets in the water column, as inferred from echo-integration during each trawl;
4. Determine the diet composition and feeding levels of predatory fish, and the spatial overlap of predators and their prey;
5. Map the distribution of eggs and larvae of cod and other species in the plankton;
6. Determine pollutant and contaminant levels in samples of water and sediment, and in bodies of trawl-caught dabs at and near the National Monitoring Plan site off Dundrum Bay (DED/ISC project), and in dabs from other sites in the Irish Sea;
7. Collect dabs and squid for projects at the University College Cork.

PERSONNEL (\* disembarked, Belfast, 9 March; \*\* embarked 11 March)

M. Armstrong (S.I.C.)	DANI	SSO
W. McCurdy	DANI	SSO
M. Collas	DANI	HSO
C. Burns*	DANI	ASO
J. Peel	DANI	ASO
P. Moorehead*	DED/ISC	
J. Meneely*	DED/ISC	
S. Lapsley**	DANI	student

## METHODS

A commercial Rockhopper trawl fitted with a 20 mm liner in the cod-end was towed for one hour or three nautical miles at the stations shown in Figure 1. Gear and towing procedures were those employed on all previous DANI groundfish surveys. During each trawl, a 38 kHz transducer was towed to allow echo-integration of targets in the water column.

The catch at each station was sorted to species using a multiple-stage sampling procedure, and length-frequencies were recorded for each species. Subsamples of cod, whiting and hake were taken for recording length, mass, sex and maturity stage, and for removal of otoliths for ageing. Samples of fish were taken for removal of stomachs which were either examined on board or frozen for later analysis. All squid and cuttlefish and samples of 30 dabs at each station were frozen for projects at the University College of Cork. Samples of dabs were also collected at selected stations for examination of contaminant and pollutant levels by ASRD and DED staff.

Immediately after each station, a Bongo net fitted with 300 micron mesh was deployed vertically to estimate the abundance of cod eggs in the plankton. Oblique tows using a double Bongo assembly were attempted initially but abandoned due to poor control of the gear and loss of one of the nets in rough seas.

For the purposes of analysis, the survey area was divided into seven strata defined by depth and substratum (Fig. 1):

Stratum	Region	Depth	Substratum
1	Ards Peninsula-North Channel	< 100 m	Mixed
2	Co. Down - Dublin	< 50 m	Sand and finer
3	Co. Down - Dublin	50 - 100 m	Sand and finer
4	IOM west coast	50 - 100 m	Sand and finer
5	North IOM	< 50 m	Coarse sediments
6	Solway Firth-Liverpool Bay	< 50 m	Sand and finer
7	Anglesey - IOM	< 100 m	Coarse sediments

Although the stations mostly utilize known trawl lanes, it is emphasized that they have a semi-random distribution within each stratum, with greatest emphasis on strata in the western Irish Sea.

**CRUISE NARRATIVE**Sunday 28 February

Lough Foyle departed Belfast at 22h.10 and proceeded towards station 61 south of Luce Bay. During the evening the Fishing Master provided a safety demonstration to the scientific staff.

Monday 1 March

Four trawl stations (61, 63, 256 and 64) were completed in rough sea conditions with 30-40 mph NE winds. The acoustic towed body was only used on the first tow due to the poor conditions. The Bongo net was deployed obliquely at the first station but one of the nets was torn off. Vertical hauls were made at subsequent stations. During the evening the vessel anchored off St. Bees Head.

Tuesday 2 March

Stations 257, 258, 259 and 242 were fished in good conditions with 15-20 mph NE winds. On completion of station 242 the vessel anchored at 20h.50 off Barrow-in-Furness.

Wednesday 3 March

Stations 250, 249, 247 and 246 were completed in light easterly winds. Acoustic targets were abundant throughout the water column off Liverpool Bay. As in March 1992, a large catch of whiting was taken at station 246. In the evening, the vessel drifted between the Isle of Man and Anglesey.

Thursday 4 March

Stations 245, 243, 102 and 76 were fished in almost calm conditions. Acoustic targets were abundant at station 243 where 78 kg of adult herring, some spawning, were taken. On completion of station 76, the vessel proceeded SW towards station 103.

Friday 5 March

Three existing stations (103, 56 and 94) and one new (104) station were fished in N to NW winds of 10-20 mph. Large catches of herring were taken at the first three stations. Jellyfish were also abundant. On completion of station 104 at approx. 18h.00, the vessel anchored off Howth for the night.

Saturday 6 March

Stations 93, 92, 79, 75 and 90 were completed in calm conditions. Herring were again abundant and nearly four tonnes were taken at station 92. On completion of station 79 the vessel anchored for the night to the south of Clogher Head.

### Sunday 7 March

Stations 73, 71, 80 and 208 were fished in good to moderate conditions. At station 80 the area to be trawled was first surveyed for gill-nets that were staked out in the vicinity, and local fishermen were contacted to determine the location of the nets. The transducer was not towed at station 208 due to a fault in the echosounder. Three additional Bongo net samples were taken offshore of the last trawl station (208) after which the vessel drifted for the night.

### Monday 8 March

Three stations were fished (17, 100 and 88) before commencing grab sampling and water sampling at the National Monitoring Plan site just offshore of station 17. Conditions were moderate with southerly 25 mph winds combining with very large tides. After the successful completion of sampling, the vessel drifted for the night in the vicinity of the offshore trawl sites.

### Tuesday 9 March

Stations 101 and 81 were fished in 15 mph SE winds. On completion of station 81 at about 10h.30, the vessel headed back to Belfast for the mid-cruise break, docking at 15h.00.

### Wednesday 10 March

In port.

### Thursday 11 March

Lough Foyle departed Belfast at 10h.00. Shortly after departure a fire drill was held and the use of the stretcher was practiced using Mr Lapsley as the "casualty". Work commenced at 11h.30 at station 35. On completion of stations 86 and 83 the vessel proceeded southwards during the night towards stations off the southwest of the Isle of Man.

### Friday 12 March

Stations 50, 96, 77, and new station 105 were completed in 20 mph southerly winds. After station 77 the vessel anchored off Peel for the night.

### Saturday 13 March

Stations 48, 51, 216 and 99 were fished in moderate conditions, with large catches of whiting being taken. An additional Bongo station was completed after trawl 99, after which the vessel anchored off Peel for the night.

## Sunday 14 March

Two trawl stations (46 and 97) and an additional Bongo station were completed in the morning. The vessel then returned to Belfast, docking at 16h.45

### WORK COMPLETED

Forty six valid hauls were completed (Fig. 1). Two of these were new stations for *Lough Foyle*. The positions of the trawl stations and the total catches are given in Table 1.

Length measures were carried out on approximately 38,000 fish. Where possible, hardy fish such as dogfish and rays were returned alive to the water after measuring. A total of 392 cod, 1305 whiting, 212 haddock, 219 herring and 73 hake were analysed for length, mass and maturity stage. Otoliths were taken from each fish for ageing. Approximately 1500 fish stomachs were examined or frozen for later analysis. The new Marel balance was used for weighing items from cod stomachs.

Fifty two vertical Bongo net hauls (300 micron net) were completed for enumeration of eggs and early larvae of cod and other species. Echo integrations were carried out at each station using the Hadas software. At slow trawling speeds of approx. 3 knots through the water, the towed body could not attain a horizontal position. As a result it swam slightly nose-down and was more affected by motion of the vessel than would normally be the case. This resulted in a larger than normal dead-zone near the seabed.

The Day Grab was successfully deployed on a grid of nine sampling points at the National Monitoring Plan Site off Dundrum Bay on Monday 8 March (Fig. 1). A portable CTD was deployed at each point, and water samples were taken for analysis. Samples of muscle and liver tissue were taken from dabs caught at trawl station 17, close to the site. Tissue samples were also taken from dabs at other selected sites throughout the survey.

### PRELIMINARY RESULTS

The catch-rates of selected species are given in Table 2. Catches of cod and whiting were slightly lower than in March 1992, whilst catches of herring and plaice were higher. However, the 1991 year-classes of whiting, cod and haddock, which provided high catch-rates of 0-year-old fish in the September 1991 survey, were strongly represented in the March 1993 survey (as inferred from length-distributions, Fig. 2). Length distributions of whiting in selected survey strata are shown in Figure 3. Adult herring were widespread, with some evidence of spring spawning on both sides of the Irish Sea.

Echo integration showed extensive areas of scattering layers of whiting and other fish 10 to 20 metres off the seabed, particularly between the Isle of Man and the Irish Coast. This had also been noted

in cruise LF0693 where these layers had been sampled by midwater trawl.

A high proportion of cod and whiting sampled during this trip had ripe or ripe-running gonads. Some ripe-running herring were also taken.

Table 4 provides a summary of the stomach contents of cod analysed during the survey. As found previously, Nephrops are an important part of the diet of cod in the western Irish Sea. Whiting are also preyed on extensively by cod during the spring cod-run, as found during DANI stomach sampling programme in 1982 and 1983.

#### ACKNOWLEDGEMENTS

The Master and personnel of the Lough Foyle are thanked for their enthusiastic cooperation throughout the cruise. The Fishing Master is particularly acknowledged for ensuring efficient and consistent trawling operations. The scientific personnel are thanked for their hard work in sorting and measuring the large catches taken on this trip. Particular thanks are extended to DED/ISC personnel who provided much-needed help during the first part of the trip when there was a prevalence of large and difficult-to-sort catches.

Signed:

Scientist - in charge: ..... *M. J. Armstrong* ..... date..... *15/3/93* .....

Ships master: ..... *[Signature]* ..... date..... *15/3/93* .....

Division Head: ..... *S. J. Henry* ..... date..... *17.3.93* .....

1. Details of trawls during survey LF0793 (March 1993)

Date	trawl	shooting		hauling		mean depth (m)	dist. towed nm	total fish catch kg	
		time	lat	long	lat				long
March	61	08h.55	54 33.4	4 36.9	54 32.9	4 32.7	41	2.7	211
	63	11h.58	54 36.0	4 16.9	54 37.0	4 11.9	52	3.4	119
	256	14h.24	54 36.0	3 58.5	54 38.2	3 55.2	34	3.0	146
	64	16h.41	54 38.2	3 45.2	54 35.3	3 43.6	22	3.2	84
March	257	07h.24	54 26.6	3 46.0	54 24.0	3 43.2	27	3.2	195
	259	09h.44	54 18.6	3 42.7	54 15.7	3 41.5	34	3.1	98
	258	13h.07	54 21.5	3 56.2	54 18.5	3 55.4	36	3.2	206
	242	16h.43	54 07.1	4 02.6	54 03.9	4 02.8	36	3.2	293
March	250	07h.24	54 06.3	3 38.9	54 03.3	3 38.0	30	3.0	309
	249	10h.27	53 48.2	3 43.7	53 45.6	3 41.3	35	3.0	124
	247	13h.02	53 36.3	3 22.0	53 33.6	3 29.2	24	3.2	262
	246	15h.36	53 29.0	3 42.8	53 29.1	3 48.0	34	3.1	718
March	245	07h.26	53 30.1	4 12.9	53 31.1	4 16.4	48	2.4	112
	243	10h.34	53 46.6	4 07.9	53 49.1	4 11.0	47	3.0	191
	102	14h.04	53 44.0	4 39.0	53 46.9	4 40.7	60	3.1	130
	76	17h.10	54 00.8	4 23.1	53 59.8	4 27.3	46	2.7	121
March	103	07h.24	53 36.7	5 22.1	53 34.0	5 24.5	84	3.1	94
	56	10h.20	53 29.9	5 42.0	53 32.8	5 44.3	70	3.4	563
	94	13h.40	53 22.9	5 45.9	53 20.9	5 49.1	54	3.2	651
	104	16h.32	53 13.2	5 49.4	53 16.2	5 49.1	22	3.0	643
March	93	07h.17	53 28.8	5 49.0	53 31.6	5 50.7	58	3.0	487
	92	09h.23	53 34.6	5 54.0	53 37.1	5 56.9	41	3.0	4110
	90	13h.00	53 40.7	5 39.7	53 37.8	5 41.5	84	3.1	58
	75	15h.12	53 39.2	5 50.0	53 42.2	5 49.4	55	3.0	238
	79	17h.32	53 41.1	5 58.3	53 43.9	6 00.7	31	3.1	284
March	73	07h.12	53 52.4	6 06.5	53 50.1	6 03.2	30	3.1	425
	71	09h.33	53 54.7	5 53.2	53 54.2	5 48.0	49	3.0	336
	80	12h.37	54 00.2	5 52.4	54 57.4	5 53.5	36	2.9	152
	208	15h.23	53 48.2	5 46.7	53 50.9	5 44.1	61	3.0	908
March	117	07h.25	54 07.0	5 31.5	54 04.4	5 34.0	58	3.0	303
	100	10h.26	54 11.5	5 40.4	54 08.8	5 40.8	30	2.7	160
	88	12h.49	53 59.7	5 39.5	53 56.7	5 39.5	68	3.0	781
March	101	07h.11	54 07.4	5 19.0	54 10.2	5 20.8	85	3.0	268
	81	08h.59	54 11.8	5 23.8	54 14.9	5 24.5	51	3.1	319

TABLE 1 (contd.). Details of trawls during survey LF0793 (March 1993)

Date	trawl	shooting			hauling			mean depth (m)	dist. towed mm	total fish catch kg
		time	lat	long	lat	long				
11 March	35	11h.37	54 43.9	5 40.1	54 44.4	5 37.8	20	1.5	575	
	86	13h.54	54 38.4	5 26.7	54 37.2	5 26.2	42	1.3	21	
	83	16h.56	54 24.8	5 18.3	54 21.8	5 17.3	92	3.1	76	
12 March	105	07h.41	53 41.2	5 07.2	53 43.6	5 07.6	70	2.4	73	
	50	10h.05	53 45.1	5 20.3	53 48.3	5 17.8	76	3.6	96	
	96	12h.24	53 50.2	5 05.9	53 53.1	5 06.0	70	3.0	158	
	77	15h.47	53 49.5	4 43.4	53 51.1	4 41.0	68	2.1	81	
13 March	48	07h.52	54 01.1	4 59.7	53 58.0	4 57.6	56	3.3	802	
	51	10h.32	53 53.9	4 58.3	53 50.9	4 57.3	72	3.1	383	
	216	14h.09	53 56.4	5 11.6	53 59.1	5 09.2	67	3.1	663	
	99	16h.36	54 05.8	5 03.2	54 08.5	5 00.5	83	3.2	194	
14 March	46	07h.42	54 11.7	4 57.6	54 08.9	4 55.9	78	3.0	85	
	97	10h.10	54 18.3	4 54.0	54 21.1	4 56.2	82	3.0	293	



Table 1. Cruise LF/07/93: catches of selected species  
in kg per tow

STRATUM 1 Belfast Lough - Strangford Narrows

STN. dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB FLOUNDER	GURNARDS	LESSER SP. DCG	SPUR- DCG	NEPHROPS
35 1.54	1.3	198.9		2.1	.9	2.2		362.0	2.3	2.3	.4	.7	1.0		
86 1.25	11.3	2.6				1.8		.4	.5	.1	.2	.0	2.9		.1
83 3.07	10.2	26.1	.3	.5	.3	3.0	.3	.4	.6	.2		.0	3.2	30.4	.0
MEAN	7.6	75.9	.1	.9	.4	2.3	.1	120.9	1.1	.9	.2	.0	2.3	10.1	.0

STRATUM 2 Irish Coast: < 50 metres

STN. dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB FLOUNDER	GURNARDS	LESSER SP. DCG	SPUR- DCG	NEPHROPS	
94 3.24	14.8	92.5		1.3	.2	5.0	8.3	466.0	1.2	17.5	1.1	10.6	13.9			
104 3.00		47.2		1.5			.0	548.0	.5	25.1	.6	.9	12.4			
92 3.00	13.2	409.9		10.8			.3	3480.0	33.8	149.0	4.4	1.3	.6		.3	
79 3.10	7.1	78.1		21.3		.0		17.6	32.9	100.0	17.4		3.3			
73 3.06	8.5	82.7		1.3		.0		.7	179.0	104.4	40.1	4.1				
71 3.03	38.1	86.0	.5	3.6		.1	.4	131.4	20.9	8.5	41.8	.7	.3			
90 2.93	.9	64.7		10.3	.1	16.3	.0	13.2	23.0	97.2	16.5	.4	.2	.4		
100 2.69	9.1	19.4		2.6		.0	.5	4.2	61.1	43.5	13.4	5.0	.2	.9		
91 3.13	13.8	92.2	2.0	9.9		1.8	4.6	167.0	2.8	3.3	1.6		15.0		4.1	
MEAN	11.7	108.1	.3	6.9	.0	2.6	1.6	536.5	39.5	59.8	15.2	1.1	1.9	4.8	.0	.5

STRATUM 3 Irish Coast: 50 - 100 metres

STN. dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB FLOUNDER	GURNARDS	LESSER SP. DCG	SPUR- DCG	NEPHROPS	
56 3.44	20.7	293.0	.4	.6		6.0	9.9	224.0	.4	5.2	.1	1.1			20.0	
93 3.00	44.5	222.0		4.1	.3	14.7	27.9	160.0	.0	9.3	.1	.7			1.5	
75 3.00	4.8	108.0	.9	2.7	.2	1.7	2.0	112.2	.3	2.3	.9	2.2			.2	
90 3.10	20.2	25.4	.3			2.2	2.9	2.3	1.3	.3		.4			1.2	
208 3.00	15.7	450.0		16.0		1.4	27.0	387.0	.1	1.2	1.4	5.0			2.7	
17 3.00	35.6	42.2	2.5	8.9		.8	12.2	175.0	.4	3.7	14.9	1.3		.1	.4	
98 3.00	20.6	430.0	3.6	38.4	.3	2.7	18.1	260.0	.4	2.0	1.1	1.8			.3	
101 3.00	3.9	240.1	1.6	1.3		3.9	5.7	4.9	.0	.0	.4	.9		2.0	23.5	
MEAN	20.7	226.3	1.2	9.0	.1	4.2	13.2	165.7	.4	3.0	2.3	.0	1.7	.0	.3	6.2

Table 2 (contd.) Cruise LF/07/93: catches of selected species in kg per tow

STRATUM 4 West - Southwest Isle of Man : 50 - 100 metres

STN.	dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB	FLOUNDER	GURNARDS	LESSER SP. DOG	SPUR- DOG	NEPHROPS
103	3.07	27.8	34.5		10.4		.6	1.0	.5	.8	2.2	.2	4.2	1.0	1.5		
50	3.55	19.8	42.3	2.1	8.2	.1	1.2	.9	3.6	.1	1.5	1.3		5.0	.7		.4
96	3.00	7.3	136.4		3.3		1.6	4.4	1.4	.1	.1	.2		1.3	.2		.9
48	3.31	6.5	523.0	1.2	34.3	2.4	55.5	22.3	101.3	.1	.9	3.2		3.9	36.4		
51	3.08	3.6	285.0		7.5		2.1	.6	2.2	.0	.3	.5		3.4	66.3		.1
216	3.06	19.0	590.0	5.2	5.9		1.0	12.9	1.2	.1	1.9	1.0		12.1	4.3		4.4
99	3.15	29.4	127.6	7.4	.3	.3	2.1	6.7	2.6	.0	.7	1.0		6.8	3.2		9.5
46	3.00	6.7	51.6	4.1	3.5	.3	1.8	3.3	1.5	.1	1.2	.4	.6	1.6	1.9		15.8
97	3.00	15.9	99.8	5.8	10.1	1.3	4.0	1.8	149.0	.4	.4	.4		1.5	1.4		10.0
MEAN		15.0	210.0	2.9	9.3	.5	7.8	6.0	29.3	.2	1.0	.9	.5	4.1	12.9	.0	4.6

STRATUM 5 North Isle of Man

STN.	dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB	FLOUNDER	GURNARDS	LESSER SP. DOG	SPUR- DOG	NEPHROPS
61	2.70	140.3	1.4			.3	1.2			.0	.2	.1			42.2	9.0	
63	3.44	42.2	6.2	.6	1.3	8.4	9.1		.4	.1	1.4	.1		.0	45.7		
MEAN		91.2	3.8	.3	.7	4.3	5.2	.0	.2	.0	.8	.1	.0	.0	43.9	4.5	.0

STRATUM 6 Solway Firth - Liverpool Bay

STN.	dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB	FLOUNDER	GURNARDS	LESSER SP. DOG	SPUR- DOG	NEPHROPS
256	3.00	4.0	70.3			1.3	1.8		2.0	.9	52.1	2.0	1.8	.1	7.2		
64	3.15	3.4	53.4			1.1	.0		9.0	.9	51.9	3.1	7.3		3.8		
258	3.17	1.4	91.6			10.7	5.4	.0	14.8	2.7	42.7	11.9	18.8	.9	.8		15.5
257	3.15	7.7	125.5			1.3	.2		2.1	6.9	31.0	3.2	15.8	.0			42.2
259	3.07	2.2	40.9	.4		2.5	3.0		23.6	2.0	5.9	8.7	8.4	.0			39.5
250	3.02	3.2	189.6			6.5	6.5	.1	9.6	4.2	21.2	44.7	16.2	.1			17.9
242	3.17		166.9			.2	10.0	.1	60.8	.6	8.8	5.6	22.7	10.9	1.8		
249	3.00	4.4	41.8		1.1		7.9	.0	2.1	.4	17.1	24.7	17.4	.4	.8		.6
247	3.19	6.9	197.2			.4	9.9		.8	.2	6.3	31.4	6.8	3.8	1.3		
246	3.08	11.4	553.0			2.1	24.0		28.7	.7	17.5	62.4	3.8	1.2			
MEAN		4.5	152.0	.0	.1	2.6	6.9	.0	15.3	2.0	25.5	19.8	11.9	1.8	1.6	.0	11.6

Table 2 (contd.) Cruise LF/07/93: catches of selected species  
in kg per tow

STATION 7 Anglesey - Isle of Man

STN.	dist. towed	COD	WHITING	HAKE	HADDOCK	POUTING	POOR COD	NORWAY POUT	HERRING	SPRAT	PLAICE	DAB	FLOUNDER	GURNARDS	LESSER SP. DOG	SPUR- DOG	NEPHROPS
245	2.36	16.1	22.9	.4	.3	10.8	4.8	.0	.5	2.1	17.5	3.2	6.1	.3	22.5	3.0	
243	3.03	4.5	76.2			2.2	2.2	.0	78.4	.1	1.1		10.1	3.4	32.6		
102	3.05	25.7	31.9	.4	4.2	4.9	5.1	.1	1.9	.0	5.6	.4		7.8	20.6		
77	2.22	3.9	10.8		1.9	1.9	3.1	.0	.9	.6	1.2	.2		2.8	52.2		.0
76	2.66		82.3			4.2	14.8		7.9	.0	2.0	.1	.6	.3	8.0		
105	2.40	1.9	35.7		11.0		1.2	2.6	.6	.4	3.9	.2		1.0	4.2	3.5	
MEAN		3.4	43.3	.1	2.9	4.0	5.2	.5	15.0	.5	5.2	.7	2.8	2.6	23.4	1.1	.0

Percentage composition of the weight of stomach contents of cod during cruise LF8793. Data are given by stratum (see Fig. 1) and in two size-classes of cod

Table 3

(a) Cod less than 50 cm long

SURVEY STRATUM

FOOD TYPE	1	2	3	4	5	6	7
Nephrops	10.8	20.5	24.2	44.7	.0	4.8	.0
Whiting	.1	21.0	29.1	3.6	.0	15.4	.0
Haddock	2.5	.0	.0	.0	.0	.0	.0
Herring/sprat	.0	2.6	.0	.0	.0	.0	.9
Other fish	33.6	37.9	37.2	22.6	6.3	19.5	23.0
Other crustacea	41.5	14.5	9.2	17.0	26.6	53.0	54.0
Shelled molluscs	.1	.0	.0	4.7	1.5	6.6	1.6
Polychaetes	3.1	.8	.2	7.4	.0	.7	8.7
Cephalopods	1.8	2.6	.0	.0	.0	.0	7.4
Other	6.6	.1	.1	.0	65.6	.0	4.4
Number with food	24	46	41	50	19	13	22

(b) Cod of 50 cm and longer

FOOD TYPE	1	2	3	4	5	6	7
Nephrops	69.0	11.5	24.6	13.0		.0	2.1
Whiting	.0	74.7	38.0	42.0		.0	1.8
Haddock	.0	.0	.0	8.5		.0	.0
Herring/sprat	.0	.0	8.6	1.0		.0	.0
Other fish	12.3	8.4	8.0	8.0		59.4	19.6
Other crustacea	9.7	5.4	12.2	15.8		40.6	11.3
Shelled molluscs	.0	.0	2.0	6.8		.0	.0
Polychaetes	9.1	.0	6.6	4.6		.0	61.4
Cephalopods	.0	.0	.0	.3		.0	.0
Other	.0	.0	.0	.0		.0	3.8
Number with food	2	19	23	20	0	4	6

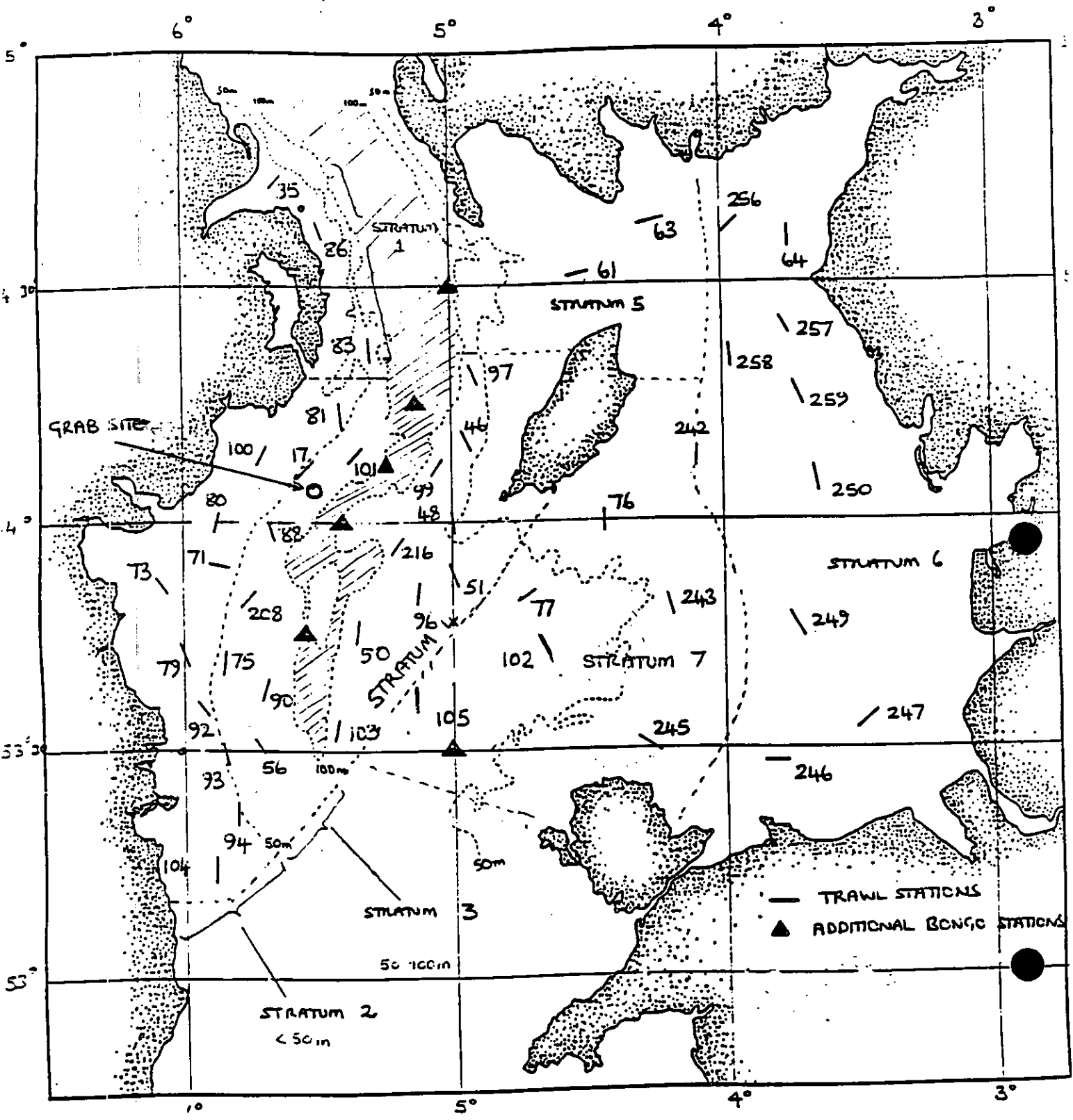
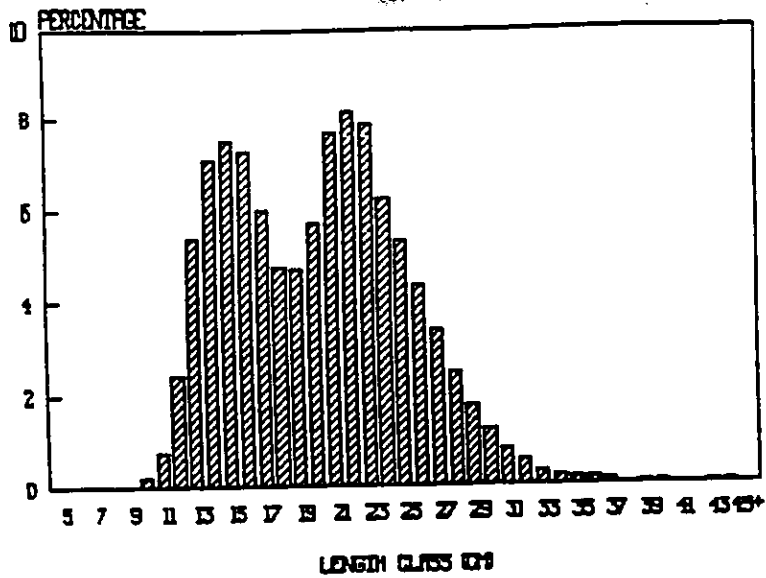
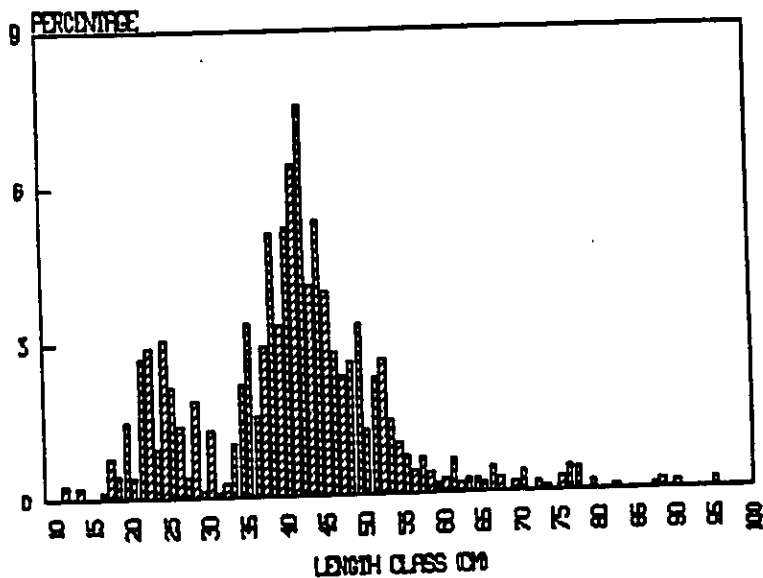


Fig. 1. Stations completed during cruise LF0793, March 1993



COD: MARCH 1993



HADDOCK: MARCH 1993

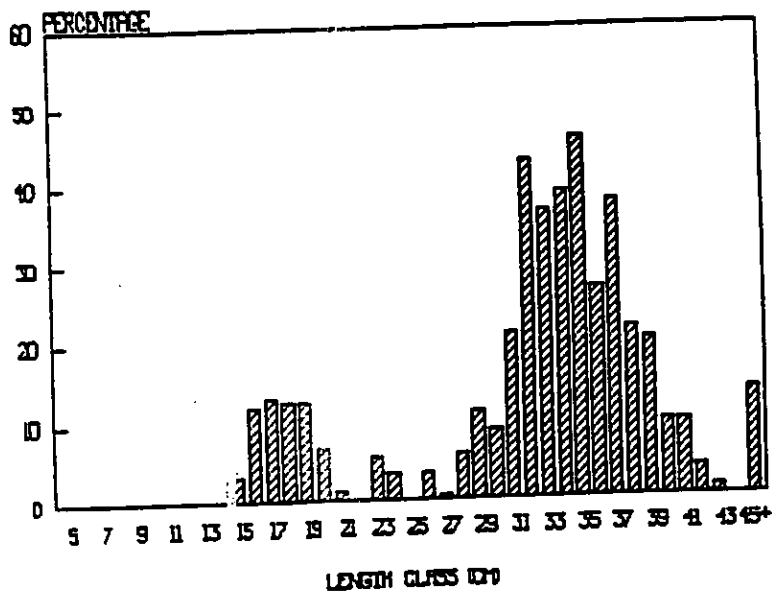


Fig. 2. Weighted mean length frequencies of whiting, cod and haddock in survey strata 1, 2, 3, 4, 6 and 7 during cruise LF0793.

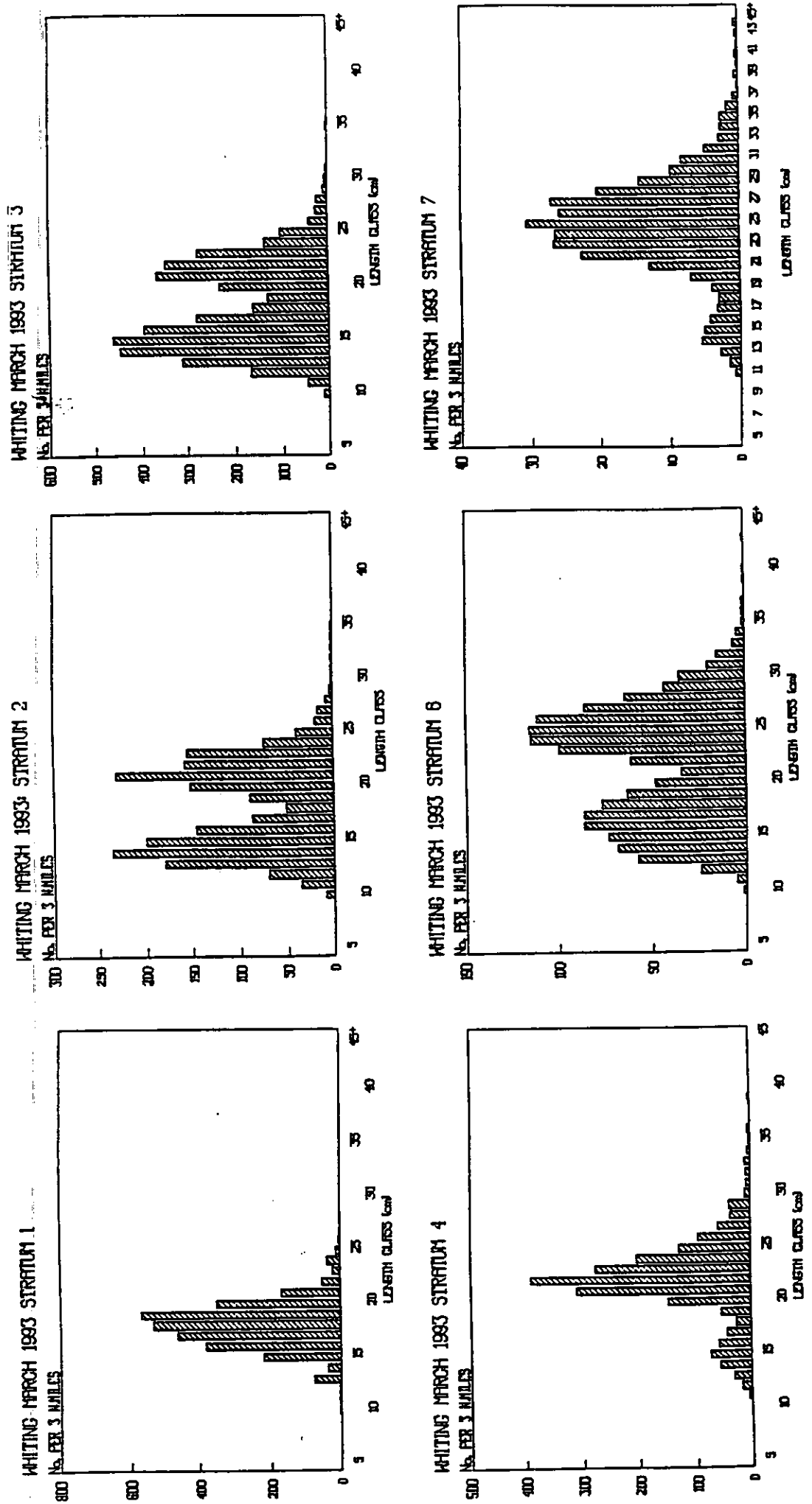


Fig. 3. Length frequencies of whiting in each survey stratum (excluding stratum 5 which had only 2 stations) in cruise LF0793.