DEPARTMENT OF AGRICULTURE FOR N. IRELAND
AGRICULTURAL AND ENVIRONMENTAL SCIENCES DIVISION

CRUISE REPORT: CRUISE LF/18/95: PELAGIC FISH ACOUSTIC SURVEY

VESSEL: R.V. Lough Foyle (DANI)

DATES: 11 - 22 September 1995

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

TYPE OF SURVEY: Acoustics / midwater trawling

PERSONNEL:

M. Armstrong	SSO	(DANI; S.I.C.)
W. Clarke	SSO	(DANI)
M. Dickey-Collas	HSO	(DANI)
M. McAliskey	SO	(DANI)
C. Burns	ASO	(DANI)
J. Peel	ASO	(DANI)
D. Steele		(RSPB)

OBJECTIVES

1. To estimate the distribution, biomass and age-composition of herring in the northern Irish Sea;

2. To determine the distribution, biomass and size-composition of sprat in the northern Irish Sea;

3. To relate the distribution and abundance of seabirds to the distribution of acoustic targets along the survey track;

METHODS

A sphere-calibrated Simrad EK-500 echosounder with 38 kHz and 120 kHz split-beam transducers mounted in a towed body were employed to carry out echo integrations along transects in the Northern Irish Sea (Fig. 1). Calibrations were carried out at the commencement of the cruise. The survey grid was stratified to allow increased sampling intensity off the Mourne Coast and around the Isle of Man where highest densities of adult herring were expected. Acoustic targets were identified by means of aimed tows of a Maritin 54m x 47m midwater trawl fitted with a 20-mm stretched-mesh liner and a Furuno netsonde. Species compositions and length-frequencies were recorded from all trawl catches. Subsamples of up to 50 herring were taken from each catch for recording of age and other biological parameters. Distribution and abundance of seabirds along the cruise track were monitored using standard survey methods.

CRUISE NARRATIVE

The vessel departed Belfast at 21h.30 on Sunday 10 September, and proceeded overnight to Dundrum Bay where the 38 kHz and 120 kHz

transducers were calibrated successfully during the following morning. The survey was suspended at 17h.00 on 11 September to allow the vessel to return to Belfast in preparation for a VIP visit on 12 September. Two transects off Belfast Lough were surveyed on 12 September, and both the midwater trawl and the Gulf-3 sampler were deployed before returning to port at 14h.30 to put the guests ashore. After departure at 16h.50 on 12 September, the survey re-commenced at the mouth of Belfast Lough. The survey proceeded in good conditions, the area off the Irish Coast being completed by the evening of 14 September. The area from North Wales to the Solway Firth was then surveyed, before commencing transects off the east coast of the Isle of Man during late afternoon on 16 September. The daylight survey of the Manx East Coast was completed off Port St Mary on 17 September. Additional transects were then surveyed between dusk and early morning, terminating off Maughold Head on the east coast of the Isle of Man at 11h.40 on 18 September. The vessel then berthed in Douglas for the mid-cruise break.

The Lough Foyle left Douglas at 17h.55 on Tuesday 19 September. Four transects off the Manx East Coast were re-surveyed during darkness before commencing the survey grid on the Manx West Coast on 20 September. Transects off the south coast of Scotland between Wigtown Bay and Luce Bay were surveyed during 21 September. The remaining transects off the Mull of Galloway were completed by mid-day on 22 September. The vessel then proceeded to Belfast, berthing during mid-afternoon.

WORK COMPLETED

Calibration

The EK-500 system was calibrated in Dundrum Bay on 11 September. The procedure was facilitated by newly built servo-motors for adjusting the length of the lines to the sphere. Conditions were breezy although the sea conditions were slight. The following small corrections were made to transducer gain settings compared with the previous calibration in Belfast Lough on 25 January 1995:

Instrument setting	Transducer	Old setting	New setting
TS transducer gain	ES38B (38 kHz)	27.0	27.0
Sv transducer gain	ES38B	26.5	26.6
TS transducer gain	ES 120-7 (120 kHz)	25.4	25.7
Sv transducer gain	ES 120-7	25.4	25.4

Echo integration

The 38 kHz and 120 kHz echosounders were run continuously during the survey at the settings given in Table 1. Data at both frequencies were captured using the EP-500 software and were backed up daily on digital audio tapes. Surveying took place mainly between dawn and dusk to allow clear separation of plankton and fish echoes. Additional transects were surveyed during darkness off the Isle of Man due to the tendency of herring to occur very close to the seabed during daylight in this region.

Target identification and biological analysis
Twenty three successful midwater trawl tows were completed for identification of acoustic targets. The trawl positions are shown on Figure 1. Details of the tows are given in Table 2. Species compositions and length frequencies were recorded for each catch. A total of 400 herring were sampled for length, weight, age, maturity and vertebral count. Length - weight parameters were estimated for the main species caught (Table 3). Catches comprised mainly sprat and herring, with smaller quantities of whiting, mackerel and Norway pout. Anchovies were caught in tows 10-12 in the eastern Irish Sea.

Seabird observations
Distribution and abundance of seabird species were recorded at intervals during daylight hours along each transect. Observations were carried out over a period of approximately 9 hours each day.

RESULTS

Echo-integration
The EK-500 and towed transducer provided continuous recording of echo-integration data in specified depth channels. Data were also logged using the EP-500 software allowing post-processing where necessary.

Large, adult herring of 22-30 cm length were found mainly in loose, scattering layers along the seabed in a large patch about 5 miles offshore between Laxey and Langness on the Manx East Coast. Off the west coast of the Isle of Man, a dense layer of 17 - 25 cm herring was observed along the seabed 7-12 miles offshore between Peel and Jurby. A number of dense schools, which may have been herring, were observed between the Scottish Coast and the Isle of Man, but the could not be caught due to avoidance of the net (tow 23). A scattering layer of adult herring and sprat was observed inshore along the Mull of Galloway. No other concentrations of herring, other than small juveniles mixed with sprats, were positively identified. Sprat were found in very high densities in Irish coastal waters south of Ardglass, and in the coastal region between Morecambe Bay and the Solway Firth. High densities of sprats were also recorded off the NE coast of the Isle of Man and off the Mull of Galloway.

Analysis of the echo-integration data collected during the survey will provide estimates of biomass for both herring and sprat. The estimate for herring will be submitted to the 1996 meeting of the ICES Herring Assessment Working Group. Information from the survey will contribute to an in-depth study of Manx herring being carried out jointly in 1995 between DANI and the Port Erin Marine Laboratory, with assistance from the NI Fishing Industry.

Seabird distribution
The general distribution of seabirds was broadly similar to the pattern observed during the DANI acoustic survey in August - September 1994. Auks and shearwaters were most abundant in relatively shallow water along the coasts of Ireland, Cumbria, the Solway Firth and the Mull of Galloway, and in slightly deeper water off the Manx West Coast. These smaller seabirds were

observed mainly in regions where sprat and small herring, which form part of their diet, were abundant within foraging depths. Numbers were low in the deeper offshore regions and off the Manx East Coast. The distribution of gannets was similar to that of auks, but extended into waters off the Manx East Coast where the pelagic fish population consisted mainly of adult herring.

ACKNOWLEDGEMENTS

The Ship's Master, Officers, Fishing Masters, Engineers, Catering Staff and Crew are thanked for their cooperation and service during this cruise. The scientific staff are also acknowledged for their dedicated hard work.

Signed:

Scientist in charge.....M.O. Armstrong..... **date**.....29/9/95.....

Ships master.....[signature]..... **date**.....29.9.95.....

ASG

Division Head.....[signature]..... **date**.....8.11.95.....

Table 1 EK-500 instrument settings used during cruise LF1895

Transducer	ES38B	ES120-7
Frequency	38 kHz	120 kHz
(1) TRANSCEIVER MENU		
Absorption coefficient	10 dB/km	38 dB/km
Pulse length	Medium (1.0 ms)	Medium (0.3 ms)
Bandwidth	Wide	Wide
Max. power	2000 W	1000 W
Angle sensitivity	21.9	21.0
2-way beam angle	-21.2 dB	-20.7 dB
Sv transducer gain	26.6 dB	25.4 dB
TS transducer gain	27.0 dB	25.7 dB
3 dB beamwidth	6.6 dg	7.0 dg
Alongship offset	0.0 dg	0.0 dg (offsets not yet
Athwartship offset	0.0 dg	0.0 dg calibrated)

(2) OTHER SETTINGS	
Operation menu:	Ping rate = 0.5s (25, 50m range); 0.8s (100m); 1.0s (250m)
Log menu:	Mode = ping based Ping interval = 1800 (25, 50m range); 1125 (100m); 900 (250m)
Layer menu:	Super-layer = 9 - 250m
Printer / EP-500 settings: (both frequencies)	Sv colour min. = -70 dB TS colour min. = -50 dB
TS detection menu: (both frequencies)	TS min. = -50 dB Min. echo length = 0.8 Max. echo length = 1.3 Max. gain compensation = 3.0 dB Max. phase deviation = 4.0 dB
Bottom detection menu:	Minimum level = -50 dB (deep water; soft seabed) -40 dB (shallower water, hard seabed)

Table 2 :Details of trawl catches taken during cruise LF1895

		Shooting details				Total	percentage composition by weight					Mean length (cm)	
Tow	Date	Time	Lat.	Long.	depth (m)	catch kg.	sprat	herring	mackerel	gadoids	other	sprat	herring
1	11 Sept.	16h.30	54, 05.1	5, 38.4	34	147	98.0	0.6	1.4	0.0	0.0	8.4	11.5
2	12 Sept.	12h.22	54, 45.9	5, 35.4	54	86	0.7	57.8	0.0	41.5	0.0	10.1	18.8
3	13 Sept.	07h.45	54, 14.9	5, 31.0	25	10	97.0	3.0	0.0	0.0	0.0	12.5	15.0
4		09h.30	54, 14.9	5, 19.9	53	621	99.6	0.3	0.0	0.1	0.0	8.6	10.3
5		16h.50	54, 07.2	5, 37.1	30	141	99.2	0.8	0.0	0.0	0.0	9.4	10.1
6	14 Sept.	08h.30	53, 55.2	5, 08.8	61	260	96.5	1.0	0.0	2.5	0.0	7.0	11.8
7		12h.56	53, 45.2	5, 45.1	79	144	89.8	8.5	0.8	0.9	0.0	8.7	11.8
8		18h.52	53, 34.4	5, 18.5	78	35	56.7	8.3	3.2	28.1	3.7	6.5	11.5
9	15 Sept.	07h.30	53, 50.1	4, 38.5	56	0							
10		16h.45	54, 05.1	3, 38.0	30	173	96.7	3.1	0.2	0.0	0.0	8.5	15.5
11	16 Sept.	06h.15	54, 15.3	3, 45.2	35	110	95.4	0.5	0.5	3.2	0.4	8.7	13.8
12		09h.05	54, 25.2	3, 45.6	27	75	92.3	0.6	3.4	0.2	3.5	7.0	13.6
13		11h.12	54, 29.1	3, 38.5	18	60	83.7	0.8	1.1	14.3	0.0	5.4	11.6
14		13h.54	54, 42.8	3, 51.5	22	320	95.7	3.8	0.2	0.2	0.0	7.5	14.0
15	18 Sept.	02h.33	54, 06.8	4, 18.3	32	662	0.0	98.9	1.1	0.0	0.0		25.5
16		06h.12	54, 10.6	4, 19.0	30	21	0.0	74.2	25.8	0.0	0.0		25.3
17		09h.52	54, 19.3	4, 11.6	24	207	62.7	2.4	0.2	34.6	0.1	13.1	19.7
18	20 Sept.	00h.35	54, 04.5	4, 27.9	33	222	0.0	100.0	0.0	0.0	0.0		26.1
19		08h.48	54, 01.9	5, 00.1	70	1042	99.8	0.1	0.0	0.1	0.0	9.6	11.8
20		12h.55	54, 12.8	4, 56.6	83	134	36.3	59.8	0.0	3.9	0.0	7.6	19.5
21		16h.40	54, 21.1	4, 55.9	88	1966	3.4	94.0	2.2	0.3	0.0	7.4	20.0
22	21 Sept.	07h.53	54, 28.4	5, 01.5	120	90	63.0	5.3	0.9	30.4	0.4	7.4	11.0
23		16h.16	54, 32.9	4, 26.2	41	0							
24	22 Sept.	08h.15	54, 39.8	5, 05.4	123	102	99.9	0.0	0.0			7.3	11.0
25		09h.20	54, 44.0	5, 01.3	28	429	79.9	20.1	0.0			7.5	25.6

Table 3 Length - weight parameters estimated during cruise LF1895
(Lengths in cm; weights in g)

SPECIES	INTERCEPT	SLOPE	SAMPLE SIZE
Herring	0.00267	3.368	612
Sprat	0.00364	3.301	400
Anchovy	0.00405	3.161	50
Mackerel	0.00582	3.099	64
Scad	0.00699	3.145	5
Whiting	0.00724	3.030	156
Norway Pout	0.00502	3.167	90
Grey Gurnard	0.00604	3.062	13

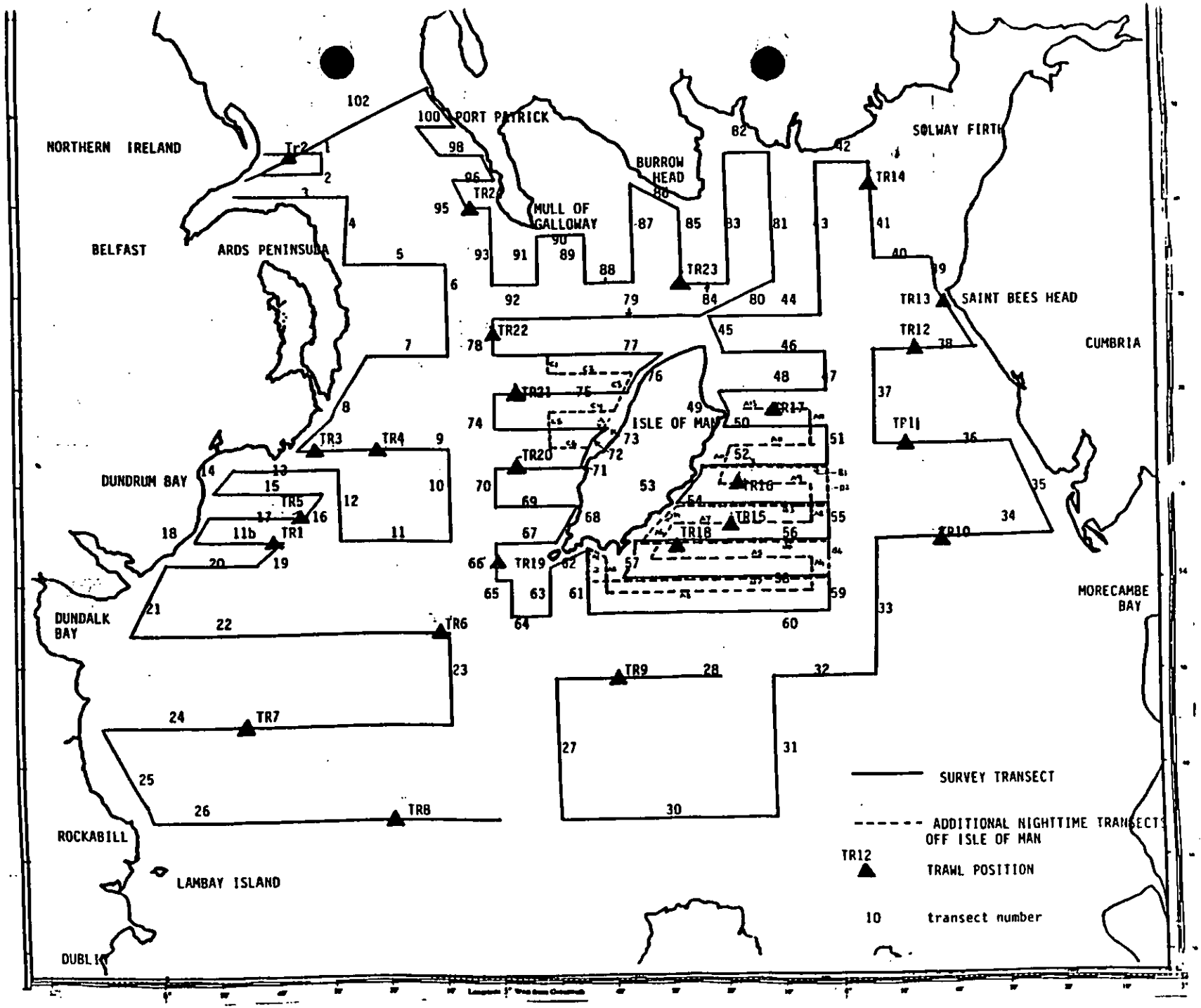

Figure 1 Survey grid for cruise LF1895, showing trawl positions and transect numbers.