

CRUISE REPORT: LF/36/96: PELAGIC FISH ACOUSTIC SURVEY

VESSEL: R.V. *Lough Foyle* (DANI)

DATES: 2 - 12 September 1996

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

TYPE OF SURVEY: Acoustics / midwater trawling

PERSONNEL:

M. Armstrong	(DANI: S.I.C.)
W. Clarke	(DANI) (2 - 7 Sept only)
W. McCurdy	(DANI)
M. Dickey-Collas	(DANI)
M. McAliskey	(DANI)
J. Peel	(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 a 38 kHz split-beam transducer mounted in a towed body was employed to carry out echo integrations along transects in the Northern Irish Sea. The baseline grid for surveying between dawn and dusk is shown in Fig. 1. Certain areas were delimited as separate strata for night-time surveying of adult herring (Fig. 2). 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 Maritim 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 22h.00 on Sunday 1 September, and proceeded overnight to the start of transect 47, off the NE coast of the IOM (Fig. 1). The survey progressed clockwise around the Isle of Man, along the south coast of Scotland, northwards along the Mull of Galloway and was then suspended for a mid-cruise break in Belfast from 22h.00 on Friday 6 September to 14h.00 on Sunday 8 September. After the mid-cruise break, the survey recommenced off Belfast Lough on 8 September and proceeded along the Irish Coast, the north coast of Wales and the west coast of England, finishing at the offshore extremity of transect 43 at 14h.10 on 12 September. The vessel then returned to Belfast. The 38 kHz and 120 kHz echosounders were calibrated in Douglas Bay during the evening of 2 September. Survey work was carried out mainly between dawn and dusk, the vessel drifting or dodging overnight. However, the region within three nautical miles of the coast of the Isle of Man between the Calf of Man and Douglas was delineated as a separate stratum for a night-time survey of herring between 2 and 4 September (Fig. 2).

WORK COMPLETED

Calibration

The EK-500 system was calibrated in Douglas Bay on 2 September. Sea conditions were calm, with declining tidal movement during calibration of the 38 kHz sounder and zero tidal movement during calibration of the 120 kHz sounder. Whilst affected by small off-axis movements of the sphere within the acoustic beam, the results of the 38 kHz calibration indicated no significant change in instrument sensitivity compared with previous calibrations. The 120 kHz calibration was of much higher precision than attained previously at this frequency, and indicated a requirement for small corrections to transducer gain settings. The results are given below:

<u>Instrument setting</u>	<u>Transducer</u>	<u>Old setting</u>	<u>New setting</u>
TS transducer gain	ES38B (38 kHz)	27.0	27.0
Sv transducer gain	ES38B	26.6	26.6
TS transducer gain	ES 120-7 (120 kHz)	25.7	25.8
Sv transducer gain	ES 120-7	25.4	25.6

Insufficient time was available to run the 'lobe' program.

Echo integration

The 38 kHz echosounder was run continuously during the survey at the settings given in Table 1. The 120 kHz sounder was not used. Data 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 seven midwater trawl tows were completed for identification of acoustic targets. The trawl positions are shown on Figs 1 and 2. Details of the tows are given in Table 2. Species compositions and length frequencies were recorded for each catch. A total of 336 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. As in 1995, anchovies were taken in some catches in the eastern Irish Sea.

Seabird observations

A survey of seabird abundance was carried out along most of the survey grid, with the exception of transects surveyed at night. Observations were carried out between 06h.30 and 20h.00 BST, totalling about eight hours each day. Weather conditions for detecting birds were excellent with good visibility, no rain and mainly calm to moderate seas.

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 concentrated within 3 nautical miles of the Manx coastline between the Calf of Man and Douglas, with highest densities on and around the spawning grounds between Santon and Douglas. Another concentration of herring schools was observed inshore near Peel, on the Manx West Coast. Occasional schools of herring were recorded in other areas.

Sprat and juvenile herring were most abundant within about 15 miles of the Irish Coast between Dundrum Bay and Rockabill (transects 14 - 29), in depths of 50 - 100 m off the west coast of the Isle of Man, in the eastern Irish Sea between Morecambe Bay and the Solway Firth and inshore along the Mull of Galloway. Densities of pelagic fish off North Wales and in Liverpool Bay were extremely low.

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.

Seabird distribution

The broad patterns of seabird distribution and abundance were in keeping with the findings of the previous two DANI acoustic surveys in 1994 and 1995. There was an apparent strong correspondence between seabird abundance and the abundance of small, midwater or surface-schooling fish (principally sprats). Seabirds were most abundant in the western Irish Sea, with much lower numbers to the east of the Isle of Man. Densities were highest in the shallower waters of the Irish Coast, the areas immediately west and south of the Isle of Man, and the shallower inshore waters of the North Channel. Manx shearwaters and guillemots were abundant in all these

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areas. Numbers of razorbills and puffins were much lower. Gannets, kittiwakes and fulmars were widespread but showed a strong association with fishing vessels.

ACKNOWLEDGEMENTS

The Ship's Master, Officers, Fishing Master, 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. E. Hamilton* date..... *12/9/96*

Ships master..... *A. W. [Signature]* date..... *12 1X 1996*

Head. Aquatic Sciences..... *[Signature]* date..... *24 1 96*

Table 1 EK-500 instrument settings used during cruise LF3696

Transducer	ES38B	ES120-7
Frequency	38 kHz	120 kHz
(1) TRANSCIEVER MENU		[calibrated but not used in survey]
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	25.6 dB
TS transducer gain	27.0 dB	25.8 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 = 0.5 s (50m,100m range); 0.8s (250m) [25m range not used]
Log menu:	Mode = ping based Ping interval = 1800 (50, 100m range); 1125 (250m)
Layer menu:	Super-layer = 9 - 250m
Printer / EP-500 settings: (both frequencies)	Sv colour min. = -70 dB [printer set to -60 dB for transect B13 - transect 4] 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 (6.0 for calibration) Max. phase deviation = 4.0 dB (2.0 for calibration)
Bottom detection menu:	Minimum level = -55 dB to -45 dB depending on seabed hardness

Table 2 Details of trawl catches taken during cruise LF3696

Tow	Date	Time	Shooting details			Total catch kg.	percentage composition by weight					Mean length (cm)	
			Lat.	Long.	depth (m)		sprat	herring	mackerel	gadoids	other	sprat	herring
1	02-Sep	12h.32	54 19.82	4 01.13	26	26	89.8	10.2	0.0	0.0	0.0	8.8	11.9
2	03-Sep	04h.44	54 03.96	4 33.12	41	225	0.1	92.2	7.3	0.4	0.0	7.7	24.9
3	03-Sep	13h.30	53 59.58	4 35.91	44	5	0.0	46.3	53.7	0.0	0.0		21.8
4	03-Sep	22h.00	54 01.31	4 40.64	29	1000	0.0	100.0	0.0	0.0	0.0		25.9
5	04-Sep	04h.30	54 08.54	4 25.60	41	888	0.0	100.0	0.0	0.0	0.0		26.0
6	04-Sep	08h.47	54 04.2	4 58.15	76	91	90.2	1.9	4.9	2.9	0.0	7.3	10.5
7	04-Sep	13h.45	54 12.13	4 48.54	35	2000	0.0	100.0	0.0	0.0	0.0		25.6
8	04-Sep	15h.43	54 16.42	4 50.19	51	109	95.8	2.0	0.0	2.2	0.0	9.0	21.9
9	04-Sep	19h.00	54 20.48	4 40.41	38	39	97.6	2.4	0.0	0.0	0.0	12.4	18.4
10	05-Sep	06h.43	54 28.65	4 54.16	71	80	2.7	9.8	0.0	81.2	6.3	8.1	9.8
11	05-Sep	12h.50	54 38.97	3 53.91	31	100	53.4	41.9	0.0	4.4	0.3	12.1	12.7
12	06-Sep	06h.05	54 38.81	5 00.06	69	10	57.8	18.0	0.9	12.0	11.3	7.5	9.9
13	06-Sep	08h.44	54 42.80	4 59.23	25	11	0.0	60.6	39.4	0.0	0.0		20.4
14	06-Sep	11h.29	54 52.96	5 11.65	25	116	98.3	1.4	0.3	0.0	0.0	7.1	12.7
15	06-Sep	19h.04	54 44.79	5 24.01	139	13	23.5	70.5	3.6	0.0	2.4	7.9	9.9
16	08-Sep	21h.20	54 14.54	5 33.09	23	67	91.4	5.6	0.6	2.3	0.0	12.0	11.9
17	09-Sep	9h.44	54 04.57	5 22.64	126	16	16.4	4.9	3.3	41.1	34.2	6.3	9.5
18	09-Sep	13h.07	54 10.06	5 50.69	22	30	97.6	2.3	0.0	0.0	0.0	11.5	13.2
19	09-Sep	15h.22	54 10.01	5 31.34	41	500	83.9	16.1	0.0	0.0	0.0	8.7	12.8
20	09-Sep	21h.07	53 54.99	5 58.54	39	142	97.0	0.8	1.5	0.7	0.0	8.4	9.7
21	10-Sep	8h.48	53 55.15	5 23.8	108	59	13.6	4.0	7.6	48.8	25.9	6.6	9.2
22	10-Sep	12h.27	53 44.91	5 13.55	74	110	82.0	2.7	0.0	15.3	0.0	8.1	10.3
23	10-Sep	15h.06	53 45.01	5 44.30	77	88	86.5	7.4	0.0	6.1	0.0	7.3	9.7
24	10-Sep	18h.40	53 34.65	5 59.86	33	75	90.9	2.5	6.3	0.3	0.0	6.0	12.2
25	11-Sep	18h.18	54 04.89	3 41.68	35	181	78.0	8.4	9.7	2.9	1.0	7.8	13.8
26	12-Sep	08h.39	54 14.93	3 46.41	36	1001	94.4	5.5	0.1	0.0	0.0	8.4	12.3
27	12-Sep	11h.13	54 25.07	3 45.35	35	413	91.0	3.2	5.5	0.2	0.1	8.0	12.3

Table 3 Length - weight parameters estimated during cruise LF3696
(Lengths in cm; weights in g)

SPECIES	INTERCEPT	SLOPE	SAMPLE SIZE
Herring	0.00248	3.389	636
Sprat	0.00319	3.354	426
Anchovy	0.00566	3.079	55
Mackerel	0.00371	3.230	127
Scad	0.02050	2.753	53
Whiting	0.00744	3.022	269
Norway Pout	0.00783	2.932	45

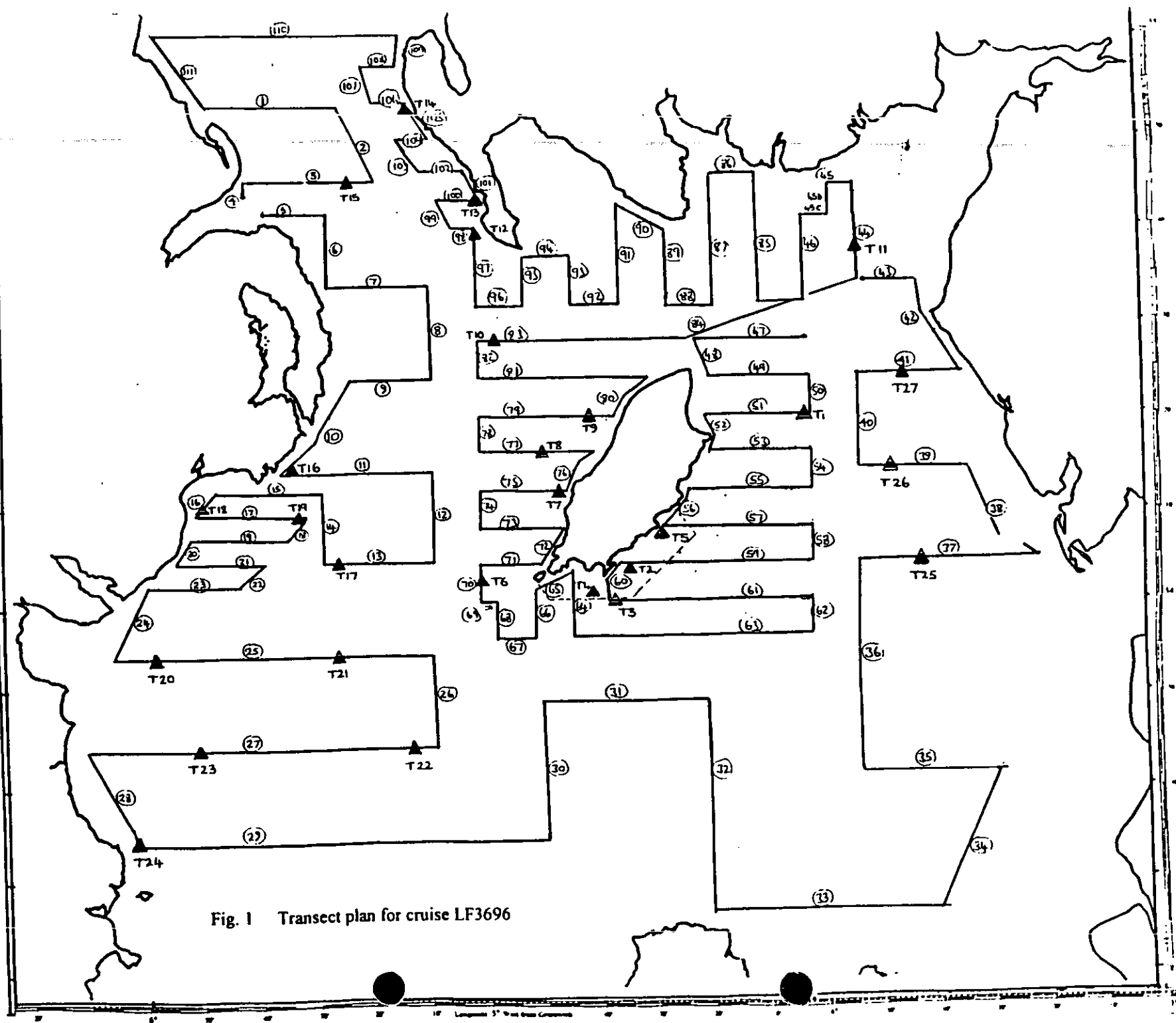


Fig. 1 Transect plan for cruise LF3696

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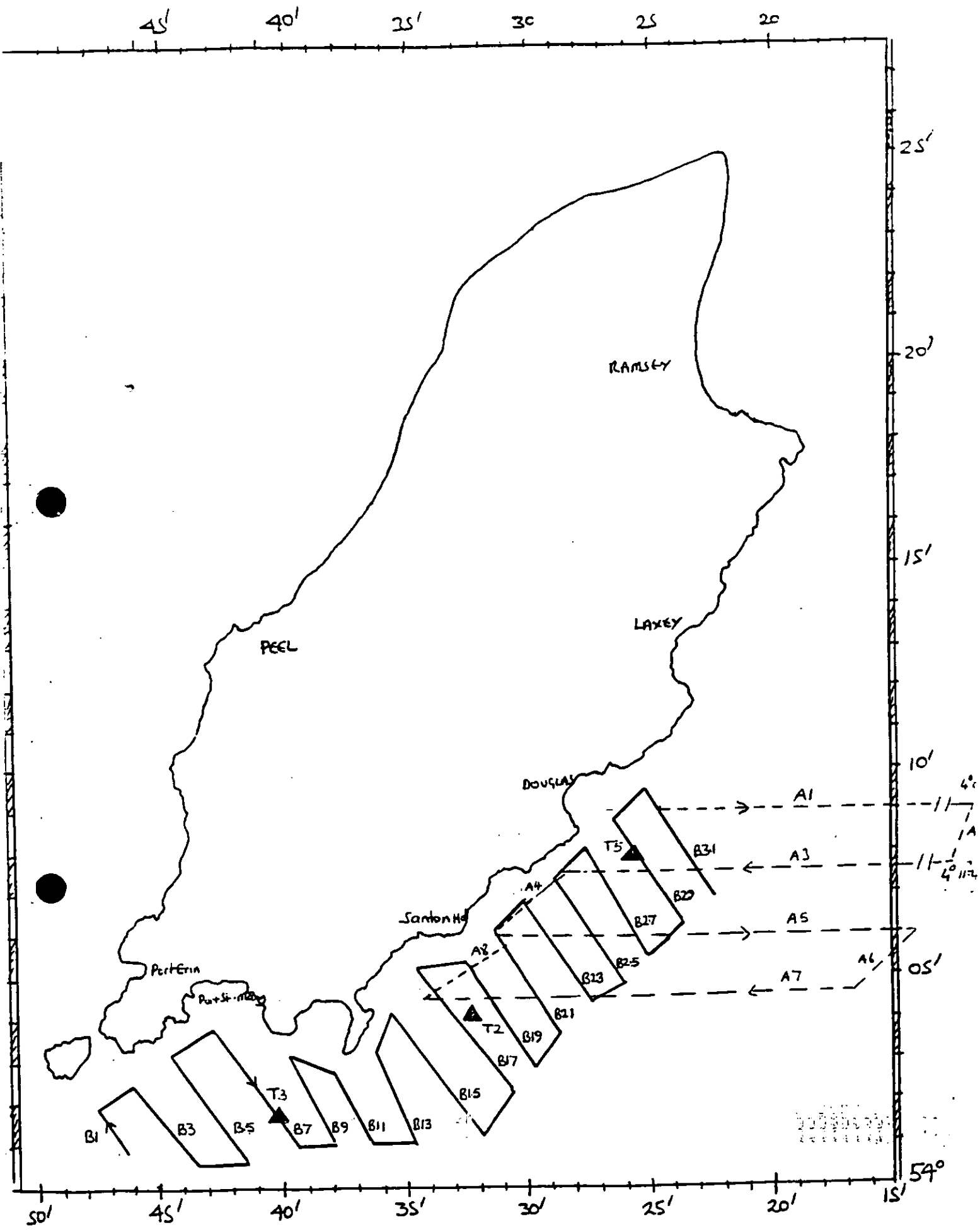


Fig. 2 Transects surveyed after dark during nights of 2-3 September (dashed lines) and 3-4 September (solid lines).