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Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory

CRUISE REPORT

S.M.B.A., P.O. Box No. 3, Oban, Argyll, Scotland.

Scottish Marine Biological Association

Dunstaffnage Marine Research Laboratory

Cruise Report

R.R.S. Frederick Russel

Cruise 14/1987

16 June - 29 June 1987

CRUISE REPORT

RRS Frederick Russell Cruise 14/1987

Leg 1: Plymouth to Troon: 16th to 20th June 1987

Leg 2: Troon to Dunstaffnage: 21st to 29th June 1987

Personnel

	Institute	Leg 1	Leg 2	Responsibility
Anton Edwards	SMBA (PSO)		*	CTD
Brian Grantham	SMBA	*	*	Nutrient analysis
Crawford Grier	SMBA		*	Zooplankton
Colin Griffiths	SMBA (PSO)	*		Moorings, CTD
Ken Jones	SMBA		*	Productivity
Marianne MacDougall	UCNW		*	Species composition
Neil MacDougall	SMBA	*		
Ken Medlar	MAFF	*		
David Mills	UNCW		*	
Kirsty Petre	SMBA	*	*	
Joe Robson	MAFF	*		
Elizabeth Woods	UCNW		*	

SMBA - Scottish Marine Biological Association
UCNW - School of Marine Sciences, Menai Bridge
MAFF - Ministry of Agriculture, Fisheries and Food, Lowestoft

Note: CTD = Conductivity - Temperature - Depth probe.
CPR = Longhurst Hardy Continuous Plankton Recorder.

Aims

To service MAFF current meter moorings in the Irish Sea.

To make CTD surveys in the Irish Sea in relation to the MAFF mooring programme.

To map the distribution of phytoplankton measured in terms of chlorophyll concentration and species composition in the Clyde Sea and on the Scottish continental shelf from north of Ireland to the southern end of the Minch.

To make primary productivity measurements on water collected in the Clyde Sea and on the Scottish continental shelf from north of Ireland to the southern end of the Minch.

To map the distribution of temperature and salinity in the Clyde Sea and on the Scottish continental shelf from north of Ireland to the southern end of the Minch.

To collect zooplankton samples by overside pumping and towing a Longhurst-Hardy continuous Plankton recorder in the Clyde Sea and on the Scottish continental shelf from north of Ireland to the southern end of the Minch.

To collect twelve hour time series of observations of phytoplankton, light and water properties at stations in the Clyde Sea and on the Scottish continental shelf.

To collect large volume water samples for caesium analysis on CTD lines Z,A and G.

Narrative

Leg 1 started when scientific personnel joined "Frederick Russell" at Plymouth on Monday 15th June. The ship sailed for the Irish Sea at 1000Z on the 16th and started work on the MAFF moorings at 1300Z on the 17th. Moorings X, U, W and V were serviced during the remainder of the day, with associated CTD and water sampling stations. On the 18th, moorings R, Q, P and M were serviced, with associated CTD and water sampling stations. During the first half of the 19th, a time series of CTD and water bottle casts was collected at station ld9, followed by a similar series at nearby station ld7. At 0200 on the 19th, the time series was stopped and the vessel sailed for the Z line of CTD and Caesium sampling stations in the southern end of the North Channel. This line was reached shortly before 1000Z on the 20th, completed by midday and the ship then sailed to Troon, docking at about 1900Z, when MAFF gear was unloaded.

Leg 2 started on the 21st June, when SMBA gear and staff came aboard at 0830Z. The ship steamed in fine calm weather for the southern end of Kilbrannan Sound at about 1000Z and started station work at AB17 in the early afternoon. CTD and sampling stations were worked up Kilbrannan Sound during the afternoon and night until the early morning of the 22nd, when the vessel headed for Campbeltown to stand off and pick up further SMBA gear by boat. Zooplankton pumping and CTD stations were worked up Kilbrannan Sound during the day, reaching station AB41 in Loch Fyne about 1800BST. An oblique CPR tow from 100 m to the surface was made at about 2 knots south of AB41 in water about 135m deep. The vessel then headed south to resume CTD and sampling work in fine weather in the waters around Arran and the Inner Firth. This work continued in calm overcast drizzly weather during the 23rd. The CPR was towed obliquely from 100m near station AB30. Occasional lapses in CTD performance occurred, with depth spiking irrespective of lowering speed. These faults disappeared after regreasing the top connector on the sea unit. The 24th dawned fine and clear. A light northwesterly wind blew until dusk, when it became calm. The ship worked steadily southwestwards towards the North Channel, arriving off Loch Ryan in the early afternoon, and continuing northwestwards on the Y line, which was finished shortly after midnight. The position of the Clyde Sea front northeastward of Y5 was found by a strong surface temperature change and the CPR was towed across the front for about one hour before heaving in and going to line A.

The central trio of stations on the A line was worked during the morning of the 25th, after which the vessel emerged from the North Channel onto the Malin shelf to work the C line to Islay in the afternoon, followed by the D line to the West, started at midnight. In continuing fair

weather, it was decided to take zooplankton samples at each station on the D line after D7, so as to map changes in relation to the geographical variation in stratification west of Islay. This work was finished at midday on the 26th and the vessel steamed in gently deteriorating weather to the FL line. Stations FL20-23 were worked to 250m over the shelf break in the late evening. Work began at station FL0 soon after midnight and continued until 1600Z on the 27th, comprising initial and final CPR tows in darkness and daylight respectively, plankton pumping and a 12 hour time series of CTD and water bottle casts. During this work, conditions were overcast, the wind remained southeasterly 20-25 knots, and the vessel performed very well on station. The remainder of the FL line to FL15 was worked in the remainder of the day in southeasterly winds and on the 28th in light breezes and progressively calmer conditions. The evening of the 28th and the early hours of the 29th were spent on station work in the Sound of Mull and its western approaches. The ship made rendezvous off Dunstaffnage with the SMBA's "Seol Mara" at 0800BST on the 29th June to discharge spare parts urgently required at RVS Barry. Some gear and UNCW staff also went ashore. "Frederick Russell" spent the rest of the day working in calm conditions in lower Loch Linnhe, returning to Dunstaffnage for a final transfer of remaining gear and SMBA staff via "Seol Mara" at 1800BST. The vessel then left for Barry.

Results

Table 1 lists the work done at each station. Figures 1 and 2 outline the working areas and positions of the stations. Some standard stations in the Clyde Sea were omitted to save time and the western part of the G line could not be finished. A CPR tow across the Clyde Plateau front worked well. Extra stations were worked on the FL line across the shelf break so as to take advantage of a lull in work caused by the timing of productivity experiments.

Equipment

All ship gear worked satisfactorily. There were some problems with the CTD system which had a tendency to produce spikes in the depth measurement, but the problem was cured by regreasing the underwater unit connnector. The Longhurst Hardy CPR was used successfully several times before succumbing to minor breakages. The plankton pump and water sampling proceeded smoothly, although the water bottle rack provided in the wet laboratory needs to be rebuilt with the bottle holders lower on the bulkhead, in a level row, and further apart.

Acknowledgements

Both PSOs cheerfully acknowledge the willing and competent assistance of Captain Jonas, the officers and all the crew during the cruise.

Salve Regina!
A.Edwards/C.Griffiths
29th June 1987

Table 1

Frederick Russell Cruise 14/87: Station List

This list summarise the work done on the cruise according to station. The headings are:

Station	Station name
Lat	Latitude, degrees N., usually to the nearest minute. Otherwise to a tenth of a minute. e.g. 56.123 = 56 degrees 12.3 minutes.
Long	Longitude, degrees W., usually to the nearest minute. Otherwise to a tenth of a minute. e.g. 56.123 = 56 degrees 12.3 minutes.
Date	Date, GMT
Time	Time, GMT at the start of the station.
Depth	Sounding from PDR, metres, at the start.
Dip	CTD dip reference number. CTD data are stored on floppy discs 022 (stations 1-99) and 023 (stations 100 onwards).
Nut	Samples for nutrient and chlorophyll concentration analysis were collected at the depths shown, in metres.
Cs	Large volume samples were collected at the depths shown for later analysis of the Caesium content, either by MAFF, Lowestoft or the University of Glasgow, Chemistry Department.
Zoop	The number of overside large volume pump samples taken is shown. They were gathered at 10m and 30m.
Light	The number of irradiance profiles taken. Exclusively a daytime operation.
-	Phytoplankton species composition samples were taken at 5m and other depths.

MOORINGS : 14A/87 : JUNE 16 - 20

Station	Lat °N.	Long °W.	Depth,m.
X	53 39.9	4 38.5	
Y	53 36.0	4 38.0	79
W	53 46.9	4 39.1	72
V	53 58.4	4 39.8	47
S	54 19.3	4 14.2	23
R	54 22.6	4 3.2	39
Q1	54 25.0	3 57.0	37
Q	54 27.3	3 49.0	32
P	54 29.8	3 41.5	25
A	54 38.5	4 22.5	63
M	54 35.0	4 22.0	53
N	54 30.0	4 22.0	45
ID9	54 2.0	3 34.0	32
ID7	54 18.0	3 43.0	42
IZ	54 40.0	5 30.0	32
2Z	54 41.5	5 25.0	105
3Z	54 43.0	5 20.0	155
4Z	54 44.5	5 15.0	269
5Z	54 46.0	5 10.0	128
6Z	54 48.0	5 5.0	19

Name	Latitude N		Longitude W		Depth	Time	Date	CTD	Sample Depths	
	deg	min	deg	min	m	GMT	GMT	Dip No.	CS	
Z1	54	40	5	30	33	0753	20/6	36	0	
Z2	54	41.5	5	25	116	0821	20/6	37	0	115
Z3	54	43	5	20	148	0903	20/6	38	0	150
Z4	54	44.5	5	15	265	0954	20/6	39	0	250
Z5	54	46	5	10	128	1040	20/6	40	0	120
Z6	54	48	5	05	21	1123	20/6	41	0	

STATION LIST: FR14B/87

Name	Lat N	Long W	Dp m	Time GMT	Date GMT	CTD Dip	L	Z	Sample depths Nut. + Phyt.						Cs
AB17	55.270	5.280	56	1252	21/ 6	42	1	0	5	15	25	35	50		-
Phytoplankton species composition samples taken															
AB47	55.310	5.270	79	1520	21/ 6	43	1	0	5	15	25	40	70		-
AB46	55.340	5.250	90	1516	21/ 6	44	1	0	5	10	20	40	80	140	-
AB45	55.370	5.260	146	1743	21/ 6	45	1	0	5	10	20	40	80	140	-
AB44	55.420	5.210	120	1904	21/ 6	46	1	0	5	10	20	40	80		-
AB42	55.450	5.160	130	2053	21/ 6	47	0	0	5	10	20	40	80		-
AB38	55.470	5.140	156	2211	21/ 6	48	0	0	5	10	20	40	80	120	-
Phytoplankton species composition samples taken.															
AB38A	55.500	5.110	58	2331	21/ 6	49	0	0	3	5	15	35	50		-
AB39	55.500	5.170	156	39	22/ 6	50	0	0	5	15	50	100	145		-
AB40	55.540	5.230	144	149	22/ 6	51	0	0	5	15	45	90	135		-
Productivity sample from 10m.															
AB17	55.270	5.280	63	952	22/ 6	52	0	2	-						-
AB44	55.420	5.210	118	1300	22/ 6	53	0	2	-						-
AB40	55.540	5.230	146	1614	22/ 6	54	1	2	5	10	20	40	80	130	-
Continuous plankton recorder tow.															
AB41	55.580	5.230	100	1838	22/ 6	55	1	0	5	10	20	40	80	110	-
AB37	55.420	5.090	154	2116	22/ 6	56	0	0	5	10	20	40	80	150	-
AB36	55.420	5.040	86	2203	22/ 6	57	0	0	5	10	20	40	75		-
AB35A	55.540	5.040	61	15	23/ 6	58	0	0	5	10	20	35	50		-
AB35	55.500	4.580	44	235	23/ 6	59	0	0	5	10	20	40			-
AB34	55.500	4.550	75	315	23/ 6	60	1	2	5	10	20	40	65		-
AB33	55.390	4.550	75	615	23/ 6	61	1	0	5	10	20	40	65		-
AB32	55.380	5.000	140	714	23/ 6	62	1	0	5	10	20	40	80	120	-
AB31	55.360	5.050	83	824	23/ 6	63	1	0	5	10	20	40	75		-
AB30	55.340	4.590	106	920	23/ 6	64	1	2	5	10	15	20	40	80	-
Productivity and species samples here.															
AB25	55.290	5.010	104	1145	23/ 6	65	1	0	5	10	20	40	60	90	-
Continuous plankton recorder tow.															
AB26	55.290	4.550	75	1311	23/ 6	66	1	0	5	10	20	40	60		-
AB27	55.280	4.500	59	1412	23/ 6	67	1	0	5	10	20	35	50		-
AB28	55.280	4.440	46	1508	23/ 6	68	1	2	5	10	15	25	40		-
Continuous plankton recorder tow.															
AB23A	55.220	4.510	47	1713	23/ 6	69	1	0	5	10	15	25	40		-
AB23	55.220	4.580	60	1807	23/ 6	70	1	0	5	10	15	25	40		-
AB24	55.230	5.050	79	2028	23/ 6	71	1	0	5	10	15	25	40	70	-
AB20	55.200	5.080	55	2130	23/ 6	72	0	2	5	10	15	20	30	50	-
AB10	55.130	4.580	24	2332	23/ 6	73	0	2	5	10	15	25			-
AB11	55.140	5.030	47	100	24/ 6	74	0	0	5	10	15	25	40		-
AB13	55.160	5.130	44	152	24/ 6	75	0	0	5	15	25	40			-
AB14	55.190	5.200	44	241	24/ 6	76	0	2	5	10	15	25	40		-
AB16	55.220	5.270	36	434	24/ 6	77	1	0	5	10	20	32			-
AB5A	55.150	5.300	60	555	24/ 6	78	1	0	5	10	15	20	40	60	-
AB5	55.120	5.270	78	715	24/ 6	79	1	2	5	10	15	25	40	70	-
Productivity sample at 10m.															

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Name	Latitude N deg	min	Longitude W deg	min	Depth m	Time GMT	Date GMT	CTD Dip No.	Sample Depths CS	
Y	53	36	4	38	79	1135	17/6	01	0	75
W	53	46.9	4	39.1	72	1737	17/6	02	0	70
V	53	58.4	4	39.8	47	2030	17/6	03	0	42
S	54	19.3	4	14.2	23	0603	18/6	04	0	20
R	54	22.6	4	3.2	39	0747	18/6	05	0	36
Q	54	25	3	57	37	0926	18/6	06	0	34
Q	54	27.5	3	48.7	32	1036	18/6	07	0	29
P	54	29.8	3	42.5	25	1213	18/6	08	0	19
A	54	38.5	4	22.5	63	1636	18/6	09	0	60
M	54	35	4	22	53	1752	18/6	10	0	51
N	54	30	4	22	45	1840	18/6	11	0	40
				Start of 12 hour series						
ID9(1)	54	2	3	34	32	0009	19/6	12		
ID9(2)	54	2	3	34	23	0105	19/6	13		
ID9(3)	54	2	3	34	26	0200	19/6	14		
ID9(4)	54	2	3	34	27	0256	19/6	15		
ID9(5)	54	2	3	34	28	0359	19/6	16		
ID9(6)	54	2	3	34	28	0459	19/6	17		
ID9(7)	54	2	3	34	33	0559	19/6	18		
ID9(8)	54	2	3	34	33	0701	19/6	19		
ID9(9)	54	2	3	34	31	0800	19/6	20		
ID9(10)	54	2	3	34	28	0901	19/6	21		
ID9(11)	54	2	3	34	27	1000	19/6	22		
ID9(12)	54	2	3	34	27	1059	19/6	23		
ID9(13)	54	2	3	34	26	1201	19/6	24		
				Start of 12 hour series						
ID7(1)	54	18	3	43	42	1459	19/6	25		
ID7(2)	54	18	3	43	42	1558	19/6	26		
ID7(3)	54	18	3	43	42	1659	19/6	27		
ID7(4)	54	18	3	43	42	1758	19/6	28		
ID7(5)	54	18	3	43	42	1900	19/6	29		
ID7(6)	54	18	3	43	41	1959	19/6	30		
ID7(7)	54	18	3	43	41	2101	19/6	31		
ID7(8)	54	18	3	43	39	2159	19/6	32		
ID7(9)	54	18	3	43	39	2259	19/6	33		
ID7(10)	54	18	3	43	38	0001	20/6	34		
ID7(11)	54	18	3	43	38	0056	20/6	35		

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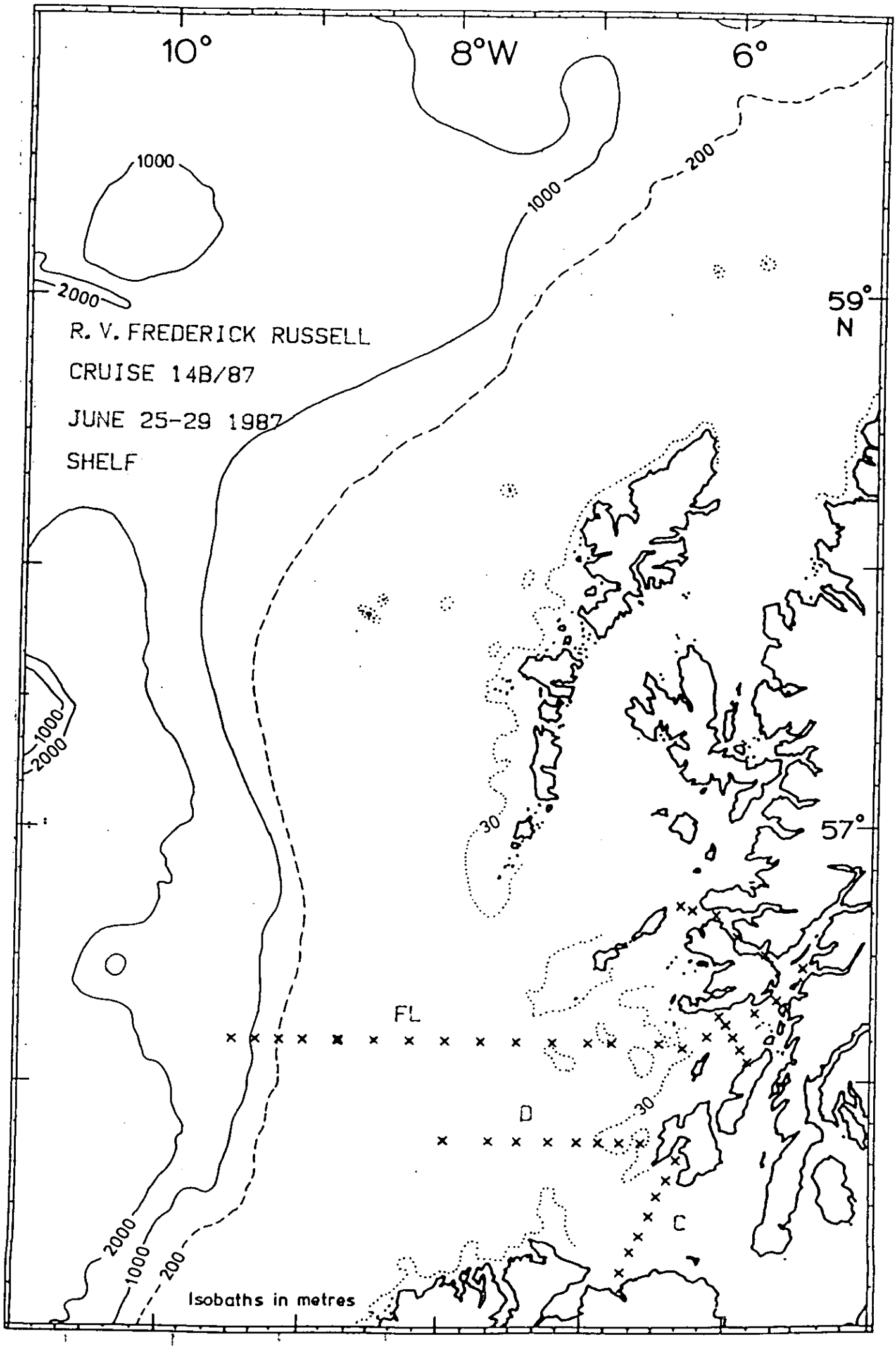
Name	Lat N	Long W	Dp m	Time GMT	Date GMT	CTD Dip	L	Z	Sample depths Nut. + Phyt.					Cs
LM1	56.296	5.380	203	859	29/ 6	152	1	0	5	15	25	60	100	-
LL1	56.303	5.365	190	938	29/ 6	153	0	0	-					-
LL2	56.310	5.350	151	1007	29/ 6	154	0	0	-					-
LL3	56.317	5.335	73	1026	29/ 6	155	0	0	-					-
LL4	56.325	5.324	66	1042	29/ 6	156	0	0	-					-
LL5	56.331	5.308	76	1102	29/ 6	157	0	0	-					-
LL6	56.338	5.292	100	1120	29/ 6	158	0	0	-					-
LL7	56.349	5.280	96	1144	29/ 6	159	0	0	-					-
LL8	56.357	5.268	78	1204	29/ 6	160	0	0	-					-
LL9	56.365	5.253	72	1222	29/ 6	161	0	0	-					-
LM2	56.374	5.240	88	1247	29/ 6	162	1	0	5	10	20	40	80	-
LL10	56.382	5.227	92	1322	29/ 6	163	0	0	-					-
LL11	56.391	5.215	84	1345	29/ 6	164	0	0	-					-

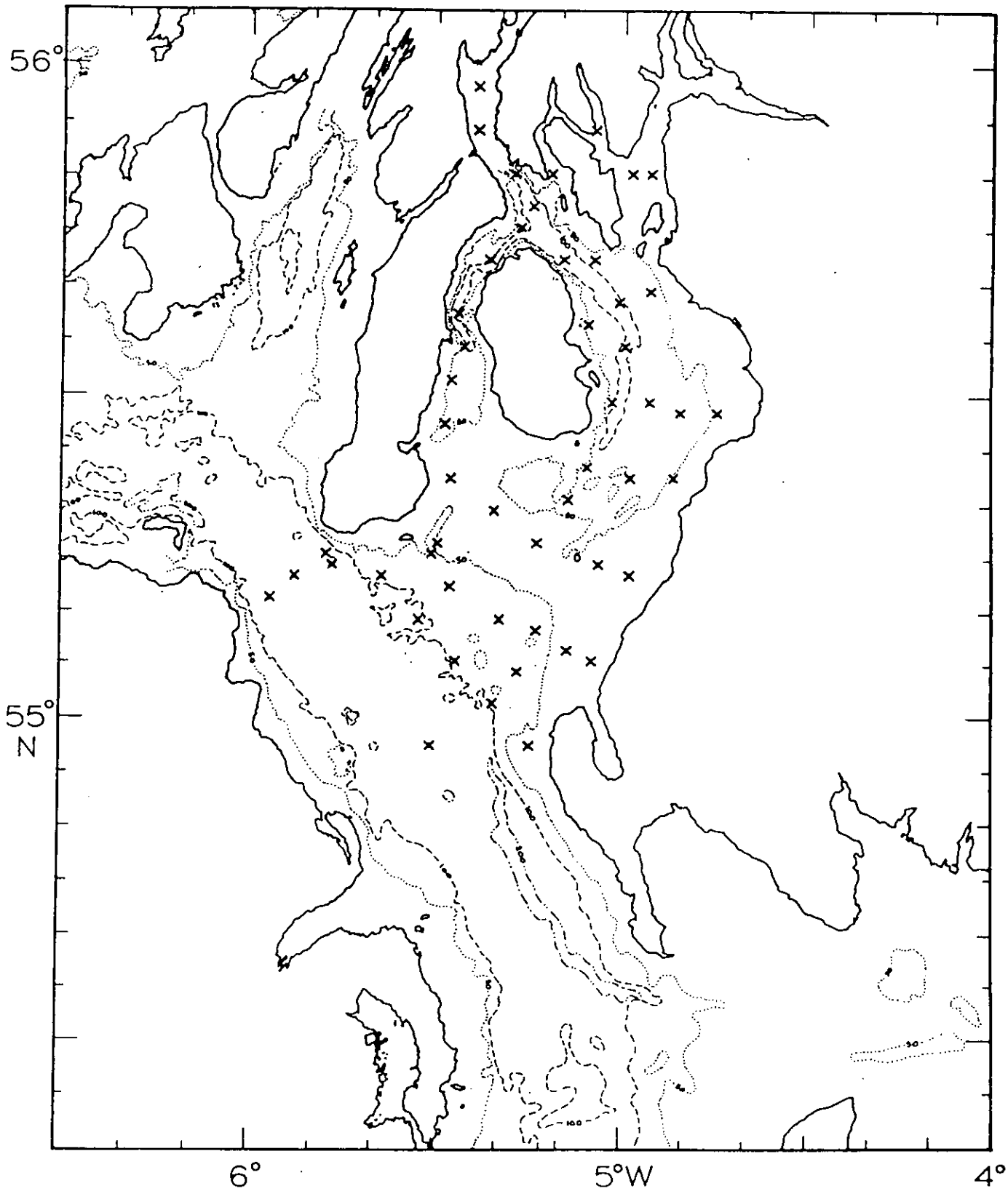
STATION LIST: FR14B/87

Name	Lat N	Long W	Dp m	Time GMT	Date GMT	CTD Dip	L	Z	Sample depths Nut. + Phyt.						Cs		
AB4	55.090	5.190	65	929	24/ 6	80	1	0	5	10	15	25	40	60	-		
AB3	55.080	5.130	55	1027	24/ 6	81	1	0	5	10	15	25	40		-		
AB2	55.060	5.080	34	1118	24/ 6	82	1	0	5	10	15	30			-		
AB1	55.050	5.040	15	1206	24/ 6	83	1	1	5	8	12				-		
Species composition samples taken.																	
AB3A	55.040	5.160	67	1400	24/ 6	84	1	0	5	10	15	35	60		-		
1Y	54.570	5.140	57	1508	24/ 6	85	1	2	5	10	30	45			-		
Species composition samples taken																	
2Y	55.010	5.200	86	1714	24/ 6	86	1	0	5	10	25	50	75		-		
LS	54.570	5.300	140	1826	24/ 6	87	1	0	5	10	25	55	95	135	0	0	
3Y	55.050	5.260	100	2008	24/ 6	88	1	2	5	10	20	90			-		
4Y	55.090	5.320	108	2155	24/ 6	89	0	0	5	10	15	25	40	95	-		
5Y	55.130	5.380	85	2246	24/ 6	90	0	2	5	10	20	40	80		-		
Species composition samples taken.																	
TF1	55.160	5.290	47	151	25/ 6	91	0	0	-						-		
Start of CPR tow across Clyde front																	
TF2	55.140	5.460	116	346	25/ 6	92	0	0	-						-		
End of CPR tow across Clyde front																	
2A	55.150	5.470	128	417	25/ 6	93	1	0	5	20	70	120			0	50	100
No salinity samples with Caesium samples																	
3A	55.130	5.520	126	552	25/ 6	94	1	2	5	10	25	75	150		0		
4A	55.110	5.560	138	819	25/ 6	95	1	0	5	25	50	130			0	50	100
1C	55.140	6.450	20	11	25/ 6	96	1	0	5	10	15				-		
2C	55.190	6.410	73	1243	25/ 6	97	1	0	5	15	25	40	70		-		
3C	55.230	6.370	80	13	25/ 6	98	1	2	5	15	30	50	70		-		
Species composition samples taken																	
4C	55.280	6.330	95	1557	25/ 6	99	1	0	5	20	45	90			-		
5C	55.330	6.300	101	1720	25/ 6	100	1	2	5	20	45	90			-		
Species composition samples taken																	
6C	55.370	6.260	85	2020	25/ 6	101	1	0	5	10	25	40	70		-		
7C	55.420	6.220	24	2111	25/ 6	102	0	0	5	10	15				-		
D7	55.460	6.370	63	2253	25/ 6	103	0	0	5	10	25	40			-		
D6	55.460	6.460	38	23	25/ 6	104	0	2	5	10	20	35			-		
D5	55.460	6.550	43	105	26/ 6	105	0	2	5	10	25	40			-		
D4	55.460	7.040	47	217	26/ 6	106	0	2	5	10	25	40			-		
Species composition samples taken																	
D3	55.460	7.160	62	337	26/ 6	107	0	2	5	15	25	50			-		
D2	55.460	7.290	62	607	26/ 6	108	1	2	5	10	15	30	55		-		
Species composition samples taken																	
D1	55.460	7.410	86	822	26/ 6	109	1	2	5	10	15	30	50	75	-		
Species composition samples taken.																	
D0	55.460	8.000	104	1036	26/ 6	110	1	2	5	10	15	20	40	80	-		
FL20	56.100	9.000	146	1517	26/ 6	111	1	0	5	15	30	60	90	120	-		
4 Stations over the shelf break																	

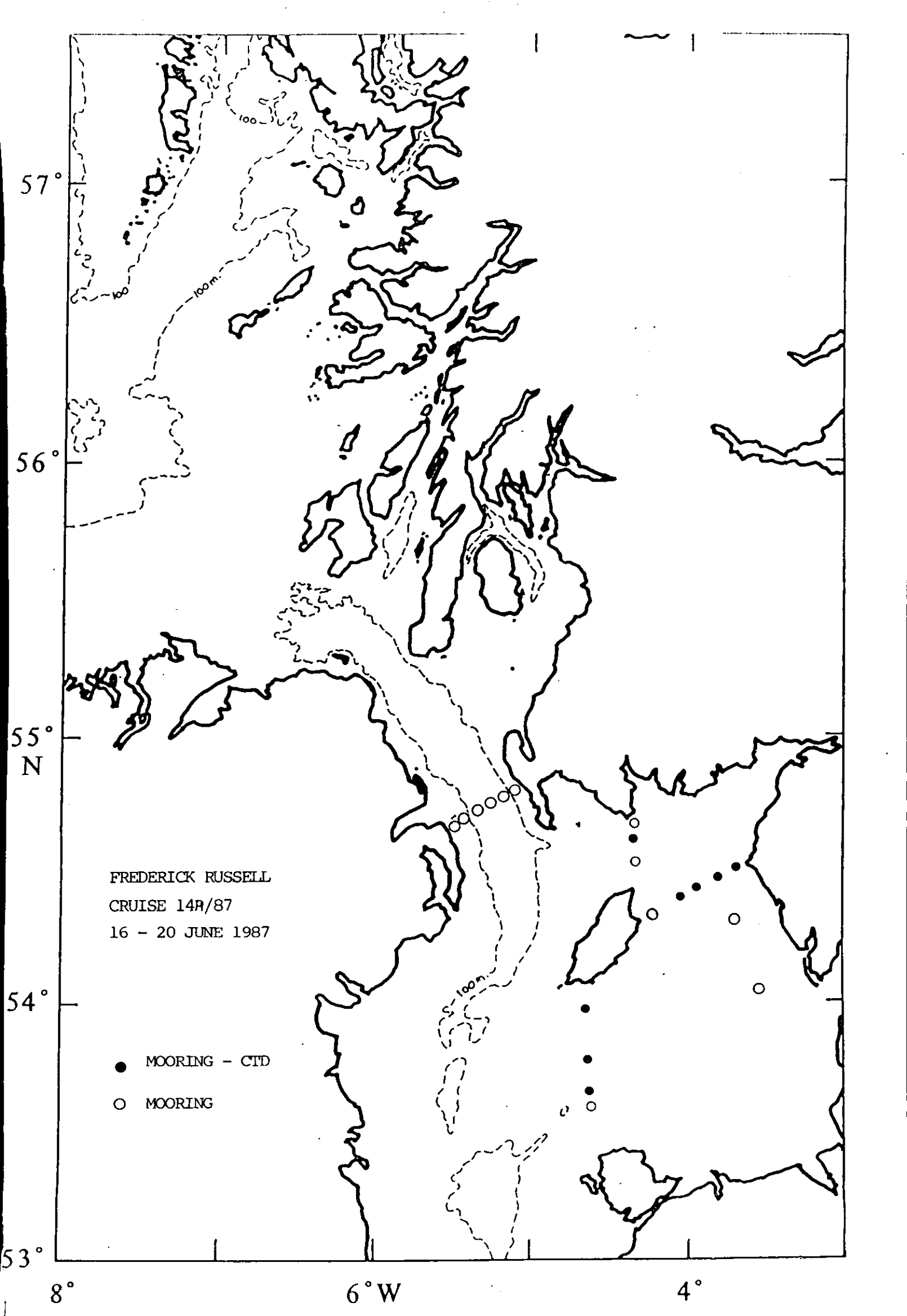
STATION LIST: FR14B/87

Name	Lat N	Long W	Dp m	Time GMT	Date GMT	CTD Dip	L	Z	Sample depths Nut. + Phyt.						Cs
FL21	56.100	9.100	188	1643	26/ 6	112	1	0	5	15	30	45	85	175	-
FL22	56.100	9.200	910	1801	26/ 6	113	1	0	5	20	40	80	160	230	-
	Species composition samples taken.														
FL23	56.100	9.3001015		1930	26/ 6	114	1	0	5	15	30	60	150	250	-
FL0	56.100	8.450	120	130	27/ 6	0	0	2	-						-
	Longhurst-Hardy CPR towed obliquely. Plankton pump.														
FL0(1)	56.100	8.450	120	300	27/ 6	115	0	0	14	20	48				-
	Start 12 hr time series. First 3 samples on 10,11,12 deg. C isotherms.														
FL0(2)	56.100	8.450	120	400	27/ 6	116	1	0	14	18	47				-
FL0(3)	56.100	8.450	124	500	27/ 6	117	1	0	15	19	47	5	80	110	-
FL0(4)	56.100	8.450	120	600	27/ 6	118	0	0	18	20	52				-
FL0(5)	56.100	8.450	120	700	27/ 6	119	1	0	18	22	47				-
FL0(6)	56.100	8.450	120	800	27/ 6	120	0	0	20	24	54				-
FL0(7)	56.100	8.450	128	900	27/ 6	121	1	0	19	24	55				-
FL0(8)	56.100	8.450	125	1000	27/ 6	122	0	0	18	26	46				-
FL0(9)	56.100	8.450	118	1100	27/ 6	123	1	0	20	26	47				-
FL0(10	56.100	8.450	120	1200	27/ 6	124	1	0	20	27	52	5	80	110	-
FL0(11	56.100	8.450	120	1302	27/ 6	125	1	0	17	24	46				-
FL0(12	56.100	8.450	120	1402	27/ 6	126	0	0	14	23	47				-
FL0(13	56.100	8.450	120	1504	27/ 6	127	1	0	11	16	42				-
	End of time series. Oblique CPR tow.														
FL1	56.100	8.300	124	1724	27/ 6	128	1	0	5	20	30	70	115		-
FL2	56.100	8.150	121	1908	27/ 6	129	1	0	5	15	25	60	110		-
FL3	56.100	8.000	111	2039	27/ 6	130	1	2	10	23	35	60	100		-
FL4	56.100	7.450	100	2248	27/ 6	131	0	0	10	15	25	55	70		-
FL5	56.100	7.300	108	1	28/ 6	132	0	0	10	20	40	70	100		-
FL6	56.100	7.150	75	110	28/ 6	133	0	0	10	20	30	50	70		-
FL7	56.100	7.000	65	225	28/ 6	134	0	0	5	20	35	45	65		-
FL8	56.100	6.500	63	335	28/ 6	135	1	0	5	15	25	35	55		-
FL9	56.100	6.300	60	512	28/ 6	136	1	2	5	25	35	45			-
FL10	56.090	6.200	75	748	28/ 6	137	1	0	10	20	35	50			-
FL11	56.110	6.100	80	846	28/ 6	138	1	0	5	10	20	30	60		-
E4	56.140	6.020	81	959	28/ 6	139	1	2	5	20	30	60			-
	Otherwise FL12. Productivity and species composition samples.														
E5	56.160	6.050	76	1115	28/ 6	140	1	0	5	10	20	40	70		-
E4	56.140	6.020	74	1204	28/ 6	141	0	0	-						-
	Continuous plankton recorder tow.														
E3	56.110	5.590	110	1316	28/ 6	142	1	0	5	15	35	70	100		-
E2	56.080	5.560	74	14	28/ 6	143	1	2	5	10	20	40	70		-
E1	56.050	5.530	98	1545	28/ 6	144	1	0	5	10	20	40	90		-
FL13	56.170	5.504	150	1820	28/ 6	145	1	0	5	15	40	80	135		-
FL14	56.200	5.410	190	1943	28/ 6	146	1	0	5	25	50	100			-
FL15	56.280	5.300	168	2005	28/ 6	147	1	2	5	15	25	50	100		-
SM1	56.312	5.465	110	2205	28/ 6	148	0	0	5	10	25	50	80		-
SM2	56.354	5.585	56	2320	28/ 6	149	0	0	5	10	25	35	50		-
1G	56.400	6.070	64	12	29/ 6	150	0	0	5	15	25	40	60		0 30 60
2G	56.410	6.170	36	135	29/ 6	151	0	0	5	15	25	32			0 15 30
3G	56.420	6.220	0	230	29/ 6	0	0	0	-						-
	Surface salinity sample only.														


10°
8°W
6°
59° N
57°
1000
2000
200
30
R. V. FREDERICK RUSSELL
CRUISE 14B/87
JUNE 25-29 1987
SHELF
FL
D
C
Isobaths in metres



R. V. FREDERICK RUSSELL CRUISE 14B/87. JUNE 21-25 1987.
STATIONS IN THE CLYDE SEA AND NORTH CHANNEL.


57°
56°
55°
N
54°
53°
8°
6°W
4°
100
100m
FREDERICK RUSSELL
CRUISE 14A/87
16 - 20 JUNE 1987
MOORING - CTD
MOORING