

Cruise Report 13-24 January 1993

RV MICHAEL SARS

Norwegian Institute of Marine Research
Bergen

Introduction

In response to an offer from Lars Føyn at the Norwegian Government Institute of Marine Research the *Michael Sars* sailed from Bergen to take part in a joint monitoring programme at Shetland with the Marine Laboratory Aberdeen. The vessel arrived at Lerwick, Shetland Islands at 2230 on 14 January 1993. Steve Hay of SOAFD joined the scientific complement to liaise between Norwegian and Scottish research interests and to assist with and help direct the sampling effort. Coordination was maintained throughout with other sampling by onshore teams and from the FRV *Clupea*.

The aims of the cruise were to study the vertical and horizontal distribution of oil from the MV *Braer* tanker oil spill and to investigate the biological effects on plankton and fish larvae. Studies of oil dispersion patterns and effects were to be guided by local knowledge, the sampling requirements of the incident response coordinator and the predictions of mathematical modelling at the Proudman Oceanographic Laboratory (POL) commissioned by SNH.

Methods

A standard sampling protocol was devised to be employed at each sampling station. This comprised a CTD cast, fixed depth sampling of the water column using 5 litre Niskin bottles, two near bottom to surface WP2 (0.25 m² mouth, 180 µm mesh) plankton net hauls and sampling for macroplankton and fish larvae with a MIK net (3 m² mouth, 1,500 µm mesh) in a double oblique haul. Very severe weather restricted sampling to the 18, 19, 22 and 23 January and not all stations were sampled for plankton. A cruise track with sampled stations is shown in Figure 1. Table one summarises the sampling at each station. In addition three Argos satellite tracked drifting buoys were deployed as shown in Figure 2.

Narrative

The *M. Sars* sailed on 18 January and carried out a transect of stations from inshore to the southeast of Shetland across the POL predicted centre of the oil distribution to 00°30'W. Discrete depth water samples were collected for Norwegian and Scottish analysis, WP2 net samples were collected in duplicate with one formalin preserved sample for species analysis (Norway) and the other frozen in liquid nitrogen for gut fluorescence analysis in Aberdeen. MIK net samples were taken and clupeoid larvae extracted for otolith and RNA/DNA analysis of larval growth in Aberdeen with the remainder of the samples preserved in formalin for macroplankton species counts (Norway). Two Argos buoys were deployed at stations five (POL oil distribution centre) and seven. The vessel then returned to Lerwick in deteriorating weather to pass samples to the Scalloway laboratory for analysis.

The *M. Sars* returned to sea on 19 January and sampled at a number of stations around the southern tip of Shetland being forced back to port in Lerwick once more by stormy weather. Sailing was impossible on 20 and 21 January. During this interval S Hay took

the Norwegian scientists to visit the Scalloway laboratory and the situation and problems were discussed with the coordinator (R Johnstone) and chemist (A Macintosh). Further to these discussions calibration materials for oil analysis and results to date were exchanged. On 21 January S Hay temporarily joined the shoreside sampling effort and also obtained three duplicated water samples from inshore locations. One of each sample set was given to the Norwegian chemist (Kjell Westrheim) the other was retained by the Scalloway laboratory.

On 22 January the *M Sars* sailed despite rough weather and started work south of Sumburgh Head. A transect of stations was worked northwest to a point south of Foula Island from where, after a break between midnight and 0630 on 23 January due to weather, another transect of stations was worked inshore towards the Scalloway Deepes. A single Argos buoy was released at station 27 and a further three stations were sampled just off the southwest coast of mainland Shetland. *M. Sars* returned to Lerwick to deposit samples and S Hay, then sailed at 2300 on 23 January home to Bergen arriving at 2200 on 24 January. S Hay joined the shoreside sampling team before returning to Aberdeen on 27 January.

Observations

Preliminary observations of total oil by UV fluorescence from around southern Shetland suggest that the oil is well distributed through the water column with levels between 1 and 11 ppb ($\mu\text{g.l}^{-1}$) in the southeast. To the west, higher levels in the range 2-30 ppb were found with highest levels inshore to the north of the area surveyed west of Shetland. A definite "blue sheen" surface film of oil was present at stations 30, 31 and 32 (Fig. 1), where oil droplets could be seen rising to add to the surface film from deeper layers when waves were calmer. As could be expected given the extended fierce southwesterly weather, there was a considerable amount of sand and seaweed debris in suspension and appearing in the 180 μm plankton net samples from the west side of Shetland. Samples of herring larvae were collected from relatively clean, low and high oil concentration areas for larval growth analysis. The zooplankton consisted mainly of copepod species, euphausiids, chaetognaths and pelagic amphipods typical of mixed coastal and boreal Atlantic ocean waters. Live specimens appeared to behave normally and euphausiid guts were frequently full. Argos buoy tracks to date indicate wind driven circulation in the surface layers and the CTD data show well mixed water columns at all stations as expected given weather and season. Close contacts will be maintained between the Norwegian scientists and those at Aberdeen to exchange results and establish intercalibrations.

Acknowledgements

Warm thanks are due to the Norwegian Government, their Institute of Marine Research in Bergen and particularly Dr Lars Føyn at the Bergen laboratory, Tor Knutsen the scientific cruise leader on RV *Michael Sars*, his colleague Kjell Westrheim and assistants Berit, Karsten and Magnus and to the captain, officers and crew of the vessel. Their efforts in extremely trying weather conditions and their friendly welcome to and collaboration with the Aberdeen laboratory representative are to be commended. The samples collected have already provided and should yield in later results much useful information on the consequences of the *Braer* oil spill.

Steve Hay
29 January 1993

Table 1 - Sampling summary. (Note - Seabird CTD sample profiles were performed at all stations. Values at depths are ppb ($\mu\text{g l}^{-1}$) total oil by UV fluorescence). * = Norwegian samples CO = CTD only

Date/ time	Stn No	Lat/Long	Water depths sampled (m)											WP2 net	MIK net	Argos buoy	
			1	3	5	10	20	25	30	50	65	70	75				90
18.1																	
1202	2	6002.0N 0108.0W	*	*	4.0	*	*	3.0	*	*				*	*		
1416	3	6000.0N 0100.0W			0.9			1.5						*	*		
1612	4	5959.0N 0052.0W	*		5.9	*		0.7						*	*		
1800	5	5958.0N 0045.0W	*	*	1.1	*	*	2.0	*	*				*	*	*	
2030	6	5956.5N 0038.0W	*		10.1	*		0.4						*	*		
2220	7	5955.5N 0030.0W	*	*	1.4	*	*	1.2	*	*				*	*	*	
19.1																	
1015	8	5957.0N 0107.0W			3.9			4.8						*	*		
1200	9	5955.0N 0102.5W			4.9			5.0						*	*		
1243	10	5952.5N 0057.5W			4.8			4.1						*	*		
1424	11	5952.5N 0101.5W			5.6			4.4									
1502	12	5952.5N 0107.0W			3.8			4.6									
1533	13	5952.5N 0112.5W			3.5			4.6						*	*		
1705	14	5950.5N 0118.0W			18.0			26.7						*	*		
1825	15	5952.5N 0122.5W			36.8			37.3						*	*		
1955	16	5955.0N 0131.0W			12.5			11.3									
2025	17	5955.0N 0126.5W			18.5			*									
2100	18	5957.5N 0123.5W			30.7			*									
22.1																	
1558	19	5950.0N 0122.5W	CO														
1755	20	5957.5N 0127.5W			34.4			17.4		41.2				*	*	*	
1855	21	5957.5N 0137.5W			7.2			4.0		4.6				*	*	*	
2045	22	5957.5N 0142.5W			3.6			2.6		1.8				*	*	*	
2245	23	5957.5N 0155.0W			3.8			5.5		1.5				*	*	*	
2245	24	6000.0N 0210.0W			19.0	*		4.9		4.0				*	*		
23.1																	
0700	25	6002.5N 0205.0W			4.3			3.4		2.5							
0755	26	6005.0N 0200.0W			3.4			4.8		4.6							
0830	27	6005.0N 0152.5W			4.0	*		2.3		4.0							*
0940	28	6006.0N 0142.5W			4.1	*		5.2		5.0		*		*	*		
1045	29	6006.0N 0135.0W			8.5			0.4		10.4				*	*	*	
1205	30	6007.0N 0130.0W	29.0		11.3	*		10.5		20.4		*		*	*	*	
1411	31	6007.0N 0125.0W	*		8.2	*		11.5		10.2	*			*	*	*	
1540	32	6001.8N 0126.3W			23.6			*		*	*			*	*	*	
1745	33	5952.5N 0127.5W			2.7	*		*		*	*			*	*	*	
1950	34	5950.0N 0122.5W			*			*		*	*		*	*	*	*	

South Shetland - "Braer" impact area.
Michael Sars Sampling Sites

DATE	STATIONS
18.1.93	2 → 7
19.1.93	8 → 18
22.1.93	19 → 24
23.1.93	25 → 34

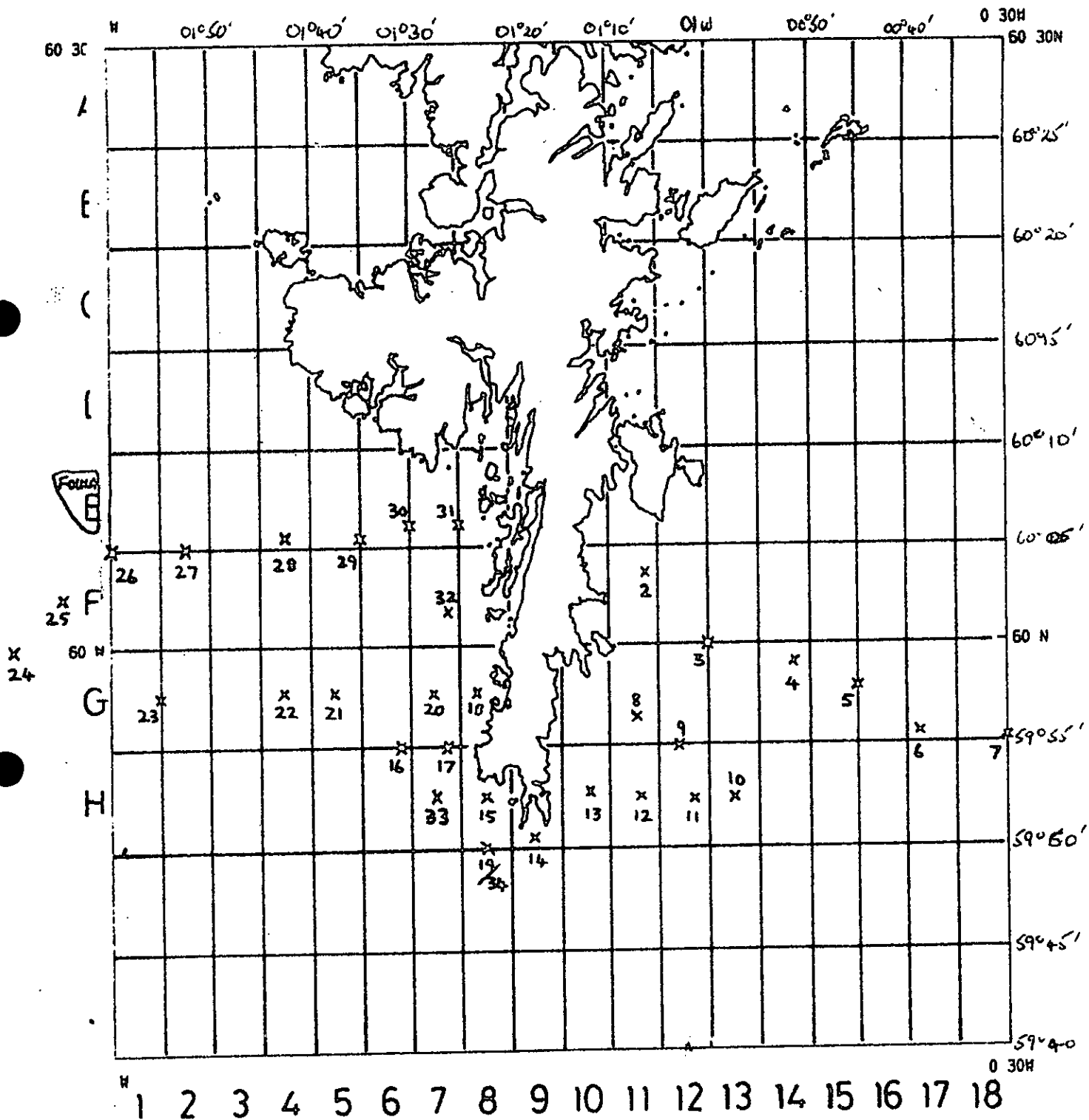


FIGURE 1

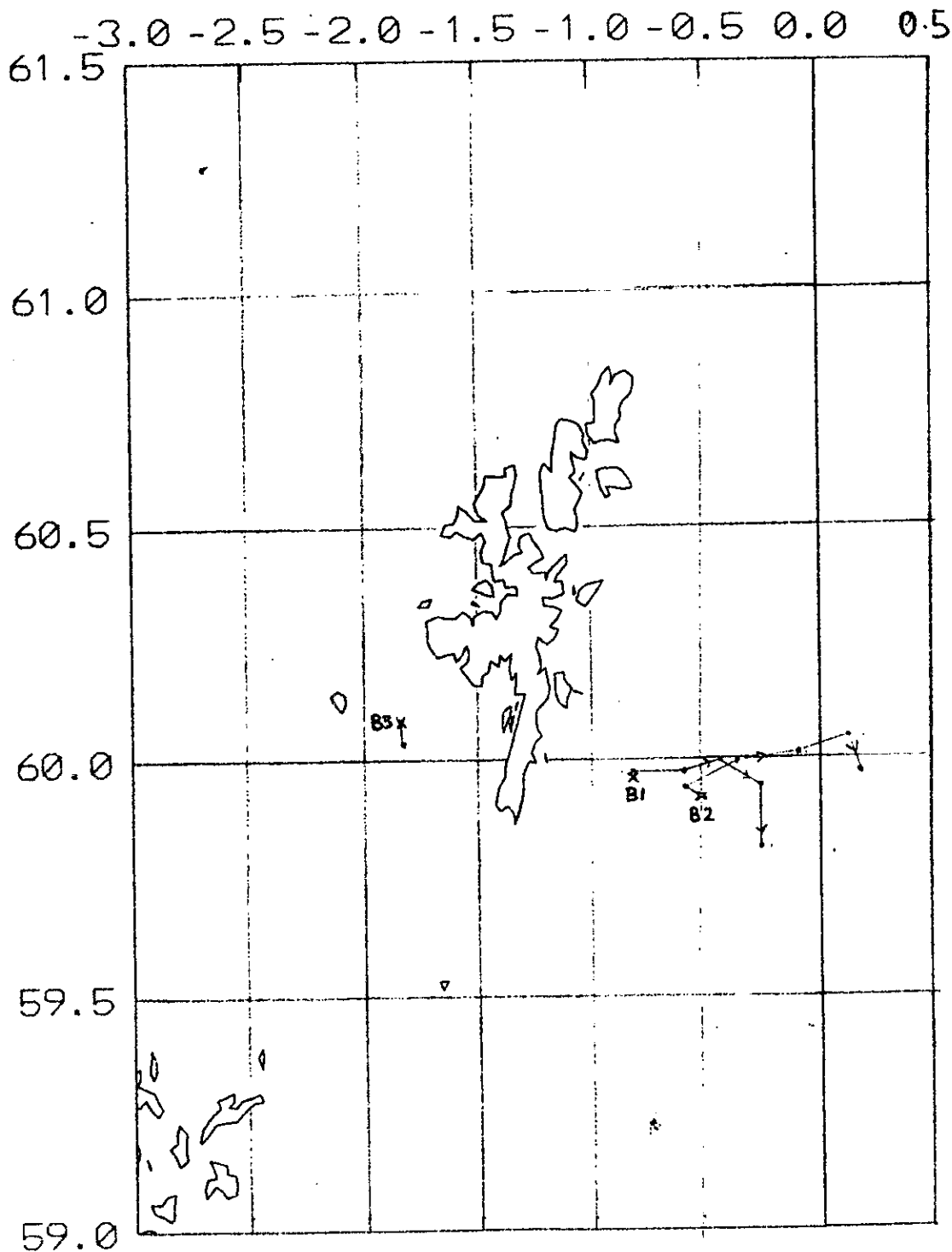
MICHAEL SARS - ARGOS BUOY TRACKS

B1
N°1583

DATE	TIME	LAT.	LONG.
18-1-93	1917	59°57.86'N	00°45.09'W
19-1-93	0934	59°58.50'N	00°48.78'W
20-1-93	0727	59°58.58'N	00°34.94'W
21-1-93	0552	59°59.74'N	00°27.78'W
22-1-93	0358	59°58.58'N	00°17.16'W
23-1-93	1522	59°48.66'N	00°16.74'W

B2
N°1576

DATE	TIME	LAT.	LONG.
18-1-93	2317	59°54.90'N	00°30.90'W
19-1-93	0934	59°56.28'N	00°34.44'W
20-1-93	0727	59°59.94'N	00°23.70'W
21-1-93	0708	60°01.02'N	00°06.30'W
22-1-93	0358	60°03.00'N	00°07.98'E
23-1-93	1522	59°58.56'N	00°11.22'E



B3
N°1580

DATE	TIME	LAT.	LONG.
23-1-93	0920*	60°05.00'N	01°52.50'W
23-1-93	1522	60°02.10'N	01°50.88'W

*: APPROXIMATE

FIGURE 2