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Ödsmål, Kville sn, Bohuslän

Hällristning
Fiskare från
bronsåldern

Rock carving
Bronze age
fishermen



MEDDELANDE från
HAVSFISKELABORATORIET · LYSEKIL

nr
218

Hydrografiska avdelningen, Göteborg

THE BRAVO BLOW OUT. OIL POLLUTION
ANALYSIS ON NORTH SEA WATER 9-11 MAY 1977.
PRELIMINARY RESULTS.

Martin Ahnoff, Stig R. Carlberg,
Lars Johnson, Bengt Yhlen.

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THE BRAVO BLOW OUT
OIL POLLUTION ANALYSIS ON NORTH SEA WATER 9-11 MAY 1977
PRELIMINARY RESULTS

by

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ABSTRACT

During a cruise with R/V Argos in the North Sea 9-11 May 1977, water samples were collected at nine stations east and north east of the Ekofisk area. The samples were extracted and analysed for petroleum hydrocarbons by spectrofluorimetry. At eight stations, no significant increase in the petroleum content could be noticed, compared with earlier measurements in the same area. At one station, about 60 nautical miles ENE of the Bravo platform, a ten times higher level was found, which extended from the sea surface down to at least 30 m depth. No traces of oil were visible on the sea surface. No oil particles were found at any of the stations as judged from visual inspection of net samples.

INTRODUCTION

Within the Ekofisk area in the North Sea a blow-out started at the oil production platform Bravo, situated at N 56°33' E 03°12.2', at 22 April. The blow-out caused an uncontrolled outflow of oil during the nearest days at an estimated rate of 3 - 4000 tons per day.

At 30 April the out-flow was mastered and the oil well was capped. The oil was reported to have spread over an area of about 4000 km², although the oil had been broken up in several fields, intersected by water without visible traces of oil.

Because of the importance of the North Sea for, amongst other things, the commercial fisheries it was of course of primary importance to undertake as quickly as possible a number of investigations in order to assess information about possible damages to the biological life in the sea area in question. Several groups from the Institute of Marine Research in Bergen were quickly on the spot, and some preliminary results of their work have been reported (1).

The National Board of Fisheries in Sweden had a cruise for biological investigations in the Skagerrak and North Sea area scheduled for early May. The programme for this cruise was modified to include samplings for chemical analysis of oil in water and some net samplings of particulate oil as well. Because of the limited ship time available, it was however, not possible to extend the investigations to the immediate vicinity of the Bravo platform.

Because the hydrographic department of National Board of Fisheries was in the process of moving to new premises, the chemical laboratory was inoperative. The colleagues at the Department of Analytical Chemistry at the University of Göteborg kindly put their expertise and analytical capacity at disposition and with joint efforts this report with preliminary results could be presented. The Institute of Oceanography at the University of Göteborg had a cruise at the western border of Skagerrak at this time, and thus additional sampling could be made and the results be incorporated here. In figure 1 the localities of the sampled stations are shown.

METHODS

Water sampling

The sampling and analytical procedures for water samples were identical to those described by Ahnoff et al. (2) and Ahnoff and Johnson (3). Water was sampled at depths from 1 m to 30 m. Closed 1-l bottles were lowered to the desired depth in a special sampler (2). A teflon film covering the opening was punched by a spring loaded mechanism triggered by a falling messenger. The bottles were then filled with water in 5-15 seconds. Samples from 1 m depth were taken by an open "drop bottle" of the type recommended for IGOS (4). Both sampling methods ensured that samples were taken unaffected by the surface water or a surface oil slick.

Net-sampling and trawling

As a rough scanning for oil particles in the water, net-sampling and trawling were carried out on some stations (Table I).

A bongo-net with two openings of 600 mm in diameter and clothing with mesh size at 300 μm and 500 μm respectively was towed in oblique hauls between the sea surface and 50 m depth. The towed distance was about 0.5 nautical mile and the filtered volume of sea water was about 250 m^3 .

An Isaac-Kid Mid Water Trawl (IKMWT) was towed in the same way for about 0.9 nautical mile, filtering approximately 20 000 m^3 of sea water.

Analytical procedure

Water samples were extracted aboard the ship directly after collection, using n-hexane as extractant. (The solvent was spectroscopic grade n-hexane, Merck, which had been additionally purified on an activated silica gel column). The extraction was performed in the sampling bottles by means of vigorous magnetic stirring during 45 minutes. The extracts and possible emulsions were pipetted off and stored in test tubes and analysed upon return to the laboratory on shore. Without further pretreatment UV-fluorescence spectra of the extracts were recorded with a double monochromator spectrofluorimeter. (Aminco Bowman

SPF) equipped with a 200 W xenon lamp. Ekofisk crude oil (more than one year old) was used as a reference substance. For quantitation the following wavelengths were used: excitation 230 nm, emission 340 nm.

RESULTS

Water samples

The measured content of petroleum hydrocarbons (see Table II) was very much the same at eight of the nine stations (see Figure 1) the concentration at 1 m depth was 0.9 - 1.7 $\mu\text{g/l}$ and it decreased to 0.5 - 1.0 $\mu\text{g/l}$ at 30 m depth. In comparison, water samples taken in the North Sea in October 1975 at 2 m depth contained 1.0 - 2.0 $\mu\text{g/l}$ (see Table III). Compared in this way, no significant increase in oil content was observed.

At one station (No 7) the concentration was 13 $\mu\text{g/l}$ at 1 m and 6 $\mu\text{g/l}$ at 30 m depth. This is ten times the mean level at the other stations. It is also considerably higher than any concentration measured by our laboratory in open sea water using the same analytical method, including samples from the North Sea, Skagerrak, Kattegatt and the Baltic Sea.

Net samples

At visual inspection no oil particles could be detected in either of the samples obtained with the bongo-nets or with the Isaac-Kid trawl. The only exception was a trawling in the vicinity of station 1 which yielded some oil particles, which were hard and apparently of other origine than the Bravo blow out.

CONCLUSIONS

This investigation, although limited, shows that ten days after the uncontrolled leak on the Bravo platform was stopped, at a time when no visible traces of oil on the water surface remained in the area of investigation, the polluting oil had spread into the water body down to at least 30 m depth. At this occasion, 9-11 May, high levels were found only near the Ekofisk area and had apparently not spread to the Norwegian coast or the Skagerrak.

ACKNOWLEDGEMENTS

Thanks are due to O. Hagström, National Board of Fisheries, for providing information about the results of net-sampling and trawling. The Institute of Oceanography at the University of Göteborg kindly put the results of their observations at our disposition. Thanks are also due to Dr. K. Palmork at the Institute of Marine Research in Bergen for providing the reference oil and to the officers and crew of R/V Argos for their extra work, caused by this additional part of the programme.

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Figure 1.

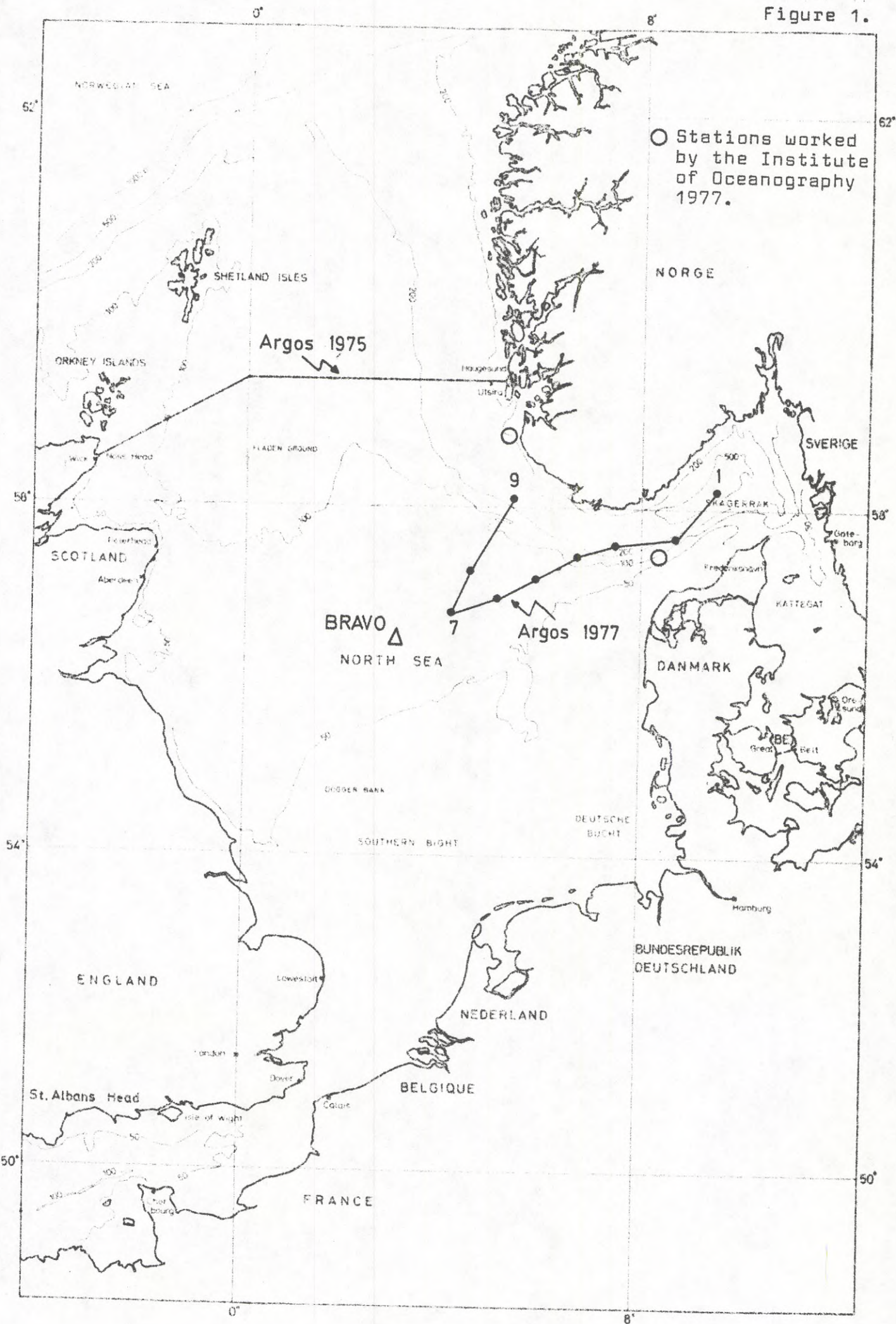


Table I

Samplings performed

Argos 1977 Station no	Water samples	Bongo-net	IKMWT
1	x		
2	x		
3	x	x	
4	x	x	
5	x	x	
6	x		
7	x	x	x
8	x	x	x
9	x		

On all stations water was sampled at the following depths:

1 m, 5 m, 10 m and 30 m.

IKMWT = Isaac Kid Mid Water Trawl

Table II

Results obtained from water samples taken during cruises with R/V Argos (National Board of Fisheries) and R/V Svanic (Institute of Oceanography, University of Göteborg). All values are average of duplicate samples.

Position and date	Depth	$\mu\text{g/l}$	Position and date	Depth	$\mu\text{g/l}$	Position and date	Depth	$\mu\text{g/l}$
Station 1 N 58°06.7' E 09°43.0' 1977-05-09	1 m	1.7	Station 5 N 59°07' E 05°54' 1977-05-10	1 m	1.2	Station 9 N 58°02' E 05°20' 1977-05-11	1 m	1.2
	5 m	1.2		5 m	0.8		5 m	0.7
	10 m	1.0		10 m	0.5		10 m	0.6
	30 m	0.7		30 m	0.6		30 m	0.7
Station 2 N 57°38' E 08°49' 1977-05-10	1 m	1.5	Station 6 N 56°56.8' E 05°05.5' 1977-05-10	1 m	0.9	JÄREN N 58°40' E 05°20' 1977-05-04	1 m	0.4
	5 m	1.0		5 m	0.7		10 m	1.4
	10 m	0.7		10 m	0.5		20 m	1.3
	30 m	0.7		30 m	0.6			
Station 3 N 57°30.8' E 07°39.0' 1977-05-10	1 m	1.3	Station 7 N 56°46' E 04°14' 1977-05-10	1 m	13.3	N. HANSTHOLM N 57°30.6' E 08°23.6' 1977-04-26	1 m	1.2
	5 m	1.4		5 m	8.1		10 m	1.7
	10 m	0.9		10 m	6.3		20 m	1.0
	30 m	0.5		30 m	6.2			
Station 4 N 59°19.2' E 06°47' 1977-05-10	1 m	1.2	Station 8 N 57°12' E 04°34' 1977-05-11	1 m	1.0	N. HANSTHOLM 1977-05-05	1 m	1.5
	5 m	0.9		5 m	0.9		20 m	1.4
	10 m	1.2		10 m	0.8			
	30 m	0.7		30 m	1.0			

Table III

Results obtained from water samples taken at 2 m depth during a cruise with R/V Argos 14 - 16 October 1975.

Position		µg/l
N 59°20'	E 04°50'	1.7
"	04°30'	2.0
"	04°11'	1.7
"	03°51'	1.8
"	02°00'	1.7
"	01°19'	1.4
"	00°40'	1.1
"	00°00'	1.0
N 58°30'	W 02°51'	1.3

