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Results of Sea Testing a Device for  
Recording Fishing Effort Data

by

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Abstract

Sea tests were conducted of the Fishnet Bathykymograph (FBK) aboard commercial otter trawlers and Bureau of Commercial Fisheries research vessels, during the period of November 1969 through March 1970. The FBK, attached to an otter trawl headrope, recorded the number of tows and the duration and depth of each during a fishing trip. Test methods and results are described.

Introduction

A fishing effort data acquisition system has been developed (Crossen, 1970) and field tested by the Bureau of Commercial Fisheries and the Geodyne Division of EG&G International. The system incorporates a 14-day time-depth recorder named the Fishnet Bathykymograph (FBK) and Dockside Support Equipment (DSE). The FBK is an instrumented headrope float which, when attached to a commercial trawl, records the number of tows made during a fishing trip and the duration and depth of each.

The FBK senses depth by a solid state, strain gauge, pressure transducer which is part of a bridge circuit. A one-minute multivibrator timer provides the basic time interval reference. Frequency stability of the timer over a 14-day period is well within  $\pm$  three hours. The motor control turns the tape recorder on for a 4-second period every minute. During this period, three coded pulses are recorded. The position of the second pulse, in relation to the first, and the third, is a function of depth.

A survey was made of New England trawler captains to determine the best location on the trawl headrope for placement of the FBK. Damage occasionally occurs to the floats when fishing rough, rocky bottom where frequent hangups are likely. Occasionally, serious hangups cause wing sections to part resulting in the loss of floats. As a result of the survey we decided to attach the FBK to the center of the headrope.

Cruise 68-1 of the research vessel, Albatross IV, was conducted to measure the configuration of several otter trawls (headrope height, and wingspread) while towing. During these tests an FBK recorder was attached to the trawl to determine its effect, if any, on the net's shape. The FBK replaced one of the forty 20-cm (8-inch) aluminum floats distributed along the headrope of the net. The 24-cm (9.5-inch) FBK has a positive buoyancy of two pounds compared to approximately ten pounds for the standard float. Measurements recorded by a headrope mounted echo-sounder transducer showed no difference in headrope height, with and without the FBK recorder.

### Operation

During December 1969, twenty-three FBK recorders were prepared for field tests. Each recorder was loaded with a 14-day magnetic tape cartridge and 8 "C" cell battery pack. Pressure calibration levels of 0,100,200,300 and 400 meters (0,146,292,437,585 psi) were applied to all recorders with the Time-Pressure Calibrator (TPC). The calibration system consists of a hydraulic hand pump, a vernier pressure control, a test gauge and electric-timing clock. Calibration pressure points are established by a two-step procedure starting with a rough setting of the hand pump and a fine adjust with the pressure control. The pressure gauge is a bourdon tube type and is accurate to 0.26 percent.

Bureau port agents delivered the FBK's to commercial trawlers out of the ports of Boston, Mass., New Bedford, Mass., and Provincetown, Mass. The instrumented floats were attached to the headrope of the net in the same manner as the standard floats. The trawler captains were requested to log the date and time of the first tow. The area fished by those trawlers carrying FBK's was within Division 5Y and 5Z (Georges Bank) of the Convention Area for the ICNAF.

At the end of the fishing trip the port agent retrieved the FBK from the trawler. Then each unit was recalibrated with the TPC prior to removing the magnetic tape cartridge containing trip data. The tape cartridge was then inserted into the Analog Playback System (APS) which contains electronic logic necessary for converting the pulse interval coded signal into analog readout (Figure 1). The APS generates a strip chart record of a 14-day trip in seven minutes. The strip chart record was then checked to determine the accuracy of the time-depth data. An oscilloscope display was also used to determine the coded pulse accuracy directly off the magnetic tape.

To assure a high level of reliability each FBK was required to successfully complete a mission of up to 14 days. A set of specifications determined the success or failure of each mission. In general, each unit must automatically start and then record the depth and duration of each tow, as well as the time between tows.

### Results

The results of sea tests (see Table 1) aboard commercial otter trawlers and Bureau research vessels indicate that the FBK is capable of withstanding two-week periods of dragging over rough bottom. The time versus depth data recorded on the FBK tape cartridge is easily changed into analog form for immediate analysis.

Figure 2 is a record of groundfish survey Cruise 70-3, Part I aboard research vessel Albatross IV. A total of 56 one-half hour tows were made in the Gulf of Maine using a #36 otter trawl with an FBK attached to the headrope. Depths recorded ranged from 45 to 275 meters. Figure 3 is a 41-hour record of the F/V Francis J. O'Hara making 26 one to two hour tows in the Georges Bank area. Depths ranged from 130 to 230 meters.

During the FBK sea trials a failure was detected which caused false depth indications (see Figure 2, point A). The cause of this problem was attributed to electrical noise generated by the tape drive motor and influenced by the attitude of the motor with respect to gravity. Corrective action consisted of shielding motor leads. The electronic module within the recorder does contain an interference suppression circuit for the motor drive. This problem was also detected on other recorders, and corrective measures have been taken.

### Discussion

Sea tests have been conducted to determine the reliability of the FBK and DSE. The FBK recorder is a very rugged instrument capable of operating in the severe environment encountered at sea. The "noise" problem which causes erroneous depth data has been analyzed in the laboratory under simulated ocean conditions. Modifications have been made to the recorders and sea tests will be resumed.

Upon successful completion of the further sea tests a six-month to one-year evaluation period of the fishing effort data acquisition system will be initiated. This study will be made to determine instrument reliability, maintenance costs, and data reduction methods prior to procuring a number of production recorders for collecting effort data in the fleet.

References

Crossen, J.M. 1970. In press. A device for automatically recording fishing effort aboard otter trawlers. Annual Proceedings International Commission Northwest Atlantic Fisheries, No. 7

20 May 1970

FBK (EG&G MODEL 690) SEA TESTS - NOVEMBER 1969 - MARCH 1970

Test	FBK	Vessel	Port	Date		Battery Voltage	No. Tows Recorded	Results
				Start	Evaluation			
1.	23	Terra Nova	New Bedford	22 Nov 69	5 Dec 69	5.4	25	Satisfactory, except for slight noise
2.	22	Narragansett	New Bedford	19 Nov 69	5 Dec 69	5.4	9	" " " "
3.	24	Liberty Belle	Provincetown	23 Nov 69	5 Dec 69	5.3	27	Satisfactory, noise inc. at end of record
4.	29	Sturgeon Bay	Boston	21 Nov 69	5 Dec 69	---	--	Flooded due to sharp blow at seal
5.	18	O'Hara	Boston	24 Nov 69	5 Dec 69	5.4	44	1st 3 days satisfactory, motor drive resistor (R3) open
6.	05	Kilkenny	New Bedford	25 Nov 69	5 Dec 69	5.2	22	Satisfactory, except for noise
7.	14	Shamrock	New Bedford	28 Nov 69	5 Dec 69	5.4	29	" " " "
8.	13	R/V Delaware II	Gloucester	7 Dec 69	23 Dec 69	6.0	--	Failed to turn on faulty relay K1
9.	15	R/V Albatross IV	Woods Hole	6 Dec 69	23 Dec 69	5.0	8	Defective tape drive motor
10.	26	Falcon	New Bedford	10 Dec 69	23 Dec 69	5.3	33	Satisfactory, except for slight noise
11.	11	Liberty Belle	Provincetown	6 Dec 69	23 Dec 69	4.2	14	" " " "
12.	07	Narragansett	New Bedford	15 Dec 69	31 Dec 69	2.4	--	Snarled tape cartridge
13.	08	Valkyrie	New Bedford	15 Dec 69	23 Dec 69	---	--	Flooded due to improper O-ring assembly
14.	32	Mari-Gail & Barbara	New Bedford	17 Dec 69	23 Dec 69	5.4	45	Satisfactory except for slight noise
15.	21	Kilkenny	New Bedford	13 Dec 69	23 Dec 69	5.3	20	" " " "
16.	27	Johnny-O	Provincetown	17 Dec 69	16 Jan 70	1.4	6	1 tow on 1st day, 5 tows on 2nd day then record ends

Table 1 Continued.

Test FBK	Vessel	Port	Date		Battery No.	Voltage	Tows	Results
			Start	Evaluation				
17. 00	Johnny-O	Provincetown	17 Dec 69	16 Jan 70	2.1	--	Snarled tape cartridge	
18. 04	Seagold	New Bedford	17 Dec 69	23 Dec 69	5.4	38	Satisfactory, except for slight noise	
19. 25	O'Hara	Boston	18 Dec 69	31 Dec 69	4.9	20	" " " " " "	
20. 16	Angela W.	New Bedford	3 Jan 70	16 Jan 70	5.2	46	" " " " " "	
21. 33	S. Fisher	New Bedford	3 Jan 70	16 Jan 70	3.5	--	Snarled tape cartridge	
22. 17	Shamrock	New Bedford	15 Jan 70	11 Feb 70	4.1	--	" " " " " "	
23. 13	Kilkenny	New Bedford	16 Feb 70	--	---	--	Lost at sea. Headrope parted.	
24. 18	Zebet	New Bedford	8 Mar 70	16 Mar 70	5.3	32	Satisfactory, except for slight noise	
25. 15	R/V Albatross IV	Woods Hole	12 Mar 70	21 Mar 70	5.4	56	" " " " " "	

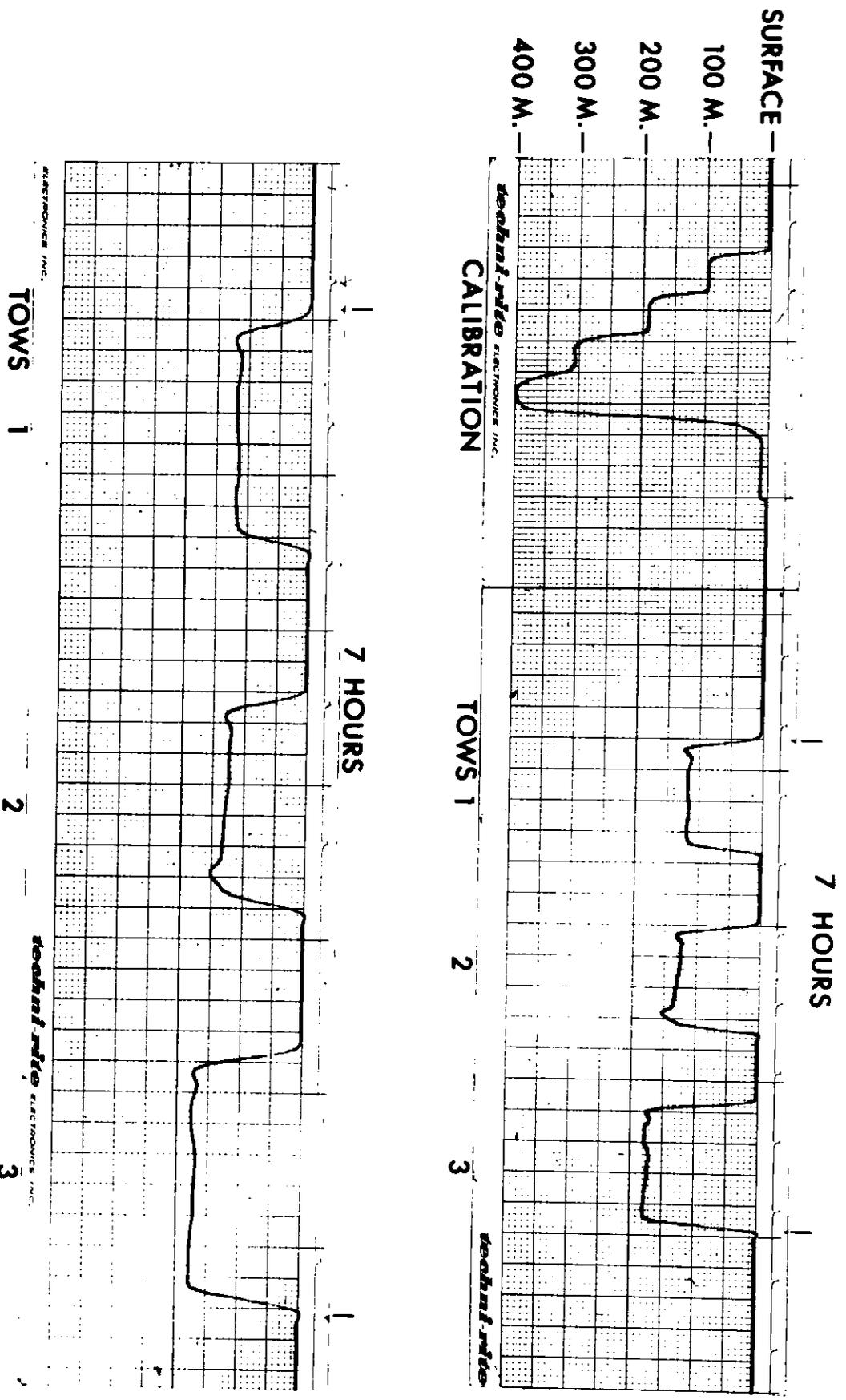


FIG. 1. RECORD OF F/V FRANCIS J. O'HARA (OTL) OF BOSTON, MASS.  
 UPPER: SLOW PLAYBACK SPEED.  
 LOWER: FAST PLAYBACK SPEED.

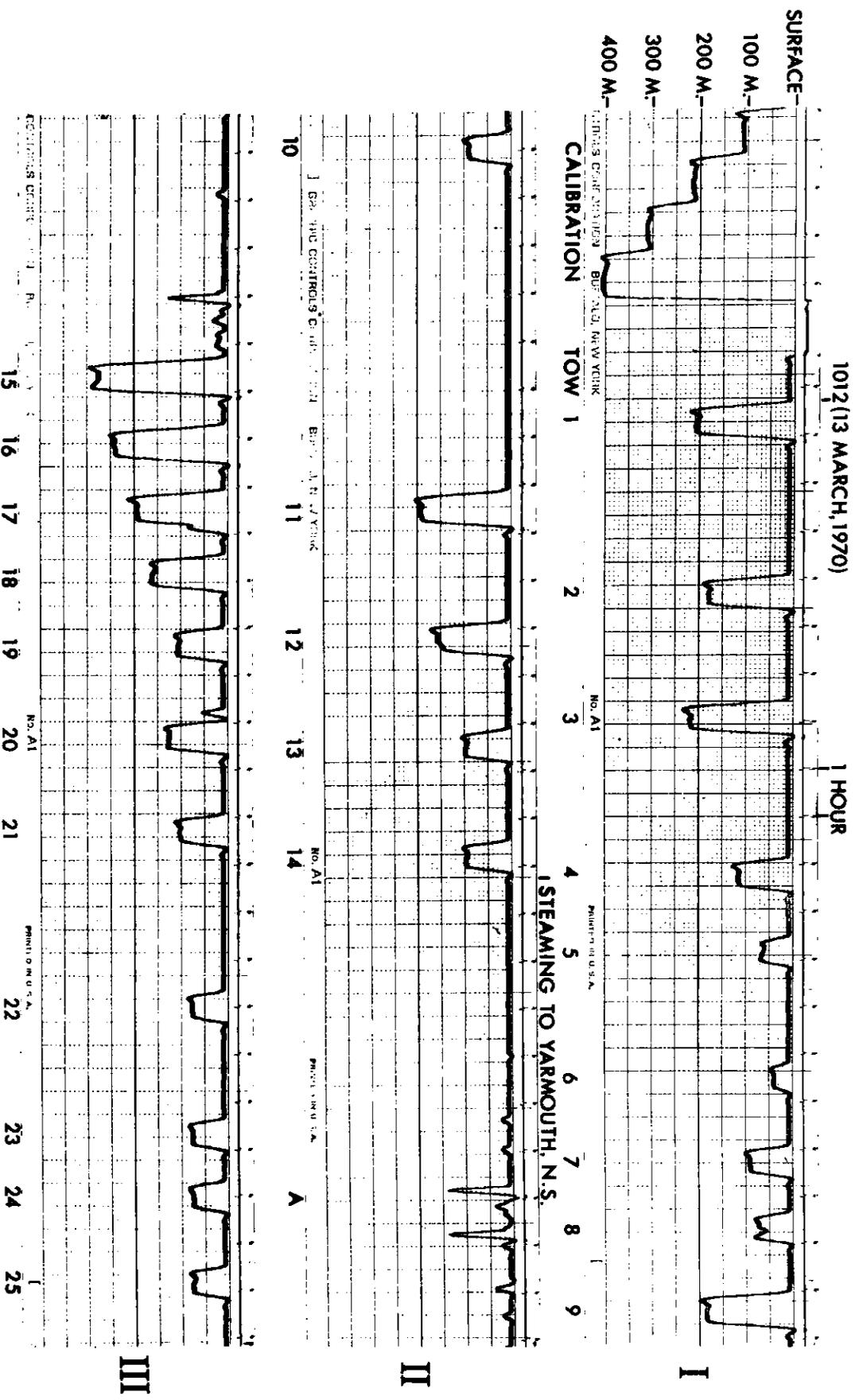


FIG. 2 RECORD OF R/V ALBATROSS IV CRUISE 70-3, PART I. (GROUNDFISH SURVEY - GEORGES BANK)

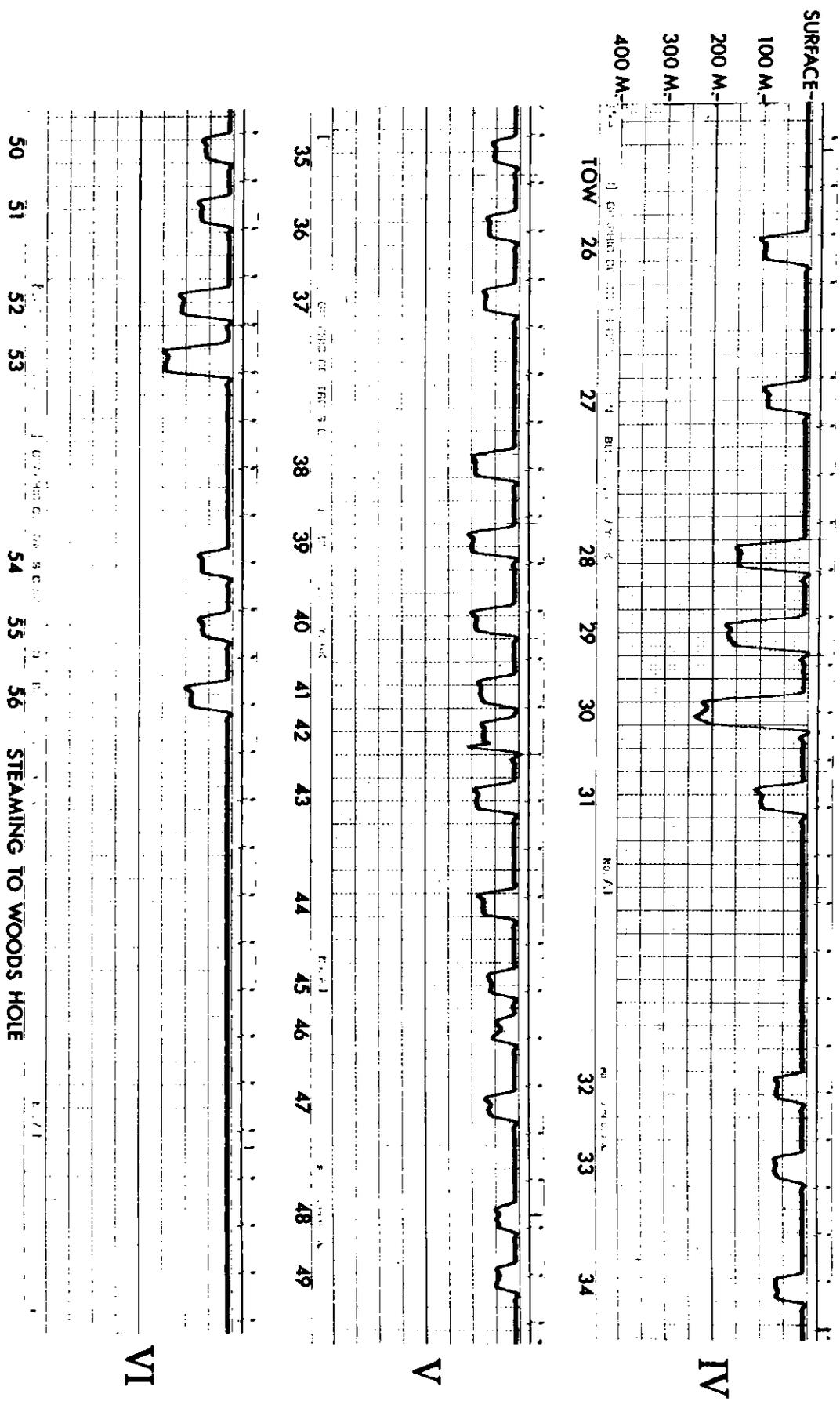


FIG. 2 (Cont.)

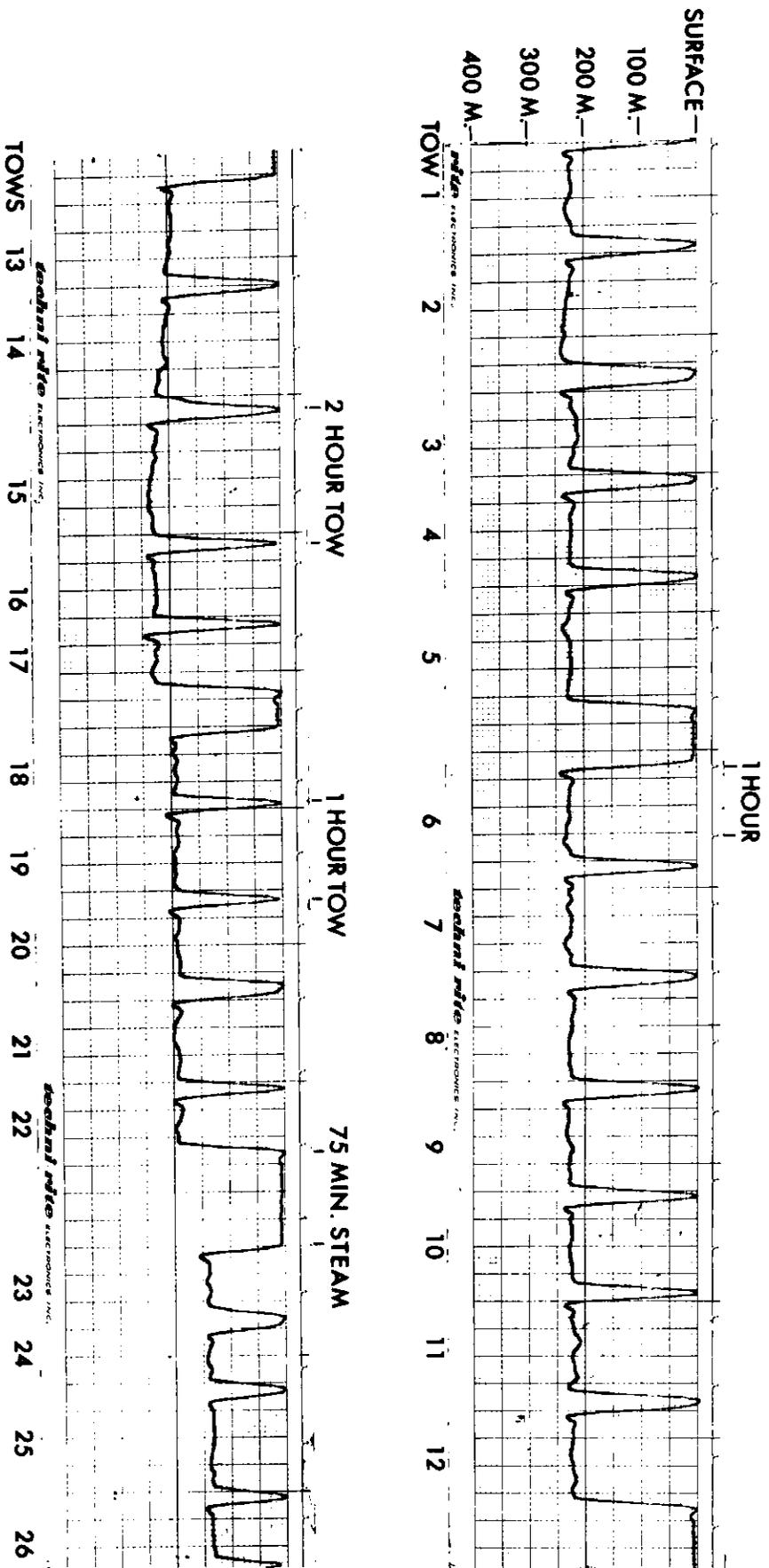


FIG. 3 RECORD OF F/V FRANCIS J. O'HARA DURING NOVEMBER, 1969 IN THE GEORGES BANK AREA. 26 ONE TO TWO HOUR TOWS MADE IN A 41 HOUR PERIOD.