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REPORT ON TOPOGRAPHIC SURVEY AND DEEP-SEA TRAWL OPERATIONS IN THE ANDAMAN SEA

by

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SEAFDEC Training Department

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Introduction

The Department of Fisheries of the Kingdom of Thailand initiated fishery exploration of the Andaman Sea in 1965 and, the Thai-Japanese-SEAFDEC joint oceanographic and fishery survey was conducted, at a depth of 30 to 300 metres, in the Andaman Sea during 1981.

Both activities were very successful and well evaluated.

We are very pleased to present a report on our activities there during M.V. PAKNAM Cruise No.79-3/1987 the objective of which was primarily to conduct shipboard training for 1986-1987 Regular Course Trainees from 19 August to 24 September 1987.

The vessel also carried out a topographic survey and deep-sea trawl operations, at a depth of more than 300 metres, in the Thai EEZ of the Andaman Sea .

The aim of the survey and operations was to introduce the trainees to deep-sea fishing methods and a survey of the sea-bed and floor by echosounder and fishfinder, making use of the trainees' navigational knowledge.

Before carrying out deep-sea trawl operations, three topographic surveys were conducted. The first survey was conducted on 20 August 1987 on the way to the Indian Ocean from the port of Phuket, Thailand, the second one on 29 August 1987 after leaving the Indian Ocean for the Andaman Sea and, the third one on 6 September 1987 after leaving Penang Island, Malaysia. The areas where topographic surveys and deep-sea trawl operations were carried out are shown in Figure 1.

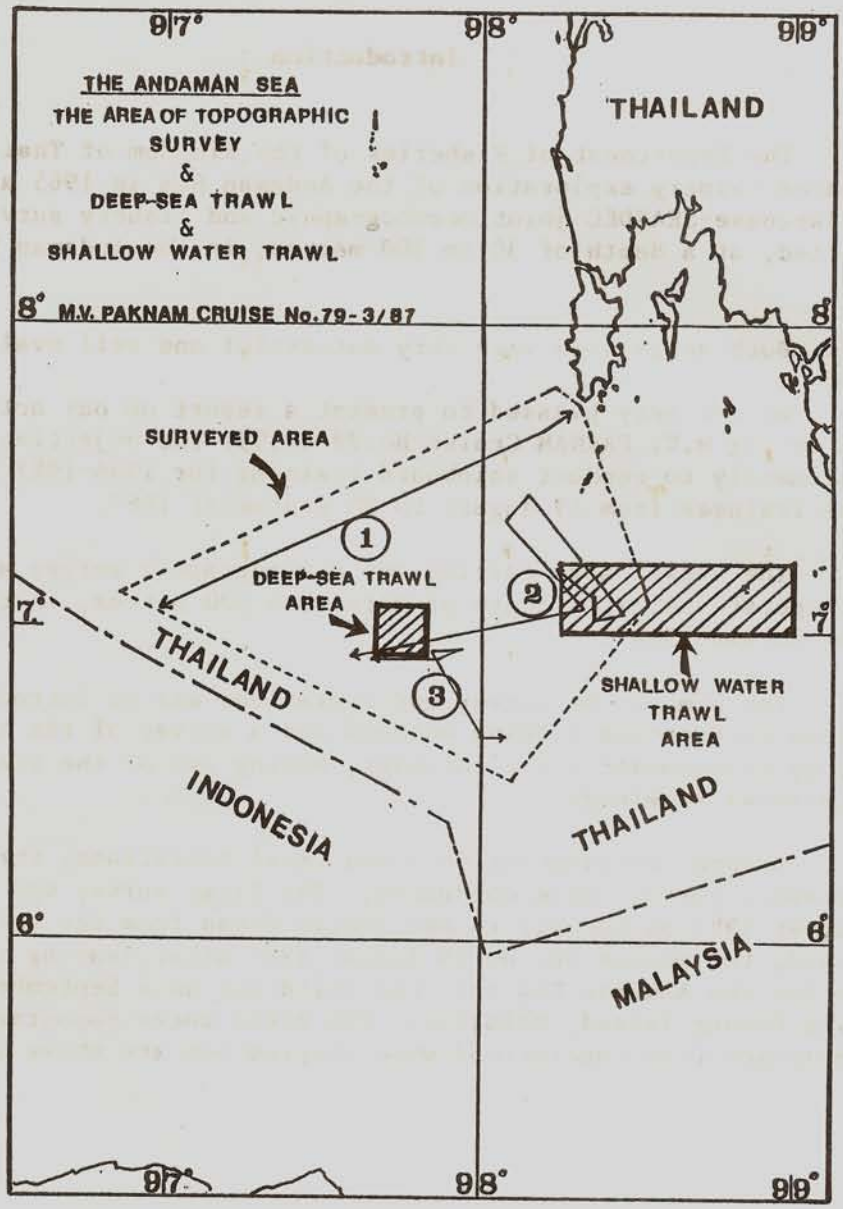

Fig. 1 Topographic survey and deep-sea trawl areas.

Legend

①, ② and ③: Topographic survey course over ground (C.O.G.)

: Trawled area

: Unilateral Claim

Materials and Methods

1. Data collection of ship's position and travelling speed were obtained by Navy Navigation Satellite System (NNSS); Model JLE-3500, Japan Radio Co., Ltd., and the marine radar; Model FCR-1411, Furuno Electric Co., Ltd.

When ship's position was not available by NNSS or marine radar, it was determined by the method of Dead Reckoning according to the ship's travelling speed and course over ground (C.O.G.)

2. Soundings were obtained by echosounder; Model JFF-620, Japan Radio Co., Ltd. (JRC) and Colour-Video Fishfinder; Model FCV-200, Furuno Electric Co., Ltd.

3. Height of net mouth and water temperature near the sea-bed were observed by net monitor; Model FNR-700 Mark III and CN-10A, Furuno Electric Co., Ltd.

4. The bottom trawl net used was of a 2-seam type, prepared at the Training Department. (see Figs. 11 and 12).

5. The otter boards used were of paravane type manufactured by Hakodate Seimo-sengu Co., Ltd. (see Fig. 13 and Photos 4, 5 and 6).

6. The estimated isobathic lines drawn on the chart in Figure 4 were obtained from nautical chart No.830 published at Taunton 3rd January 1975 under Superintendence of Rear-Admiral G.P.D. Hall, C.B., D.S.C., Hydrographer of the British Royal Navy and from the survey data of M.V. PAKNAM.

7. Ship's speed through the water was measured by the Pitometer log.

Results and Discussion

1. Topography and fish schools

The topographic surveys show that the floor of the Andaman Sea, below 400 metres, is almost all very smooth and slightly sloping (see Figs. 2, 3 and 4). However, some areas of the floor are steep and rough (see Figs. 6, 7, 24 and 26), and the fishfinder detected well concentrated schools of demersal fish in these areas (see Figs. 6 and 7).

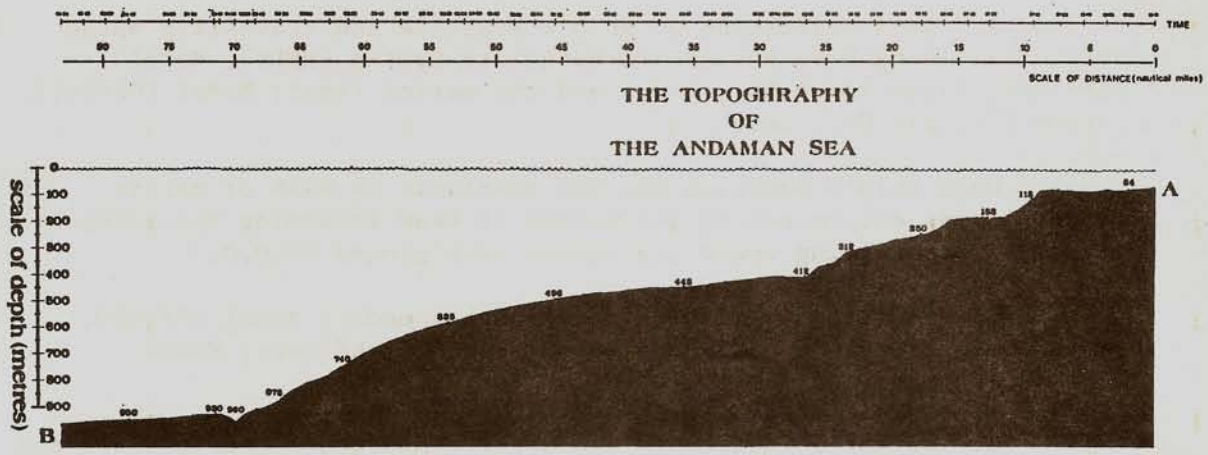

Fig. 2 Cross section diagram of the Andaman Sea-bed. between 07°36′.9 N, 98°03′.6 E (89 metres) and 07°02′.9 N, 96°55′.1 E (970 metres).

Ref.: A ⟶ B ; Course Over Ground (C.O.G.)
See Fig. 5.

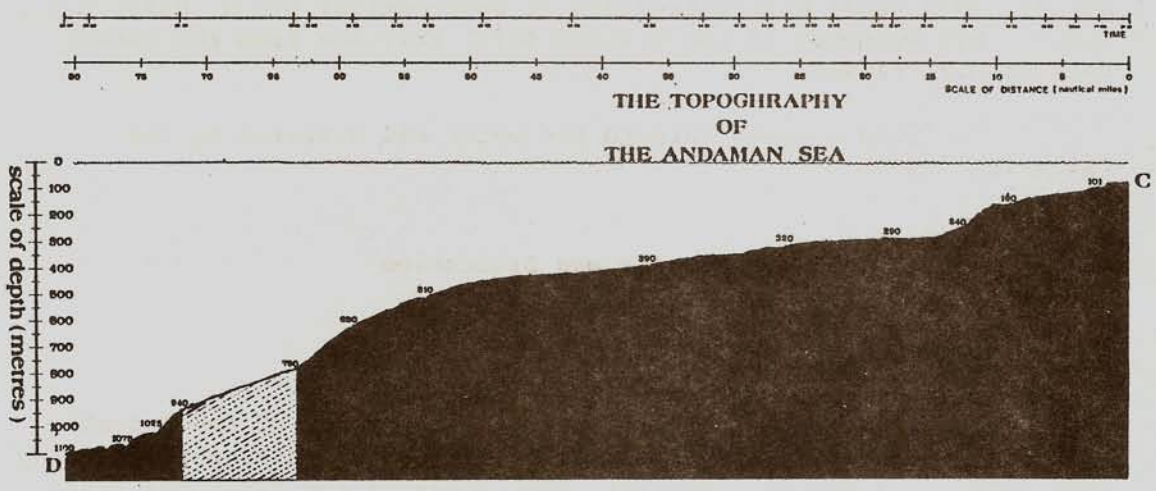

Fig. 3 Cross section diagram of the Andaman Sea-bed. between 07°03′.7 N, 98°22′.7 E (84 metres) and 06°49′.2 N, 97° 04′.4 E (1100 metres).

Ref. : C ⟶ D ; Course Over Ground (C.O.G.)
See Fig. 5

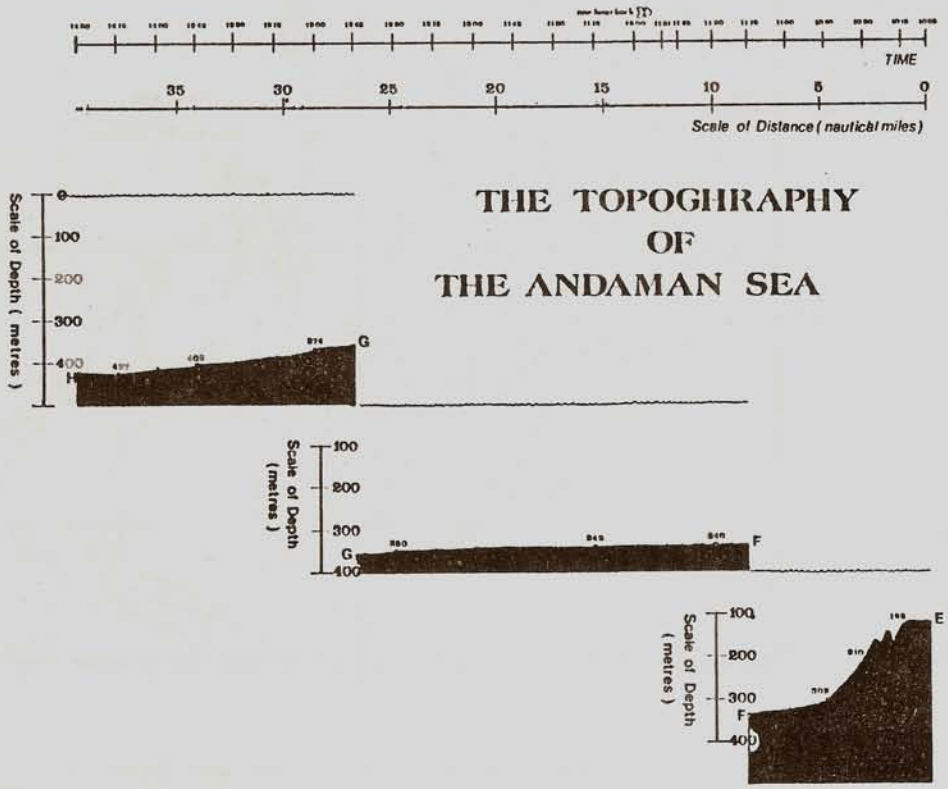

Fig. 4 Cross section diagram of the Andaman Sea-bed between 06°39′.7 N, 98°08′.6 E (124 metres), 06°39′.7 N, 98°00′.8 E (340 metres), 06°56′.45 N, 97°52′.06 E (360 metres) and 06°54′.2 N, 97°39′.3 E (425 metres).

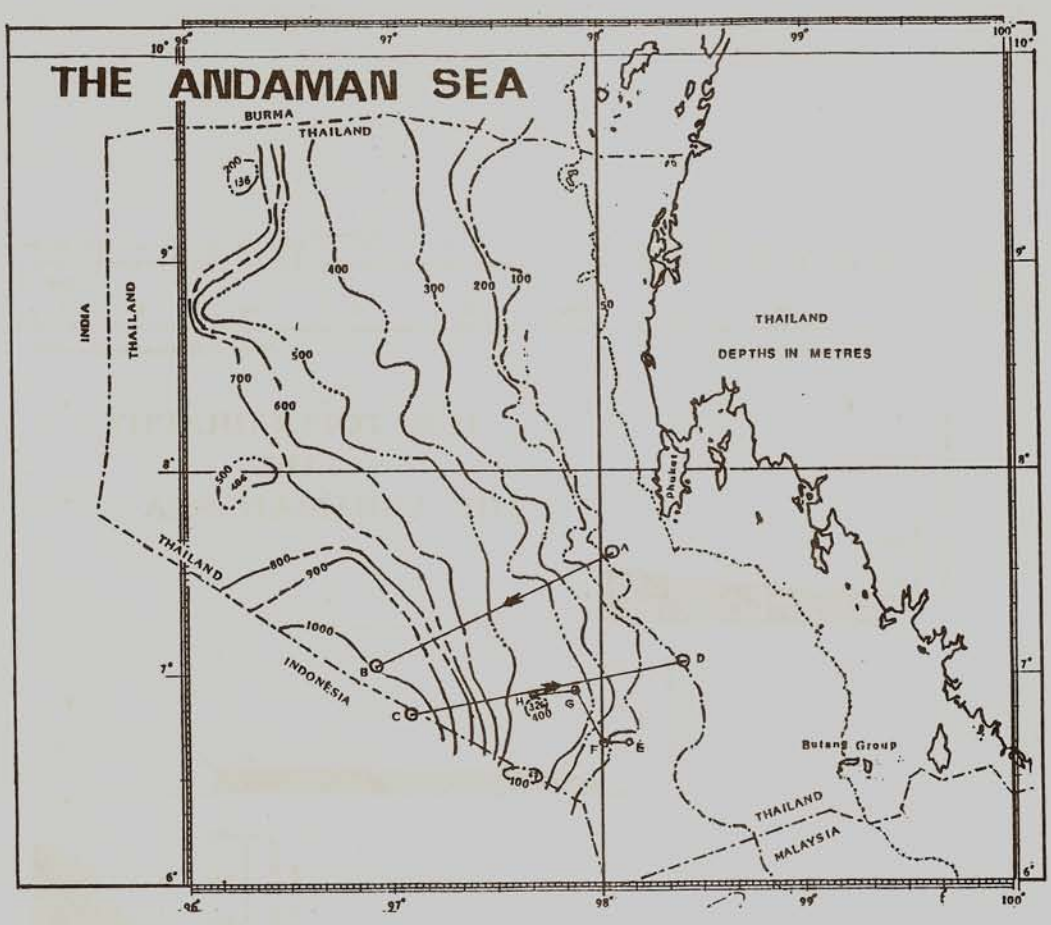

Fig. 5 EEZ of Thailand in the Andaman Sea and Isobathic lines. Excluding areas below 100 metres; about 29,060 NM^2.

Legend

1. Unilateral claim ——— – ——— – ———

2. Isobathic lines

100 metres ——.——.——	200 metres ——.——.——
300 metres ——..——..——	400 metres ——...——....
500 metres ——.....——.....	600 metres ——— – ——— –
700 metres ——— – – ——— – –	800 metres ——— – – – ———
900 metres ——— – – – – ———	1000 metres ———————

3. Course Over Ground

B ←——— A C ———→ D

The floor shallower than 400 metres is rather rough and the fishfinder detected fish schools there (see Figs. 17, 33 and 35).

Specially designed trawl gear, bottom longlines and trap-cage nets have potential to catch these schools, on condition that a 20-50 gross tonnage wooden boat, could be equipped with a hydraulic hauling device.

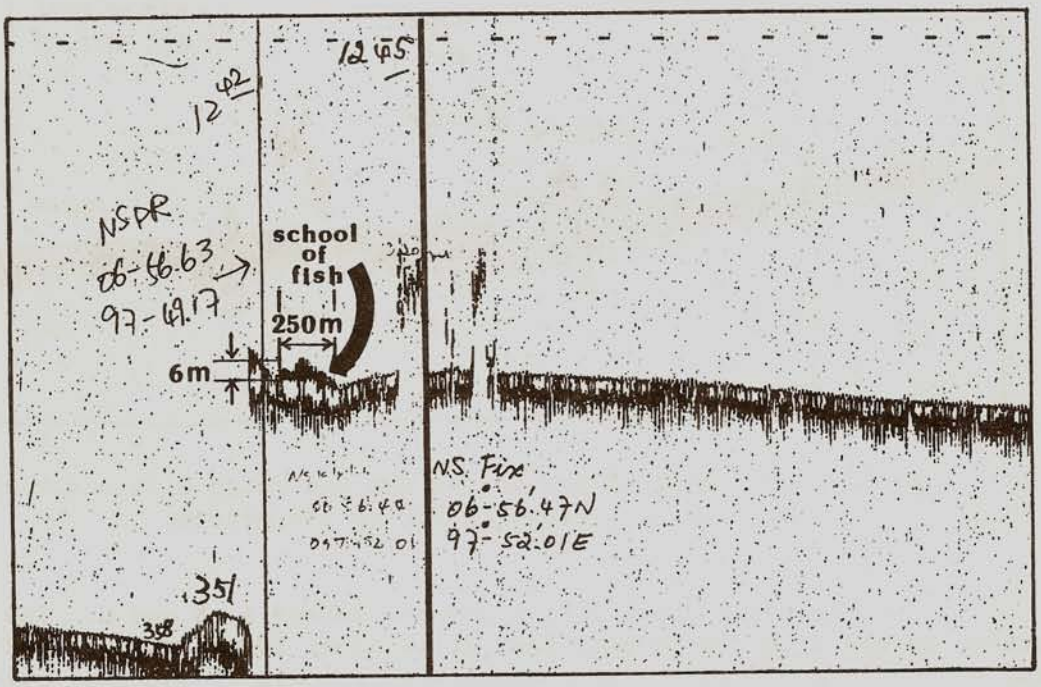

Fig. 6 Recording of sea-bed, steep and rough with a school of fish at a depth of 360 metres.

School of fish : 6 metres wide and 250 metres long.

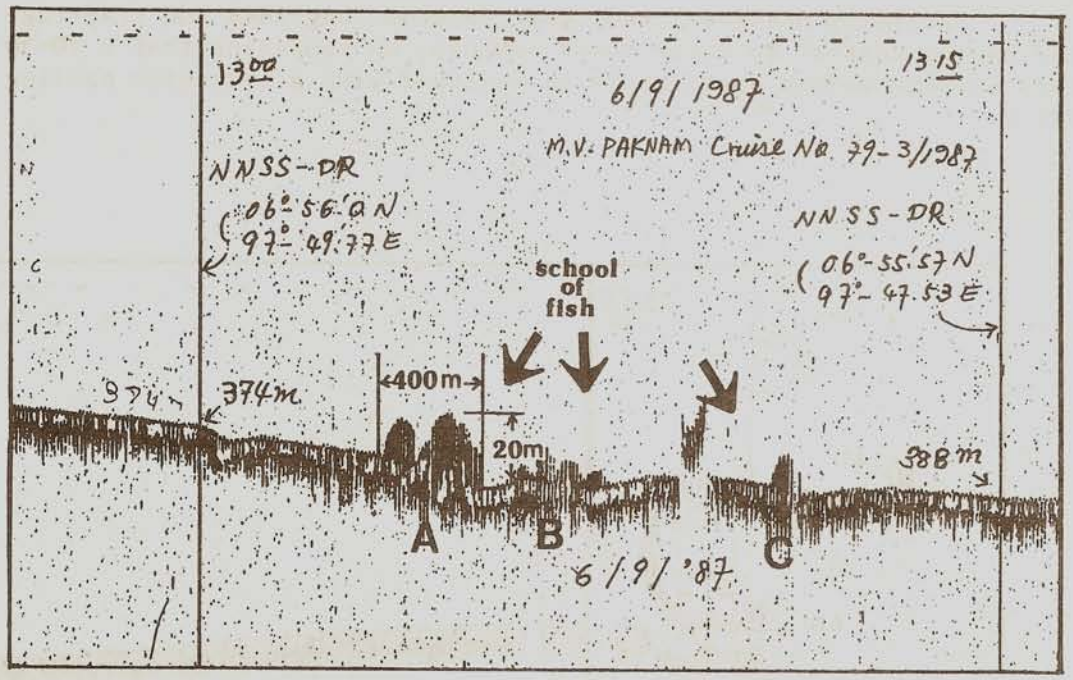

Fig. 7 Recording of sea-bed, steep and rough with a school of fish at a depth of 380 to 386 metres.

The recording shows 3 fish schools marked A, B and C. The school marked A is the largest one, it is about 20 metres wide and 400 metres long. To catch the concentrated schools of demersal species detected by the fishfinder on the rough bed with the conventional trawl gear of M.V. PAKNAM would be rather difficult. On the other hand, for M.V. PAKNAM (1000 Horse-power) to drag trawl gear over a smooth deep floor would be easy.

2. Deep-sea trawl operations

The training vessel dragged 2-seam trawl gear 4 times (trawl serial numbers 7, 8, 9 and 10) over the smooth deep-sea floor. Figure 8 shows trawled course over ground.

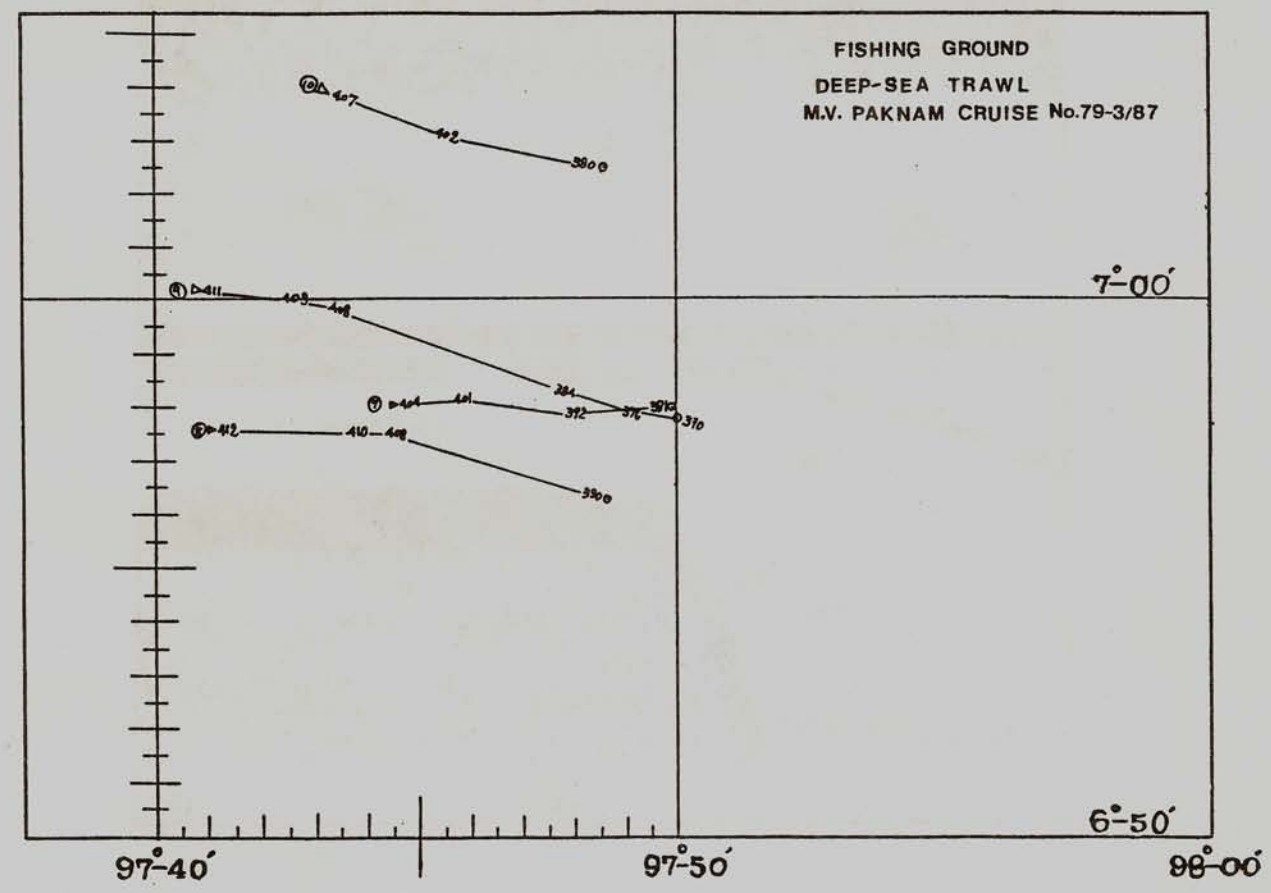

Fig. 8 Trawled course over ground on deep-sea floor of the Andaman Sea.

Soundings in Metres

Dragging speed through the ground was 2.0 to 2.2 knots (3.7- 4.0 Kilometres per hour) and through the water 2.4 knots (4.4 Kilometres per hour).

The height of net mouth during dragging was 4.5 to 5.5 metres measured by the net monitoring system (see Fig. 9).

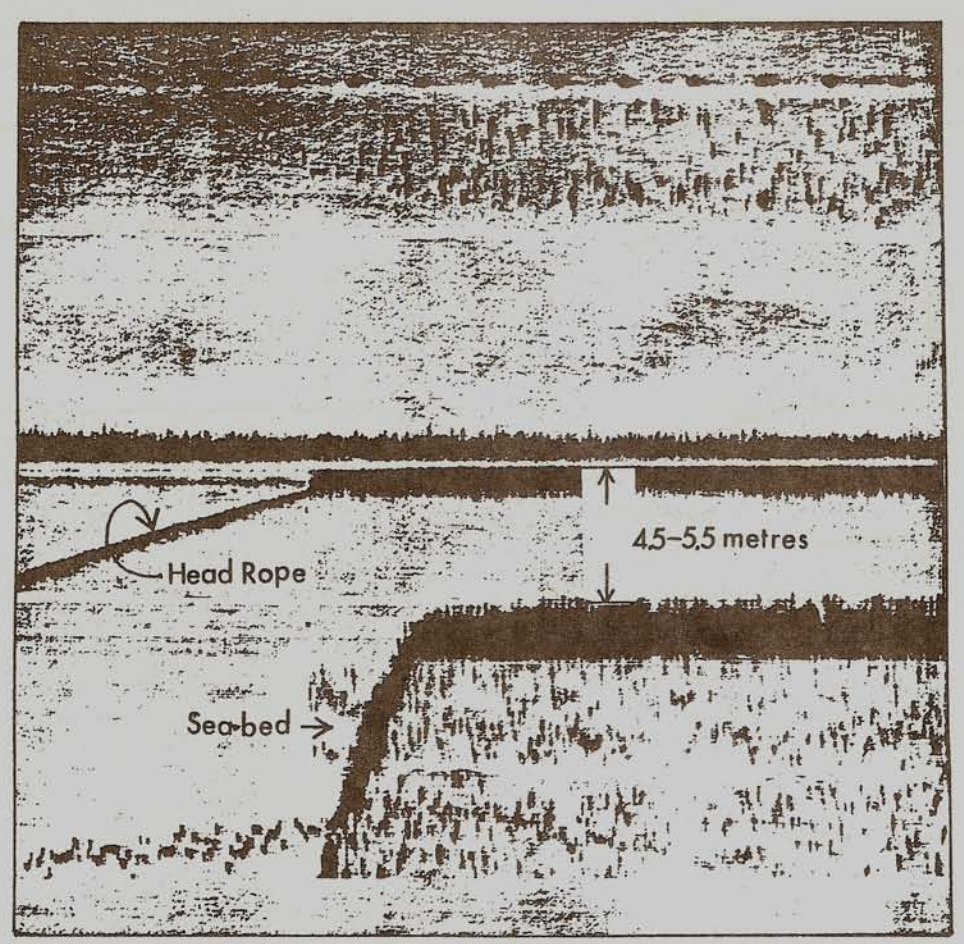

Fig. 9 Recording of net monitor

Showing the headrope of net, sea-bed and the height of 2-seam trawl net while dragging over the sea-bed at a depth of 400 metres in the Andaman Sea.

Spreading distance ("S" in Fig. 10) between both ends of the 2-seam trawl net under trawling conditions was 20 to 23 metres (see Fig. 10).

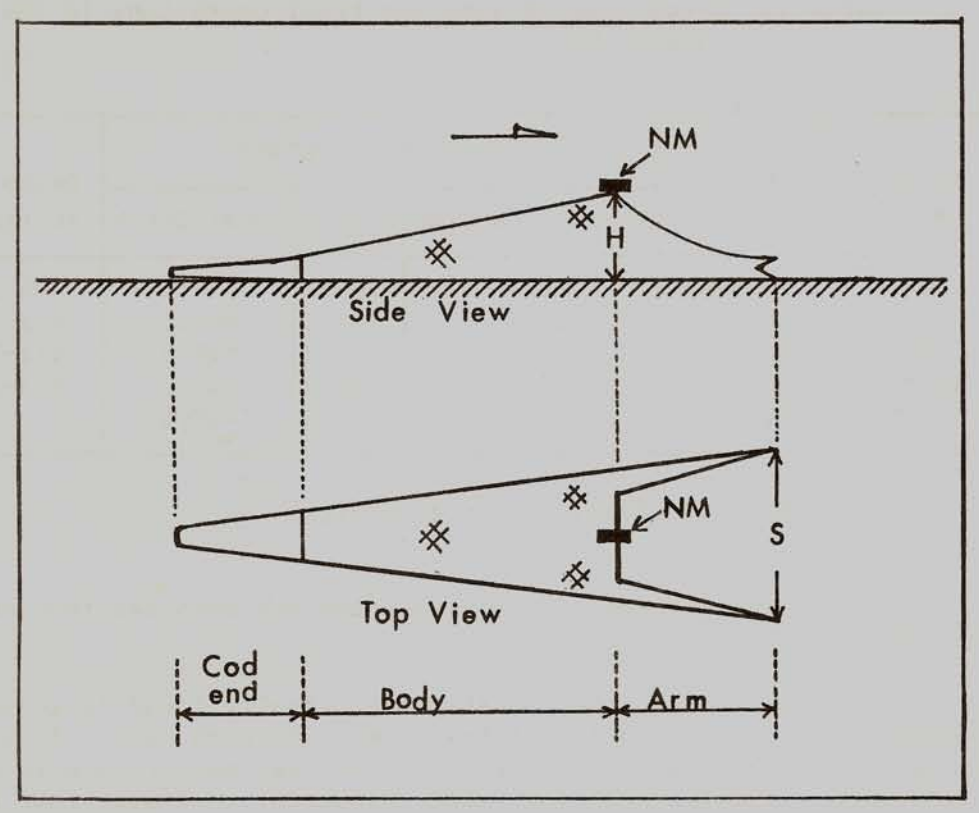

Fig. 10 Side and top views of 2-seam trawl net.

H : Height of net mouth (4.5-5.5 metres)

S : Spreading distance between both ends of trawl net arms (20-23 metres)

NM: Transmitter of net monitor

Temperatures near the sea-bed observed by net monitoring system were 11.4°C at a depth of 403 metres, 11.6°C at a depth of 399 metres and 14.3°C at a depth of 381 metres.

Table 1. Catch data of deep-sea trawl operations in the Andaman Sea.

Serial No.	Drag hours	Catch in Kilograms			Depth (metres)
		Deep sea shrimp	Others	Total Catch	
7	2h 40m	29.0	265.2	294.2	404-381
8	2h 19m	29.0	431.5	460.5	412-390
9	4h 01m	53.0	495.3	548.3	411-370
X10*	2h 26m	7.5	138.0	145.5	407-380
Grand Total	11h 26m	118.5	1330.0	1448.5	

Ref.: X No.10* trawl operated at night

One of the interesting species found was deep-sea lobster (see Photo 1).

Despite the fact that lobsters are usually found in groups the deep-sea trawl only brought up a few of them in each haul. It is unknown to the reporter whether the Andaman Sea lobsters are in groups or not, and the area fished was rather deeper or shallower than areas where they dwell since the number caught was few in comparison with the reporter's fishing experience in other lobster fishing grounds.

This species of lobster has been found in fishing grounds off the East African Coast, ranging from the Republic of South Africa to the Somali Democratic Republic, and lobster products have been exported in the form of "Frozen and Headless lobster" or "Boiled lobster" packed in waxed carton cases to markets abroad. They could be exported to fish markets in Japan in the form of "Head-on lobster" after boiling on board the fishing boat.

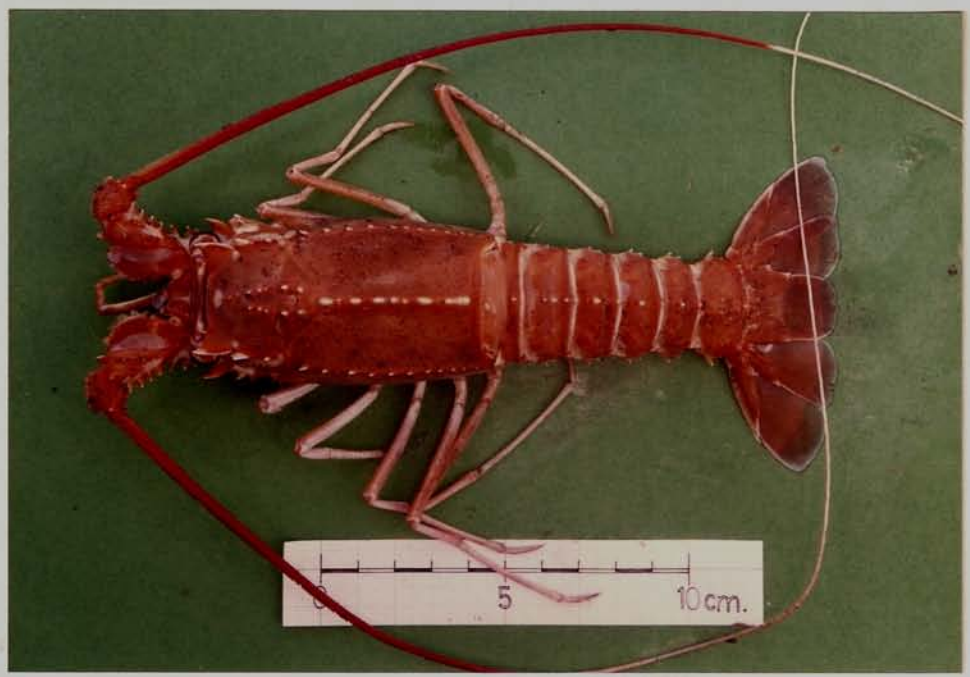

Photo. 1 Deep-sea lobster (Spiny lobster), 7/9/'87 at a depth of 400 metres in the Andaman Sea.

Another interesting species was deep-sea shrimp. During operations various types of shrimp were caught, but the deep-sea shrimp was dominant (see Photos. 2 and 3).

Photo. 2 Deep-sea shrimp, 7/9/'87 at a depth of 400 metres in the Andaman Sea.

Photo. 3 Catch on deck, deep-sea shrimp was the dominant species.

There are, three commercially interesting species: 1. demersal fish detected by the echosounder, 2. deep-sea lobster and 3. deep-sea shrimp.

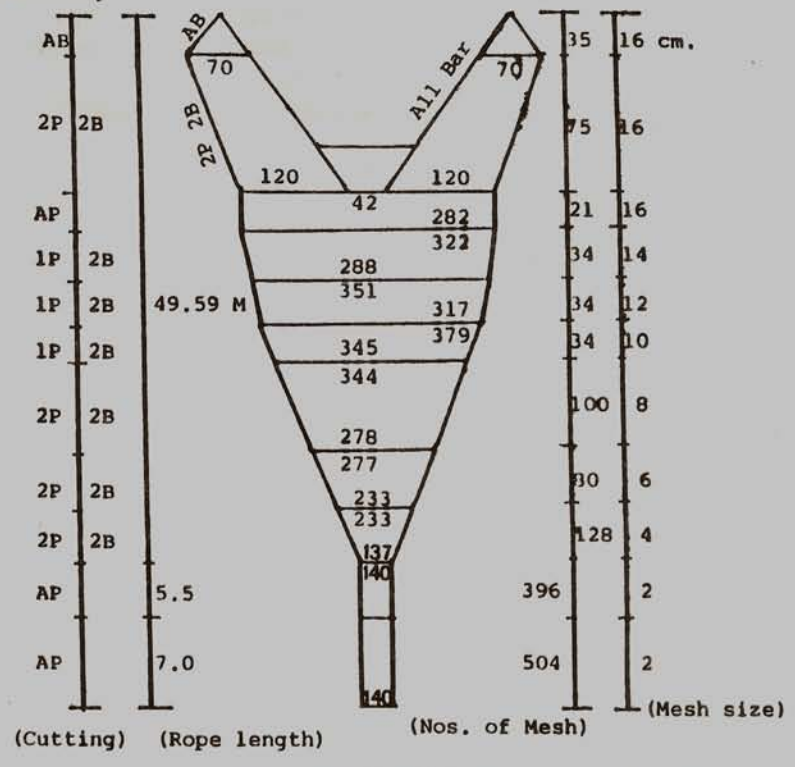

Fig. 11 Upper panel of 2-seam trawl net

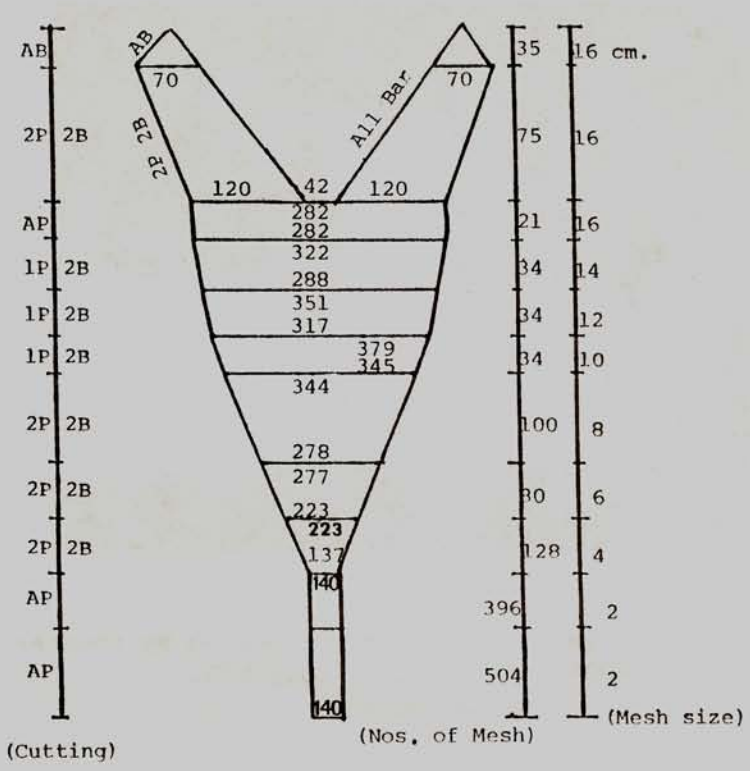

Fig. 12 Lower panel of 2-seam trawl net

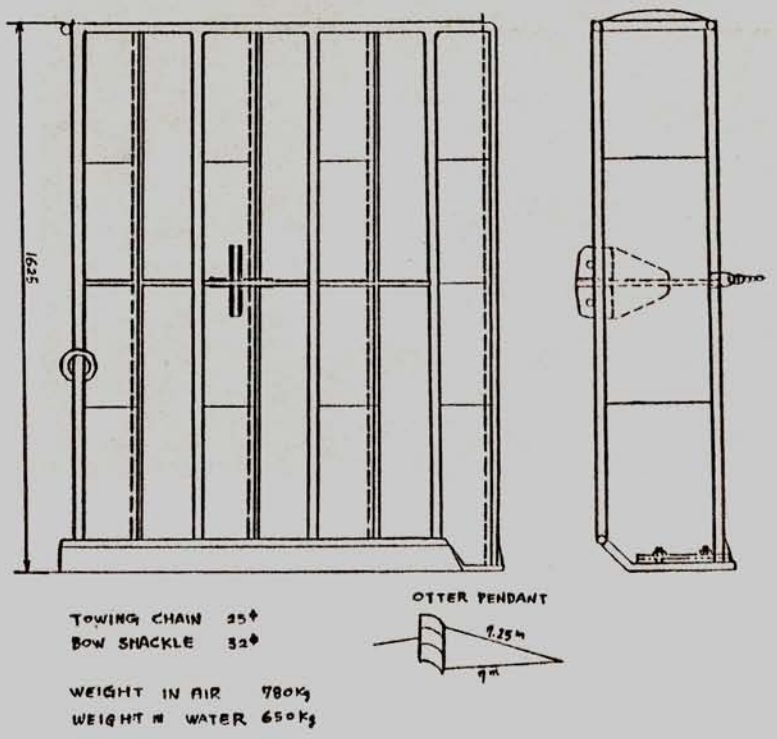

Fig. 13 Paravane otter-board for bottom and mid-water trawl

Photo. 4 Paravane otter-board on bottom by courtesy of HAKODATE SEIMO-SENGU CO., LTD.

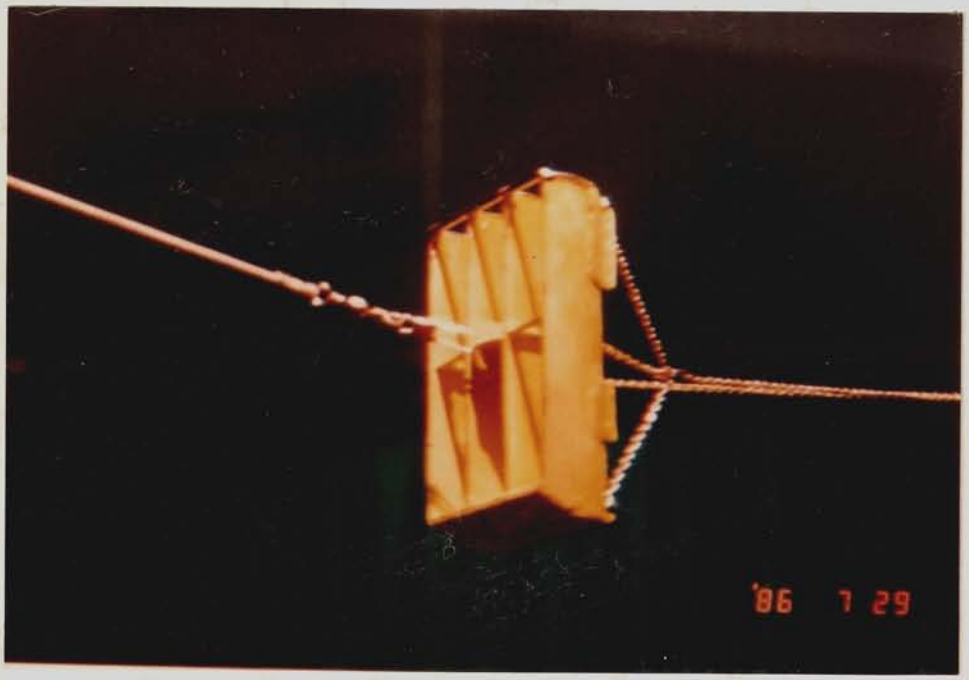

Photo. 5 Paravane otter-board in mid-water by courtesy of HAKODATE SEIMO-SENGU CO., LTD.

Photo. 6 Paravane otter-board shooting from M.V. PAKNAM

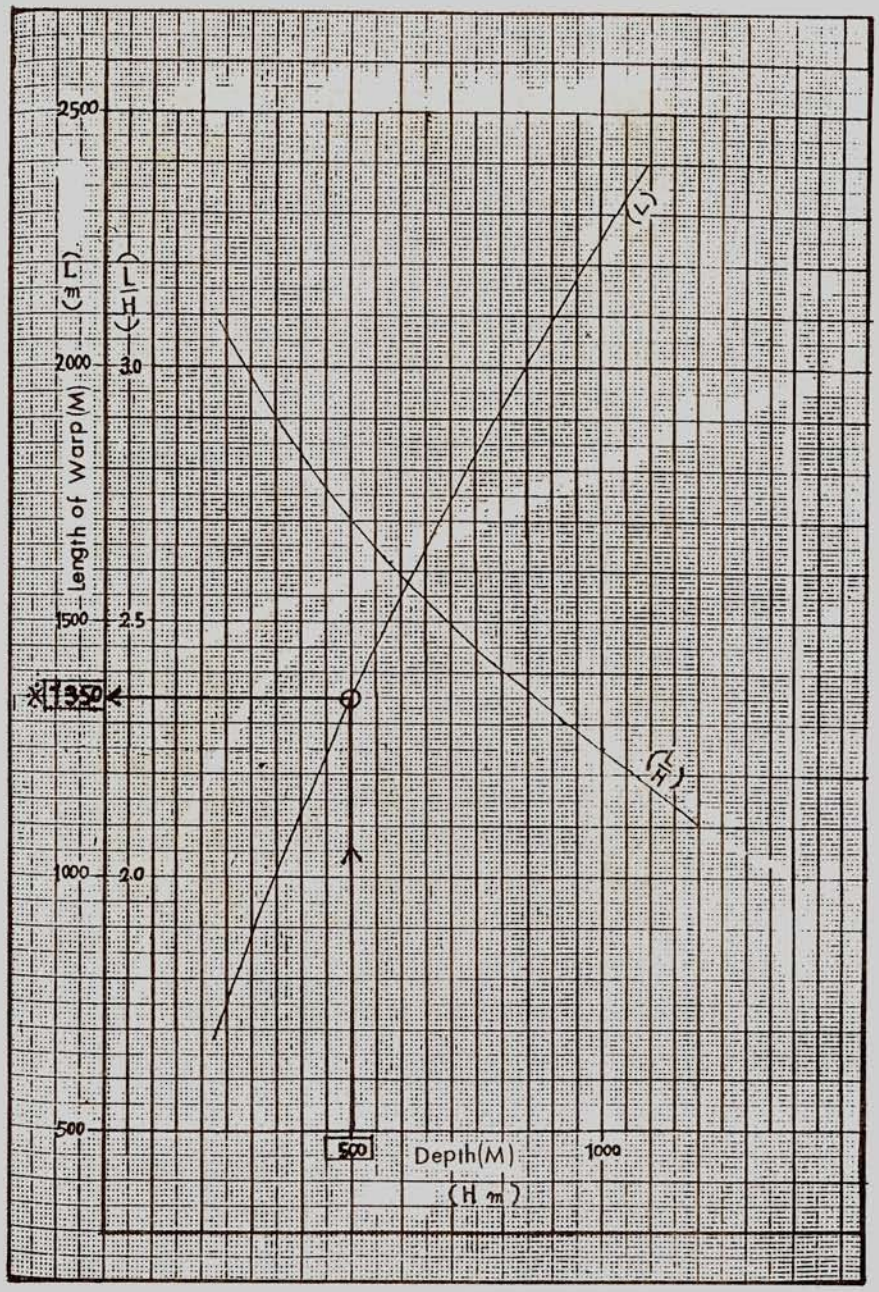

Fig. 14 Relationship between length of warp given out and depth of water for trawl fishing.

Ref.: In the case of deep-sea trawl, when the sea-bed depth is 500 metres, the length of warp given out is more or less 1350 metres.

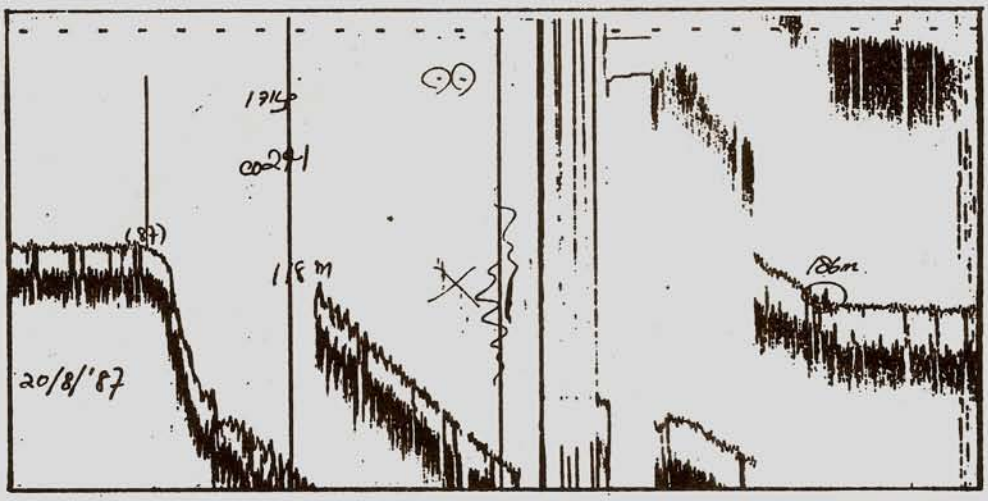

Fig. 15 Recording of sea-bed

Steep and rough, at a depth of 87 to 186 metres.

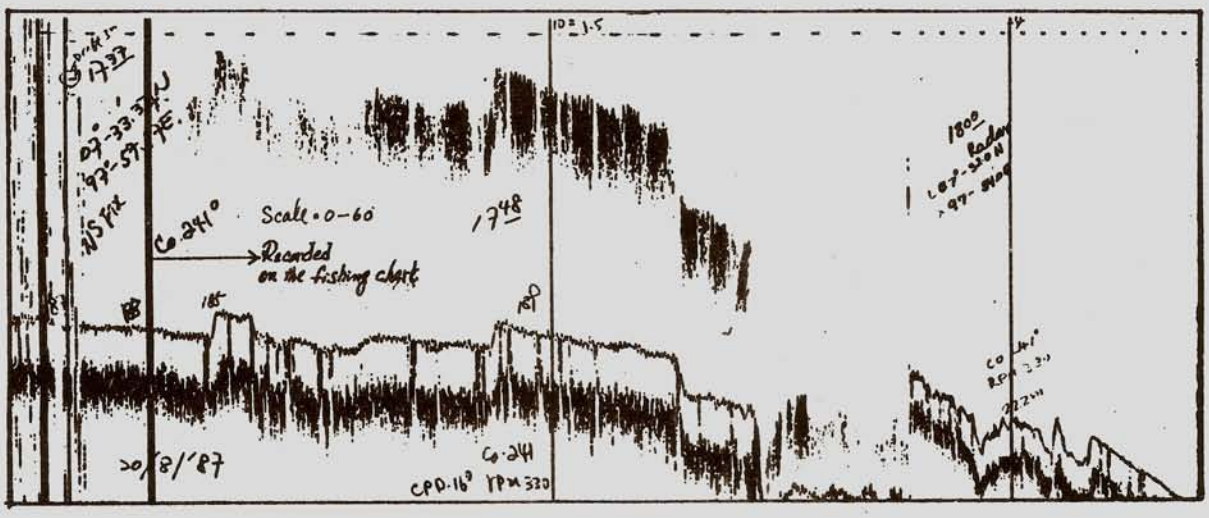

Fig. 16 Recording of sea-bed

Steep and rough, at a depth of 87 to 222 metres.

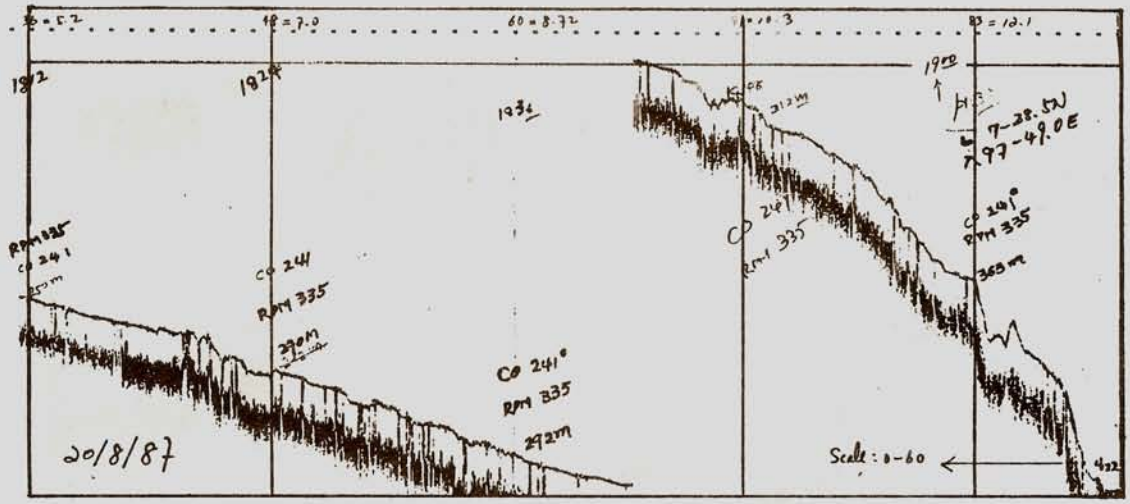

Fig. 17 Recording of sea-bed

Steep, at a depth of 250 to 422 metres.

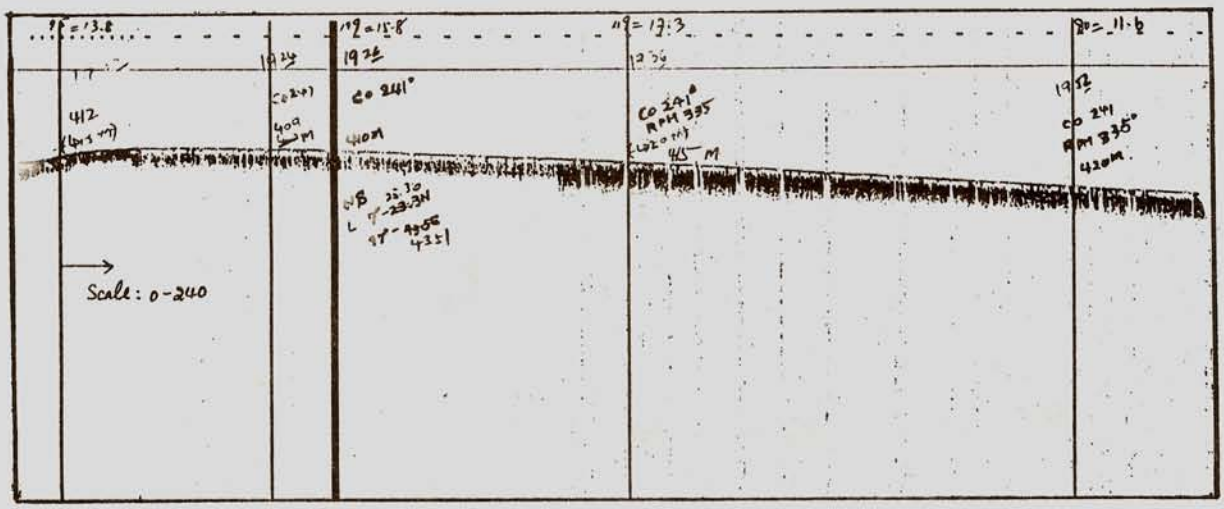

Fig. 18 Recording of sea-bed

Slightly sloping and smooth, at a depth of 412 to 420 metres.

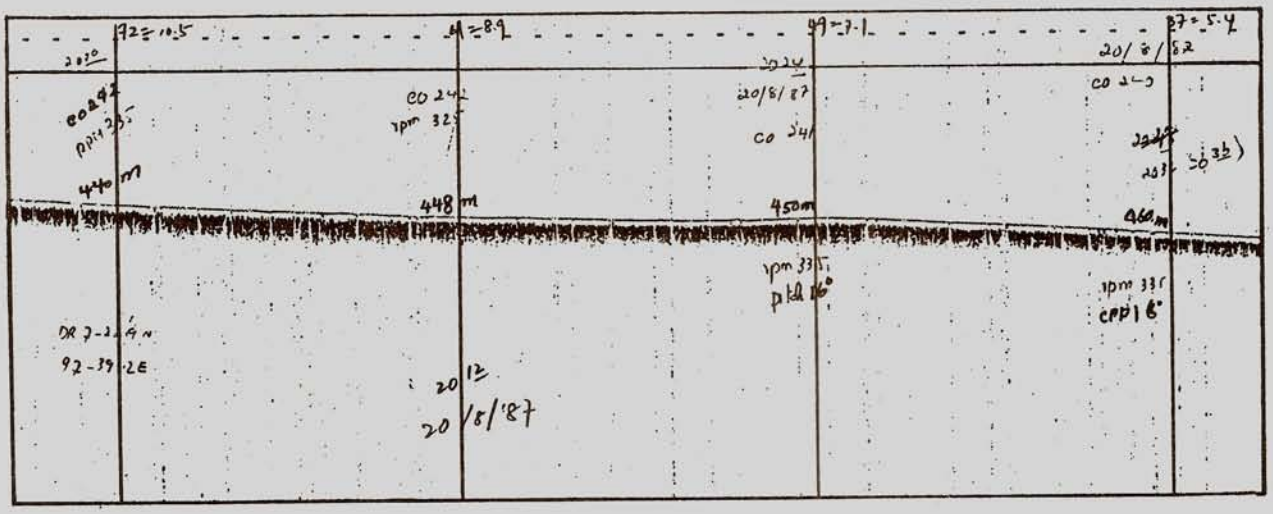

Fig. 19 Recording of sea-bed

Very smooth, at a depth of 440 to 460 metres.

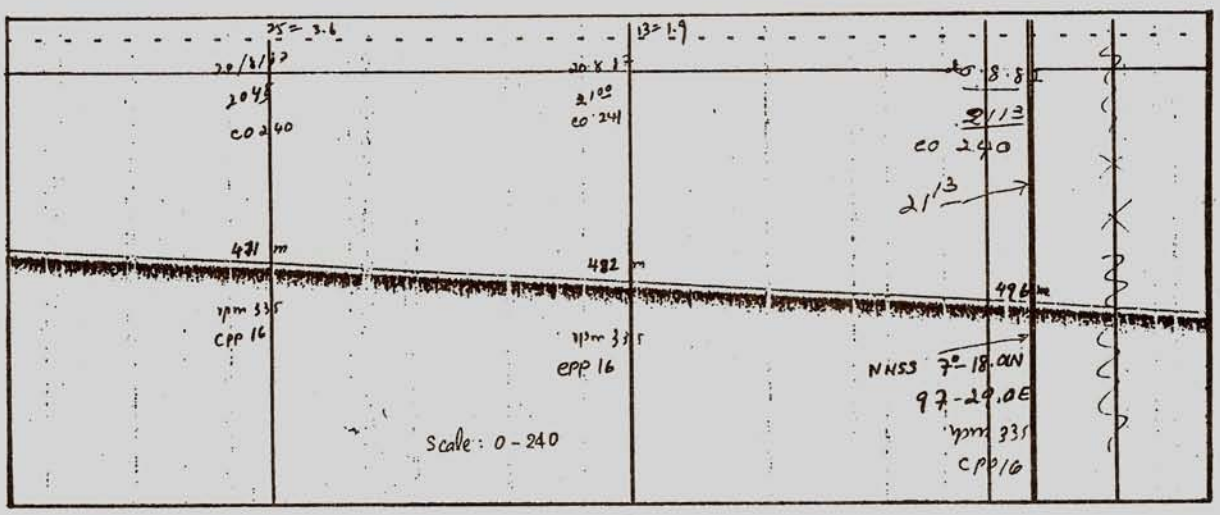

Fig. 20 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 471 to 496 metres.

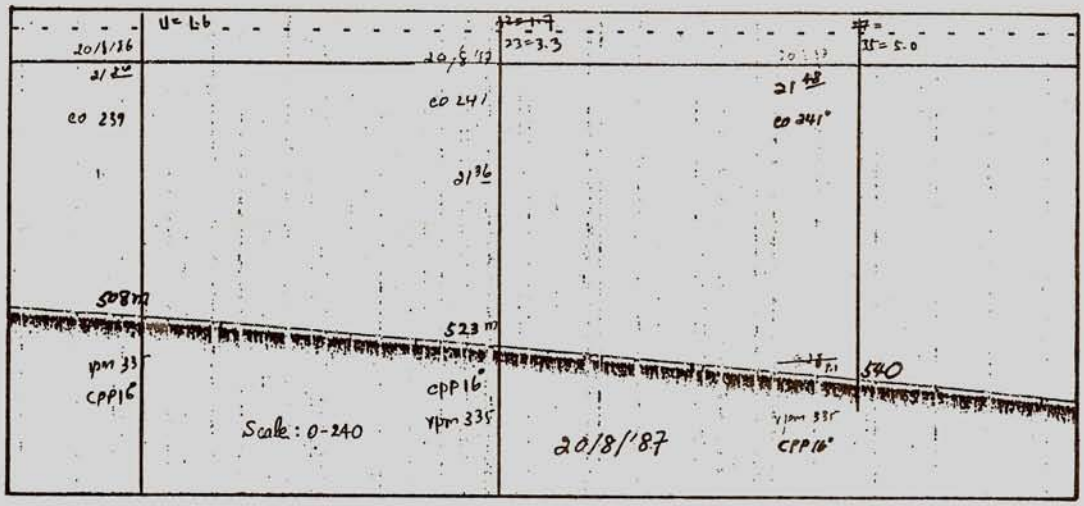

Fig. 21 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 508 to 540 metres.

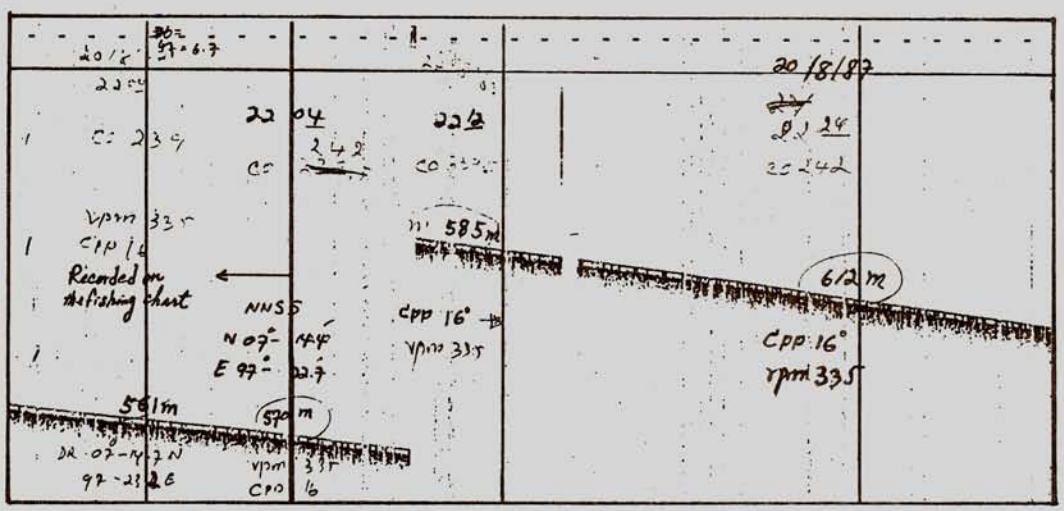

Fig. 22 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 561 to 612 metres.

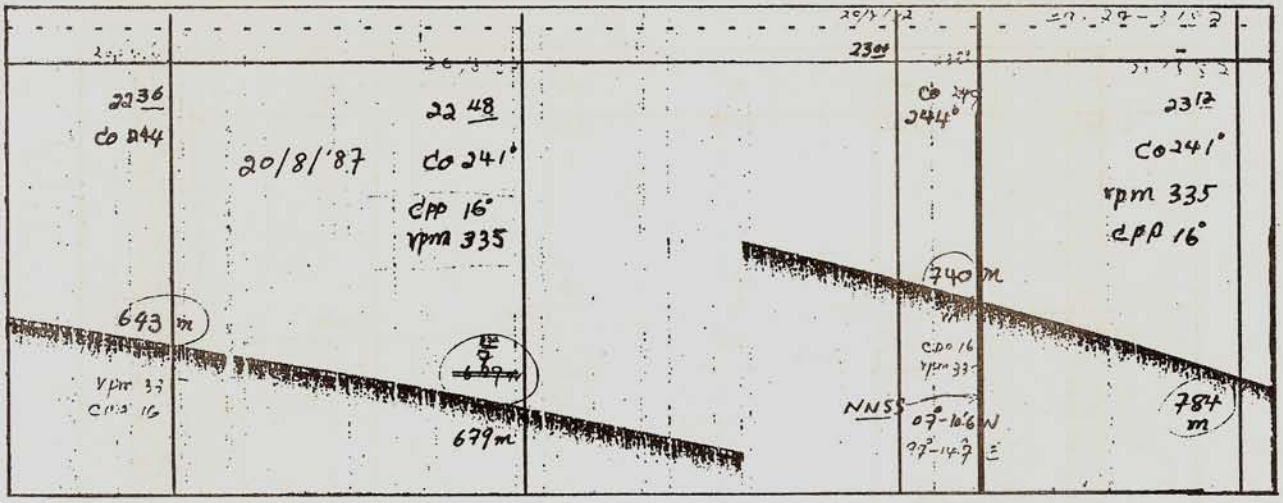

Fig. 23 Recording of sea-bed

Smooth and sloping, at a depth of 643 to 784 metres.

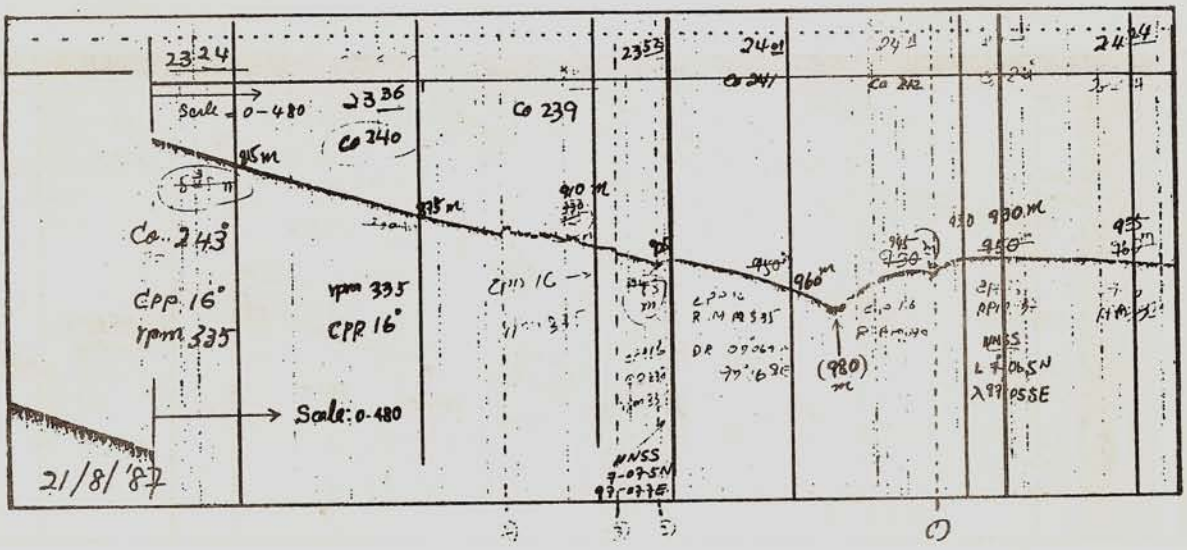

Fig. 24 Recording of sea-bed

Smooth but partialy rough, at a depth of 815 to 980 metres.

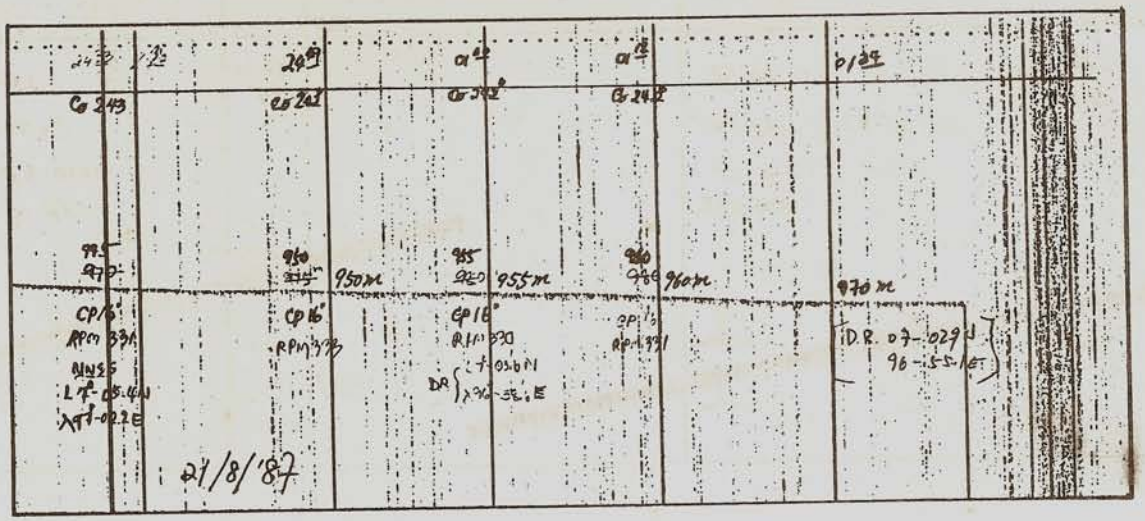

Fig. 25 Recording of sea-bed

Very smooth and flat, at a depth of 945 to 970 metres.

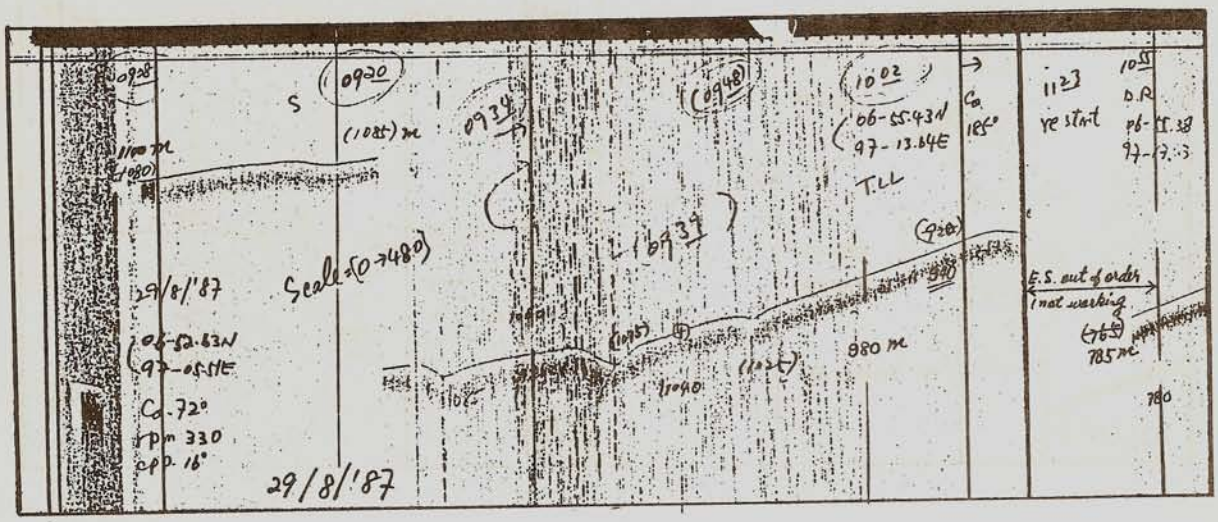

Fig. 26 Recording of sea-bed

Rough and sloping, at a depth of 785 to 1100 metres.

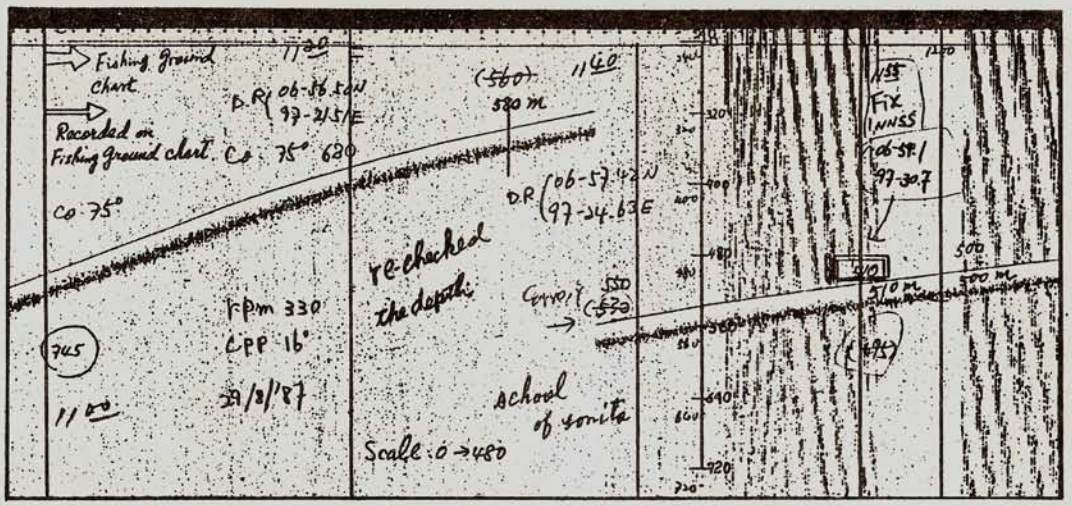

Fig. 27 Recording of sea-bed

Smooth and sloping, at a depth of 500 to 745 metres.

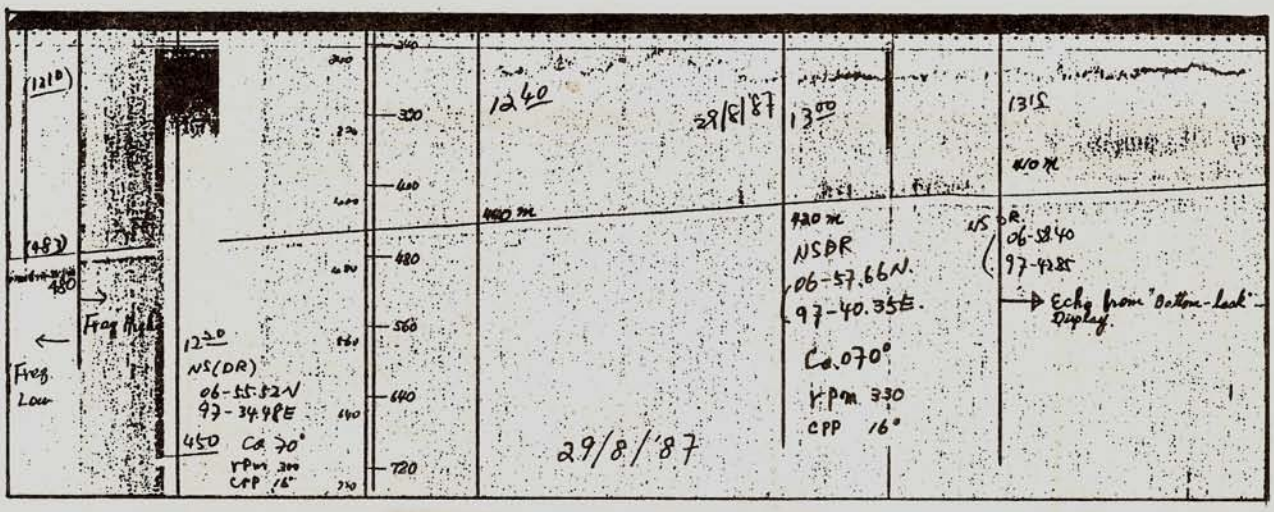

Fig. 28 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 410 to 480 metres.

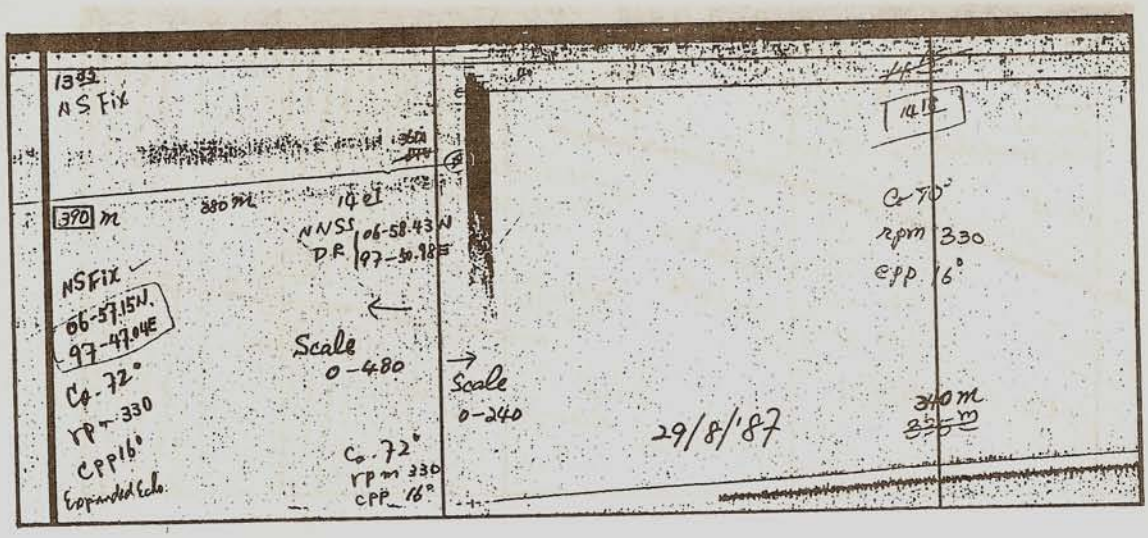

Fig. 29 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 340 to 390 metres.

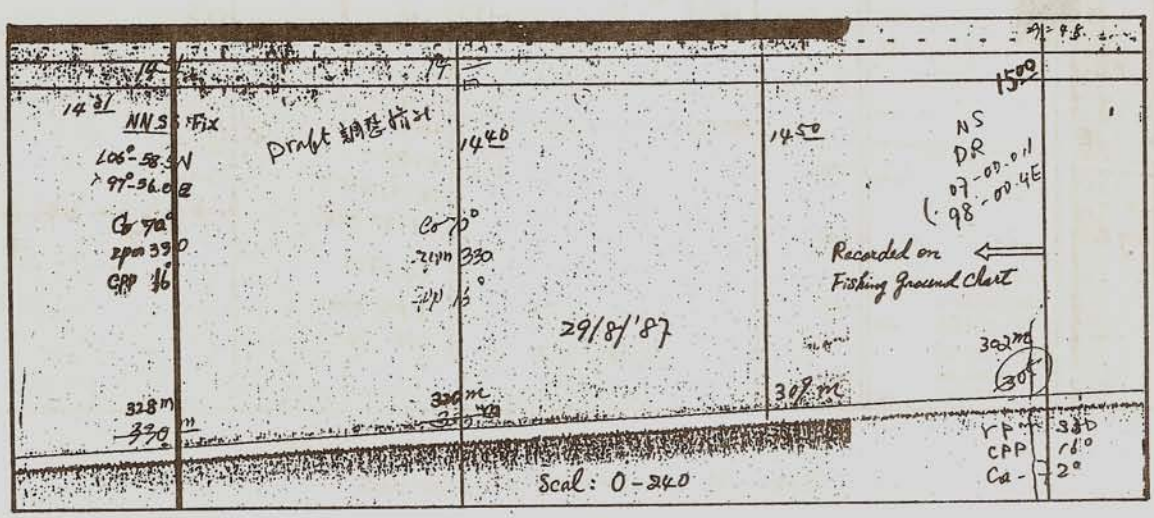

Fig. 30 Recording of sea-bed

Very smooth and slightly sloping, at a depth of 302 to 328 metres.

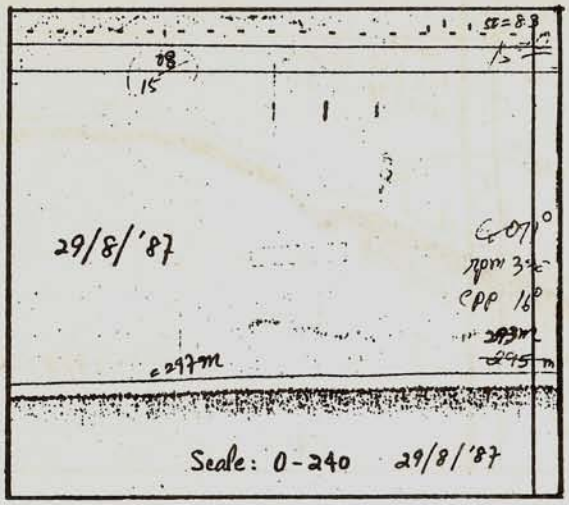

Fig. 31 Recording of sea-bed

Smooth and flat, at a depth of 293 to 297 metres.

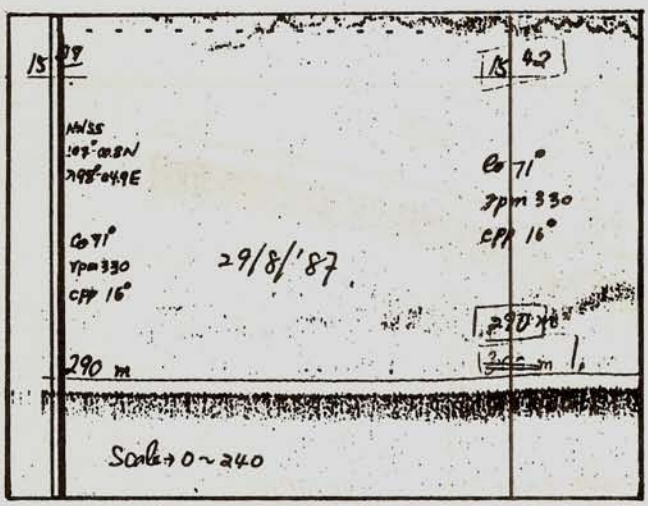

Fig. 32 Recording of sea-bed

Smooth and flat, at a depth of 290 metres.

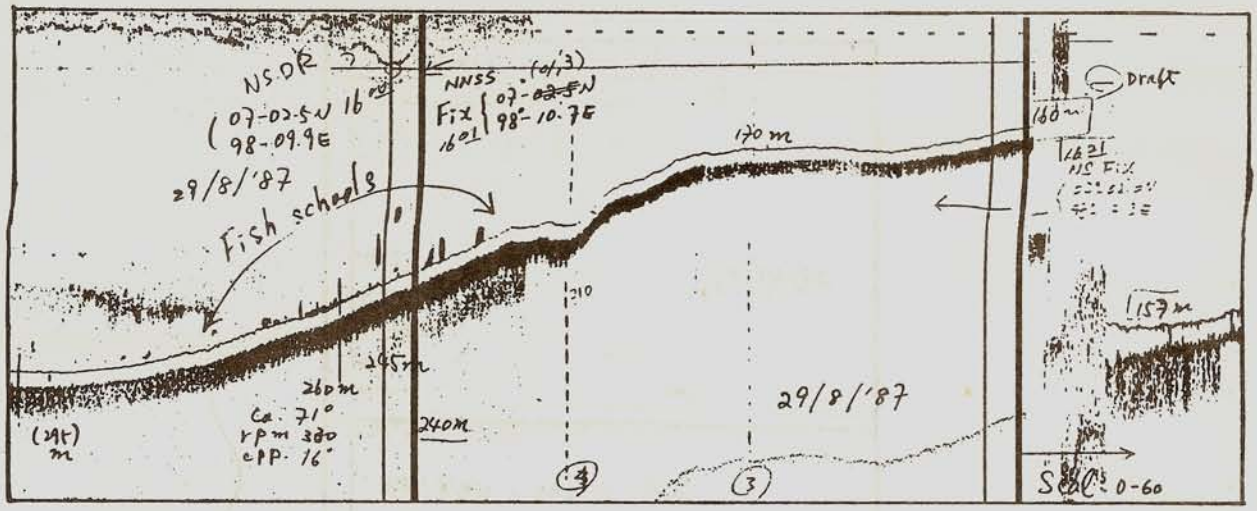

Fig. 33 Recording of sea-bed with schools of fish

Sloping and rather rough, at a depth of 157 to 295 metres.

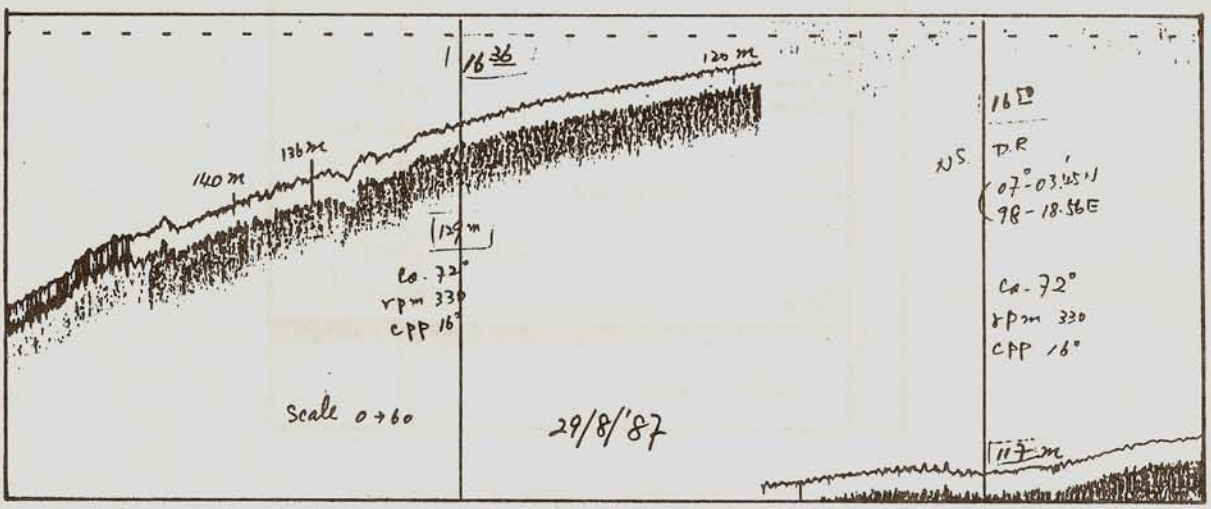

Fig. 34 Recording of sea-bed

Sloping and rather rough, at a depth of 117 to 140 metres.

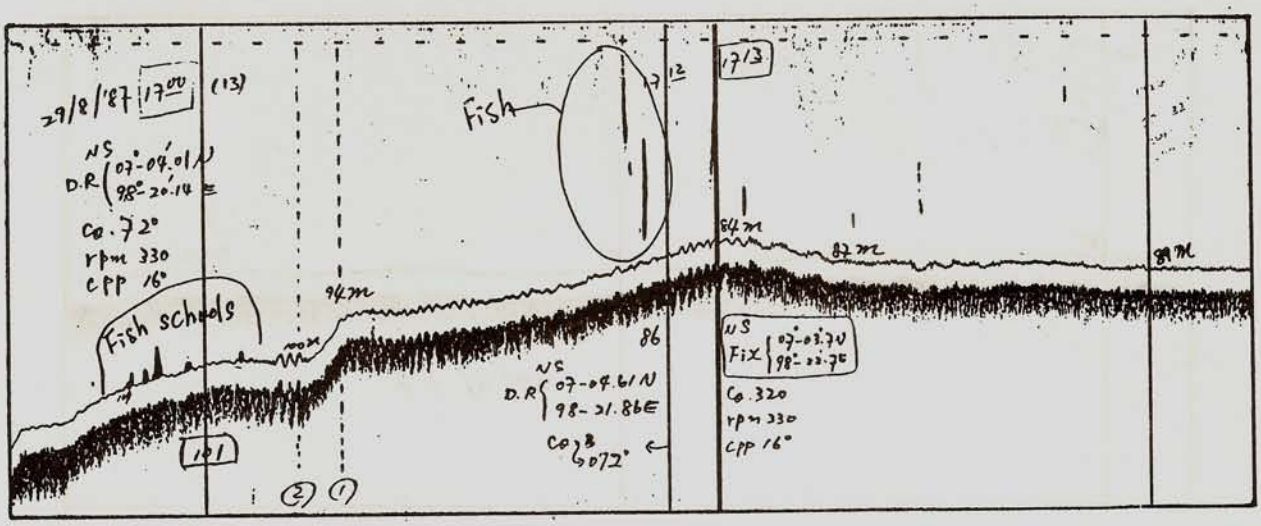

Fig. 35 Recording of sea-bed with schools of fish

Steep and rough, at a depth of 89 to 101 metres.

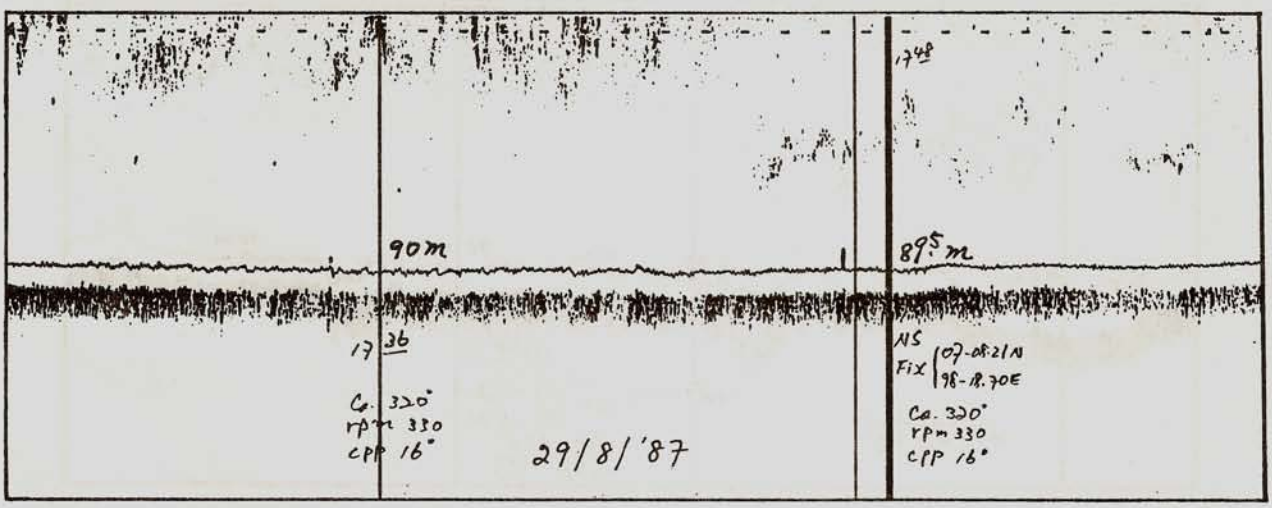

Fig. 36 Recording of sea-bed

Flat, at a depth of 89 to 90 metres.

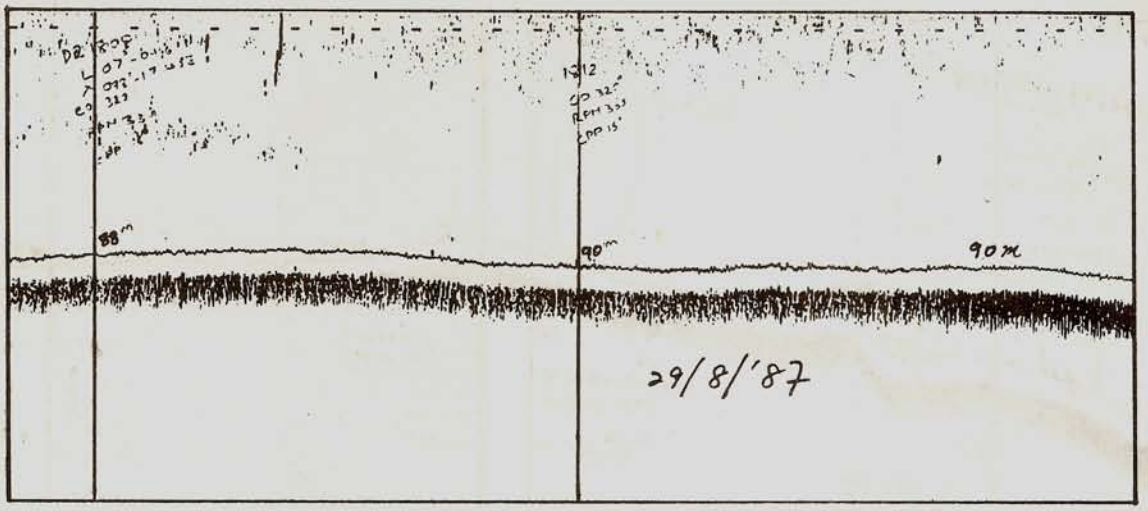

Fig. 37 Recording of sea-bed

Smooth, at a depth of 88 to 90 metres.

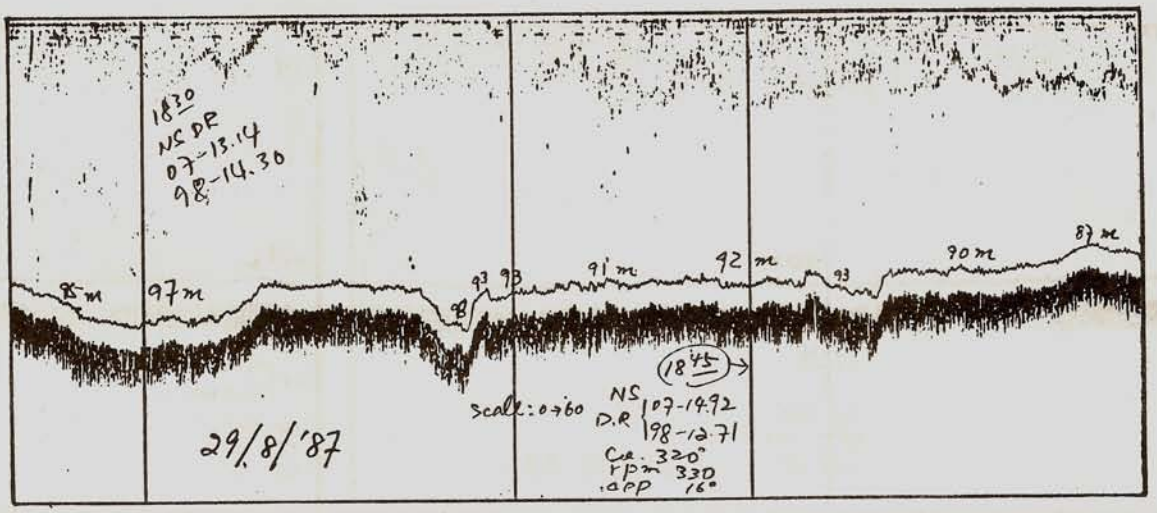

Fig. 38 Recording of sea-bed

Very rough and steep, at a depth of 85 to 98 metres.

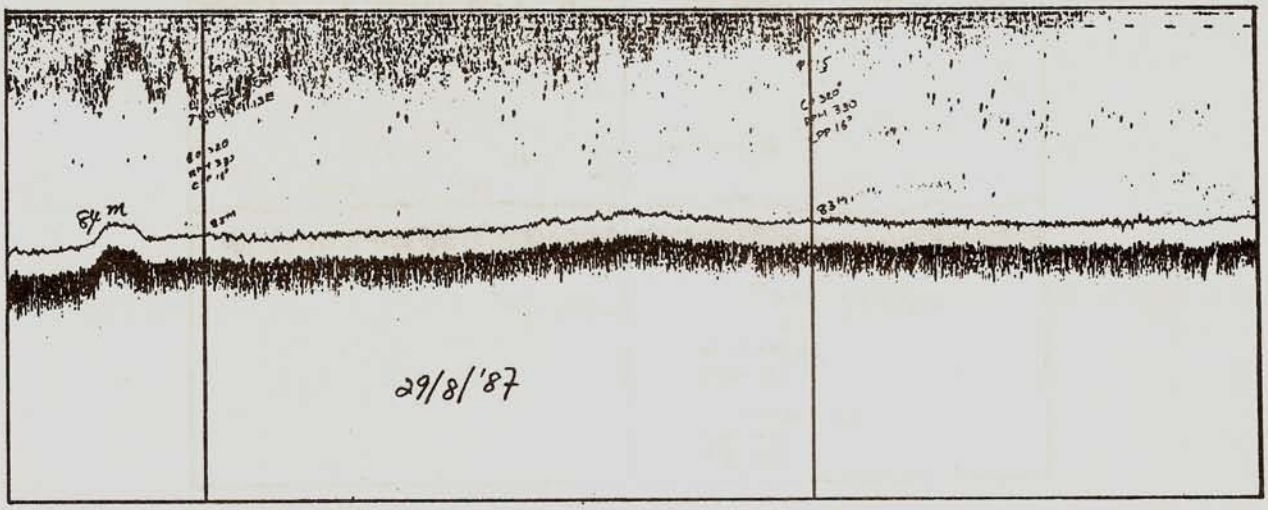

Fig. 39 Recording of sea-bed

Almost flat, at a depth of 83 to 84 metres.

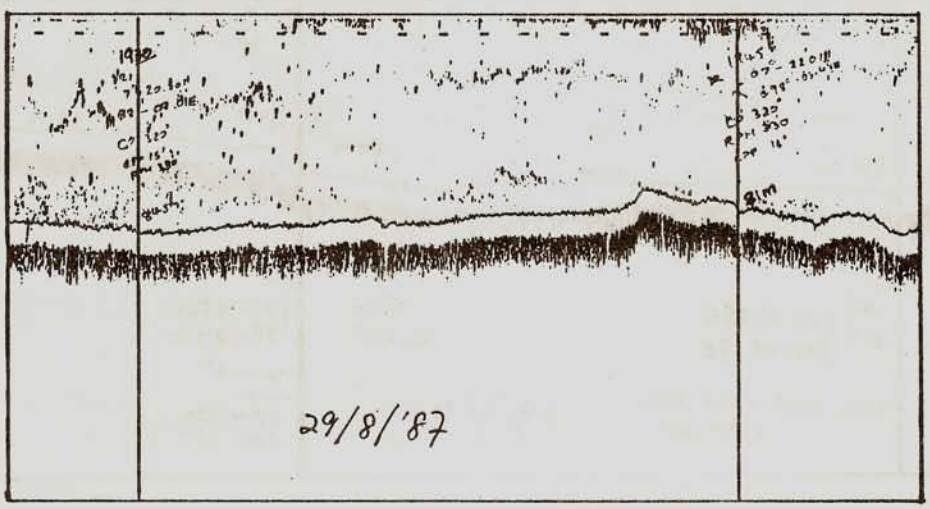

Fig. 40 Recording of sea-bed

Rough, at a depth of 81 to 84 metres.

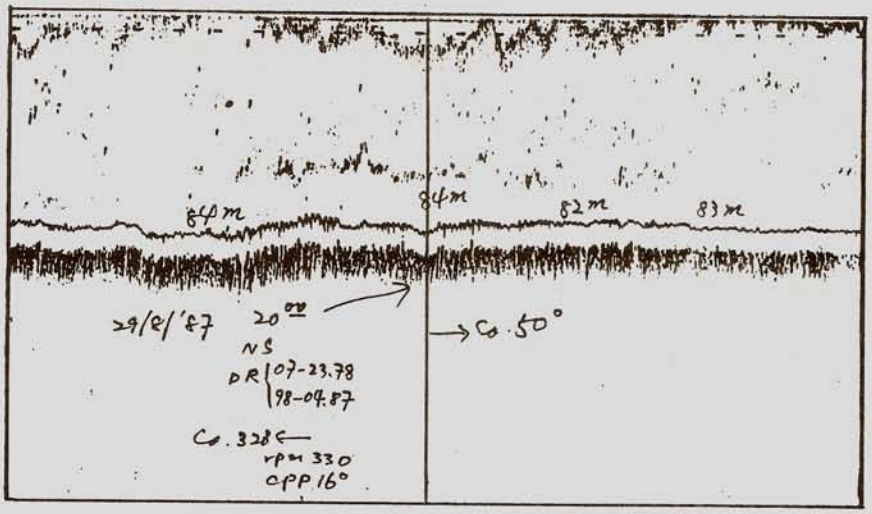

Fig. 41 Recording of sea-bed

Rather rough, at a depth of 82 to 84 metres.

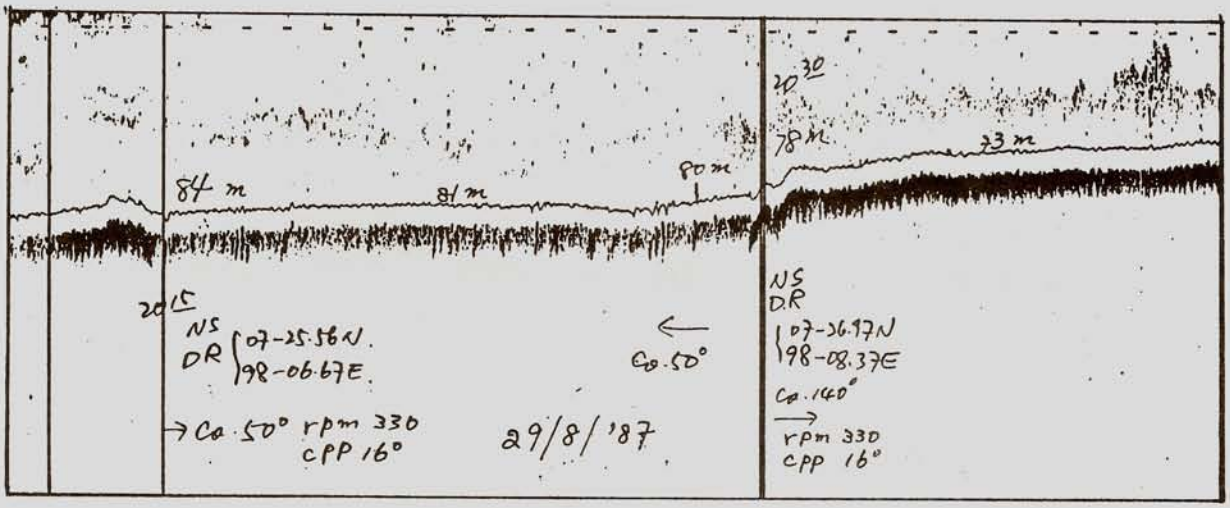

Fig. 42 Recording of sea-bed

Rather rough, at a depth of 73 to 84 metres.

Table 2. Presumed Break Horse Power (B.H.P.) given by the temperature of exhaust gas from the main engine during deep-sea trawl operations.

Date	Serial No.	R.P.M.	C.P.P. (°)	Presumed B.H.P.
6 Sept. 1987	7	300	14.0	350
	8	302	10.0	350
	9	303	10.0	350
	10	300	10.0	315