

## STUDIES ON MID-WATER TRAWL GEARS AND MID-WATER TELEMETERS

by

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### ABSTRACT

Describes studies on mid-water trawling gear and the use of telemeters for adjusting the depth of the gear. A telemeter with operating frequencies 200 k.c. and 50 k.c. appears to be suitable for working the mid-water trawl.

The author has studied the mid-water trawl gear and their telemeters since 1957, and has completed new types of these gear which have been used on the Bering Sea, the East China

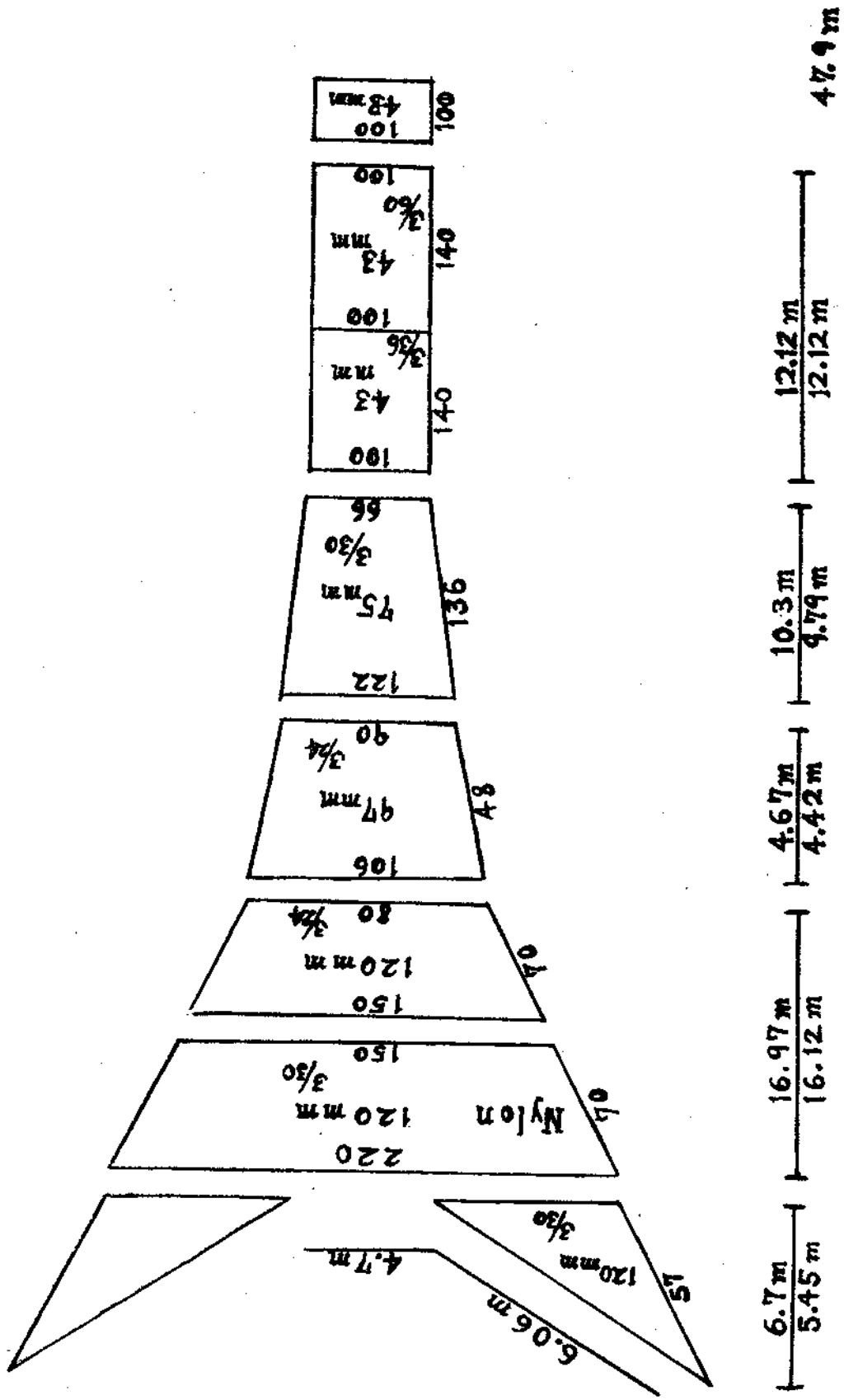
Sea and the Atlantic Ocean, with satisfactory results. Five mid-water trawls and two telemeters have been designed. (Tables 1 & 2)

TABLE 1

Type	Tonnage	Horse power of the main engine	Towing speed	Net mouth
One Boat Type	25 tons	100 HP × 2 High speed	2.0 knots	6 m × 6 m
	80 tons	400 „	2.5 „	10 m × 10 m
	350 tons	550 „	3.0 „	10 m × 10 m
	1,200 tons	1,200 „	4.5 „	14 m × 14 m
Two Boat Type	90 tons × 2	320 Hp × 2	2.3 „	10 m × 10 m

Type	Ultrasonic wave frequency	Signal Distance	Method of Indication
I	200 K.C.	1,000 m	Telemeter
II	200 K.C. 50 K.C.	1,000 m	Telemeter and recorded on echo sounder recording paper.

The mid-water trawl gear of the 80 ton type and telemeter of the IIInd type which are show in Tables 1 and 2 are described below :—



1. The fishing net

i) The net (Fig. 1)

The net was made of nylon twine and the warps of the net's mouth of polyethylene. Wire ropes were used along with the polyethylene for head and foot ropes.

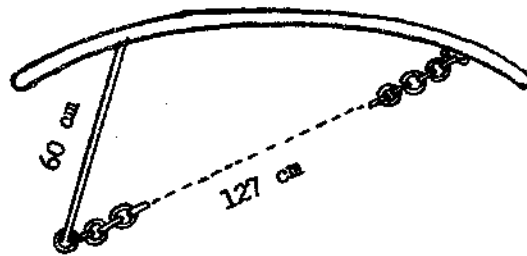
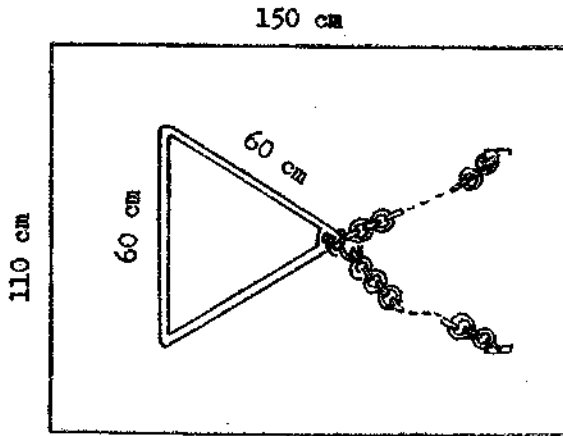
ii) The otter boards (Figs. 2, 6)

The otter boards were so designed that net mouth should have a 10 meter breadth at a towing speed of 2.5 knots, and the length of the sweepline (bridles) was 72 meters.

These otter boards were designed to be heavier to make the gear keep desirable depth in the sea.

The author planned to keep the ratio of the warps length to the depth of the fishing gear 2:1 when the towing speed was 2.5 knots. The characteristics of the otter boards are as follows:—

The weight in air	200 Kg.
"    water	180 Kg.
The expansive capacity	1.3m/sec 225 Kg.
The angle of attack	34°



iii) The depressor

These depressors were so designed that the net mouth should keep a 10 meter height under the towing speed of 2.5 knots and they were fitted at the ends of both lower sweep lines.

The characteristics of the depressors are as follows:—

The weight in the air	20 Kg.
"    water	19 Kg.
The diving capacity	80 Kg. (2.5 knots)

iv) Floats, leads

Plastic (6 in.) and glass (8 in.) balls were used as floats, with a total buoyancy of 120 kg. Lead was used to ensure sinking, and the total sinking force was 30 kg.

v) The shape of the fishing gear under tow was measured with apparatus fitted on the gear as shown in Figs. 3 and 4.

The measured values are shown in Table 3.

TABLE 3

<i>Depth</i>								
Warp Length	Included angle of warp	Inclination of warp	Towing speed	Height, upper from lower wing	Height, mid point of head rope from lower wing	Mid point of head rope	Mid point of foot rops	Top of otter boards
100 m	14°	27°	2.5 knots	7 m	11.2 m	44.8 m	55 m	47 m
150 m	9-10°	25°	2.5 „	7 m	11.2 m	65.8 m	77 m	68 m
200 m	8°	25°	2.5 „	7 m	11.2 m	90.8 m	102 m	93 m

This gear was operated for cod-fishing in the Bering Sea from May 1960, and obtained satisfactory results.

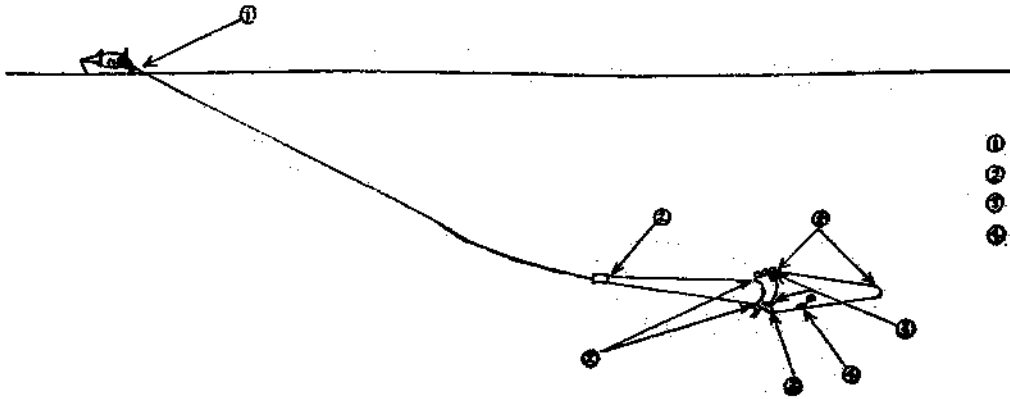
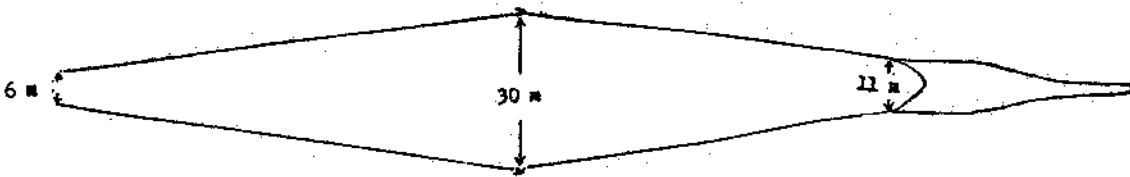
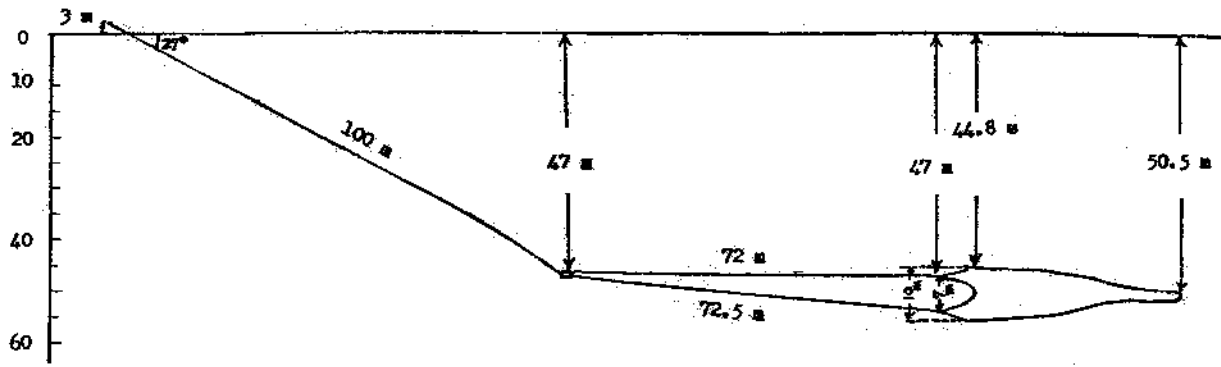
## 2. The mid-water telemeter

The dispatcher was fitted on the net or the warp-end in front of the otter board (Fig. 6), and the receiving transducer fitted on the warp in the water to avoid the disturbance of the propeller current. The amplifier, receiving device, meter and recorder were fitted in the wheel house.

The signal waves (ultrasonic), which are automatically controlled according to the depth of the instruments, are dispatched to the receiving transducer from the dispatcher. The bellows in the dispatcher are transformed by the hydraulic pressure and drive the pen on the constantly revolving drum. The signal wave of the first type telemeter

was 200 k.c. and that of the second was 200 k.c. and 50 k.c. By many experiments, it has been proved that there is no interruption by noise in the water with 200 k.c. but a little with other frequencies. The first type telemeter shows the depth of the net by its indicator, while the second one by its indicator and recorder of the the fish finder. Moreover, there are also recorded the distance on the recording paper of both pens (the echo sounder and the net's depth) with (d) cm . . . .  $\left(\frac{D}{V}\right)$ . (Figs 6, 7)

The fishermen are able to catch fish surely with the 2nd type telemeter, because they can adjust the depth of the net to the depth of the fish school by lengthening or shortening the warps of the net.



- ① Tension Meter
- ② Depth Meter
- ③ Net Height Meter
- ④ Speed Meter

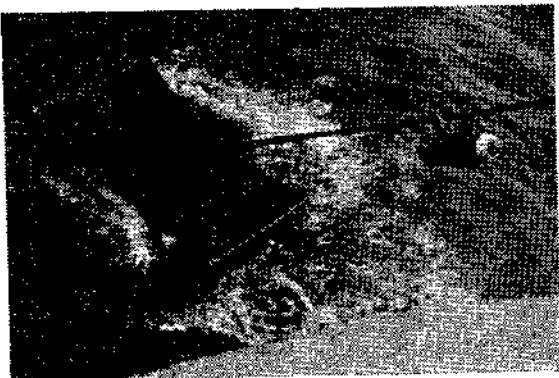
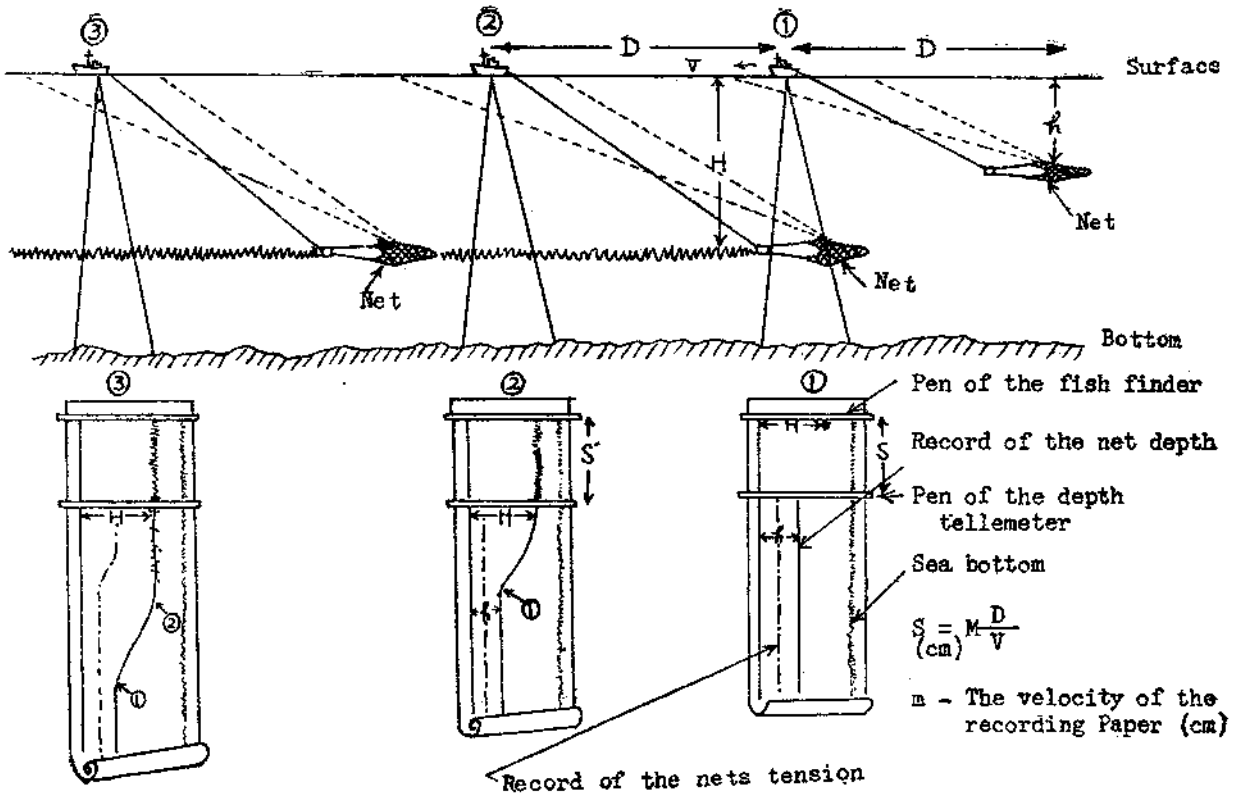


Figure 6.

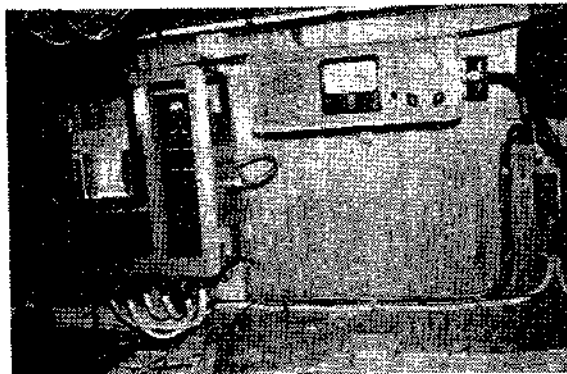


Figure 7.