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Report of the joint survey on by-catch
in Japanese Illex trawl fishery, 1977

by

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Objective

The objective of this survey was to determine the by-catch associated with catches of Illex by the two types of off-bottom trawl gears. This survey was planned in relation to the current regulation imposed by Canada for fishing grounds restriction in ICNAF subarea 4.

Method

R/V Shirane-maru (owned by Nippon Suisan Kaisha, Ltd) conducted two survey cruises. Areas surveyed by the first cruise (19th July-17th August) and the second cruise (19th August - 15th September) are shown in Figs. 1 and 2 respectively, and these areas are interpreted in Table 1.

Three types of trawl gears were used in this survey. Two of them were off-bottom trawl which were called "Chain type" and "Bobbin type" respectively. Another one was regular bottom trawl which has been used traditionally by Japanese squid trawl fishery, and this gear was called "Regular type". Their structures are illustrated in Figs. 3-9.

In the first cruise, Chain type and Bobbin type were used, and in the second cruise Regular type was added to them. The number of hauls are shown in Table 1.

Whenever Chain type gear was towed, the height from the sea bed to the fishing line of the trawl net was adjusted to 1 or 2 meters by using the wire system net recorder.

Results and Discussion

As two cruises were carried out successively and there are no reason to treat them separately, the catch records obtained by the two cruises were treated together.

Catches by tow were summed up by area, gear and species. Results obtained on the "small mesh net zone" (see Fig. 1) and the outside of "small mesh net zone" are shown in Tables 2 and 3 respectively.

From these Tables, it is seen that by-catch ratio** of Chain type is clearly lower than that of Regular type. But it can not be said that Bobbin type has smaller by-catch ratio compared with Regular type. Chain type has very small by-catch of flatfishes and no by-catch of Lobster. Bobbin type has smaller by-catch of flatfishes and Lobster compared with Regular type. Illex CPUE of Chain type is considerably lower than that of Regular type and slightly lower than that of Bobbin type. The average Illex CPUE of Chain, Bobbin and Regular type were 1554, 1779 and 4410 Kg/hour respectively.

By-catch ratio of area 2 is distinctly higher than that of small mesh net zone. Area 3 also seems to have higher by-catch ratio compared with small mesh net zone although Chain type shows an exception. By-catch ratio of area 1E seems to be lower than that of small mesh net zone, but this is not sure as the number of hauls of Regular type in the area 1E is very small.

From the results shown in Table 2 and 3, we can estimate the amount of by-catch on various cases. Table 4 shows the estimated amounts of by-catch in the case of 3000 tons Illex quota. Regarding the Regular type in the small mesh net zone as a standard case, we can evaluate quality and quantity of by-catch of each case in this Table.

In the case of Chain type in the area 1E and 3, the amounts of by-catch are considerably smaller than the standard case, and the important species for Canada (Cod, Haddock, four species of Flatfishes and Lobster) are scarcely caught by this gear. On the contrary, in the case of Bobbin type in the area 2 and 3, by-catch especially Silver hake and Haddock are extremely big amount compared with the standard case. Chain type used in the area 2 catches slightly more Silver hake than the standard case. But this case do not catch the important species for Canada. In the case of Bobbin type in the area 1E, the values of by-catch is small. But this case catches a little amount of the important species for Canada.

Conclusion

From the considerations mentioned above, it is concluded that Chain type gear is effective for reducing the amount of by-catch associated with catches of Illex . Chain type gear, in the area 1E, 2 and 3, catches a small amount of by-catch, and hardly catches Cod, Haddock, Halibut and Lobster that are important for Canada.

** (By-catch / Illex catch) .1000

Table 1. Areas surveyed by Shirane-maru

Area	Location	No. of haul		Depth(m) at setting net		Notes	
		1st cruise	2nd cruise	Range	Mean		
1W	60°00' - 61°10' (along the edge of the continental shelf)	39	40	86-225	179	main fishing ground of <u>Illex</u> in this year.	
1E	59°00' - 60°00' (")	34	6	134-222	189		
2	57°30' - 59°00' (")	4	42	130-260	190		Banquereau bank.
3	61°20' - 63°20' (on the continental shelf or along the edge of the Emerald Basin)	0	38	77-218	150		Shallower water, outside of the small mesh net zone.
4	61°10' - 64°30' (along the edge of the continental shelf)	34	4	121-221	169	inside of the small mesh net zone.	

1
3
1

Table 2. Catch in the "small mesh net zone" (first and second cruises combined) unit:kg

Area	4			1W			4 + 1W		
	Chain	Bobbin	Regular	Chain	Bobbin	Regular	Chain	Bobbin	Regular
Gear	21	14	3	37	30	12	58	44	15
No. of haul	40.0	20.0	3.0	58.3	47.4	12.0	98.3	67.4	15.0
Trawling time (Hour)									
Illex	27900 (1000)	26245 (1000)	14378 (1000)	85471 (1000)	90800 (1000)	60966 (1000)	113371 (1000)	117045 (1000)	75344 (1000)
By-catch total	430 (15)	5407 (206)	204 (14)	170 (2)	3463 (38)	1218 (20)	600 (5)	8870 (76)	1422 (19)
Gadiforms total	130 (5)	1177 (45)	153 (11)	153 (2)	3218 (35)	885 (15)	283 (2)	4395 (38)	1038 (14)
Silver hake	130 (5)	807 (31)	78 (5)	152 (2)	3192 (35)	782 (13)	282 (2)	3999 (34)	860 (11)
Cod	-	-	2 (0)	-	6 (0)	80 (1)	-	6 (0)	82 (1)
Haddock	-	370 (14)	12 (1)	-	-	1 (0)	-	370 (3)	13 (0)
Pollock	-	-	1 (0)	-	-	-	-	-	1 (0)
Other gadiforms 1)	-	-	60 (4)	1 (0)	20 (0)	22 (0)	1 (0)	20 (0)	82 (1)
Flatfishes total	-	-	4 (0)	0 (0)	30 (0)	166 (3)	0 (0)	30 (0)	170 (2)
American plaice	-	-	3 (0)	0 (0)	29 (0)	122 (2)	0 (0)	29 (0)	125 (2)
Yellowtail flounder	-	-	1 (0)	-	1 (0)	43 (1)	-	1 (0)	44 (1)
Halibut	-	-	-	-	-	-	-	-	-
Witch flounder	-	-	0 (0)	-	1 (0)	1 (0)	-	1 (0)	1 (0)
Other flatfishes 2)	-	-	-	-	-	-	-	-	-
Redfish	-	0 (0)	1 (0)	-	1 (0)	2 (0)	-	1 (0)	3 (0)
Argentine	300 (11)	4000 (152)	-	-	-	-	300 (3)	4000 (34)	-
Atlantic mackerel	-	-	18 (1)	-	-	-	-	-	18 (0)
Sharks and Skates 3)	-	2 (0)	2 (0)	5 (0)	26 (0)	39 (1)	5 (0)	28 (0)	41 (1)
Other fishes 4)	-	220 (10)	15 (1)	12 (0)	186 (2)	127 (2)	12 (0)	406 (3)	142 (2)
Other molluscs 5)	-	-	-	-	-	-	-	-	-
Crustacea total	-	8 (0)	13 (1)	-	1 (0)	-	-	9 (0)	13 (0)
Lobster	-	8 (0)	13 (1)	-	-	-	-	8 (0)	13 (0)
Other crustaceas 6)	-	-	-	-	1 (0)	-	-	1 (0)	-
Illex CPUE (Kg/Hour)	698	1312	4793	1466	1916	5081	1153	1737	5023

- 1) Other gadiforms Red hake, Cusk and unidentified hakes
- 2) Other flatfishes unidentified flatfishes
- 3) Sharks and Skates Dogfish, Jensen's skate, Smooth skate, Thorny skate and unidentified species
- 4) Other fishes Swordfish, Monkfish, Sculpin, Ocean pout, Helicolenus, Green eye, Wolffish, Rock grenadier, Alewife and unidentified species
- 5) Other molluscs unidentified octopodas
- 6) Other crustaceas unidentified crabs

Figures in the parenthesis denotes By-catch ratio, (By-catch/Illex catch) · 1000
 0 means less than 0.5

Table 3. Catch in the outside of the "Small mesh net zone" (first and second cruises combined)

Area	1E						2			3		
	Chain	Bobbin	Regular	Chain	Bobbin	Regular	Chain	Bobbin	Regular	Chain	Bobbin	Regular
	No. of haul Trawling time (Hour)											
Illex	97448 (1000)	38624 (1000)	2161 (1000)	46690 (1000)	36054 (1000)	83903 (1000)	17354 (1000)	4658 (1000)	15005 (1000)			
By-catch total	250 (3)	717 (19)	116 (54)	2427 (52)	8227 (228)	8983 (107)	22 (1)	2892 (621)	1755 (117)			
Gadiforms total	200 (2)	686 (18)	38 (18)	1205 (26)	5506 (153)	6181 (74)	19 (1)	1114 (239)	1599 (107)			
Silver hake	200 (2)	683 (18)	36 (17)	1196 (26)	5268 (146)	5746 (68)	9 (1)	394 (85)	161 (11)			
Cod	-	-	-	-	10 (0)	69 (1)	-	19 (4)	54 (4)			
Haddock	-	1 (0)	-	-	91 (3)	232 (3)	0 (0)	501 (108)	1288 (86)			
Pollock	-	-	-	9 (0)	112 (3)	64 (1)	10 (1)	125 (27)	8 (1)			
Other gadiforms ¹⁾	-	2 (0)	2 (1)	-	25 (1)	69 (1)	0 (0)	75 (16)	88 (6)			
Flatfishes total	-	28 (1)	72 (33)	-	101 (3)	392 (5)	1 (0)	66 (14)	64 (4)			
American plaice	-	23 (1)	64 (30)	-	71 (2)	234 (3)	0 (0)	20 (4)	31 (2)			
Yellowtail flounder	-	-	0 (0)	-	1 (0)	36 (0)	-	24 (5)	8 (1)			
Halibut	-	5 (0)	7 (3)	-	19 (1)	88 (1)	-	14 (3)	18 (1)			
Witch flounder	-	-	2 (1)	-	7 (0)	35 (0)	1 (0)	8 (2)	7 (0)			
Other flatfishes ²⁾	-	-	-	-	3 (0)	-	-	-	-			
Redfish	-	0 (0)	1 (0)	20 (0)	494 (14)	681 (8)	-	2 (0)	0 (0)			
Argentine	-	-	-	828 (18)	1872 (52)	1529 (18)	1 (0)	79 (17)	2 (0)			
Atlantic mackerel	-	-	-	-	-	-	1 (0)	1566 (336)	60 (4)			
Sharks and Skates ³⁾	-	3 (0)	4 (2)	44 (1)	126 (3)	177 (2)	-	55 (12)	3 (0)			
Other fishes ⁴⁾	50 (1)	-	0 (0)	330 (7)	121 (3)	17 (0)	-	10 (2)	27 (2)			
Other molluscas ⁵⁾	-	-	-	-	-	-	-	0 (0)	-			
Crustacea total	-	-	-	-	7 (0)	6 (0)	-	1 (0)	-			
Lobster	-	-	-	-	-	2 (0)	-	-	-			
Other crustaceas ⁶⁾	-	-	-	-	7 (0)	4 (0)	-	1 (0)	-			
Illex CPUE (Kg/Hour)	2436	2414	1081	1898	2575	6992	1240	358	1364			

1) Other gadiforms Red hake, Cusk and unidentified hakes

2) Other flatfishes unidentified flatfishes

3) Sharks and Skates Dogfish, Jensen's skate, Thorny skate and unidentified species

4) Other fishes Swordfish, Monkfish, Sculpin, Ocean pout, Helicolenus, Green eye, Wolffish, Rock grenadier, Alewife and unidentified species

5) Other molluscas unidentified octopods

6) Other crustaceas unidentified crabs

Figures in the parenthesis denotes By-catch ratio, (By-catch/Illex catch)·1000
 0 means less than 0.5

Table 4. Estimated amounts of by-catch in the case of 3,000 tons Illex quota

Area	Small mesh net zone	1E		2		3	
		Regular	Chain	Bobbin	Chain	Bobbin	Chain
Silver hake	34.2	6.2	53.0	76.8	438.3	1.6	253.8
Cod	3.3	-	-	-	0.8	-	12.2
Haddock	0.5	-	0.1	-	7.6	∅	322.7
Pollock	∅	-	-	0.6	9.3	1.7	80.5
American plaice	5.0	-	1.8	-	5.9	0.1	12.9
Yellowtail flounder	1.8	-	-	-	0.1	-	15.5
Halibut	-	-	0.4	-	1.6	-	9.0
Witch flounder	∅	-	-	-	0.6	0.2	5.2
Redfish	0.1	-	∅	1.3	41.1	-	1.3
Argentine	-	-	-	53.2	155.8	0.2	50.9
Lobster	0.5	-	-	-	-	-	-
Other fish	11.2	1.5	0.4	24.0	23.5	0	1098.6

unit: ton

∅ means less than 0.05

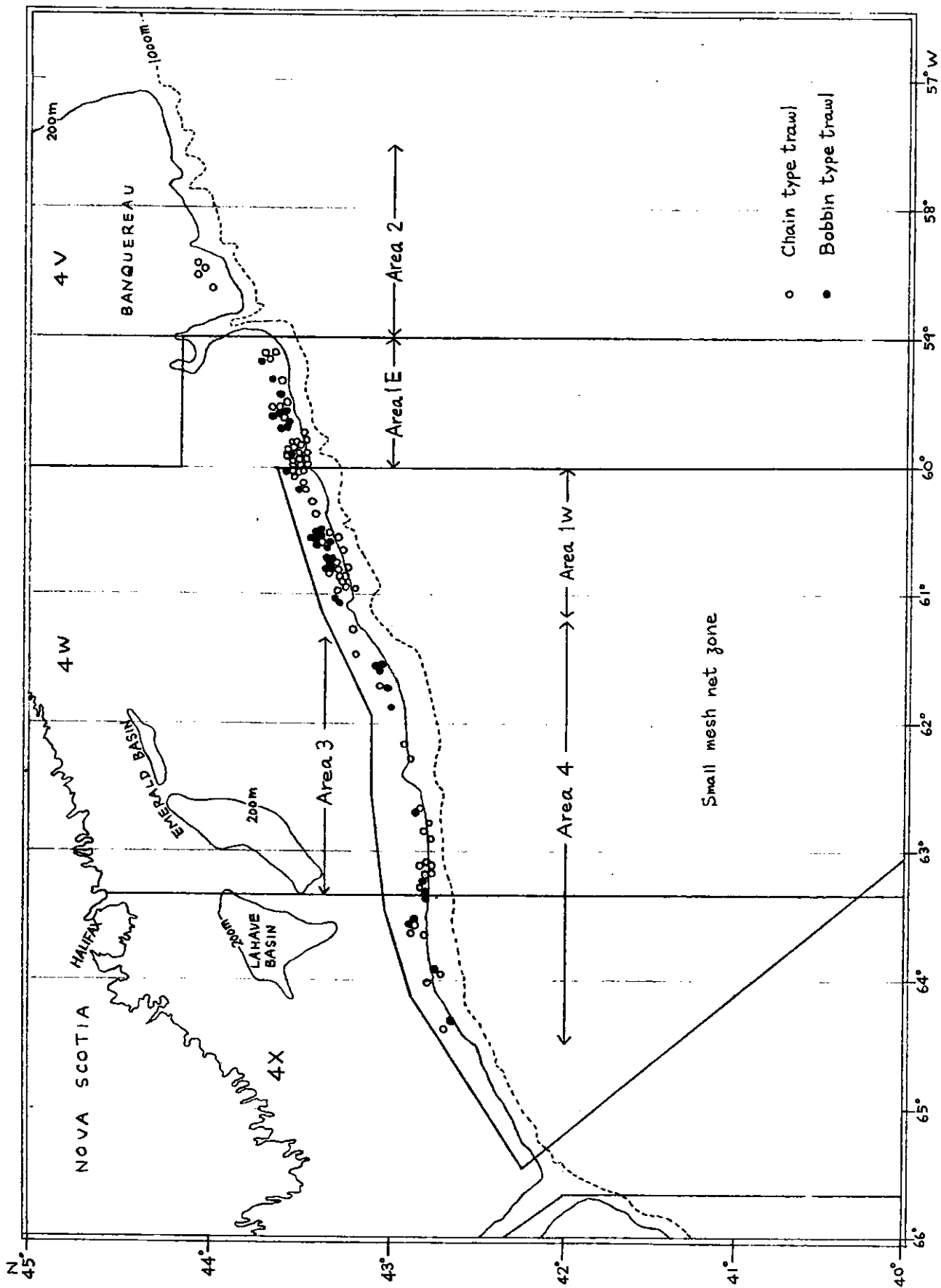


Fig. 1. Setting net position in the first cruise

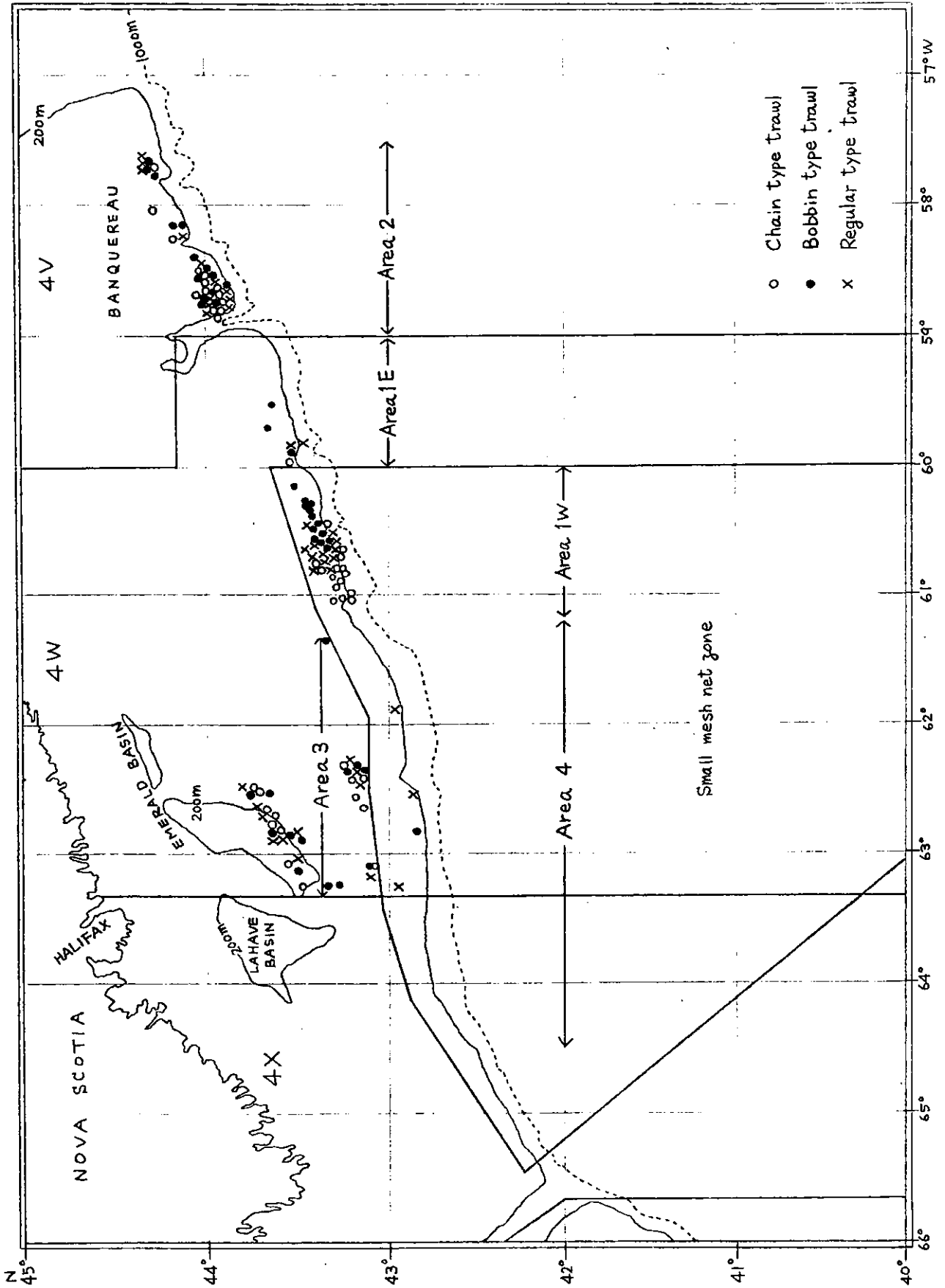


Fig. 2. Setting net position in the second cruise

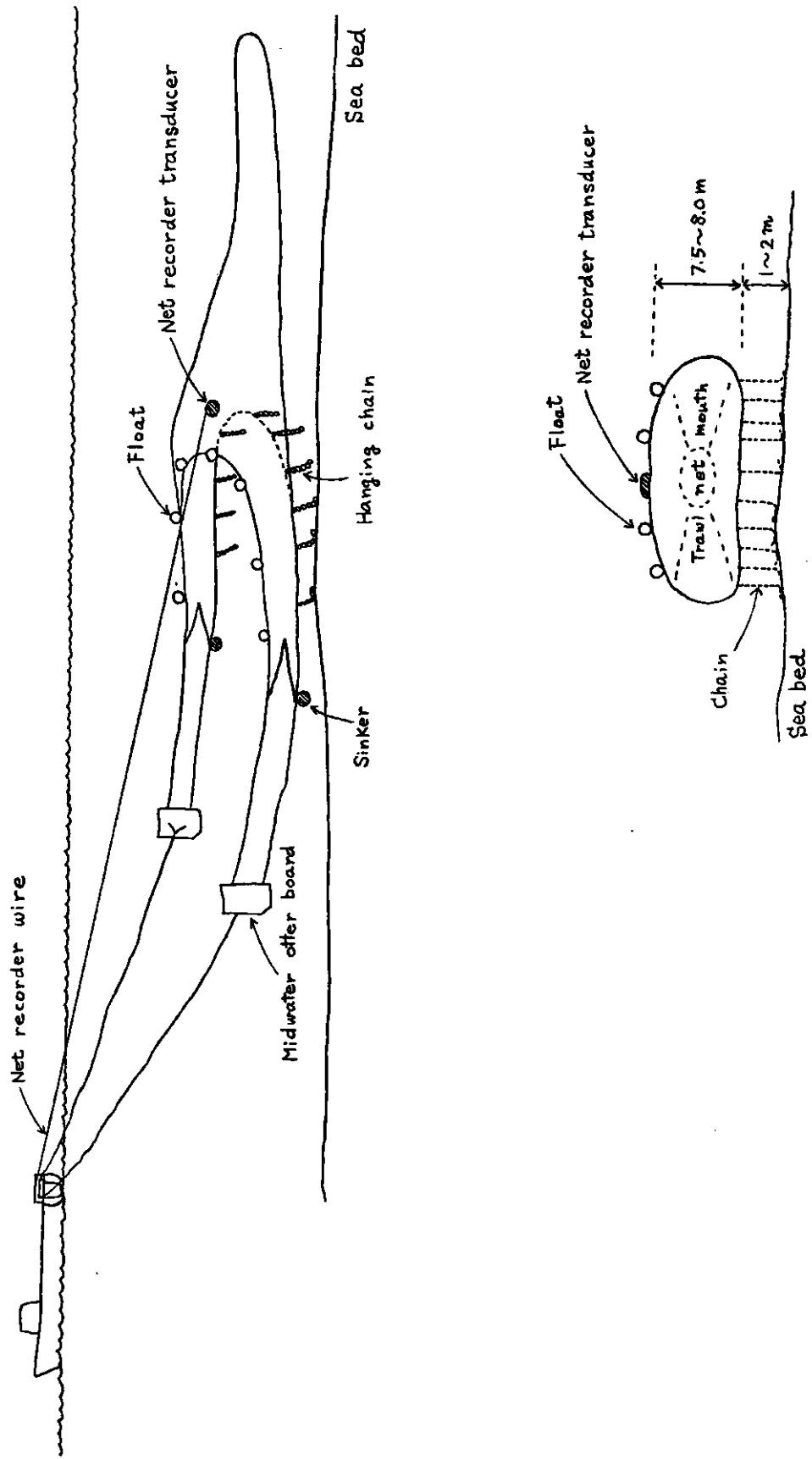


Fig. 3. Chain type trawl in operation

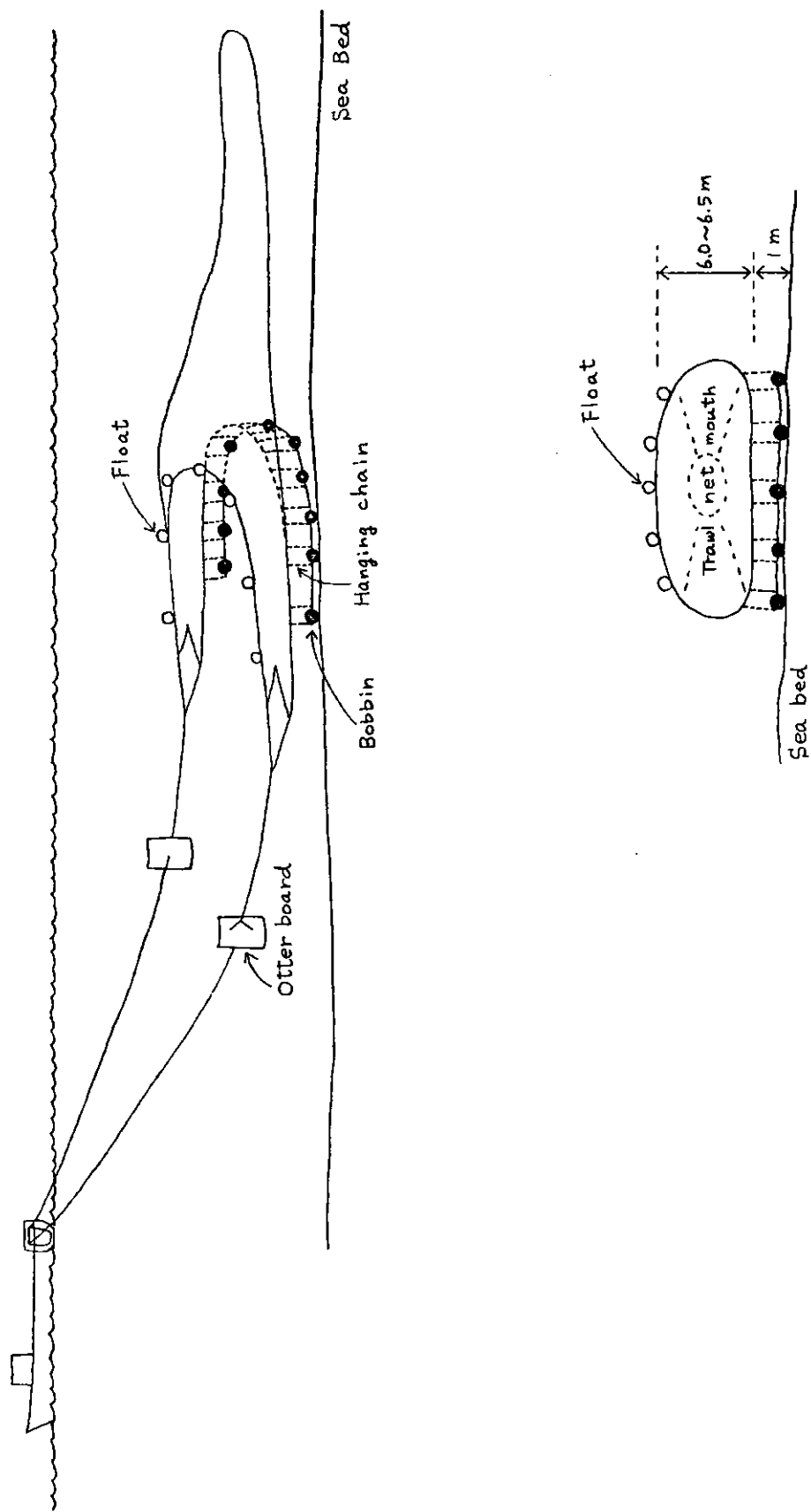


Fig.4. Bobbin type trawl in operation

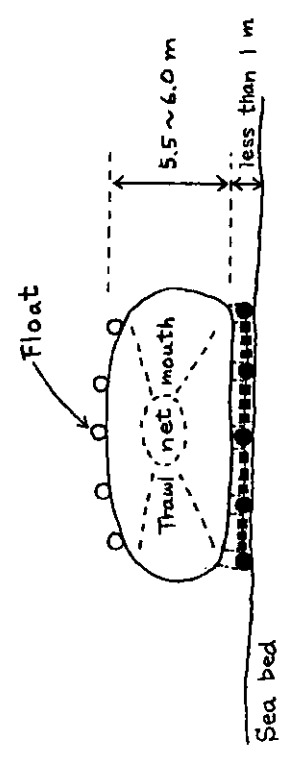
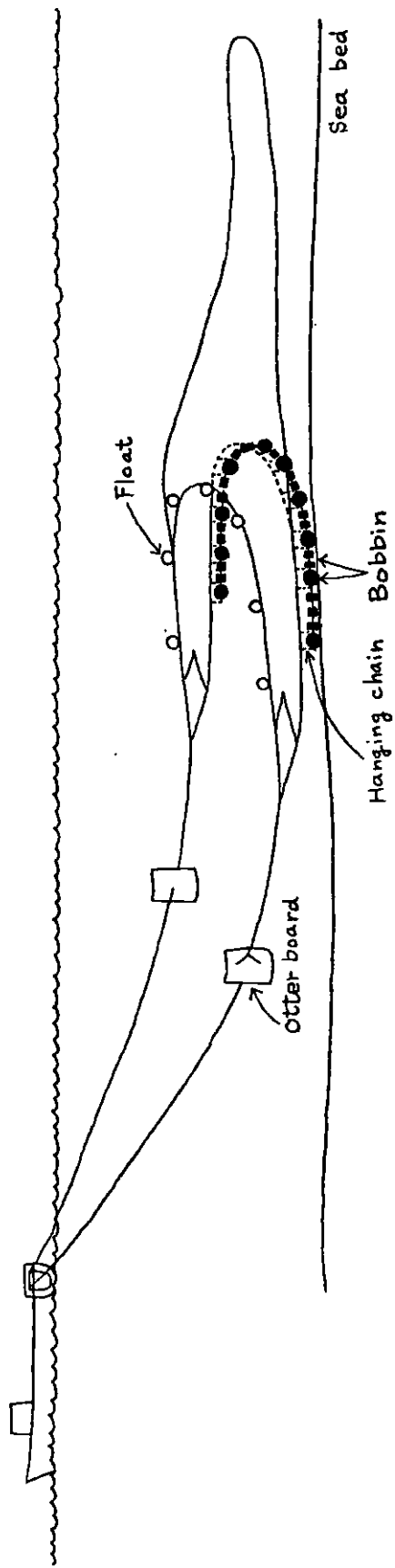
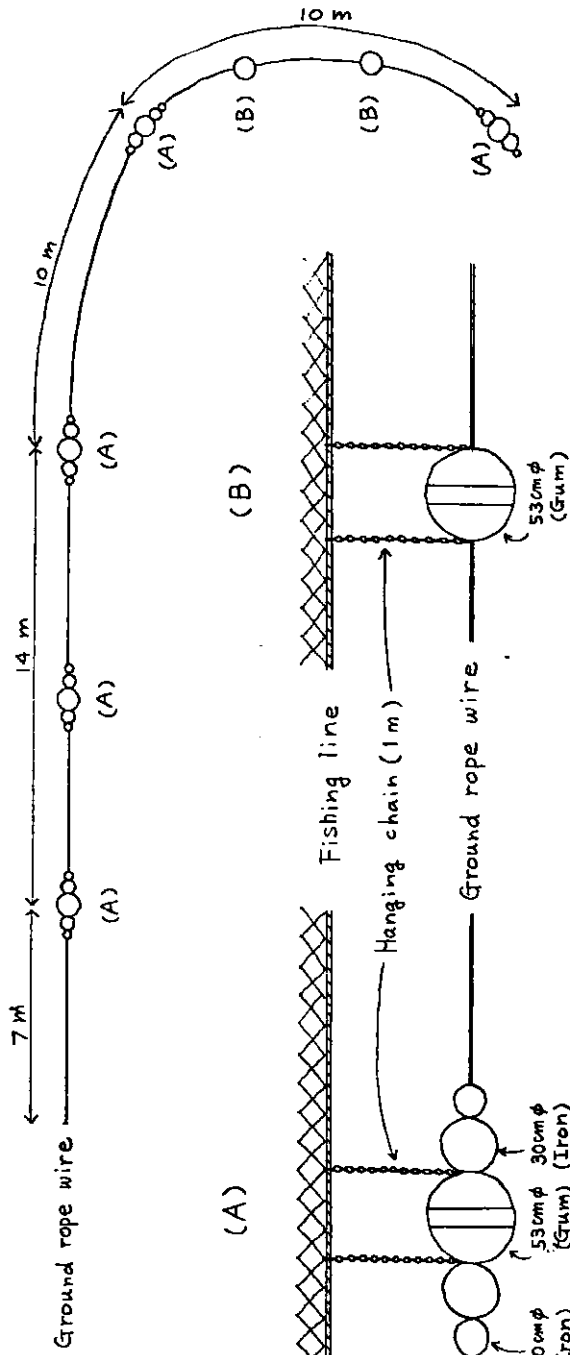
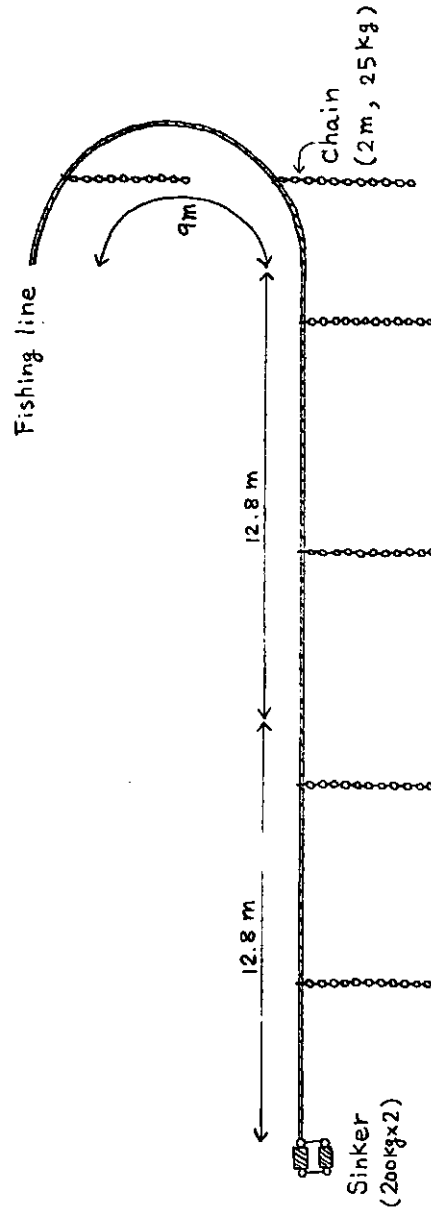


Fig. 5. Regular type trawl in operation



Bobbin type



Chain type

Fig. 6. Ground ropes of Bobbin type and Chain type gears

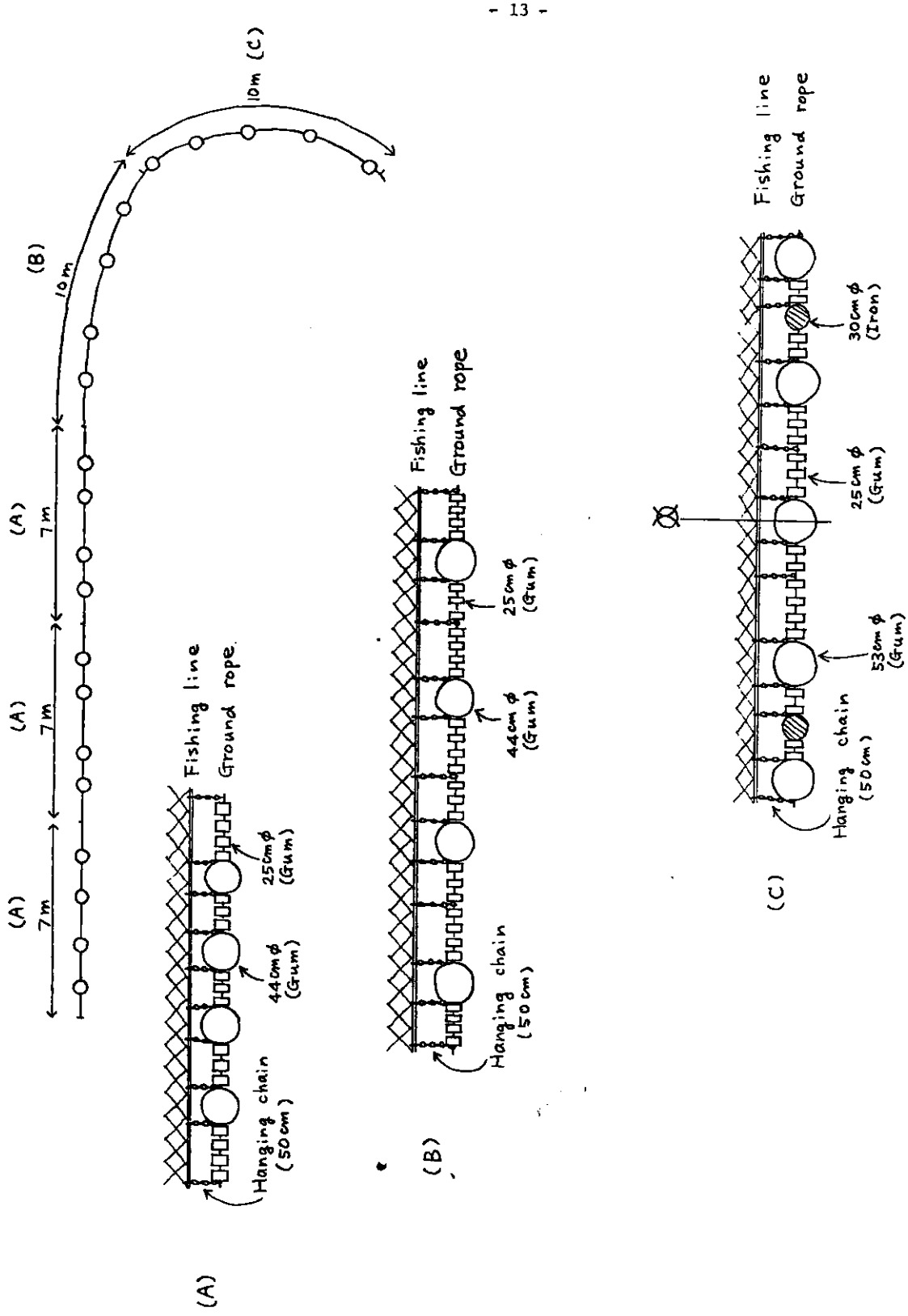
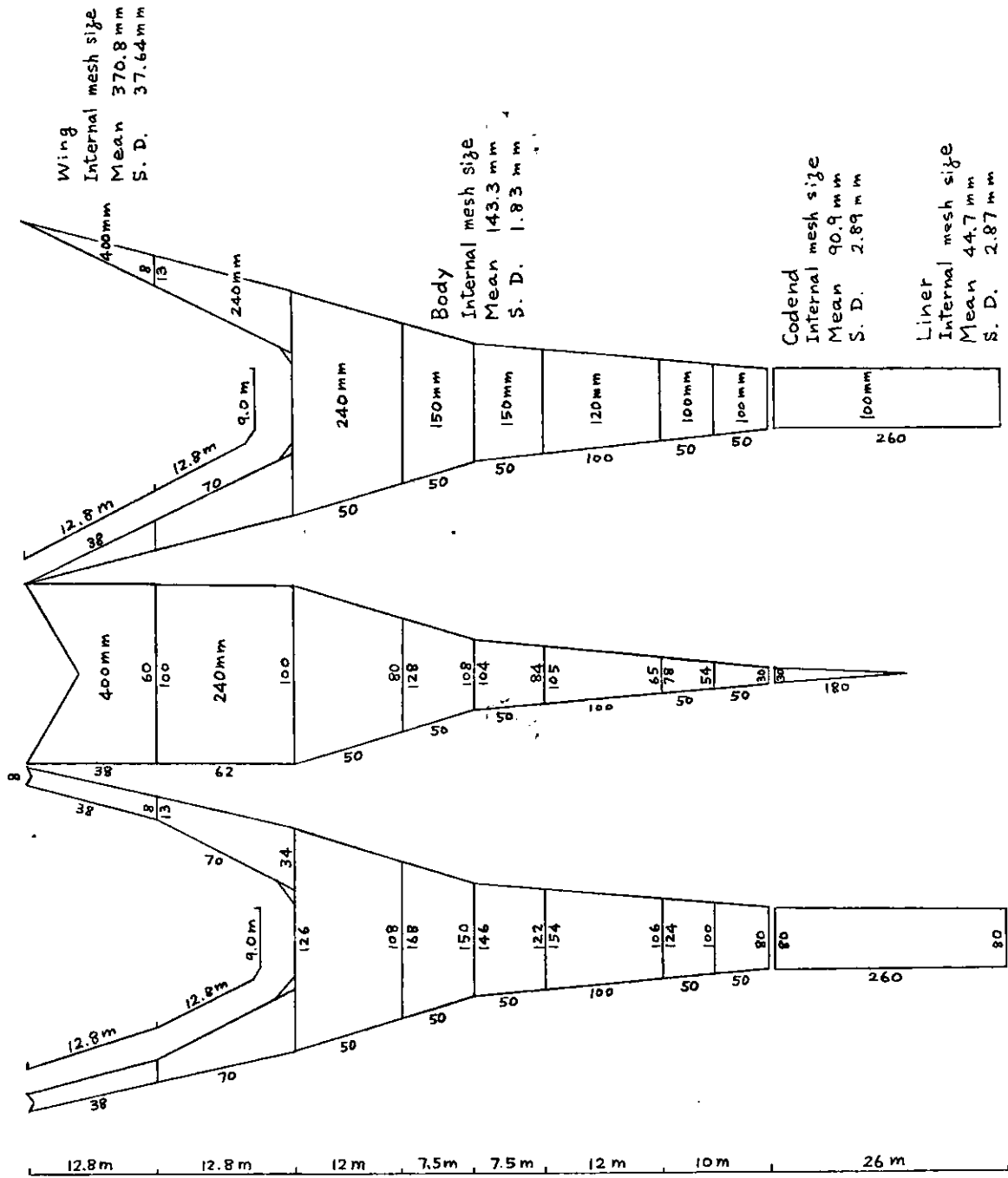
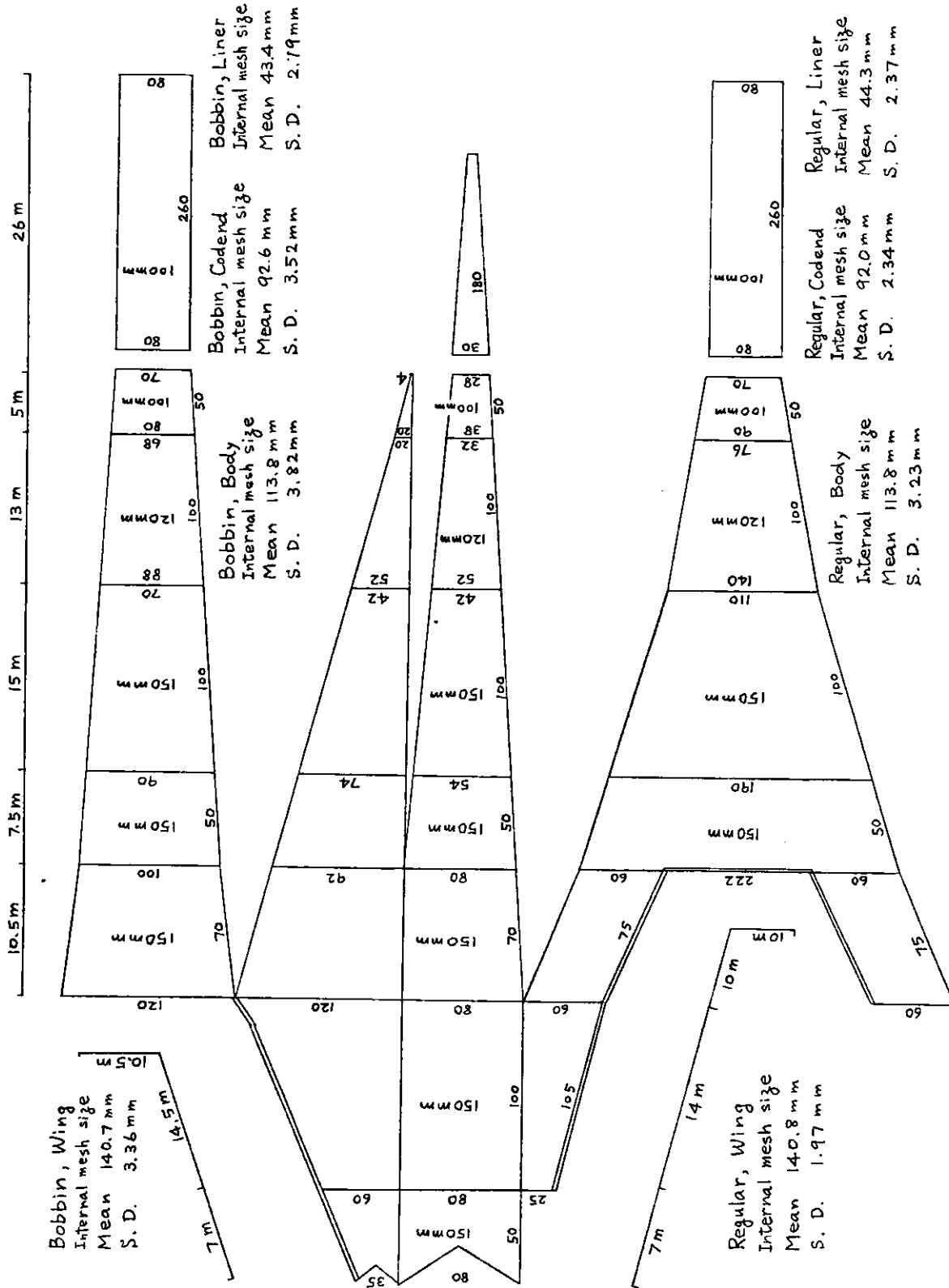


Fig. 7. Ground rope of Regular type gear



material : polyethylene

Fig. 8. Chain type trawl net



material : polyethylene

Fig. 9. Bobbin type and Regular type trawl net

