Consideration of bottom contact effect on the catch of demersal species in a trawl survey in Japan

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Stock survey for walleye pollock along the coast of Japan

- Annual trawl and acoustic surveys are conducted by Fisheries Research Agency and Prefectural Fisheries Experimental Station with relation to the area where pollock is distributed.

- The survey area is mainly divided into the Pacific and Japan sea.

Change of catch efficiency with towing condition

Efficiency is changed in different vessel or towing condition even if the same trawl gear is used.

Engås and Godø,1989, Rose and Walters, 1990, McCallum and Walsh, 2002, Weinberg, Somerton, and Munro, 2002 etc.

Efficiency and fish size composition is changed with the variation of trawl mouth shape and the condition of bottom contact.

Main and Sangster, 1981, Godø and Engås, 1989, Walsh, 1992 etc.

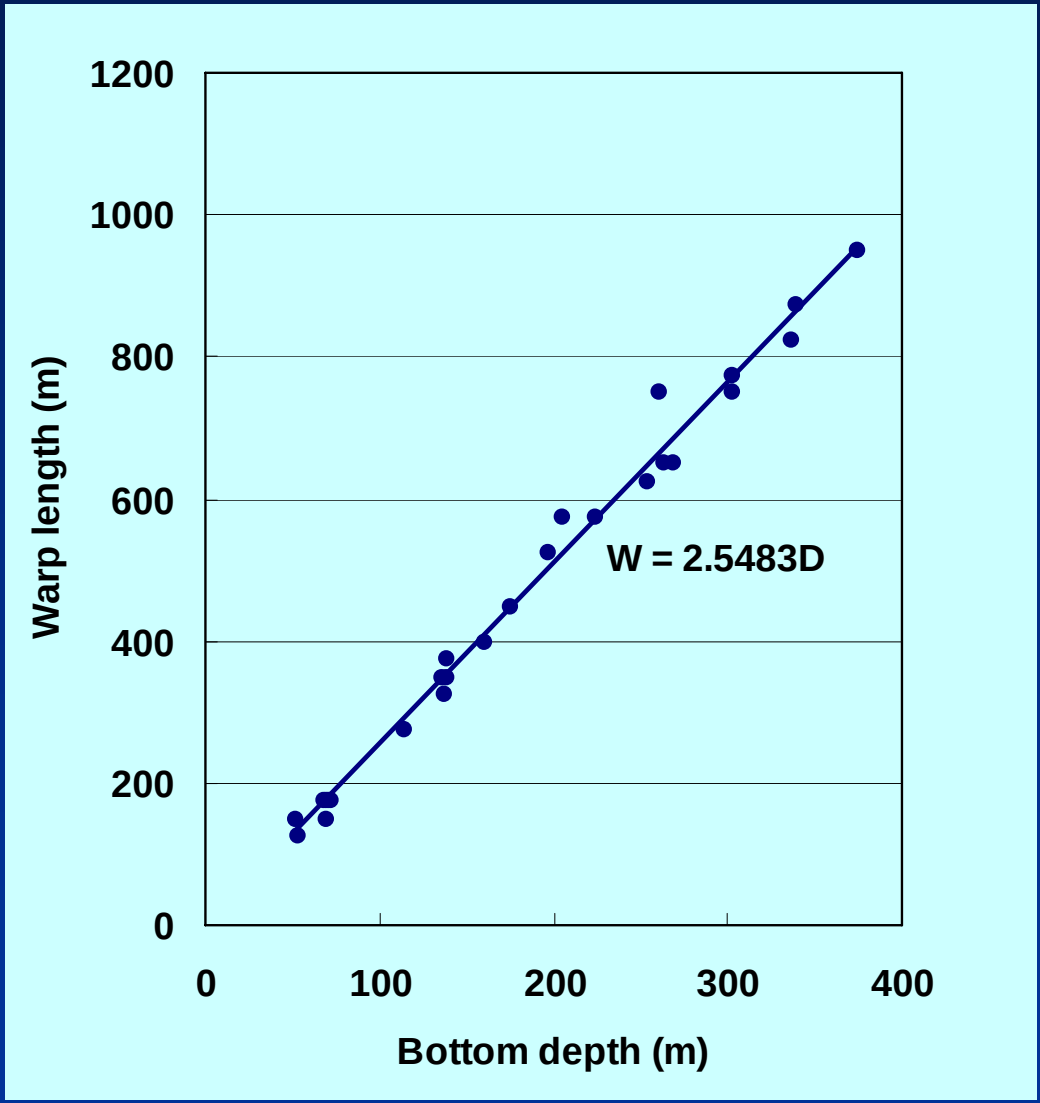
Influence of warp length to catch

- Measuring the mouth shape and bottom contact in different warp length, scope ratio (warp length / depth)
- Comparison of the catch in different scope ratio

Investigation of scope ratio (warp length / depth) in the actual trawl survey for walleye pollock

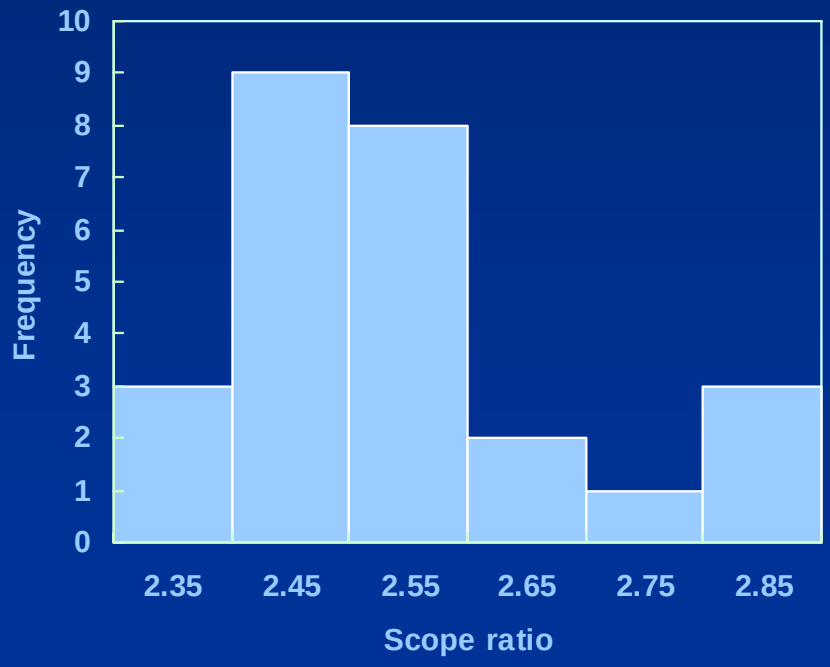
Survey area:	Offshore of North-east Japan (Sanriku area)	Depth of these area were shallower than 500 m
	Offshore of East Hokkaido	
Vessel:	RV No.3 Kaiyo-Maru (1300PS, 473GT)	
Trawl net:	JAMARC99 （Nichimo Co. Ltd.）	Wing spread: 18 m, Net length: 49.9 m
Otter board:	ORFH type （Taito Co. Ltd.）	Weight in water: 850kg each

Scope ratio in the past survey for walleye pollock

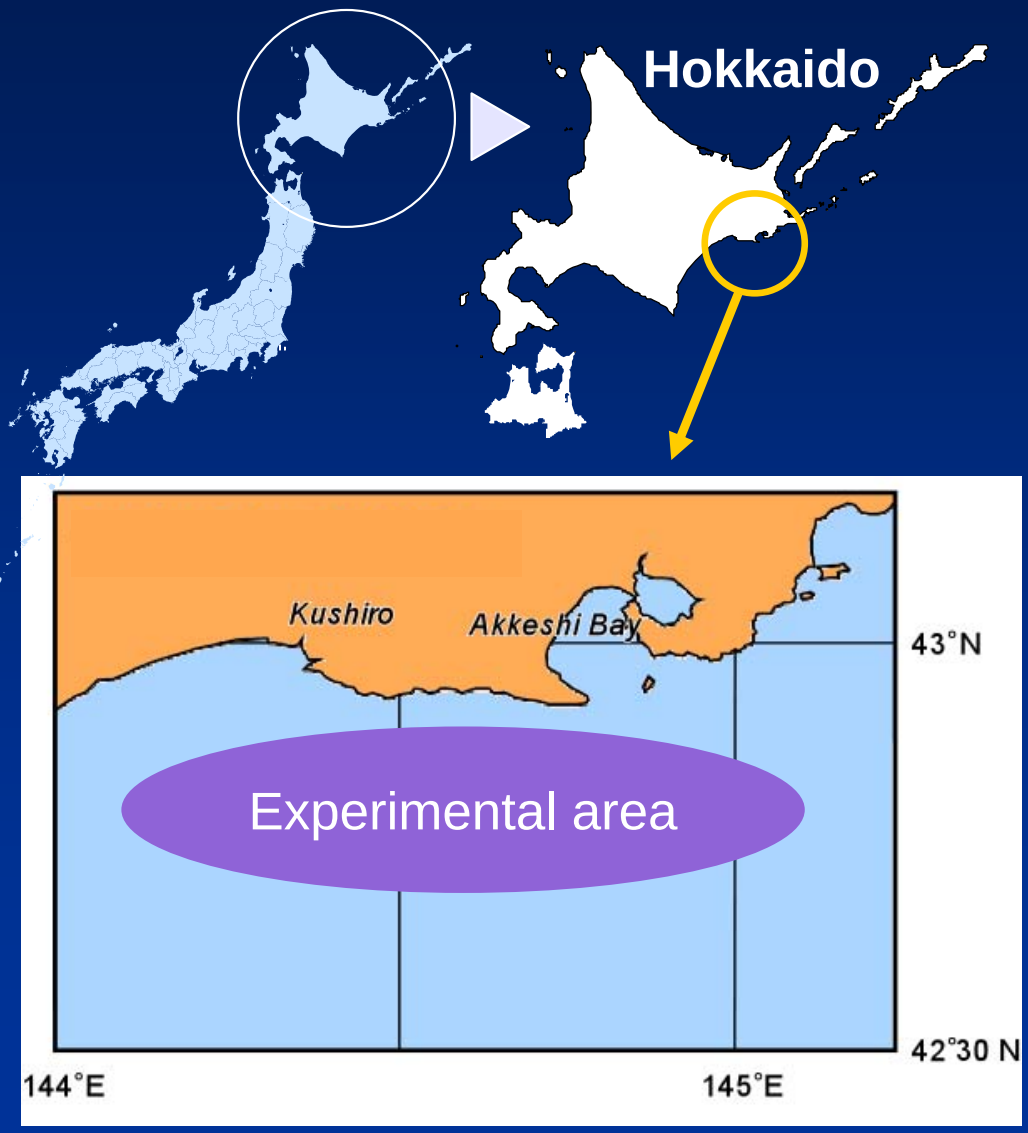


In past survey, scope ratio (W/D) was ranged from 2.4 to 2.9 (Mean=2.54).

Too short ?



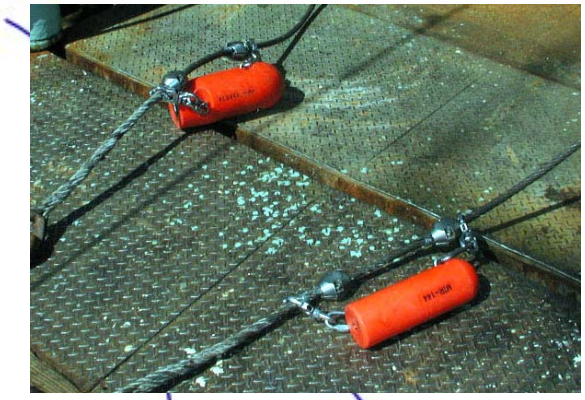
Experimental area



Date	January in 2002
Area	Offshore of Kushiro City
	Depth: 110 to 130 m
Vessel	RV No.3 Kaiyo-Maru
Gear	JAMARC 99 with ORFH otterboard
Echo sounder	SIMRAD EK60

Towing speed	4 knot
Scope ratio	2.5, 3.0, 3.5
Duration	10 min on the bottom.

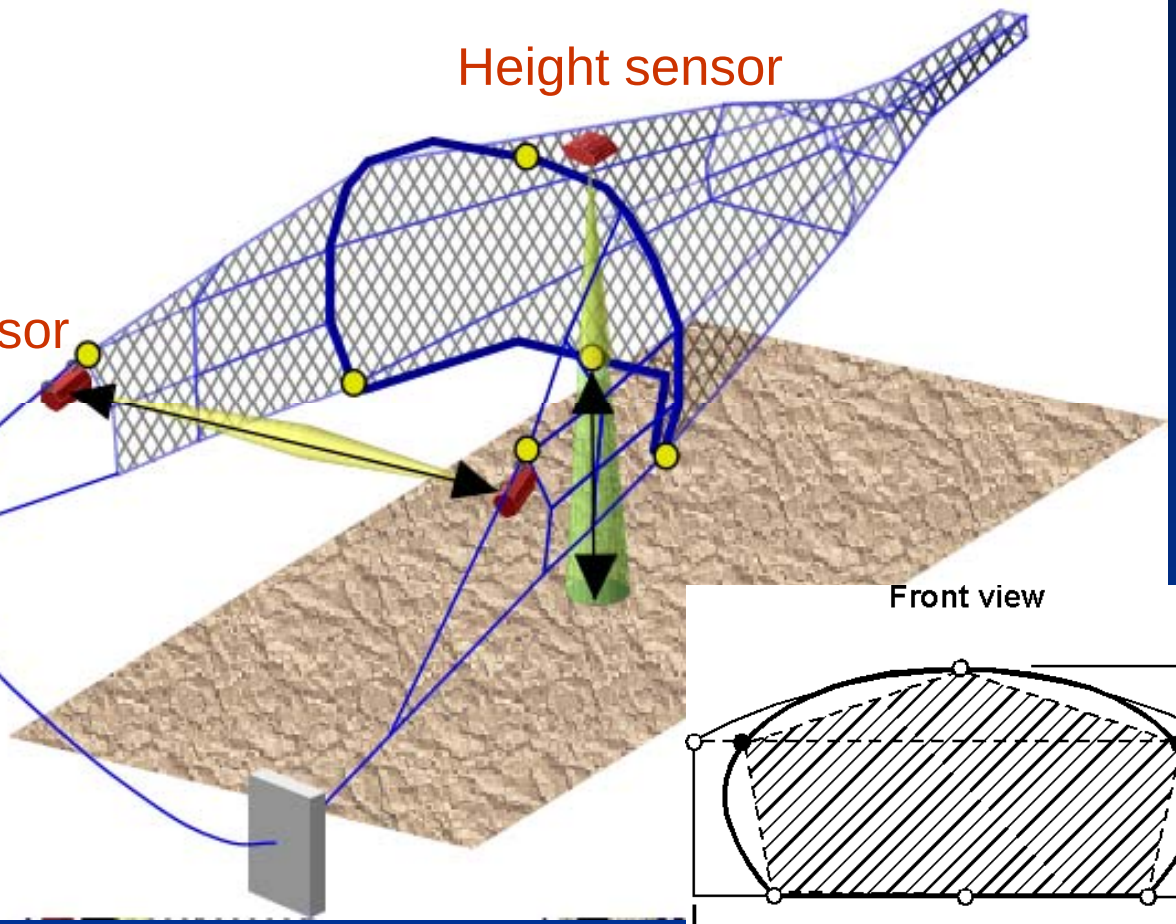
Measuring devices



Distance sensor

- Depth logger

Height sensor

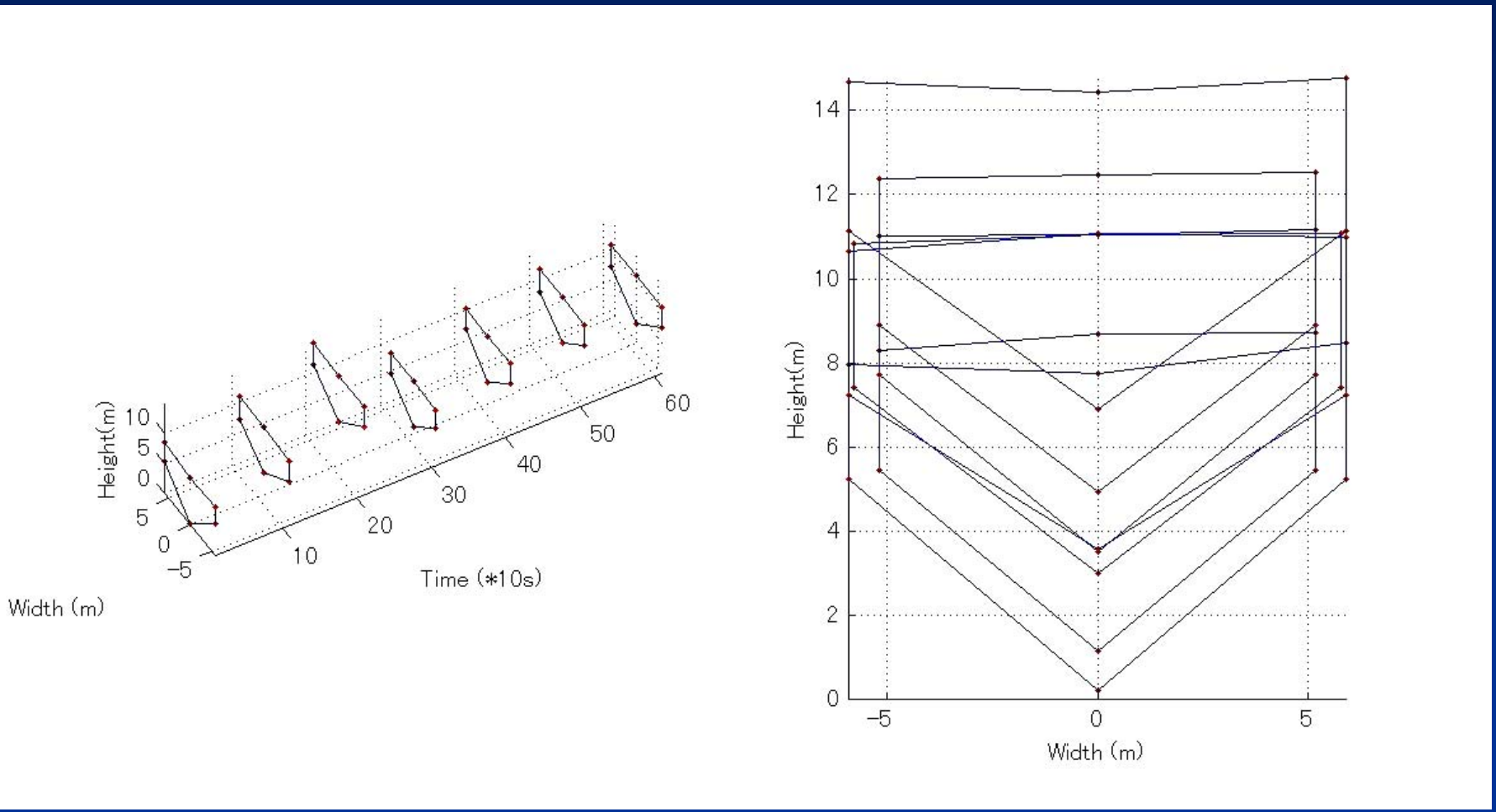


Geometry

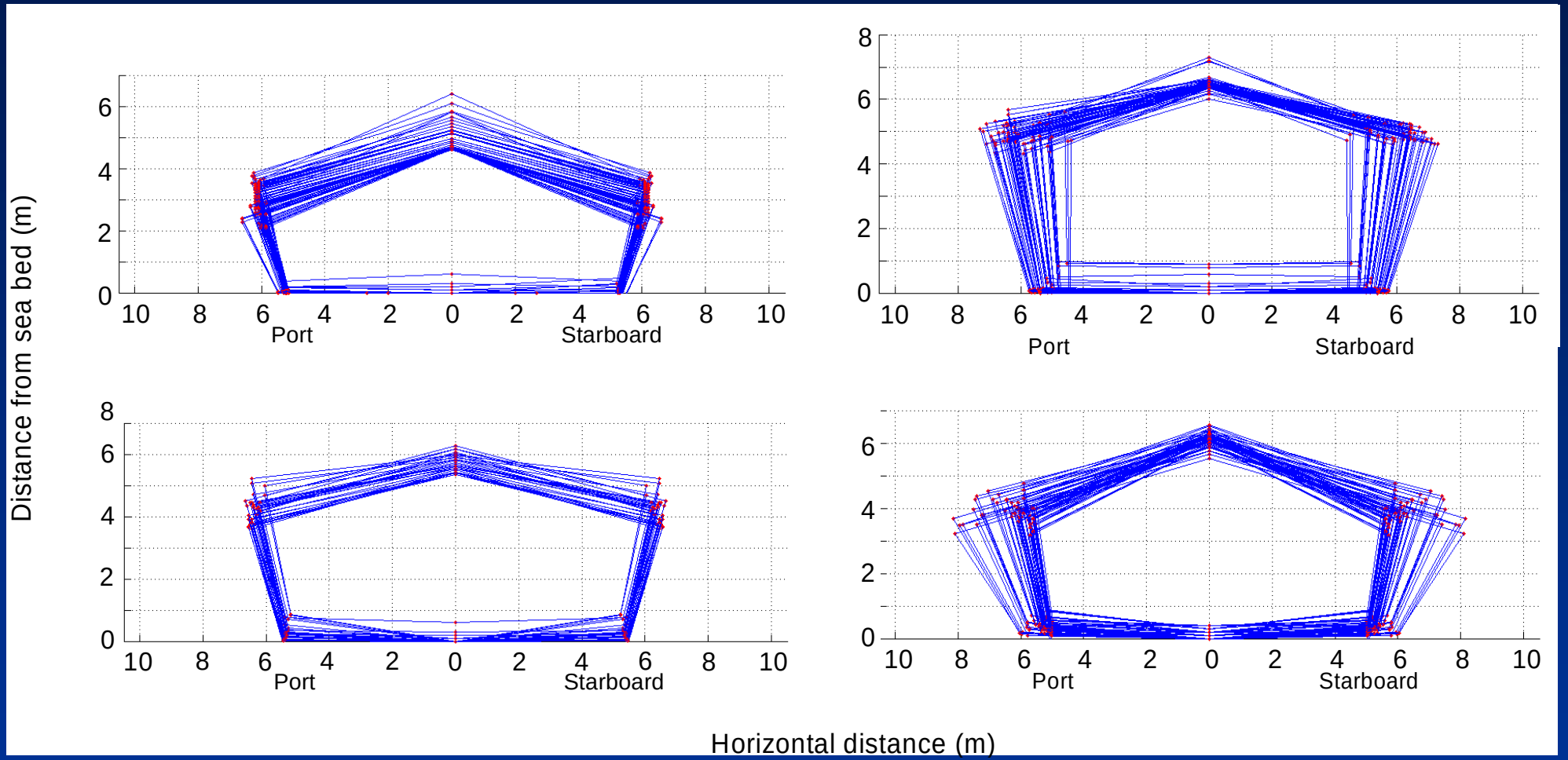
	Scope ratio	Wing spread		Trawl height		Bottom clearance	
		Avg.	S.D.	Avg.	S.D.	Avg.	S.D.
Series 1	2.5	16.1	1.71	6.4	0.19	0.1	0.30
	3.0	17.4	0.83	5.1	0.15	0.0	0.12
	3.5	18.3	3.78	5.0	0.16	0.0	0.15
Series 2	2.5	16.1	1.69	7.1	0.17	0.1	0.29
	3.0	17.4	1.46	5.6	0.15	0.1	0.17
	3.5	18.1	1.54	5.1	0.16	0.0	0.18

Mouth shape observation

The depth of each position were recorded by depth logger with the duration of 10 seconds.

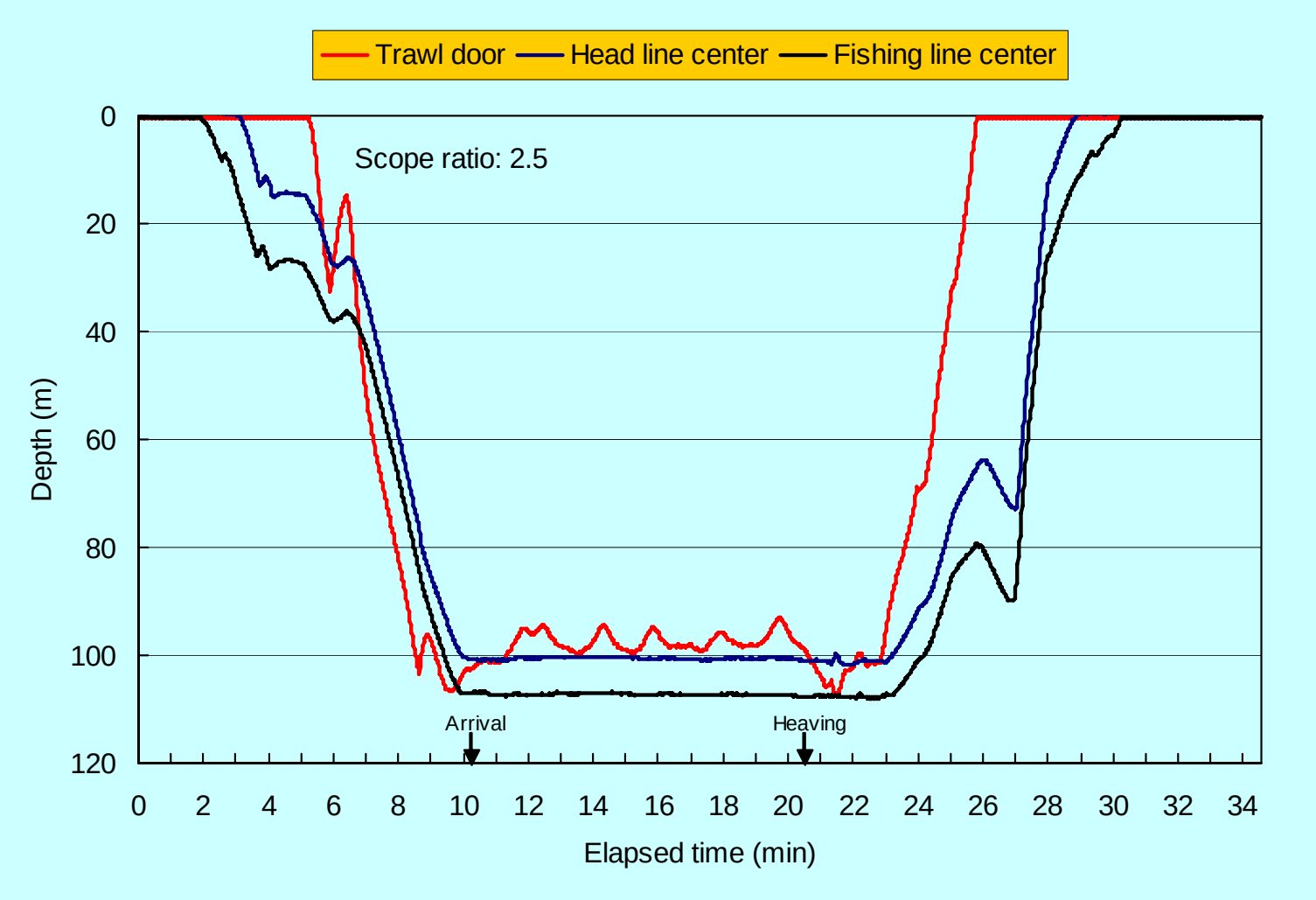


Mouth shape at scope ratio of 2.5

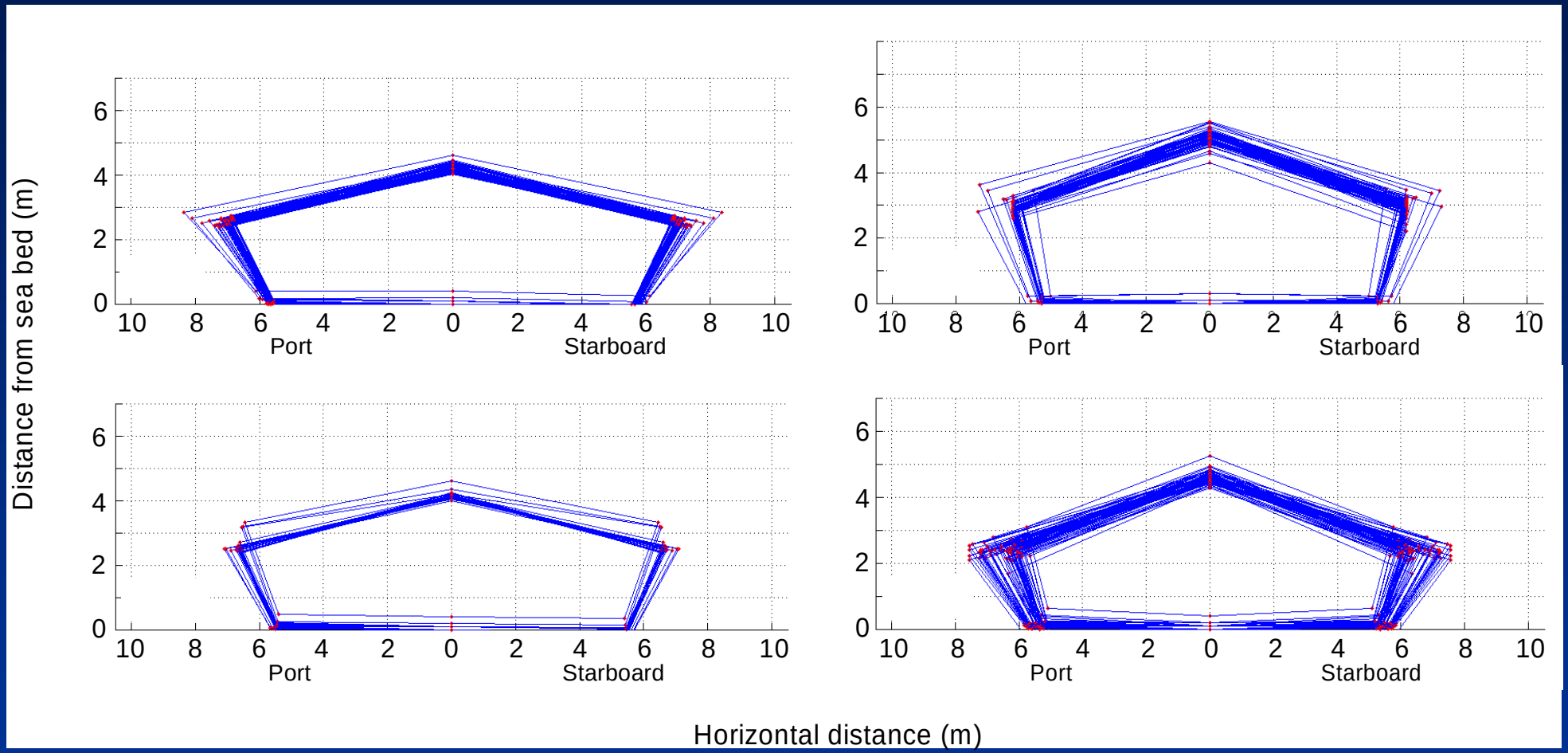


Height was 4.9 to 6.4 m, Wing distance was 16.1 to 16.8 m

Depth of the net and trawl door with elapsed tow time when the scope ratio was 2.5

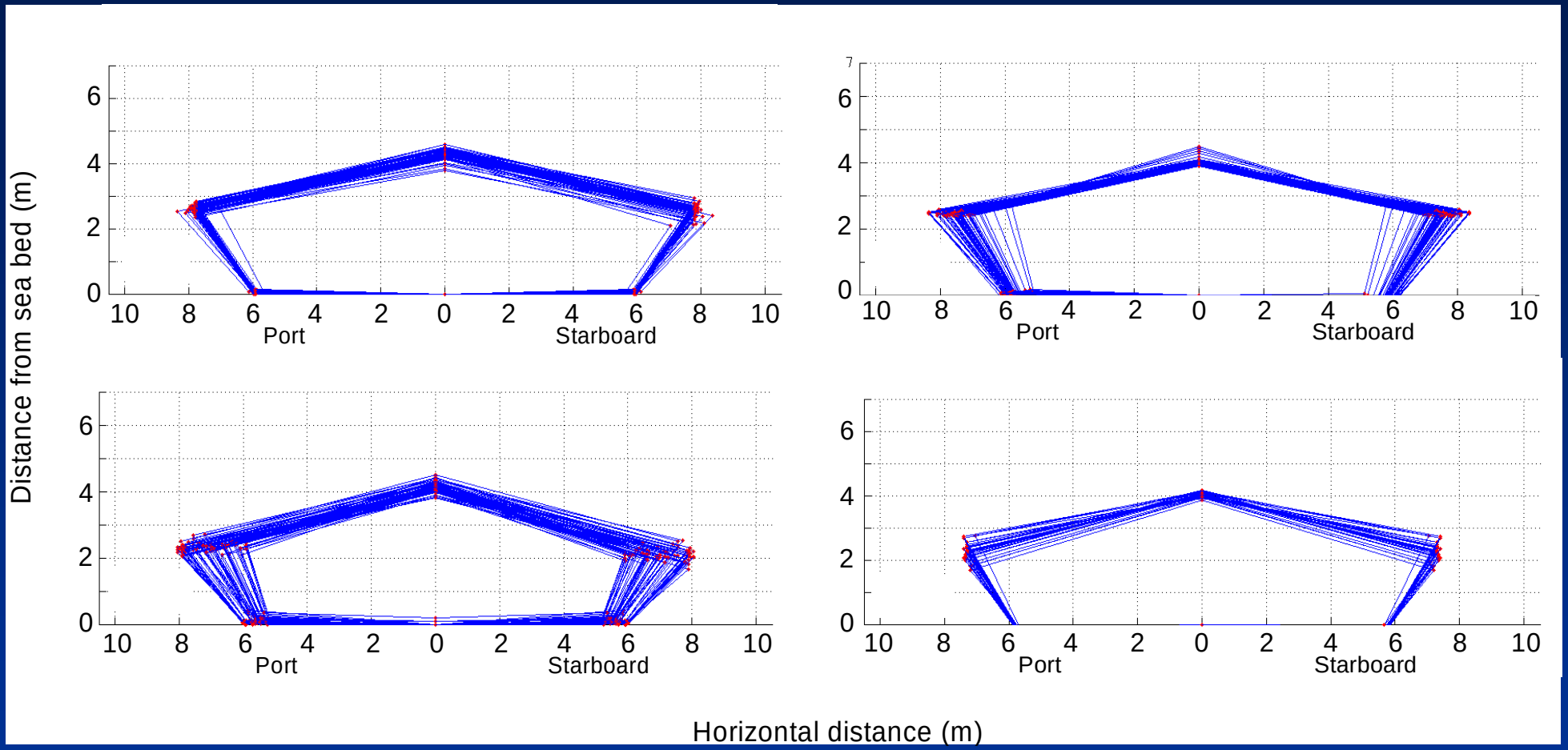


Mouth shape at scope ratio of 3.0



Height was 4.1 to 5.0 m, Wing distance was 17.1 to 18.2 m

Mouth shape at scope ratio of 3.5

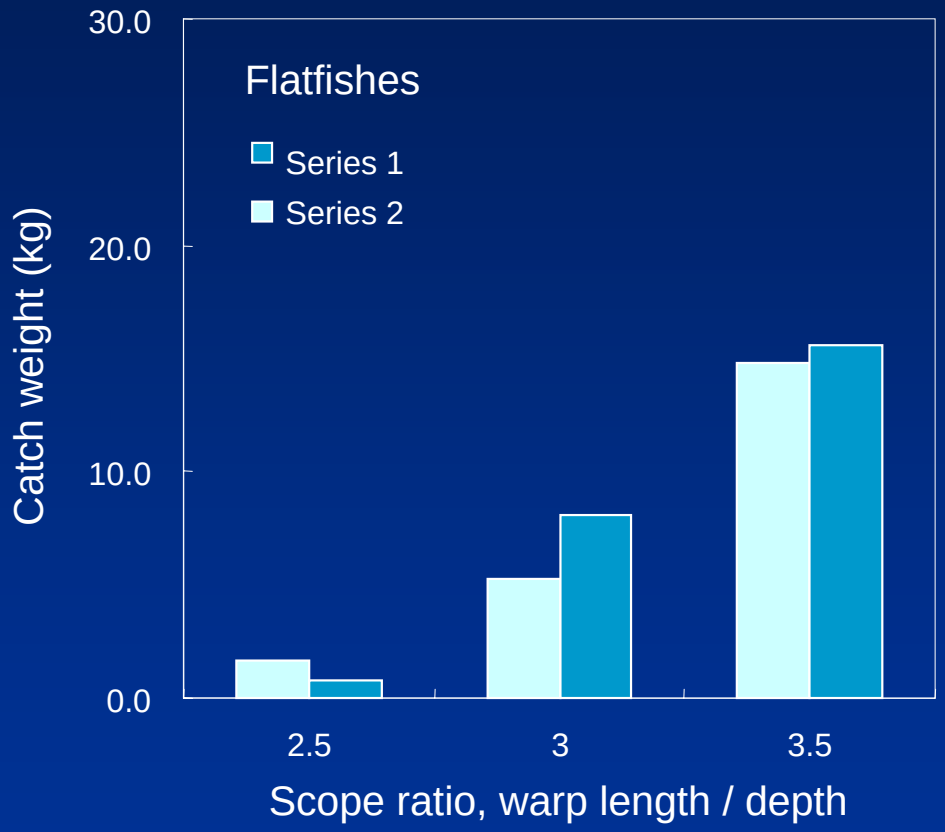


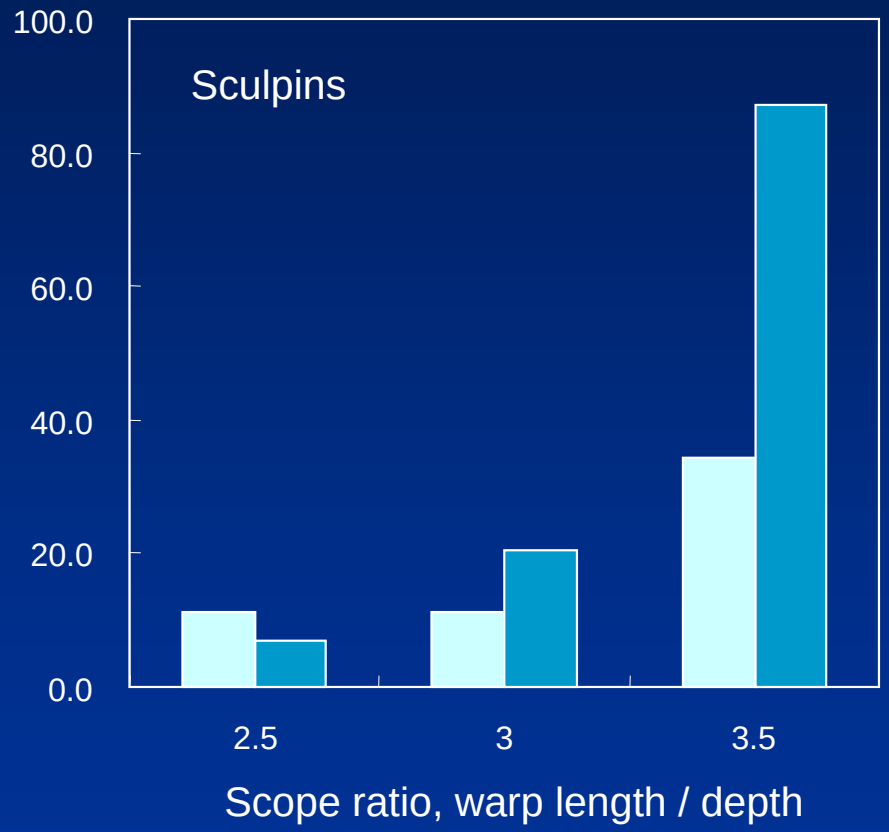
Height was 4.0 to 4.3 m, Wing distance was 18.2 to 18.9 m

Catch weight by scope ratio

Species	Scope ratio 2.5 Number	2.5 Weight (kg)	3.0 Number	3.0 Weight (kg)	3.5 Number	3.5 Weight (kg)
Walleye pollock	3704	67.6	3936	83.3	6945	146.9
Pacific cod	-	0	-	5	-	0
Sculpins	-	11.2	-	11.2	-	34.3
Flatfishes	-	1.7	-	5.3	-	14.8
Others	-	4.2	-	15.9	-	14.7
Total		84.7		120.7		210.7

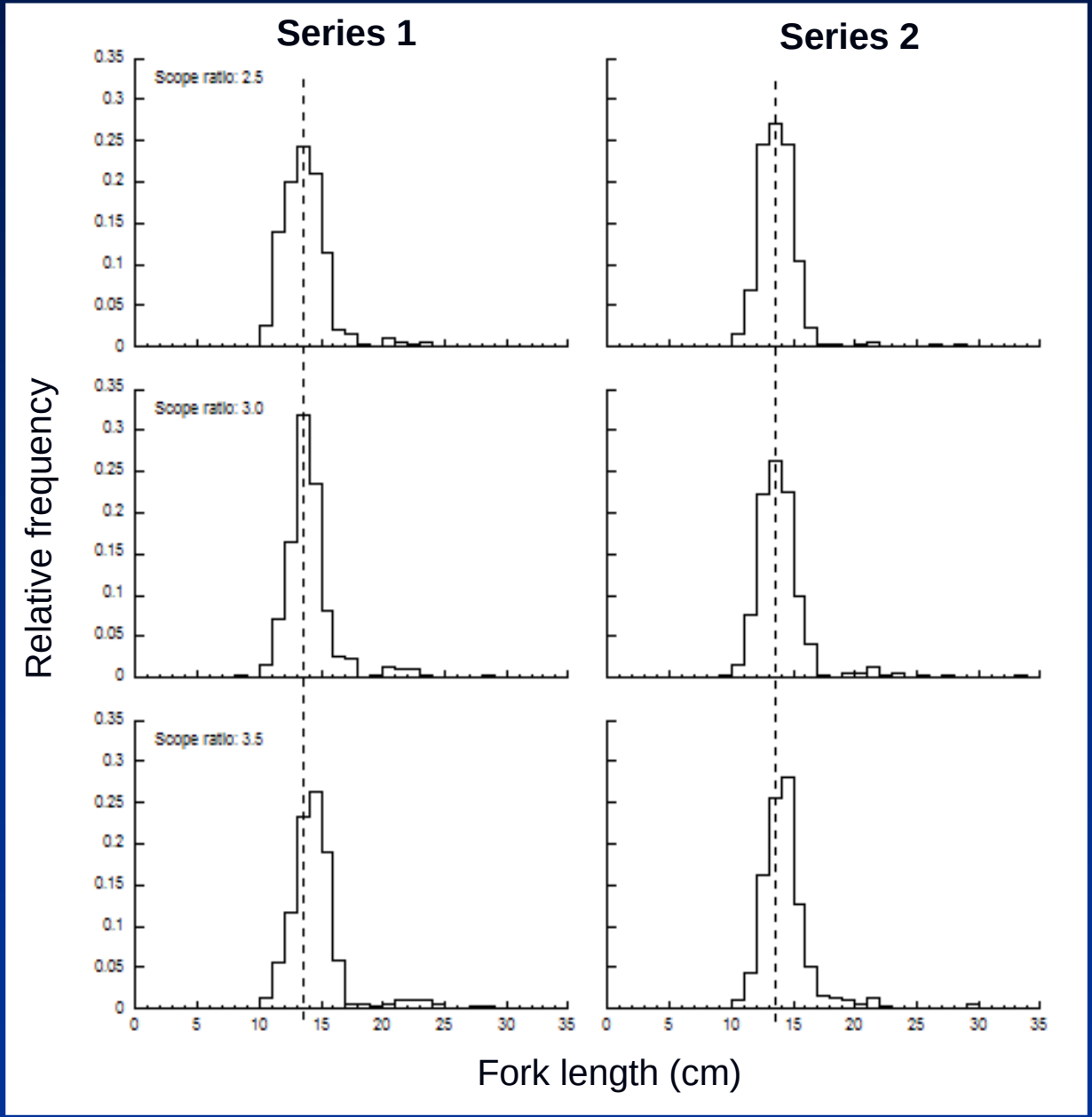
Variation of catch weight with the scope ratio for sculpins and flatfishes





Length frequency distributions of pollock caught

Scope ratio	Mean length (cm)
Series 1	
2.5	13.5
3.0	13.7
3.5	14.3
Series 2	
2.5	13.6
3.0	13.7
3.5	14.1



(N=300)

Summary

1. Relationship of scope ratio to mouth shape
   - The change in mouth shape was most notable at scope ratios between 2.5 and 3.0.
   - At a 2.5 scope ratio, it was apparent that the trawl door never touched the bottom. Moreover, the mouth shape and the bottom contact were fluctuated extremely.

2. Relationship of scope ratio to catch
   - The catch of each species were increased clearly with scope ratio.
   - The length composition of the catch at a 3.5 scope ratio was different from those at other scope ratios.

Conclusion

The scope ratio should be set as 3.0,

to prevent the large variation of catchability

to keep the consistency between the echo data and catch data

Thank you for your kind attention

We also thank the Fisheries Research Agency of Japan supported this study.