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The catching efficiency of cod gillnets with different hanging ratio (E) and different floatline buoyancy.

by

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ABSTRACT

The floatline buoyancy seems to influence the catching efficiency of cod gillnets. Trials with different byoyancies in cod gillnet fishing in Northern Norway gave the best catches with a buoyancy of about 65 grammes per metre floatline. Comparative fishing with nets of different hanging ratios showed that the usual hanging ratio in Norwegian cod gillnets E = 0.5, is not the most efficient one. The best catch per gillnet was obtained with a hanging ratio of about 0.6

1. INTRODUCTION

In experiments with a hydraulic drum for gillnet fishing, great problems were encountered when using conventional plastic rings as floats. This led to the development of a smooth floatline whereby problems of hooking and entangling in the webbing of floats and knots were mostly eliminated. At the same time work started to find out which is the optimum floatline buoyancy with regard to catching efficiency.

Combined with these developments there have been experiments with simple and cheaper methods of mounting the float- and leadline to the net. These trials gave the idea of investigating the effect on the fishing efficiency by changing the hanging ratio from the normal E = 0.5 to E = 0.75.

2. METHODS

The method used to find the optimum buoyancy in the floatline was to set in the fleet of nets two and two gillnets with the same meshsize, colour, netting material and hanging ratio but with different buoyancy. The amount of buoyancy varied from 50 gram per metre to 130 gram per metre floatline. Assuming no neighbuouring effect leading the fish from one gillnet into another, straight comparisons were made between the catches in neighbouring pairs of nets with different floatline buoyancy.

The same method was applied when testing the hanging ratio's influence on the catches. All other parameters were held constant and the catches in pains of gillnet with different hanging ratios were analysed. These experiments were all carried out in Northern Norway; in Lofoten during the spawning cod season in 1978 and 1979, at the coast of West Finnmark in 1977, and outside Senja in the autumn 1978.

3. RESULTS

2.1 The floatline buoyancy

The results are summarized in the tables below. In Table 1 the catches in the experimental nets are compared to these of standard gillnets with 7 rings for floats. This is the normal number of rings used in the cod fishery at West Finnmark, giving an average buoyancy per metre headline of about 120 grammes. In Tables 2, 3 and 4 the comparisons are between different floatlines.

Table 1. Average catches in number of fish per gillnet with different float-line buoyancy compared with the average catches in standard nets with 7 rings buoyancy (about 120 grammes per metre). Winter fishing at West Finnmark 1977.

Vessel	Number of comparisons	Floatline buoyancy in g/m	Average catch in experim.nets (no./net)	Average catch in nets with 7 rings (no./nets)	Change %
"Maifjell"	6	52.5	4.5	2.8	+ 60.7
"Karl Aas"	12	90.0	8.4	6.4	+ 31.3
"Karl Aas"/"Maifjell"	16	54.0	9.4	9.1	+ 3.3
"Maifjell"	18	75.0	15.6	17.1	- 8.8
"Maifjell"	17	50.0	15.7	18.1	- 13.3
"Maifjell"	17	100.0	13.8	17.0	- 18.8

Table 2. Average catch (no./net) in gillnets with different floatline buoyancy and the change in per cent. West Finnmark winter 1977.

Vessel	Number of comparisons	Average catch in nos./net			Change %
		Floatline buoyancy 50 g/m	Floatline buoyancy 90 g/m	Floatline buoyancy 100 g/m	
"Maifjell"	27	9.7	-	8.5	+ 14.1
"Maifjell"	26		8.9	8.5	+ 4.7
"Maifjell"	26	9.8	8.9		+ 10.1

Table 3. Average catch (no./net) in gillnets with different floatline buoyancy. Lofoten 1978.

Vessel	Number of comparisons	Average catch in no./net		Change %
		Floatline buoyancy 65 g/m	Floatline buoyancy 100 g/m	
"Skarsjø"	36	4.6	3.8	+ 21.1

Table. 4. Average catch (number of fish per gillnet) in gillnets with different buoyancy in the floatline.
Outside Senja, autumn 1978.

Vessel	Number of comparisons	Average catch in no./net			Change %
		Floatline buoyancy 65 g/m	Floatline buoyancy 100 g/m	Floatline buoyancy 130 g/m	
"Svein Roger"	8	5.6	5.0		12
"Svein Roger"	20		7.2	7.2	0

Almost all the comparisons show that the gillnets with the lowest floatline buoyancy fished best. The only exceptions are three trials at West Finnmark where gillnets with the highest buoyancy were fishing best. It is noticable that catch rate in these experiments was greater than in the other comparisons, and it is not unexpected that with more fish in the nets a higher amount of buoyancy is needed to the nets standing correctly on the sea bottom.

2.2 The hanging ratio (E)

During the experiment in Finnmark in 1977, one gillnet was mounted with the net threaded loosely on the float- and leadlines, only fastened at both ends. In conventional nets every third mesh is fixed to the ropes. The hanging ratio (E) was the normally used of E = 0.5. The catch in this net proved to be on an average 39% higher than in the neighbouring nets with standard mounting. However, the fish seemed to be more entangled and in an attempt to reduce the fishermen's work of removing fish from the nets in subsequent experiments the hanging ratio was increased. Thus, hanging ratios of E = 0.5, E = 0.67 and E = 0.75 were tried in the 1978 Lofoten season with nets of the same loose method of mounting. The meshsize was 93 mm and the nets were 300 meshes long and 50 meshes deep. The mounted length of such a gillnet with a hanging ratio, E = 0.5, is about 28 metres, for E = 0.67 about 37.5 metres and for E = 0.75 about 42 metres. The fishing results are shown in Table 5.

Table 5. Average catches (no./net) and mean length of fish taken with loosely mounted nets of different hanging ratio. Lofoten 1987.

Vessel	Number of comparisons	Average catch in no./net Hanging ratio E on the gillnets hanging ratio 0.5	hanging ratio 0.67	hanging ratio 0.25	Change %
"Skarsjø"	10	4.3	5.5		+ 27.9
"Skarsjø"	10	3.3		2.4	- 27.3
Mean length of the fish (in cm)		85.8	87.8	88.8	

The results were so encouraging that the experiments were repeated the same autumn in cod fishing off Senja, but now with the hanging ratio E = 0.6 and 0.7 in comparison with the standard E = 0.5.

Table 6. Average catches (no./net) in gillnets with different hanging ratio.

Vessel	Number of comparisons	Average catch in no./net hanging ratio 0.5	hanging ratio 0.6	hanging ratio 0.7	Change %
"Svein Roger"	15	4.8	6.2		29.2
"Svein Roger"	16	5.6		7.7	37.5

These experiments off Senja also clearly showed that the very loose method of mounting the net was not satisfactory. When hauling it was observed that most of the webbing was frequently displaced to the end of the net, possibly because of the strong current. The fishing efficiency of the net was thereby reduced after some time of fishing.

The nets were subsequently fixed to the headline only at the same places where the rings were attached, i.e. at 6-7 positions. This seemed to work well and the problem with the current effects was reduced.

These experiment also confirmed that the standard hanging ratio, E = 0.5, is not the most efficient one in the god gillnet fishery.

In order to establish the optimum hanging ratio in cod gillnet fishing and how this might be modified by mesh selection, new experiments with nets of different mesh sized and hanging ratios were conducted in Lofoten during the last winter season.

Table 7. Average catch (no./net) in gillnets with different meshsizes and hanging ratios, Lofoten 1979.

Meshsize / Hanging ratio, E.	93 mm		100 mm		110 mm	
	Average catch no./net	Mean length of fish, cm	Average catch no./net	Mean length of fish, cm	Average catch no./net	Mean length of fish, cm
0.5	4.0	87.2	4.4	90.3	3.5	91.0
0.6	4.4	85.9	4.7	89.7	5.0	91.2
0.7	3.6	87.5	4.3	88.8	3.7	92.7

From Table 7 it appears that for all meshsizes the best catches are obtained in nets with E = 0.6. The mean length of the fish does not seem to differ much when E varies from 0.5 to 0.7, only the meshsize seems to influence the size of the fish caught.

Increased hanging ratio gives an increase in the length of the gillnet, which also means a greater length of the ground covered by the net. Comparing the catches in terms of no./unit length of net show no difference between nets with E = 0.5 and E = 0.6, but both are better than nets with E = 0.7.

4. CONCLUSION

The increased catching efficiency observed in gillnets of low floatline buoyancy, may be due to the fact that the webbing in such nets is less tight than in conventional nets. The fish therefore are more easily entangled. When the floats are small and placed close together, as in a floatline, the net will get a relatively evenly distributed buoyancy the whole length of the

When using rings, the bouyoncy will be concentrated at points on the net where the webbing will be pulled tight, and this may reduce the fishing efficiency. Fig. 1 shows an assumed configuration for gillnets with floatline and rings.

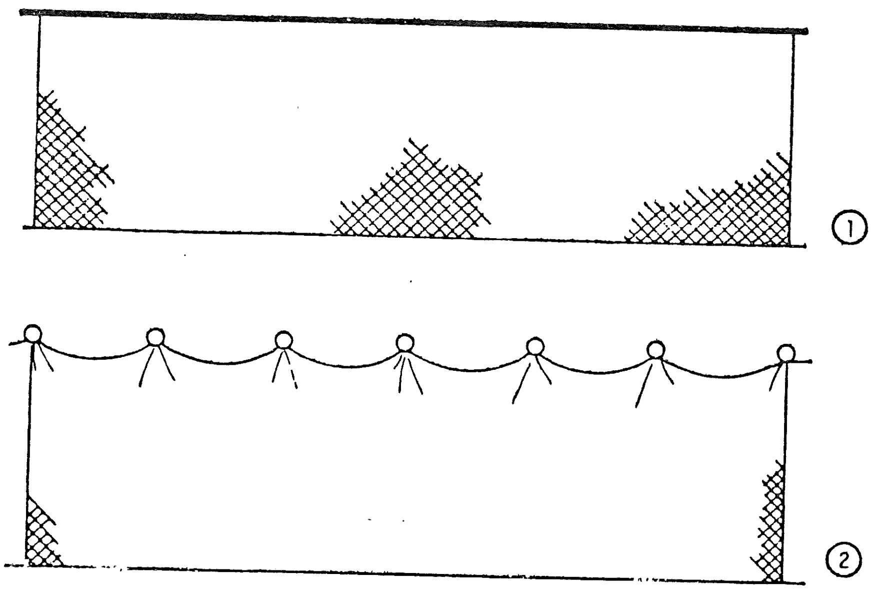

Figure 1. Assumed configuration in the sea for gillnets with 1) floatline, 2) rings.

From the floatline buoyancy experiments it appears that, the greater the catch per net is, the more buoyancy is needed. For the average level of cod gillnets catches in Northern Norway, is would seem that it is sufficient with a buoyancy of about 65 grammes per metre net. This was the amount used during this years experiments in Lofoten, and the fishing results were very good.

The experiment with different hanging ratio showed an insignificant difference per unit of length between gillnets with E = 0.5 and E = 0.6, but a clear difference between gillnet with E = 0.5 and 0.7. From the length distributions of the catches in nets with different hanging ratios, it is seen that the fish sizes are more concentrated around the mean length when the hanging ratio increases from E = 0.5 to E = 0.6, and then decrease when E = 0.7. The number of great fish also decrease with an increasing E.

It may therefore be that a hanging ratio of 0.7 is too much in cod gillnet fishing, and E = 0.6 will give the best economical results. The relative loss of great fish with increasing E may