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The Effect of Gangion Floats on Bait-loss and Catch Rates in Longlining.

By

Åsmund Bjordal
Inst. of Fishery Technology Research
P.O.Box 1964, N-5011 Nordnes, Norway

ABSTRACT

The use of gangion floats will expectedly reduces bait loss and increase catch rates in bottom longlining. Two floats of 5- and 8 g buoyancy are tested through flume tank experiments, underwater observations in the field and in comparative fishing trials with both manual and automated baiting. Compared to traditional gear, the gangion floats gave a significantly reduced bait loss and catch increase was obtained for some combinations of float and baiting technique.

INTRODUCTION

Gangion floats are not a new phenomenon in longlining. Longlines with pieces of cork or wood attached to the gangions can be seen in the collections of many different fisheries museums. According to Dannevig (1975), the gangion floats were supposed to have a dual function: Floating the baited hooks off the bottom would make them more visible and tempting for the fish, and would reduce bait predation by hagfish and other scavengers.

Similar gangion floats are not usually used in modern, intensive longlining. The rigging would be too laborious and these materials would not withstand the water pressures found at the normal depths of todays bottom longlining.

However, we might assume that bait predation by scavengers has a negative impact on catching efficiency in bottom longlining, and that this impact might be reduced by the use of gangion floats.

MATERIAL AND METHODS

Two sizes of a Japanese float were tested (8 grams and 5 grams buoyancy). These floats are moulded to the gangion.

At a test in a pressure chamber, the 8 g float was found to have a static buoyancy of 6.90 g at surface pressure and 6.30 g at a pressure corresponding to 500 m depth. Corresponding values for the 5 g float were 4.85 g and 4.55 g respectively (Bjordal, 1983).

To examine the lifting effect under various current conditions, the floats were tested at the flume tank in Hirtshals.

In addition the floats were observed on longline gear in the field by an underwater TV-equipped remote operated vehicle (ROV). Several longlines of 150 hooks were rigged with the two types of floats and standard gangions in clusters of intervals of 10 similarly rigged

hooks. The lines were set at depths ranging from 100-200 m at different times of day. Inspections by the ROV were conducted directly after setting and at irregular intervals during the soak time of each line.

Fishing trials

a) Manual baiting.

This experiment was conducted on the coastal banks off Ålesund in June/July 1983, on a 42-ft longliner. Every tub contained 4 units of line alternating between standard and experimental lines for paired comparison. All baits were mackerel. Bait status and catch data for each hook were recorded on a portable data terminal, and all fish were measured.

b) Automatic baiting.

Gangion floats were also tested on a vessel equipped with the Mustad Autoline system, from August 22nd to September 22nd, 1983. Throughout the whole trip, two fleets of line were hauled, one with 5 g and one with 8 g floats. Each fleet was rigged with floats and standard gangions on alternating skates, each skate consisting of 150 hooks with a hook spacing of 1.20 m.
The number of ling (Molva molva) and tusk (Brosme brosme) caught on each line were recorded by the skipper.

RESULTS

- Effect of current on gangion floats.

The results from the flume tank tests of gangion floats with baited hooks are shown in fig. 1. As showed in the figure, floats of 5g and 8 g buoyancy are able to keep the baited hook well off the bottom even at a current speed of 20 cm/s, which normally is a

rather strong bottom current in relatively deep water.

- Observations by the remote operated vehicle.

These field observations confirmed the findings from the flume tank test regarding the buoyancy effect. The flotation profiles of the gangions indicated current speeds from 0-10 cm/s, according to the profiles in fig. 1.

Different types of scavengers were observed: Hagfish (Myxine glutinosa) were attracted to the vicinity of the floated gangions. Hagfish searched for food on the bottom underneath the floated hook/bait, but were never observed to lift and attack the bait. The same effect was observed for different decapod crustaceans and molluscs. The bait loss on floated gangions was neglible during daytime, but during the night there was a major bait loss. This was mainly due to bait predation by isopods and amphipods. These scavengers were only observed between dusk and dawn, and they were observed to swim off the bottom and attack the bait.

- Fishing trials/manual baiting.

The catch during this fishing trial was mainly haddock (Melanogrammus aeglefinus) and tusk (Brosme brosme).

The bait status results are given in table 1.

Table 1. Bait status for hooks with 5 g and 8 g gangion floats compared to normal gangions (on the bottom).

Bait status:		Bait loss		Bait residue		Whole bait		
Gangion type	No.of hooks	No.	%	No.	%	No.	%	p. value*
Bottom	2153	857	49.7	217	12.6	650	37.7	0.000
5 g	2054	722	45.5	152	9.6	714	45.0	
Bottom	2082	832	49.6	202	12.0	644	38.4	0.000
8 g	2033	744	45.5	134	8.2	756	46.3	

*(Chi-square contingency table analysis, Zar 1974)

The floated gangions gave small, but significantly different bait status compared to normal gangions. The bait return was 7-8% higher for gangions with floats, while the bait loss was 4-5% lower. As seen in table 1, the bait status for 5 g and 8 g floats are quite similar.

The catch results and length data are given in table 2.

Table 2. Catches on bottom and floated gangions.

Gangion-float buoyancy	5 grams				8 grams			
Species	Tusk		Haddock		Tusk		Haddock	
Bottom/float	B	F	B	F	B	F	B	F
No. of fish	240	267	116	129	221	172	140	134
Catch rate/ 100 hooks	11.1	13.0	5.4	6.3	10.6	8.5	6.6	6.7
Cath difference (%)	16.6		16.6		25.5		2.0	
p-value*	0.092		0.256		0.028		0.916	
Average length	51.2	52.2	48.4	45.2	51.2	49.6	-	-
+/- 95% conf. interval	1.27	1.56	1.55	2.54	1.27	1.91	-	-
No measurem.	248	140	134	55	248	78	-	-
p-value	0.302		0.030		0.299		-	-

*t-test

A longline rigged with 5 g floats gave a non significant catch increase (16-17%) both for tusk and haddock, compared to the standard longline. The 8 g float gave a significantly lower catch rate (25%) for tusk, while the catch of haddock was similar to that of the standard longline. As for the length distribution, there was no significant differences, except for haddock in the 5g-float comparison. Here, the haddock caught on normal longline were of significantly greater average length than those caught on floated gangions.

An analysis of the data revealed no correlation between soak time and the bait status- and catch data between normal- and floated gear.

- Fishing trials/automated baiting.

A total of 48 000 hooks were hauled, and the catch was mainly tusk and ling. The catch results are given in table 3.

Table 3. Catches on bottom and floated gangions (5 g and 8 g buoyancy).

Gangion-float buoyancy	5 grams				8 grams			
Species	Tusk		Ling		Tusk		Ling	
Bottom/float	B	F	B	F	B	F	B	F
No. of fish	236	230	90	123	206	188	98	93
Catch rate/ 100 hooks	1.97	1.92	0.75	1.03	1.60	2.23	0.76	0.72
Cath difference (%)	2.6		26.7		39.8		5.4	
p-value*	0.8199		0.0172		0.0098		0.7464	

* t-test

In the comparative fishing trials with automated baiting, the line with gangion floats gave significantly better catch rates for ling (36.7%) on 5 g floats and tusk (39.8%) on 8 g floats. The other combinations: Tusk/5g and ling/8g gave no difference in catch rate compared to the standard line.

The gangion floats caused minor problems in the hook separator unit of the autoline system, but otherwise the handling of this line created no specific difficulties.

DISCUSSION

Several species of bait scavengers were identified by underwater observations of bottom set longline gear. By using gangion floats, most of the common bait scavengers did not get access to the bait. However, some scavenger species, mainly amphipods and isopods will attack a bait that is lifted 20-30 cm off the bottom. Bait predation is therefore reduced, but not totally avoided by using gangion floats.

In fishing trials the longline with gangion floats had a significantly lower bait loss. The magnitude of this effect will supposedly vary with type of bottom, time of day and type of fish and scavengers in the area. However, the use of gangion floats will normally reduce the bait loss and thus leave a higher proportion of effective baits available for the target fish species. The use of gangion floats should therefore give a general increase of the catch rates. For the 5 g float a significant higher catch rate was obtained for tusk/manual baiting and ling/automated baiting. The 8 g float gave a significant higher catch of tusk (automated baiting), but significantly lower catches of the same species in the trial with manual baiting.

The results are thus somewhat contradictory, and even if some combinations of float and baiting technique gave a distinct increased catch compared to traditional gear, it should be expected that the gangion floats would give an over all trend towards increased catch rates.

The contradictory nature of the results is difficult to explain. One explanation might be that under certain current conditions, the baited hook will stay very close to the gangion float, and that the gangion float will have negative impact in the hooking process. During the underwater observations there was several observations of fish that attacked the float instead of the baited hook. This type of behaviour might reduce the hooking probability of floated hooks. Further investigations should therefore include experiments with different float shapes and -sizes and different distances between hook and float.

LITTERATURE

Bjordal, Å. 1983. Trykktesting av ulike typer forsynfløyt. FTFI-arbeidsnotat 03.12.83, 8 pp. (Mimeo)

Dannevig, H.W. 1975. Fiske- og redskapsutviklingen på Sørlandskysten. Aust-Agder-Arv, Aust-Agder Museet, 1975.

Zar, J.H. 1974. Biostatistical analysis, Prentice-Hall Inc. Englewood Cliffs, H.J.: 1-620.

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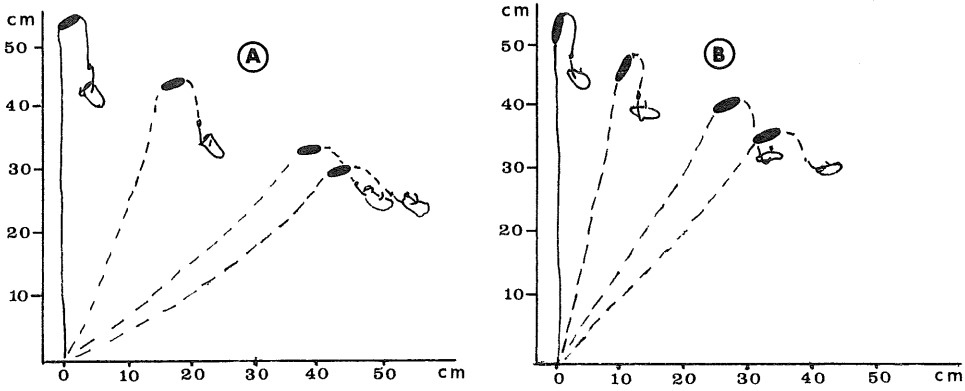

Figure 1. Flume tank testing of gangion floats at different current velocities: 0-, 10-, 15- and 20 cm/s. A: 5 g float, B: 8 g float.