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Further results of Norwegian longline studies

by

Ingvar Huse and Ludvig Karlsen  
Institute of Fishery Technology Research  
Box 1964, N-5011 Nordnes, Norway

INTRODUCTION

This project, which started in 1975 (KARLSEN, 1976), was carried further in 1976 and 1977 with emphasize on the off bottom set monofilament line for cod and haddock.

In December 1976 and in May-June 1977 fishing experiments were carried out off Vardø, Finnmark, with the main objective to estimate the relative effect of the gear parameters of the monofilament line causing its superior catching power as compared with that of the standard multifilament line (KARLSEN, 1977).

In 1977 the experiments also included tests of shorter monofilament snoods, a different type of hook, and phosphorescent plastic baits in addition to ordinary baits.

The exact hooking position was in 1977 observed on 556 cod, and a brief examination of stomach contents was made on 352 cod.

## MATERIALS AND METHODS

The same 60' fishing vessel which was used for the trials in May-June 1976 was chartered. In December 1976 the experiments were designed for comparison of catch rates within groups of 3 tubs, each with 200 hooks but differing with regard to the gear parameters. The groups were put together in strings of 15-18 tubs and soaking time was 6-7 hours.

The 3 types of lines tested were:

1. 2 mm monofilament nylon line with 90 cm long 0.8 mm monofilament nylon snoods attached to the main line with swivels and Mustad Norway hooks no. 6.
2. 3.5 mm multifilament line with snoods, hooks and swivels as above.
3. 5 mm multifilament polyester line with 50 cm long multifilament polyester snoods knotted to the main line, and Mustad Harwich hooks no. 8.

The two types of hooks used are quite similar both in form and size, but one has a plate and the other is ringed. For all 3 types of gear the hook spacing was 220 cm. Part of the experiment was carried out with the line set off bottom at an average distance of appr. 15 metres, the rest were bottom set. Mackerel was used for bait. Fishing depths varied between 200 and 300 metres.

In the 1977 May-June experiments the strings of lines were composed of paired tubs and comparisons were made of the catch rates within each pair. Hook spacing, hook size, hook number per tub and string length were the same as in the December experiment. Soaking time averaged 10 hours. Fishing depths varied between 200 and 300 metres.

Altogether 7 types of gear were used:

1. Monofilament line as described above.
2. Multifilament line with monofilament snoods as above.
3. 3.5 mm multifilament polyester line rigged as the poly-

ester line described above.

4. 3.5 mm multifilament line with 50 cm polyester snoods fastened with swivels.
5. Monofilament line as above (1) but with 50 cm long snoods.
6. Monofilament line as above (1) but with 1 cm long 2 mm wide phosphorescent plastic tubes threaded onto the hook legs.
7. 2 mm monofilament line with 110 cm hook spacing, 50 cm snoods fastened with swivels, but with two types of hooks arranged in alternating sequences of 50, the one type being the standard Mustad Norway no. 6, the other the Mustad Wide Gap no. 5/0.

All experiments were conducted with the line set at an average distance of 15-20 metres off bottom. Shrimps were used for bait throughout.

#### RESULTS AND DISCUSSION

##### The December 1976 experiments:

These experiments did not reproduce earlier results as to the degree of superiority of the monofilament gear. Only one string of 16 tubs was set off bottom. 4 comparisons between monofilament line (gear no. 1) and standard line (gear no. 3) gave a 3 to 1 advantage to the monofilament line for cod, averaging 8.1 fish per 100 hooks for monofilament and 5.5 for standard line. Too few observations prevent sure conclusions, but a smaller difference than obtained in May-June by KARLSEN (1976) is indicated. There was no appreciable difference between standard line and multifilament line with monofilament snoods (gear no. 2).

63 tubs were fished on bottom. 12 out of 19 comparisons between monofilament line and standard line showed higher catches of cod for the monofilament line. Catch rates averaged at 12.1 cod per 100 hooks for monofilament line and 9.8 for standard line. In other words, even less difference on bottom than off bottom. On bottom the multifilament line

with monofilament snoods showed an average catch rate equal to the monofilament line.

For haddock the variations in catch rates between the 3 types of gear were very small both off and on bottom.

The small differences altogether obtained during the December 1976 experiment are most likely related to the low illumination at this time of the year, and possibly to a seasonal change in the physiology of the cod.

#### The May-June 1977 experiments:

The first task of these experiments was to try to reproduce the results from May-June 1976. Shrimps were chosen for bait as they secure a higher rate of cod in the catches than mackerel. 17 comparisons between monofilament line (no. 1) and the 1977 standard polyester line (no. 3) were made. On all occasions the monofilament line caught more cod than the standard line. Catch rates averaged 21.2 cod per 100 hooks for the monofilament line and 4.4 for the standard line. This represents a difference of the same magnitude as in the May-June experiment of 1976.

The next test was to compare the catch rate of the multifilament line with monofilament snoods (gear no. 2) with that of the standard polyester line. 18 comparisons were made. A Wilcoxon signed rank test showed the line with the monofilament snoods to be significantly better on the 95% confidence level. Average cod catch rates for this line was 13.4 per 100 hooks, for the standard polyester line 9.8. The catch rate for the standard polyester line is much higher here than in the foregoing comparison. This is probably due to fish patchiness and changing conditions from day to day. However, since comparisons are made only between neighbouring tubs overall results will not be gravely affected.

To determine the possible effect of the swivel alone 7 comparisons were made between a multifilament line with swivel fastened polyester snoods and the standard polyester line.

No difference was demonstrated and the catch rates were identical.

To make a rough estimate of the relative importance of the parameters causing the difference between the monofilament line and the standard polyester line one may use the catch rates mentioned above.

Overall increase monofilament line / polyester line:

$$\frac{(21.2 - 4.4) \cdot 100\%}{4.4} \approx \underline{382\%}$$

Total increase due to monofilament snoods and swivels:

$$\frac{(13.4 - 9.8) \cdot 100\%}{9.8} \approx \underline{37\%}$$

Relative increase due to monofilament snoods and swivels:

$$\frac{37\% \cdot 100\%}{382} \approx \underline{10\%}$$

Of this the swivels, as mentioned above, seem to contribute very little, but they are important in the gear handling procedures.

The only other parameter being different is the main line material, thus seeming to account for the other 90% of the relative increase. The percentages mentioned are meant only as a guide to the magnitude of the relative importance of the parameters involved.

The reason for this strong effect might be that the visibility of the main line represents a threshold in the hooking process. The probability for a fish to get hooked is determined by the difference between the attracting and the repelling forces of the gear, and this difference determines the vigor with which a fish attacks a bait. This degree of vigor might well have a critical interval beneath which hooking probability decreases rapidly. The decrease in visibility from polyester to monofilament main line material might reduce the repelling force of the gear to rise the attacking vigor of the fish above the critical interval. This also explains

a smaller difference under lower illumination and a higher difference off bottom than on bottom. Decaying bait adhering more easily to multifilament line is also a factor that must be considered.

A comparison between monofilament lines with long and short snoods (gears no. 1 and 6) was made. 23 comparisons gave a significant advantage for the long snoods (Wilcoxon signed rank test, 95% confidence level). The increase in catches was 15%.

From hooking trials in a lab tank using the standard hook (Mustad Harwich no. 8) it became evident that the rate of successful hooking of cod trying to take a baited hook is low. Altogether inconclusive by itself this observation initiated a more thorough study of the hooking process. This study is not yet completed, but preliminary observations suggest that a hook with the point aimed in the direction of the shank end might enhance hook penetration of the side wall of the buccal cavity when the fish rushes. For this reason the Mustad Wide Gap no. 5/0 was chosen for fishing experiments. From 25 comparisons (gear no. 7) the Wide Gap hook gave significantly higher catch rates, 33% better than that of the standard hook.

Only 4 comparisons with phosphorescent baits (gear no. 6) were fished. These showed a 30% increase in catches but are of course inconclusive due to the few observations.

The exact hooking position on 556 cod was observed. Of these 84% were hooked in the lip, evenly distributed on right and left side. 16% had swallowed the hook.

A brief examination of stomach contents was made on 352 cod. 53% contained euphausiids, 4% capelin, 8% other species and 30% were empty.

REFERENCES

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