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"Basic studies of Norwegian longline gear"

by

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Introduction

This research program started with fishing experiments on tusk and ling grounds off Western Norway in May last year, testing effects on catch rate of hookspacing, hookform, snood lengths and bait size for deepsea longline gear (Karlsen, 1976). In similar experiments on cod and haddock grounds off North-Eastern Norway in May this year (1976) the effects on catch rate and fish size of different parameters of coastal longline gear were investigated, and comparative fishing between standard longline gear as used in area and a monofilament longline that has proven successful in the Lofoten cod fishery were performed. Gear testing included further examination on hookspacing and hookform and main line construction.

Methods and materials

Both series of experiments were carried out with chartered commercial fishing vessels following as close as possible the standard procedures of the fisheries. To insure minimum influence of operational factors (position, daytime, soaking time) comparable sets of experimental and standard control gear were grouped in paired tubs of line throughout the experiments. The number of fish of each species was counted separately for each tub and comparisons of catch rates were made for the most important commercial species. For further information the hauling state of

every single hook was recorded in detail for some tubs of line and fish length measurements were performed to evaluate effects on size selection.

Specifications of the standard (control) and experimental gear were as follows:

Deepsea gear - Western Norway experiments

Main line was made of 5 to 7 mm (diam) tarred spun - polyester with 40 cm long snoods of nylon twine and Mustad Norway Hook nr 7 (short leg). Hook spacing averaged 145 cm and tubs were rigged with either 220 or 400 hooks each.

Lines for the hook-spacing experiments were prepared by removing and replacing the snoods to obtain desired increased (33, 50 and 100 percent of standard, respectively) hook spacings. For hook shape experiments the standard hook was replaced with a kirbed hook of same size (i.e. Mustad Kirby nr 7/0), and for snood length experiments the snoods were shortened from the standard 40 cm to 15 cm (mounted) length. In bait size experiments mackerel was cut to 45 grams a piece in stead of the standard 30 grams.

Coastal gear - North-Eastern Norway

The standard (control) gears used were a so-called "winter line" of 5 mm (diam) twisted nylon or terylene with hook size nr 8 (16 mm hook width), and a "summer line" of 3,5 mm nylon with hook nr 9 (14 mm hook width). Hook spacing of both types averaged 110 cm and snood lengths 45 cm (mounted) and tubs were rigged with 500 and 600 hooks each, respectively.

Experimental gear with 100, 200 and 300 percent increased hookspacing, respectively, were prepared simply by removing snoods (only winter line). For hook-shape experiments a Mustad Kirby Hook of same size as the standard hook nr. 9 (summer line) was used, and for line construction experiments main line of

braided nylon was employed (both "summer" and "winter" gear).

The Lofoten type longline was made of 1,6 and 2,0 mm (diam), monofilament nylon with 1 meter long snoods of 0,8 mm monofilament nylon. Hook spacing averaged 220 cm and the snoods were fixed to the mainline with swivels. Summer line with 220 cm hook-spacing served as control gear. For the purpose of preventing ground contact of the monofilament line, a special setting method, illustrated in Fig. 1, was employed for these experiments.

Fishing experiments

For the deepsea gear experiments last year a 74 feet longliner with a crew of 7 was chartered. Fishing lines were cleared and baited manually on board, and set in strings of 6 to 16 tubs each. All gear was bottom set on depth ranges from 200 to 450 meters. 2 or 3 strings were worked simultaneously and soaking time varied from 2 to 12 hours. Altogether 95000 hooks were fished and 230 paired tub observations made. Dominating fish species were tusk and ling, and only commercial-sized specimens were recorded. Catch rates were all the time comparable to those of the other commercial longliners in the area.

For the recent experiments in Northern Norway a 60 feet long-line vessel was chartered with a crew of 4, and one "landman" who handled the gear and assisted the baiters ashore. Lines were usually set in one length of 30 tubs in the evening. Hauling started after 6 hours soaking time and lasted for about 9 hours. Except for the experiments with monofilament gear, all lines were bottomset, and fishing depths varied between 100 and 200 meters. In total 180.000 hooks were fished and 207 paired tub observations made. Dominating fish species were cod and haddock, and all species and sizes of fish were recorded. Length distribution of the catch of cod and haddock are given in Figure 2.

Results and discussion

Bait size experiments

From 42 paired observations with the deep sea gear it was found that larger bait pieces (45 grams against the standard 30 grams) gave a significant increase in catch rate for ling (average 23,5 percent) while the tusk catches were only slightly influenced (average 6,6 percent, not statistically significant). The result confirm the general opinion of the fishermen that ling prefer large bait pieces.

Snood lengths experiments

The effect of shortening the snoods from standard 40 to 15 cm was a significant decrease in catch rate of 28 percent for tusk and 17 percent for ling (42 observations). As twisted and broken snoods were more frequently observed when hauling the experimental gear, the main reason for the catch decrease is assumed to be that with the short snoods fish (especially tusk) are twisted off and lost during hauling. However, reduced bait attraction with short snoods might also be of importance.

Main line construction experiments

Comparisons between braided and the standard twisted type of main line (25 observations) showed no significant difference in catch rates. Thus, catches of cod were not influenced at all while in the case of haddock a figure of 29 percent (not significant) reduction was observed for the braided summer line, and only 3 percent for the braided winter line. Apparently therefore, the hypotheses that fish is lost during hauling due to added rotation of a twisted main line is not confirmed.

Hook shape experiments

In the experiments with deepsea gear it was found that the kirbed hook was significantly more effective than the standard one, averaging 17 (\pm 16) percent in 40 observations, with 19 percent for ling and 13 percent for tusk. In the recent experiments with coastal gear, however, no significant difference in catch rate of cod and haddock was experienced (31 observations).

The reasons for these conflicting results are probably related to differences in feeding behaviours of the fish species in question. Similarly, the great differences between the two sets of experiments in depths and thereby in hauling time may also be of importance by augmenting any difference in holding efficiency of the two hook shapes tested.

Hook spacing experiments

The effect of 100 percent increased hookspacing in the deepsea gear experiments was a significant 42 (\pm 24) percent increase in catch rate from an average catch rate for standard gear of 6.1 (number of fish pr. 100 hooks), while the corresponding figures for the 33 and 50 percent hook spacing increases were 11 and 22 percent respectively. It should in this regard be noted that any hook spacing conclusion must be related to the fish density as observed from the standard gear catch rates. Results indicate that increase in hook spacing might be recommended for this fishing condition.

In the experiments with coastal gear the effect of 100 percent increased hook spacing was a catch rate increase of 23 (\pm 15) percent, for an average catch rate of 12,8. For further increase (200 and 300 percent) of hookspacing no further increase in catch rate was found (27 and 24 percent at standard gear catch rates of 18,8 and 21,9 respectively). The results might indicate gear saturation conditions at these higher catch rates. Anyway, general conclusions about hook spacing effects should be carefully considered, and in addition to fish density, the optimal hook

spacing is also dependent on a lot of economic and capacity factors for any given fishing condition.

Monofilament gear experiments

The 1,60 and 2,00 mm monofilament Lofoten Longlines proved to be on average of 31 and 14 observations 130 (\pm 18) and 176 (\pm 26) percent more effective than the comparative standard gear at standard gear catch rates of 21,7 and 27,3, respectively. The relative high catch rates for standard gear are obviously an effect of the setting method and large hook spacings that were used. By not setting the longline on bottom, crustacea and bottom fish were prevented from feeding on bait, and might make it easier for the roundfish to discover it.

However, as the two mentioned factors were equal for the two types of gear, they should not give any preference to the monofilament gear.

Any conclusions about which parameter characteristics of the monofilament gear caused the effects, must rely on hypothesis, but both the material properties of mainline and snoods, use of swivels, and length of snoods must be considered. To obtain further information, an improvised experiment with use of 1 meter long monofilament snoods fixed to a twisted mainline without swivels, was conducted. The resulting catch rate was only slightly influenced (increased) compared to the standard gear, and material and length of snoods obviously therefore are not deciding factors.

The great difference in overall catch rate was mainly caused by higher catches of cod (on average 176 and 313 percent increase for cod for the two mainline dimensions and 39 and 19 percent, respectively, for haddock). This leads to the hypothesis that the attractiveness of gear, which is more related to mainline materials than to the use of swivels, are of greatest importance, and that cod was much more sensitive to it than haddock was. Both visual (dimensions and colour) and olfactory

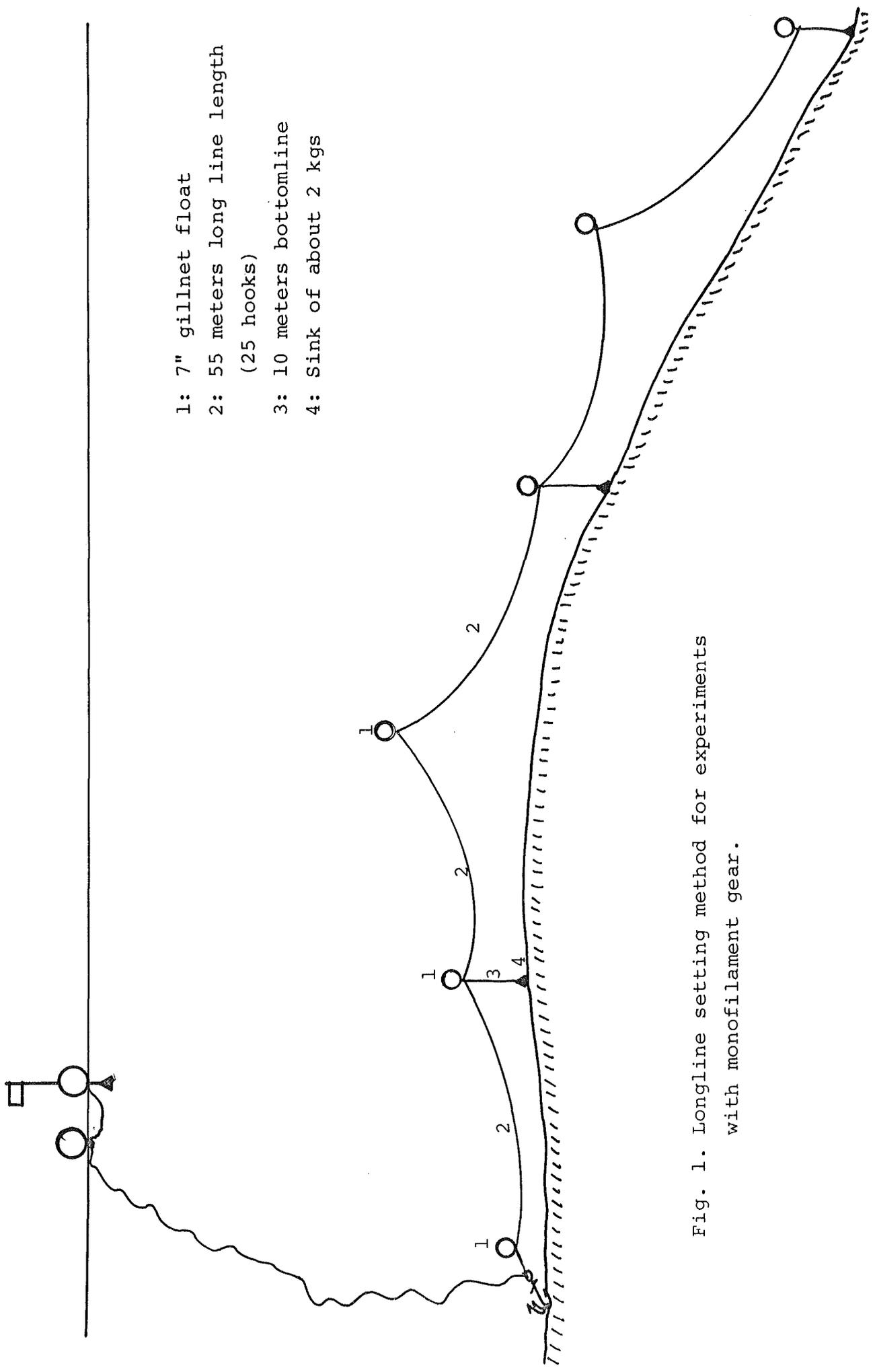
(impregnation and old bait) properties of mainline might have been effective. The analysis of the detailed registrations for some tubs supported these suggestions. Thus, for the tubs of standard line about 50 percent of the bait still remained on hooks when hauled, compared to only 5 percent for the monofilament gear.

With respect to size selectivity only 10 percent of the catch of the monofilament gear was discarded as undersigned or non-commercial fish, against 14 percent for the comparative standard gear. Comparative figures for the bottomset gear ranged from 20 to 40 percent.

References:

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Karlsen, L. 1975. Lineforsøk med M/K "BRAGE" (M3 AV) utenfor kysten av Møre og Romsdal 28/4 - 6/6 1975. Institute of Fishery Technology Research, Bergen Norway. 1975, 1-23. (Mimco).



- 1: 7" gillnet float
- 2: 55 meters long line length
(25 hooks)
- 3: 10 meters bottomline
- 4: Sink of about 2 kgs

Fig. 1. Longline setting method for experiments with monofilament gear.

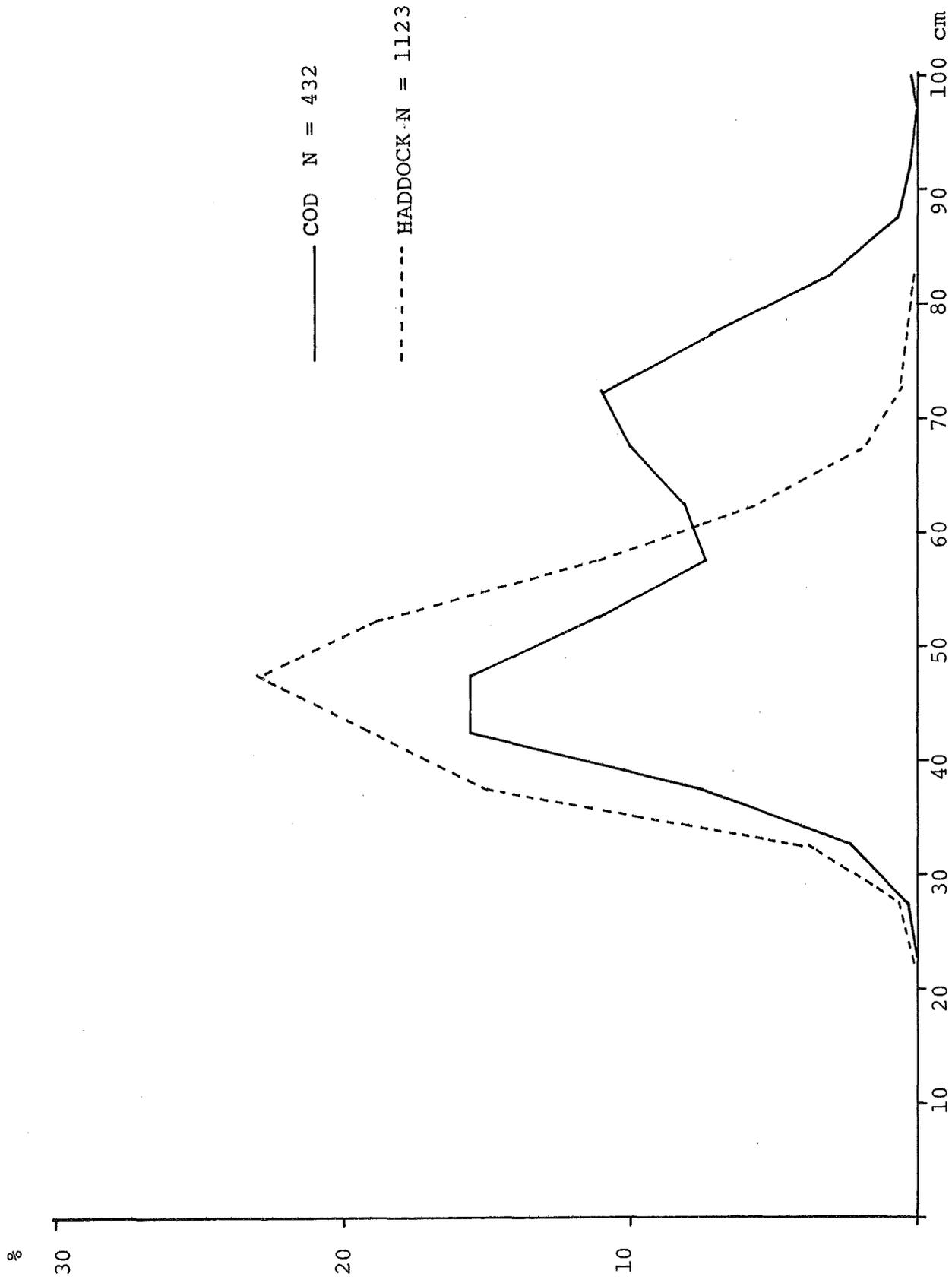


Fig. 2. Length distribution of the longline catch of cod and haddock on Vardø Grounds May 1976.