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SIZE SELECTIVE EFFECTS OF A PLASTIC BODY ON LONGLINE HOOKS

by

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ABSTRACT

The potential for improving size selectivity of longlines by using a plastic body attached to the hook shank was tested in a fishing trial for torsk (*Brosme brosme*), ling (*Molva molva*) and haddock (*Melanogrammus aeglefinus*). Catch rates and mean lengths of torsk and ling were similar for hook with plastic body and standard hook, indicating that an inedible body in combination with bait do not affect catching efficiency or size selectivity for these species. The results indicated, however, that this combination caught a lower proportion of small haddock. Based on results obtained in other studies, it is suggested that this combination may also affect size selection for cod (*Gadus morhua*).

INTRODUCTION

Longlining is regarded as a size selective and conservation oriented fishing method causing low exploitation of the younger fish groups (Bjordal 1988). However, the recently increased legal size of northeast Arctic cod (*Gadus morhua*) (from 42 to 47 cm) and haddock (*Melanogrammus aeglefinus*) (from 37 to 42 cm) may become a problem for the Norwegian longline fleet, as this regulation may cause the proportion of under-sized fish in their catches to become above the legal proportion of 15% (Løkkeborg 1990). Also when harvesting other overexploited stocks with a high proportion of small, immature fish, such as the stock of torsk (*Brosme brosme*) along the Norwegian coast, it is desirable to improve the size selectivity of longlines.

Bait size is regarded as the most important factor affecting the size of fish caught by longlines (Løkkeborg and Bjordal 1991), and using baits of increased size could therefore be a solution to this problem. Increasing the bait size, however, increases the amount of bait required and rises the bait cost for the fishermen. Alternatively, using a inedible body attached to the hook may cause the same size selective effect, as the combination of this body and a normal sized or small bait will appear as a large item to the fish. In the present study, fishing experiments with plastic bodies on the hooks were conducted to test this hypothesis.

MATERIALS AND METHODS

Fishing trials were carried out in November 1990 in the fishery for torsk and ling (*Molva molva*) at the coastal banks off Ålesund (western Norway) at 120-370 m depth (trial A), and in July 1991 in the fishery for haddock off the coast of Finnmark (northern Norway) at 385-415 m depth (trial B). Both trials were conducted on commercial longliners operating with bottom longlines in trial A and longlines floated 40-45 m below the sea surface in trial B (Table 1).

The plastic body was moulded in a semicircular form (4 cm long, 2 cm deep, 2 cm wide) and attached to the shank of a EZ-baiter circle hook (Table 1 and Fig. 1). This experimental hook

and the standard hook were mounted to the longlines in clusters of about 50 hooks. The hooks were baited with mackerel and squid baits in a 2:1 ratio in trial A, and mackerel bait only in trial B. The bait sizes were those normally used by the fishermen (Table 1). During hauling of the gear, the species of hooked fish, and the total length of each fish caught were recorded.

RESULTS

The catch rates (number of fish caught per 100 hooks) of torsk and ling were similar for standard hook and hook with plastic body (Table 2). Standard hook gave a higher catch rate of haddock than hook with plastic body, though not significant (binomial test, $0.05 < p < 0.10$). There were no significant differences in the mean lengths between fishes caught on the two hook types (two-sample *t* test). The length-frequency distributions for haddock (Fig. 2) showed, however, that hook with plastic body caught a lower proportion of small haddock (<45 cm, binomial test, $p < 0.05$).

DISCUSSION

Longline fishing trials for cod have shown that larger baits caught larger fish than smaller baits (Johannessen 1983; Løkkeborg 1990). For haddock the bait size has been shown to affect catching efficiency rather than selectivity; smaller baits caught more fish of all sizes than larger baits (Johannessen 1983). The results obtained for haddock in the present study indicated that an inedible body in combination with the bait caught a lower proportion of small fish than natural bait, whereas there was no difference for large fish.

The results for torsk and ling did not indicate an effect on catching efficiency or size selectivity by attaching a plastic body to the hook. This discrepancy may be explained by a difference in hooking behaviour between different species (see Løkkeborg 1991). Fishing trials for torsk showed no effect of different bait sizes on the number or weight of fish caught (Bjordal 1983). Alternatively, the effect of bait size may be influenced by the setting method. Bottom set longlines were used in the present trial for torsk and ling. In the fishing trials for

cod and haddock cited above and the present trial for haddock, pelagic longlines were used. In this situation, visual stimuli are probably more important because baits in midwater are more readily seen, and the effect of bait size may therefore be stronger.

Thus, increasing the bait size by attaching an inedible body to the hook may prove to affect size selectivity when fishing in shallow water or with pelagic longlines. The potential for improved size selection is probably most significant for cod and haddock.

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Table 1. Gear parameters for bottom longlines used in the fishery for torsk and ling (trial A) and floating longlines used in the fishery for haddock (trial B).

		Trial A	Trial B
MAINLINE	- Material:	Spun polyester	Polyamide, monofilament
	- Diameter:	7 mm	2 mm
	- Length:	180 m	750 m
SNOOD	- Material:	Terylene	Polyamide, monofilament
	- Diameter:	1.2 mm	0.8 mm
	- Length:	50 cm	70 cm
	- Mounting:	Knotted	Swivel
HOOK	- Type:	Mustad EZ-baiter	Mustad EZ-baiter
	- Quality:	39974	39974
	- Size:	No. 12/0	No. 12/0
	- Spacing:	185 cm	250 cm
	- Number:	ca. 90 per line	300 per line
SOAK TIME		3.5 - 14 h	10.5 - 12 h
BAIT*	- Type:	Mackerel and squid, 2:1	Mackerel
	- Size:	23x44x56 mm (mackerel) 45x21x47 mm (squid)	17x21x57 mm

*Slices of bait were cut in the dorsiventral plane, and their size measured as the thickness, the maximum width and the maximum depth, respectively. Means for 25 baits are given.

Table 2. Numbers and mean lengths of fishes caught on standard hook (Stand.) and experimental hook with a plastic body attached to the hook shank (Exp.).

Species	Hook type	Hooks fished*	Number caught	Catch per 100 hooks	Mean length (SD)
Torsk	Stand.	2369	175	7.4	53.9 (8.2)
	Exp.	2177	161	7.4	54.3 (8.1)
Ling	Stand.	2369	28	1.2	95.4 (17.4)
	Exp.	2177	24	1.1	91.1 (12.0)
Haddock	Stand.	600	119	19.8	51.3 (7.8)
	Exp.	600	93	15.5	52.7 (7.4)

* Number of hooks recorded during hauling excluding entangled and lost hooks. In the trial for haddock the number of hooks that were set are given because entangled and lost hooks were not recorded in this trial.

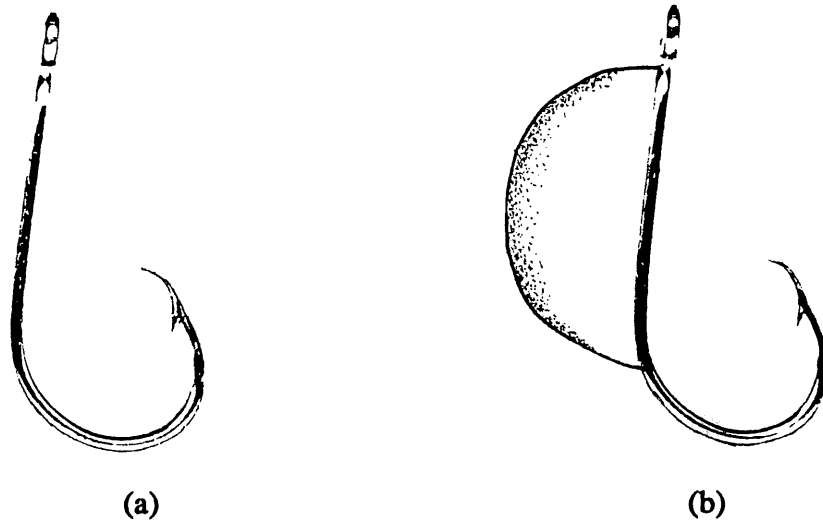


Figure 1. The two hook types tested, (a) standard hook and (b) hook with plastic body attached to the shank.

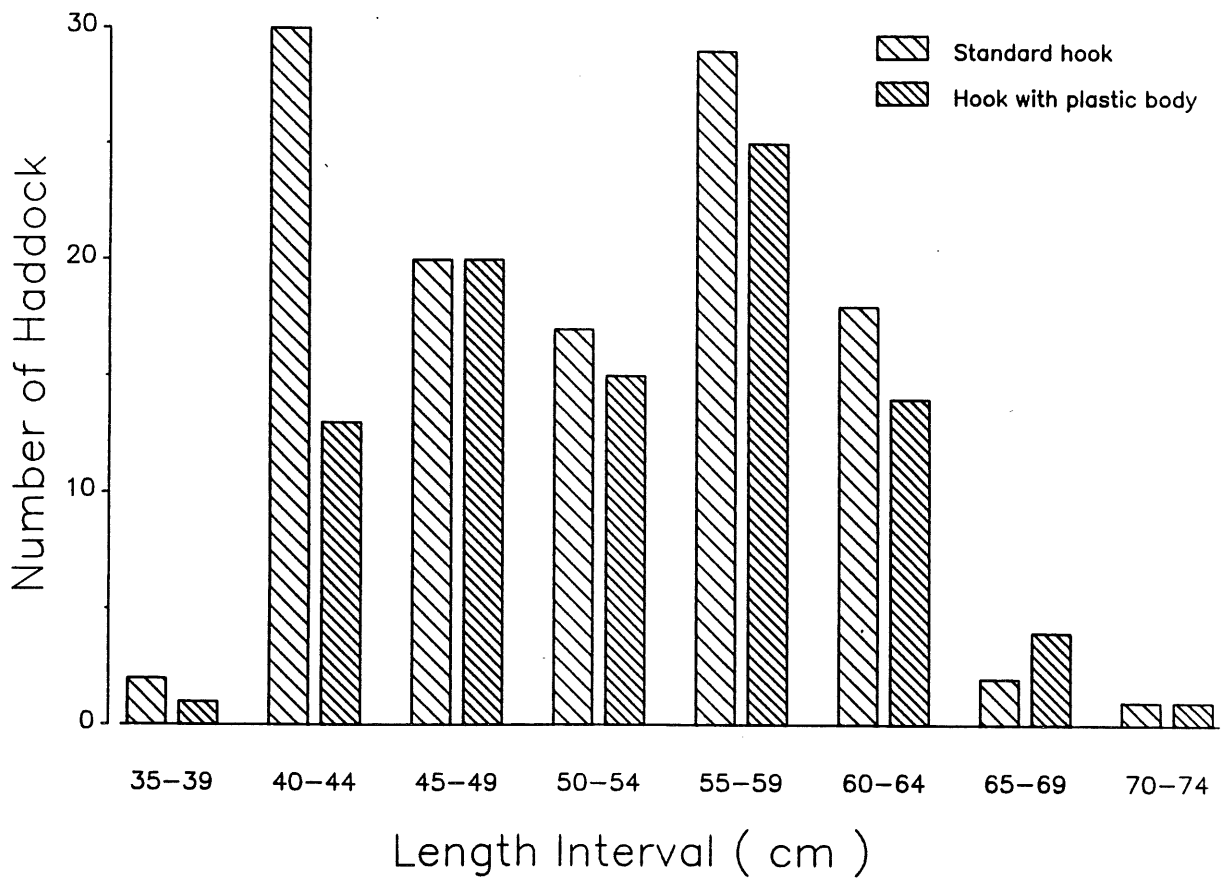


Figure 2. Length-frequency distributions for haddock caught on standard hook and experimental hook with a plastic body attached to the hook shank.