International Council for
the Exploration of the Sea

C.M.1983/B:31
Fish Capture Committee
Ref. Demersal Fish Cttee

EFFECT OF DIFFERENT LONG-LINE BAITS (MACKEREL, SQUID) ON CATCH RATES AND SELECTIVITY FOR TUSK AND LING

By

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

ABSTRACT

The experience of the fishermen in the longline fishery for tusk and ling is that a bait combination of mackerel and squid is more effective than either of the baits used alone. In this investigation, squid was found to be most effective of these two bait types, when combined in a 1:4 ratio with mackerel. Further, squid showed a species selective effect for ling.

INTRODUCTION

In a longline fishery where a variety of bait types are possible, the choice of bait is usually a compromise between its effectiveness, supply and cost. In Norwegian longlining, herring used to be the most popular bait species although salted mussels (Modiolus modiolus) were also widely used, especially in the Lofoten cod fishery. Today mackerel and squid are the main bait species while shrimp is preferred in the Lofoten fishery.

Normally, only one bait is used when fishing for a certain species during one season. However, in the longline fishery for tusk (Brosme brosme) and ling (Molva molva), lines are baited with both mackerel and squid, normally at a 4:1 ratio (every fifth hook is baited with squid). The experience of the fishermen is that squid is a poor bait in this fishery and mackerel an effective one, but a combination of the two is more effective than mackerel alone. The two main objectives of this investigation were to conduct a systematic study of the relative effect of squid and mackerel on catch rates and selectivity (using a 1:4 bait combination), and to examine differences in bait loss for the two types of bait.

MATERIAL AND METHODS

Vessel and locality

The fishing trials were conducted from a 42 foot steel vessel with two crewmembers between June 15th and July 1st 1983. The boat was operating at Storegga, about 40 n.m. off the west coast of Norway, at a depth of 150 to 350 m.

The standard longlines of the vessel were used in the experiment. Specifications of the gear are given in Table 1.

Table 1. Specifications of standard longline.

Mainline:	Spun polyester/6 mm (diam)/355 m pr. tub
Snood:	Spun polyester-Nylon/No.12(1.5-2mm (diam)/ 0.47 m (mounted)
Hook	Mustad Kirby Sea, Quality 7330, No. 7 (Kirbed, eye, extra long shank)
Hook-spacing	2.70 m (135 hooks pr. tub)
Bait size	Mackerel: 27 g (average) Squid: 31 g (average)

Normally 5 fleets with 4 tubs each were hauled during a day at sea. The first fleets were set around 3 a.m., and the soak time varied from 3 to 9 hours.

Exp. design and data collecting.

During hauling, the state of every hook were recorded directly on to a portable Micronic data terminal. The snood of each fifth hook was marked with red dye, to systematize data registration as well as baiting. Every fleet was given an identification number to indicate date and time of hauling, and the different tubs were given series numbers 1, 2, 3, 4. The data for each hook were recorded in a two-digit system as given in table 2.

Table 2. Data codes

Digit 1		Digit 2	
1	Mackerel	0	Bait loss
2	Squid	1	Remnant
		2	Bait return
		3	Tusk
		4	Ling
		5	Other species
9	(+2...) No. hooks entangled	9	Hook missing

The catch of the last fleet every day was used for length measurements. Like the hook data, the length measurements were recorded directly on the portable terminal, and the data transferred to the computer via telephone, for further analysis.

RESULTS

Catch rates

The data for 11.538 hooks were recorded. Of these 81.8% were baited with mackerel and 18.2% baited with squid. Bait status (amount of bait left on the hook) and catch rate results are given in Table 3.

The relative frequencies for bait status (hooks with catch omitted), show that the rate of bait loss is equal for mackerel and squid. However, mackerel gives a significantly greater return of bait remnants (8.9%, p=0.000, t-test), while squid gives a significantly greater return of whole bait (9.5%, p= 0.000).

Squid gives significantly better catch rates than mackerel

Table 3. Bait status and catch rates for squid and mackerel. Absolute frequency: Percent of total number of hooks. Relative frequency (for bait status): Percent of total number of hooks with no catch.

		Bait Status				Catch			
		Bait loss	Remn-ant	Bait return	Total	Tusk	Ling	others	Total
ACKEREL	No. of hooks	3793	966	2308	7067	1676	299	399	9435
	Absolute frequency (%)	40.2	10.2	24.5	-	17.8	3.2	4.2	-
	Relative frequency (%)	53.7	13.7	32.6					
QUID	No. of hooks	768	69	609	1446	443	139	75	2103
	Absolute frequency (%)	36.5	3.3	29.0	-	21.1	6.6	3.6	-
	Relative frequency (%)	53.1	4.8	42.1					
DIFFERENCE SQUID/MACKEREL						3.3 (9%)	3.4 (106%)	- 0.6 (14%)	
p						0.002	0.000	0.217	
DIFFERENCE SQUID/MACKEREL		- 0.6	- 8.9	9.5					
p		0.806	0.000	0.000					

for tusk (9%, p=0.002) and particularly for ling (106%, p=0.000), while for other species (rockfish, haddock, saithe and various small sharks) mackerel seems to be more effective.

In Figures 1 a-b, the catch rates for 25 fleets of gear are plotted against soak time. The figures illustrate the general superiority of squid and its selectivity for ling.

Further, there seems to be positive correlation between soak time and the catch rates for tusk/mackerel (r=0.438, p=0.028) and ling/squid (r=0.569, p=0.003).

The length distributions for tusk and ling are given in Figures 2 a-b. The average lengths for tusk caught by squid or mackerel were 55.7 and 56.5 cm respectively, and the corresponding values for ling were 89.4 cm and 89.0 cm. There was no significant difference between the length distributions of the catches from either bait type or species.

DISCUSSION

Although squid alone is regarded as a poor bait for tusk and ling, it gives significantly better catch rates than mackerel when used in a 4:1 mackerel/squid bait combination.

There is no size-selective effect between the two types of bait, but squid is clearly selectively attractive for ling. This result is of commercial importance since ling has a higher weight pr. individual and brings a higher price than tusk.

The results indicate that in this combined bait fishery, mackerel probably acts as the main attractant. However, probably due to its softer consistency, mackerel yields lower whole-bait return. LØKKEBORG et al. (1983) found that the force required to tear squid off a hook was three times greater than that required for mackerel. Thus the

probability for bait loss due to scavengers and fish attack is greater for mackerel and the length of soak may further influence the bait status. From this, one should expect a general increased effectiveness of squid with increased soak time, as was the case for ling. That tusk did not show such a trend may be due to differences in bait preference, bait attack- and hooking behaviour between the two species.

REFERENCES

LØKKEBORG, S., BJORDAL, Å. and FERNØ, A. 1983. Testing av konsistens, krokgjennomtrenging og strekk-styrke for naturlig og kunstig agn. Field Rep. Inst.Fish.Gear Tech. Bergen 28.07.83.

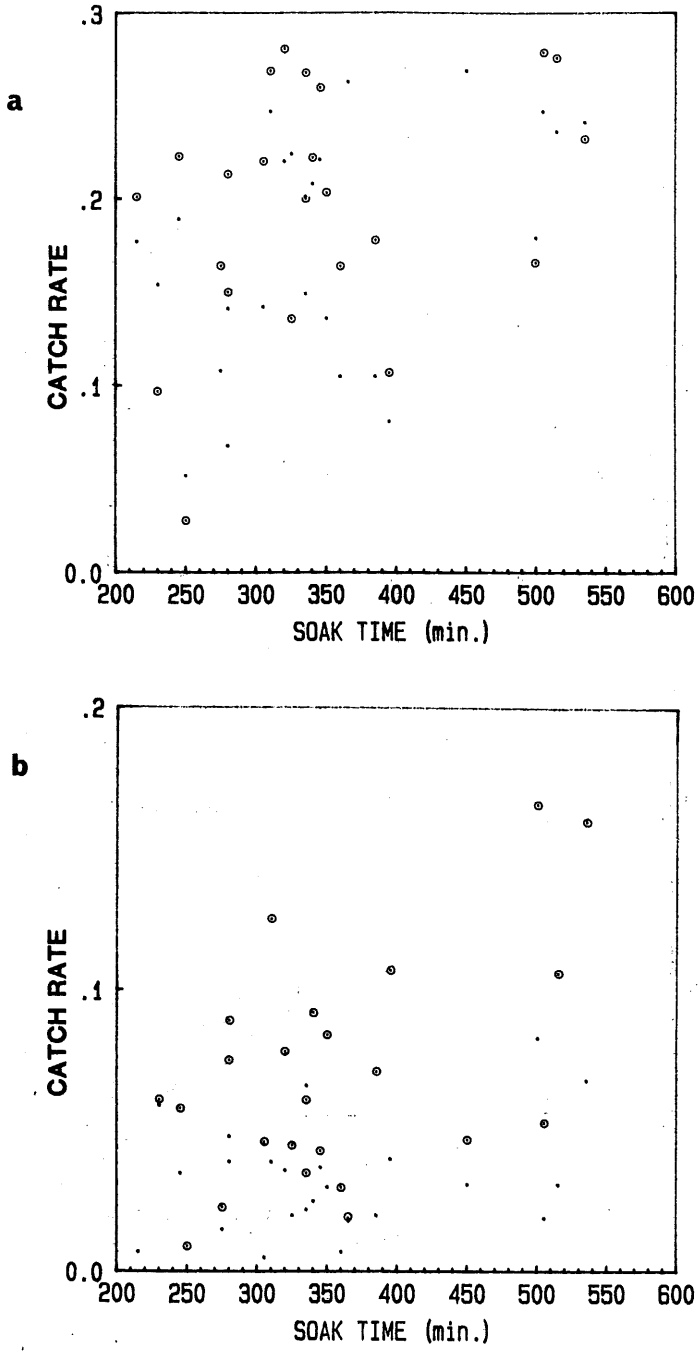

Figure 1. Catch rates pr. hook versus soak time for squid (⊙) and mackerel (.) based on 25 fleets of gear.
a) Tusk b) Ling

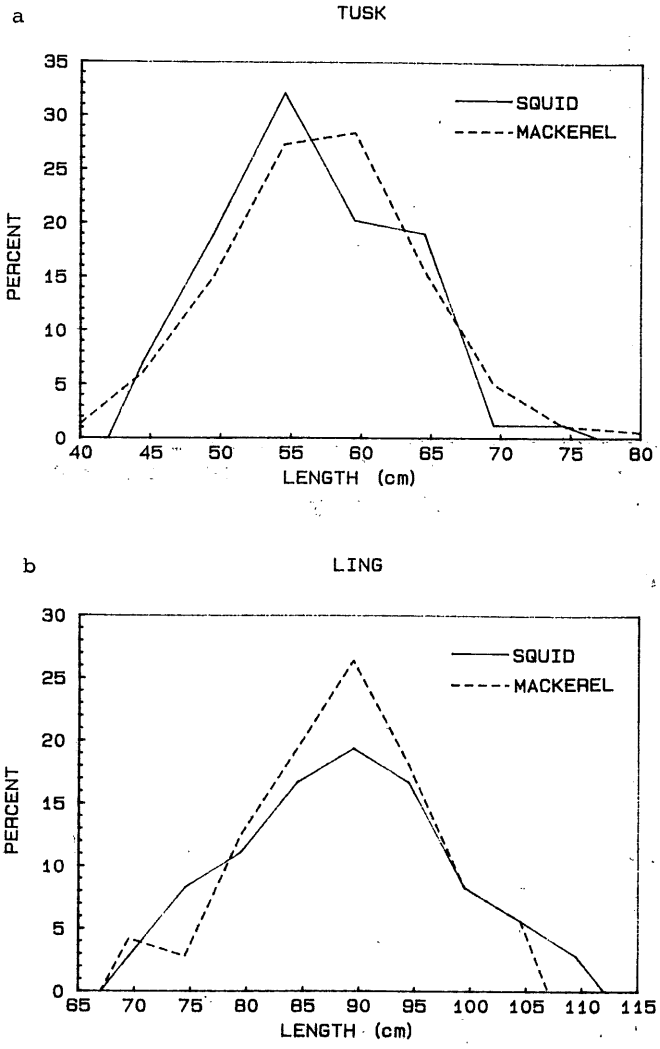

Figure 2. Length distributions of tusk and ling caught on squid and mackerel bait.
a) Tusk b) Ling