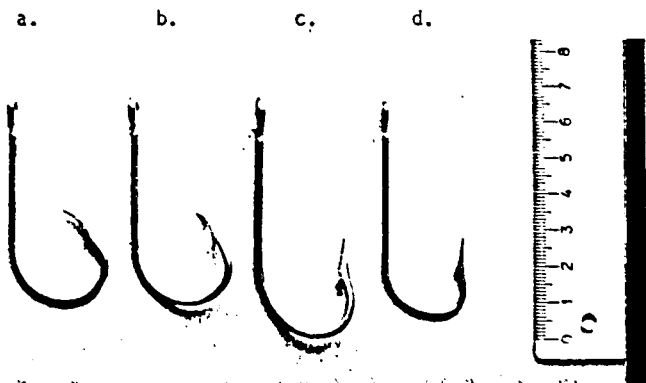THÜNEN

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TESTING OF A NEW HOOK DESIGN (E-Z-BAITER)
THROUGH COMPARATIVE LONGLINE FISHING TRIALS

By

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HOOK COMPARISON

a.   Standard hook. E-Z-Baiter (straight), Qual. 39975, No. 12/0

b.   Test hook no. 1. E-Z-Baiter (kirbed), Qual. 39975, No. 12/0

c.   Test hook no. 2. Kirby (kirbed), Qual. 2330, No. 4

d.   Test hook no. 3. Norway (straight), Qual. 7255, No. 8

SUMMARY

A new hook design, the E-Z-Baiter Circle hook was tested against two different traditional hook types in the longline fishery for cod (Gadus morhua) and haddock (Melanogrammus aeglefinus). The new hook design gave significantly improved catch rates for both species. The catch increase in the two comparisons were 18 and 24 % for cod and 46 and 54 % for haddock.

A comparative trial between a straight and a kirbed version of the new hook design gave no differance in catch rates.

The new hook design showed specifically good catching performance for fish that were hooked by the jaw (compared to those that swallowed the hook). This may indicate that the E-Z-Baiter Circle hook also is effective for other species that mainly are hooked in the jaw, like ling and halibut.

1. INTRODUCTION

The E-Z-Baiter Circle Hook is a new hook design developed for longline fishing by O. Mustad & Søn A/S. This hook type is an intermediate design between a circle hook and a standard (j)-hook.

During the last few years the Circle hook has proven to be superior to standard hook types in the US- and Canadian longline fishery (Peeling, 1985). However, the Circle hook could not be used in mechanized longline systems. The development of the new hook design therefore had a dual purpose: increased hooking efficiency and possibility for mechanized handling and baiting.

The main objective with these fishing trials was to test the hooking efficiency of the E-Z-Baiter Circle hook compared with standard longline hooks.

2. MATERIALS AND METHODS

2.1 Fishing operation

The fishing trials were conducted from January 30 to February 6, 1986 on a 33 m longline vessel (M/S "Knut Senior"). The boat was fishing with bottom set longline for cod and haddock at the North Cape Bank off the coast of Finnmark.

The line unit (skate) were rigged with 150 hooks with 1.8 m hook spacing (270 m total length). The mainline were 7 mm (diam.), tartreated spun polyester, with terylene gangions (2 mm diam.; length 0.5 m). The total amout of gear was 4 fleets of 20 skates each. Each day 6 fleets of gear were hauled (18 000 hooks).

The lines were handbaited with squid.

2.2 Experimental design

A total of 18 skates were used for the experiment (all new gear), giving 6 skates for each experiment. Each skate was divided in two parts, with 75 hooks of one type on the first half (standard) and 75 hooks of another type on the second half (test). Such each skate comprised one pair of comparison in the experiment. The combinations of hook-types in the different experiments are given in Table 1..

Data were recorded during hauling of the gear on a portable dataterminal, Micronic 445 (Floen, 1985). For every hook the following information was recorded: Hook status (hook missing, bait loss, bait remnant, intact bait), species (cod, haddock, bycatch, trashfish), hooking position for cod and haddock (jaw, throat) and gear-tangles. Further, cod and haddock were length measured (total length). After hauling of one fleet of gear, the data were transferred to a personal computer for storage and preliminary processing. A total of 36 skates (5400 hooks) were included in each of the three experiments. During

most of the trial period, the weather conditions were fairly bad with a
gale and rough seas.

3. RESULTS

3.1 E-Z-Baiter (straight) versus E-Z-Baiter (kirbed)

The results are given in Table 2a-c. This experiment showed that there
was no difference between the straight and the kirbed version of the
E-Z-Baiter hook, neither for catch rates, length distribution (see Fig.
1 and 2), hook status nor hooking position.

3.2 E-Z-Baiter (straight) versus Mustad Kirby

The results (Table 3a-c) clearly show that the E-Z-Baiter hook is
significantly more effective than the traditional longline hook. The
average over all catch increase was 27.2% (cod 24.1% and haddock
54.6%). For haddock there was no significant difference in mean length
between the two types of hooks, while for cod the E-Z-Baiter caught
fish of slightly smaller size. This is probably due to the slightly
smaller size of the E-Z-hook resulting in some higher loss during
hauling in bad weather. The length distributions are shown in Fig. 3
and 4.

Further the E-Z-hook gave less bait loss and for cod a higher
proportion of fish that were hooked in the jaw, compared with the
traditional hook design.

3.3 E-Z-Baiter (straight) versus Mustad Norway

The results are given in Table 4a-c. Also in this experiment the
E-Z-Baiter hook gave significantly better catch rates compared with the
traditional hook type, but with no significant difference in fish size.
Further the E-Z-Baiter hook had slightly less bait loss and again a

higher proportion of fish that were hooked in the jaw.

4. DISCUSSION

The results clearly demontrates the superiority of the E-Z-Baiter hook compared with the two traditional longline hook designs.

The effectiveness of a longline hook is mainly determinated by its shape and dimension. In some fisheries, kirbed hooks have shown to be more effective than straight hooks. However, this effect was not obtained in these trials.

Of the two traditional hook types, one were bigger (Kirby) and one smaller (Norway) than the E-Z-Baiter hook. The results clearly indicate the effect of dimension, as the smallest hook (Norway) gave relatively higher catch rates than the biggest hook (Kirby) in the separate comparisons with the E-Z-hook.

However, the E-Z-hook proved to be superior to both the traditional hook types, and this is clearly a result of the specific shape of the new hook design.

The fact that the E-Z-hook gave less bait loss also indicate the higher efficiency of this hook. The fish might remove the bait without getting hooked, but the bait loss from this reason will be less for a hook with a higher hooking probability.

The E-Z-Baiter hook compared with the traditional hooks was also shown to have good properties for catching the fish in the jaw. This indicate that the E-Z-hook might be effective also for other species with a hooking behaviour that leads to a high proportion of jaw-hooking (e.g. ling and halibut).

5. REFERENCES

Floen, S. 1985. Experimental design for data collection and analysis in comparative longline fishing trials. Meeting in Bergen, May 28 - 31, 1985 of the ICES Ad Hoc WG on Artificial Bait and Bait Attraction.

Peeling, D. 1985. Circle hook comparison study. Project summary No. 2. Fish.Dev.Branch, Fisheries and Oceans, Halifax, March 1985.

Table 1. Standard (S) and test (T) hook types used in the three experiments. The dimensions given are average values from 10 hooks of each type.

Exp.no.		Hook type	Point length	Barb width	Shank diam.
			Hook dimensions (mm)		
1	S	E-Z-Baiter,Qual.39975,No.12/0,straight	12.0	3.9	2.3
	T	E-Z-Baiter,Qual.39975,No.12/0,kirbed			
2	S	E-Z-Baiter,Qual.39975,No.12/0,straight			
	T	Mustad Kirby,Qual.2330,No.4, kirbed	14.3	4.56	2.6
3	S	E-Z-Baiter,Qual.39975,No.12/0,straight			
	T	Mustad Norway,Qual.7255,No.8,straight	10.85	3.45	2.0

Table 2a. Experiment 1: E-Z-Baiter (straight) versus E-Z-Baiter (kirbed).
Catch and length data.

Species	Cod		Haddock		Other		Total catch	
Hook type	*S	*T	S	T	S	T	S	T
No. of fish	375	324	73	56	196	156	453	387
Catch rate	14.0	14.3	2.7	2.5	7.3	6.9	17.0	17.1
**Catch increase %	2.1		-9.3		-5.9		1.0	
***Significance	0.812		0.641		0.604		0.917	
Mean length	60.32	61.16	49.20	48.52				
****+/-95% probability	0.92	1.06	2.18	2.48				
No. of measurements	374	321	74	51				
Significance	0.235		0.688					

* S (Standard hook): E-Z-Baiter (straight), * T (Test hook):
E-Z-Baiter (kirbed)
** Catch increase relative to the standard hook
*** Significance: If $\leq$ 0.05 the result is significant
**** Confidence limit: Possible range from mean length with 95% probability

Table 2b. Experiment 1: Hook status for hooks without catch (%)

Hook status	Bait loss	Bait remnant	Intact bait
Standard hook	45.2	4.2	50.8
Test hook	45.2	5.1	49.7

Table 2c. Experiment 1: Hooking position (%)

	Cod			Haddock		
Hooking position	Jaw	Throat	Other	Jaw	Throat	Other
Standard hook	78.1	16.8	5.1	100	0	0
Test hook	79.0	16.0	4.9	100	0	0

Table 3a. Experiment 2: E-Z-Baiter (straight) versus Mustad Kirby.
Catch and length data.

Species	Cod		Haddock		Other		Total catch	
Hook type	*S	*T	S	T	S	T	S	T
No. of fish	446	275	·84	31	158	100	531	314
Catch rate	16.8	12.8	3.2	1.4	6.0	4.6	20.1	14.6
**Catch increase %	-24.1		-54.6		-22.1		-27.2	
***Significance	0.000		0.000		0.053		0.000	
Mean length	60.20	62.12	49.72	49.54				
****+/-95% probability	0.90	1.29	1.58	3.67				
No. of measurements	447	266	80	31				
Significance	0.0147		0.91					

* S (Standard hook): E-Z-Baiter (straight), * T (Test hook):
Mustad Kirby (kirbed)
** Catch increase relative to the standard hook
*** Significance: If ≤ 0.05 the result is significant
**** Confidence limit: Possible range from mean length with 95% probability

Table 3b. Experiment 2: Hook status for hooks without catch (%)

Hook status	Bait loss	Bait remnant	Intact bait
Standard hook	49.1	3.2	47.8
Test hook	60.7	3.1	36.2

Table 3c. Experiment 2: Hooking position (%)

	Cod			Haddock		
Hooking position	Jaw	Throat	Other	Jaw	Throat	Other
Standard hook	79.1	17.0	3.8	98.8	0	1.2
Test hook	63.6	29.1	7.3	93.5	0	6.

Table 4a. Experiment 3: E-Z-Baiter (straight) versus Mustad Norway.
Catch and lenght data.

Species	Cod		Haddock		Other		Total catch	
Hook type	*S	*T	S	T	S	T	S	T
No. of fish	487	338	57	26	109	99	547	371
Catch rate	17.8	14.6	2.1	1.1	4.0	4.3	19.9	16.0
**Catch increase %		-18.0		-46.1		7.3		-19.9
***Significance		0.005		0.006		0.662		0.001
Mean length	60.71	61.67	48.07	48.85				
****+/-95% probability	0.88	1.09	1.97	3.00				
No. of measurements	484	334	55	28				
Significance		0.17		0.65				

   * S (Standard hook): E-Z-Baiter, * T (Test hook): Mustad Norway (straight)
  ** Catch increase relative to the standard hook
 *** Significance: If   0.05 the result is significant
**** Confidence limit: Possible range from mean length with 95% probability

Table 4b. Hook status for hook without catch (%)

Hook status	Bait loss	Bait remnant	Intact bait
Standard hook	49.4	3.7	46.9
Test hook	52.7	3.7	43.6

Table 4c. Hooking position (%)

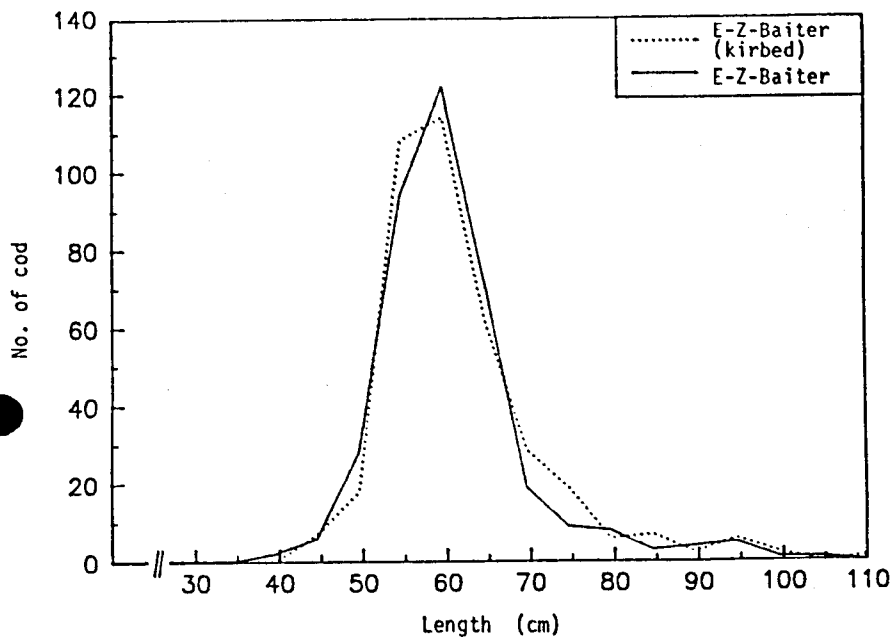|	Cod			Haddock		
Hooking position	Jaw	Throat	Other	Jaw	Throat	Other
Standard hook	78.2	17.7	4.1	98.2	0	1.8
Test hook	62.4	31.4	6.2	100	0	0

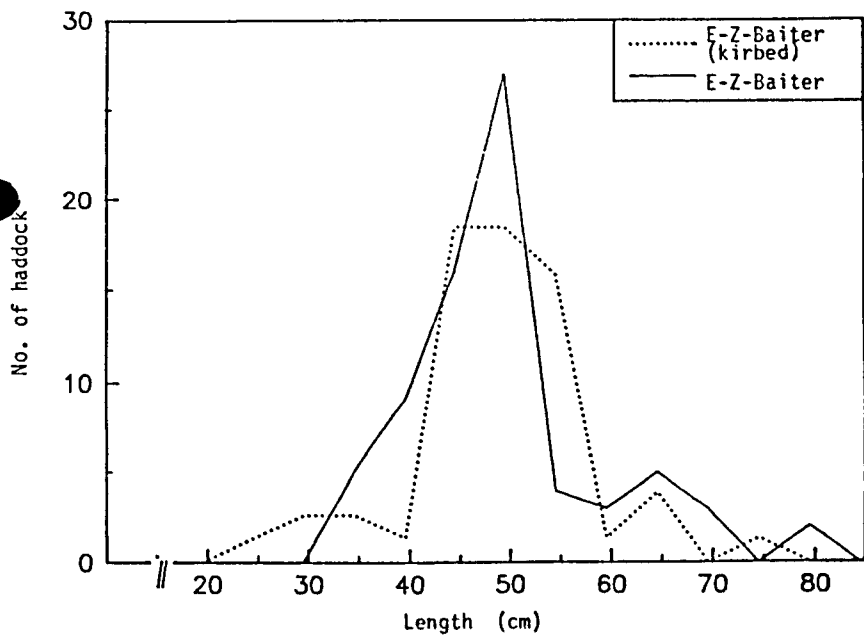Figure 1. Length distribution of cod in experiment 1

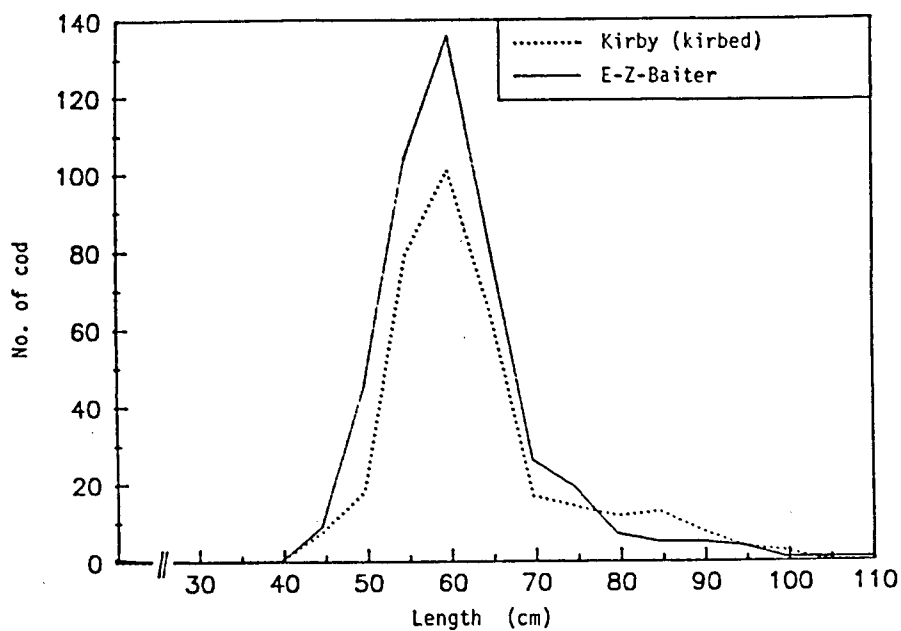Figure 2. Length distribution of haddock in experiment 1

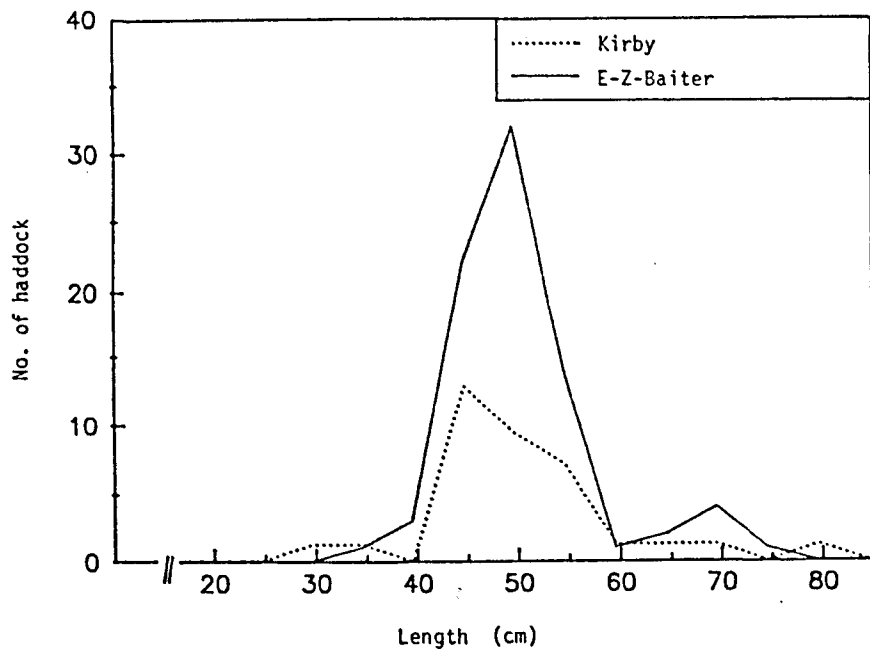Figure 3. Length distribution of cod in experiment 2

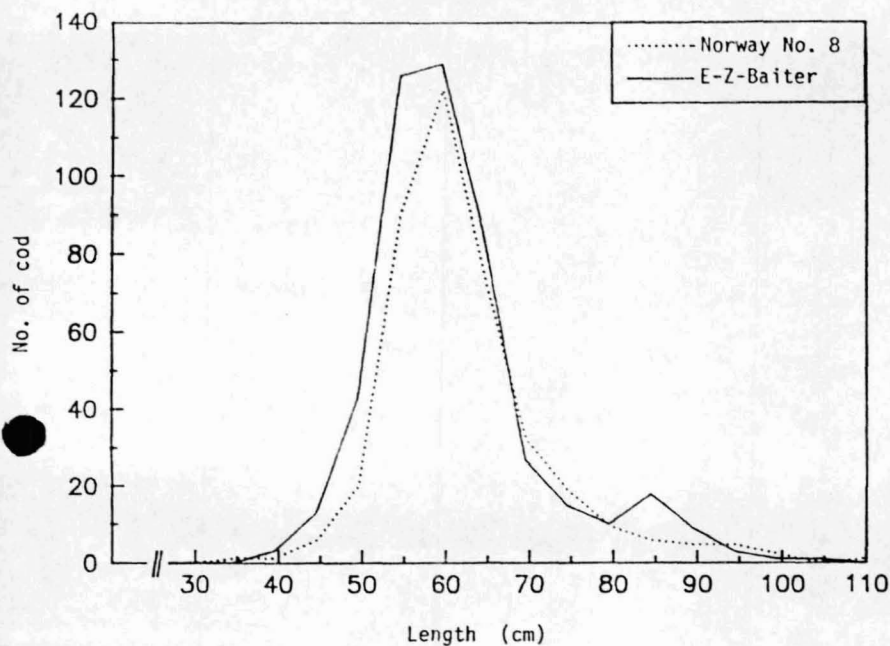Figure 4. Length distribution of haddock in experiment 2
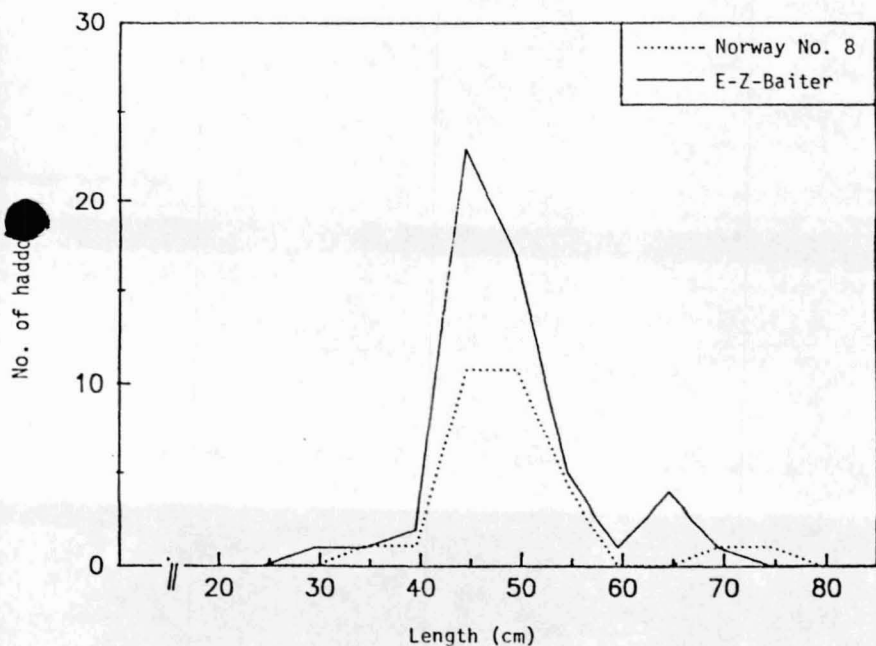
Figure 5. Length distribution of cod in experiment 3

Figure 6. Length distribution of haddock in experiment 3