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Stock assessment of *Illex illecebrosus* (LeSueur, 1821)
in ICNAF Div. 4W determined by area-density method

by

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Introduction

The area-density method was used several times for assessment of squid stocks in Subarea 5 and Statistical Area 6 (Ikeda, Nagasaki and Imanaga, 1973; Ikeda and Nagasaki, 1975; Tibbetts, 1975; Lipinski, 1975, MS; Mesnil, 1977). A critical review of these results was conducted by Sissenwine (1976), and some inaccuracies of this method were shown. This method is certainly not very sophisticated or elegant, but it underestimates the resources, therefore, it is better for conservation and management purposes than for fishermen.

The aim of the present paper is to estimate the standing stock of *Illex* in the Polish fleet operation area.

Fishing Operations of the Polish Fleet in Div. 4W (input data)

The Polish directed *Illex* fishery commenced in the first half of July and concluded at the end of August. Only four stern trawlers had participated in this fishery. Other Polish trawlers also fished for squids, but under a Canadian-Polish agreement and for a Canadian consignee. This catch is not reported here.

The total Polish catch for Div. 4W was 2,936 tons; details are shown in Table 1. By-catch is shown in Table 2. The area of this fishery is shown in Fig. 1. The area-density method was based on the two areas adequately fished and sampled; these are shown in Fig. 2. These areas were almost equal and covered roughly 7,880 km² each. The mean duration of each haul - 3 hours, mean number of hauls per day - 3, trawl speed of the net 3.5 knots.

The width between the net wings was 35 m and during a single haul covered 0.66 km². The mean weight of individual *Illex* from these catches was 185 g.

The mean catch per day was 36.2 tons, i.e. 19.57×10^4 specimens. The mean density of squids per 1 km², extracted by net: 9.88×10^4 specimens. Total number of squids extracted by net in the areas analyzed: 7.78×10^8 specimens each.

Biomass of Squids in the Area Discussed

The total Polish catch consisted roughly of 0.16×10^8 specimens. The ratio of this catch to the total number of squids in each area discussed was as follows:
$$P = \frac{0.16 \times 10^8}{7.78 \times 10^8} = 0.02$$
, then the biomass in each area equalled $B = \frac{2,936}{0.02} = 146,800$ tons. It is believed, however, that squid migrate in part from area A to area B (Fig. 2). It is presumed that that part of schools which may migrate during the period in question does not exceed 0.6 B. The total biomass in Div. 4W during summer months should then be 205,500 tons. This is regarded as a minimum biomass estimate due to high underestimation effect of the method.

Discussion

Sissenwine (op. cit.) pointed out that "the area affected by a trawl may be broader than the width of the gear at the wings, since the doors and bridle may herd individuals into the path of the net. The result is that stock size may be overestimated."

It was also shown (Ikeda, 1973) that the doors and bridle may frighten the squids away; the escaping of squids from the net was often observed, e.g. Squires, 1957 (author's own observations). It seems contrary to Sissenwine's statement that this may cause considerable underestimation of the stock.

The biomass obtained here conforms with the lower range found by Mercer (1975).

Sissenwine and Tibbetts (1977) found that E_{MSY} should be 0.37 for Illex under special assumptions in respect of its biology. Considering that the squid biomass does not depend on the size of the spawning stock, a much more reasonable assumption of E_{MSY} would seem to be the value of 0.50 - 0.60.

Conclusion

A catch yield of Illex in Div. 4W of between 102,000 and 123,000 tons does not seem to be too high for the existing stock.

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Table 1. Catches and fishing effort in the Polish squid fishery in Div. 4W, July-August 1977.

Vessel type	Tonn. class (GRT)	Fishing gear ¹	10-day periods (Jul-Aug)	Numbers of rectangles (see Fig.1)	Days fished	Hours fished	Total catch (ton)	Squid catch (ton)	By-catches				
									Silver hake	Cod	Others		
B-418	2410	MWT	01-10	5-6, 13-14	2	19	87.5	85.2	2.1	0.1	-	0.1	
"	"	"	11-20	5-7, 12-14	11	102	521.1	505.6	15.2	0.1	-	0.2	
"	"	"	21-30	5-9, 11-16	14	126	469.0	465.3	3.1	0.1	0.1	0.4	
"	"	"	31-09	3, 8-10	5	45	136.5	136.0	0.4	-	-	0.1	
"	"	"	10-19	2-3, 7-9	14	139	614.0	613.4	0.5	0.1	-	-	
"	"	"	20-29	2-3, 7-10	11	90	325.0	324.2	0.4	0.2	-	0.2	
Totals for B-418 vessels							57	2153.1	2129.7	21.7	0.6	0.1	1.0
B-18	2495	MWT	01-10	-	-	-	-	-	-	-	-	-	
"	"	"	11-20	-	-	-	-	-	-	-	-	-	
"	"	"	21-30	5-9, 11-13	4	37	89.6	86.0	3.6	-	-	-	
"	"	"	31-09	1-4, 7-9	10	72	395.5	392.4	3.0	-	-	0.1	
"	"	"	10-19	2-3, 9-10	9	67	330.0	327.5	2.1	0.1	-	0.3	
"	"	"	20-29	-	-	-	-	-	-	-	-	-	
Totals for B-18 vessels							23	815.1	805.9	8.7	0.1	-	0.4
TOTAL ALL VESSELS							80	2968.2	2935.6	30.4	0.7	0.1	1.4

¹ Fishing gear has following dimensions during fishing operations: width 35 m, height 15 m, length 80-85 m, codend mesh size 44 mm.

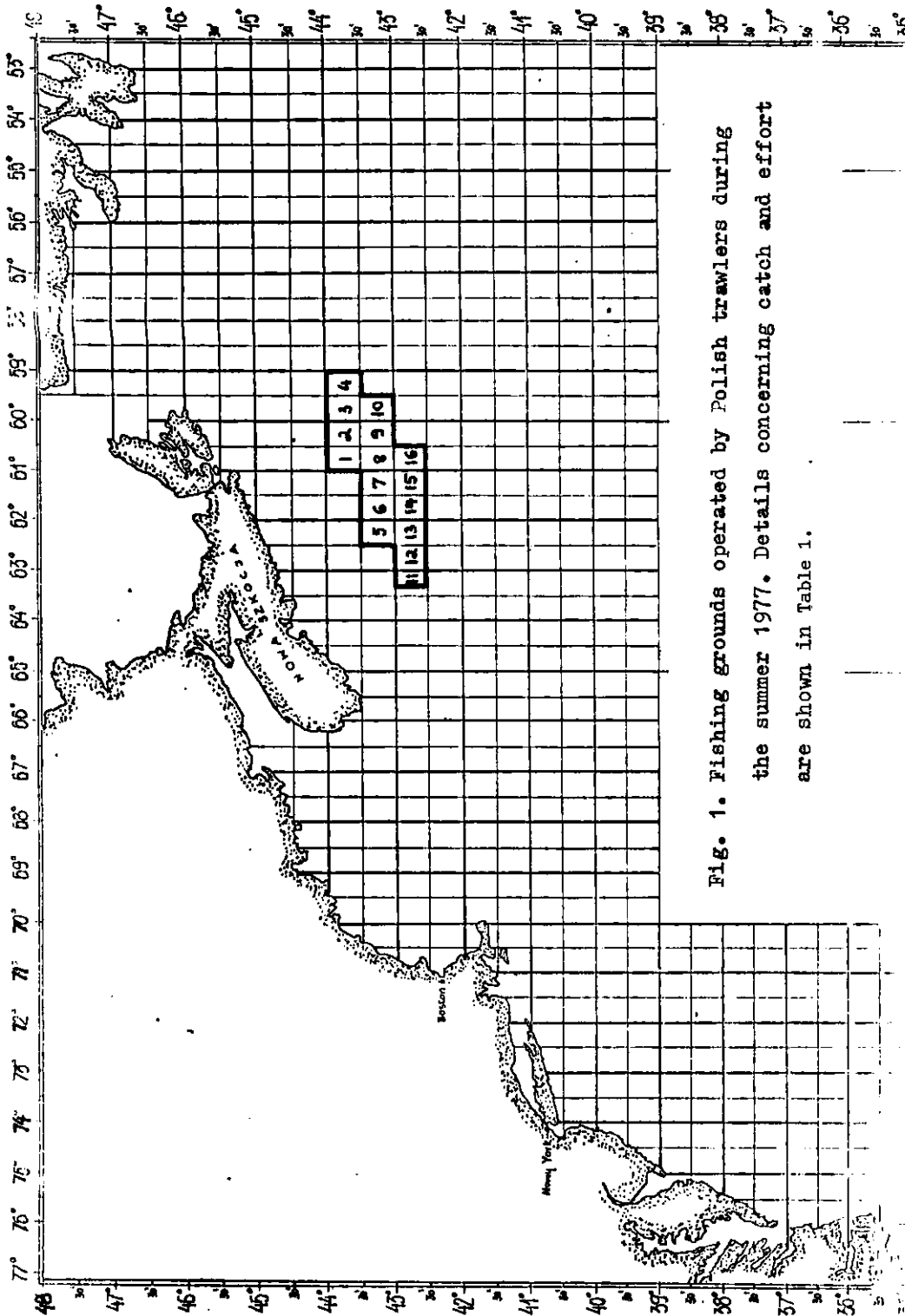


Fig. 1. Fishing grounds operated by Polish trawlers during the summer 1977. Details concerning catch and effort are shown in Table 1.

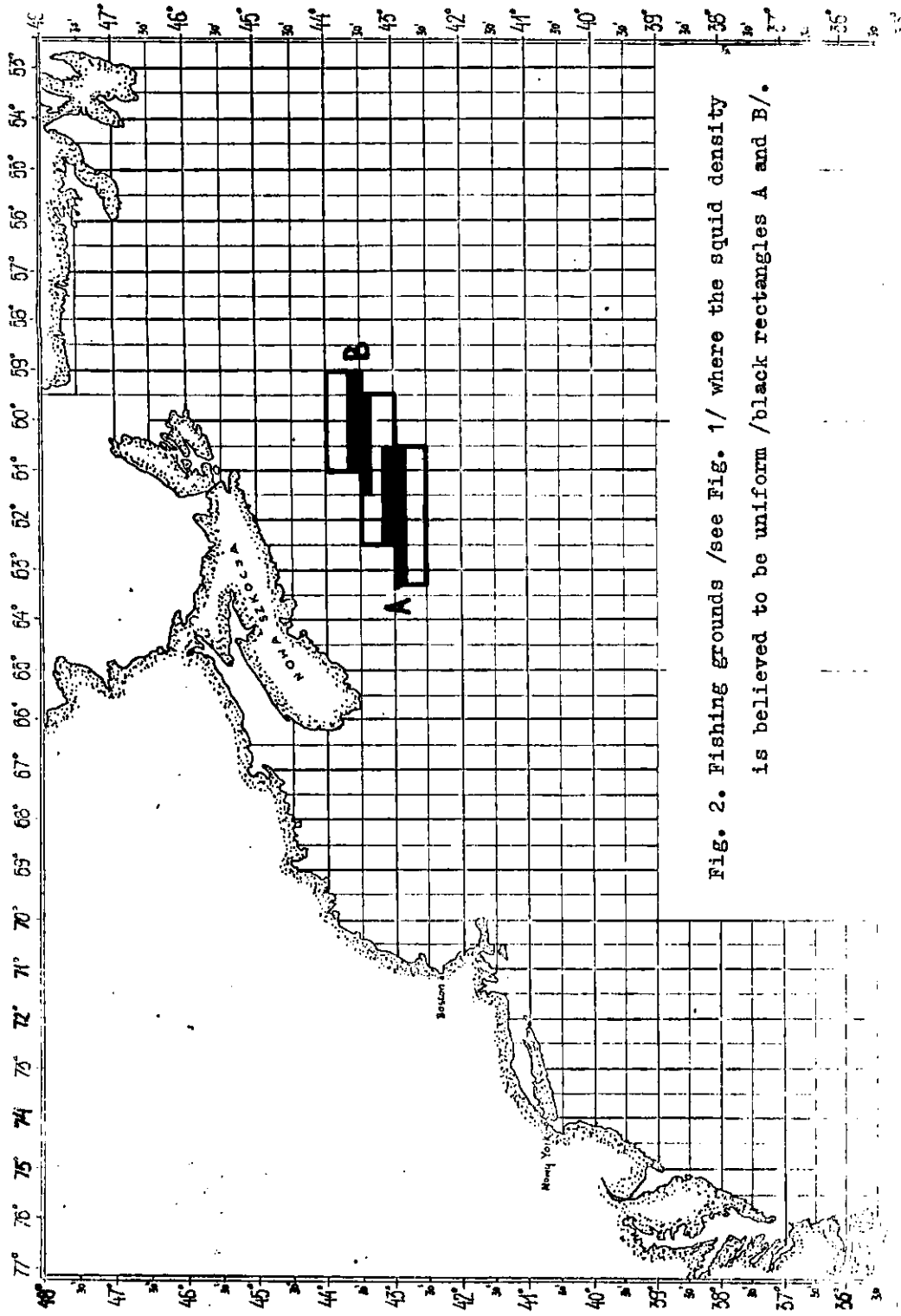


Fig. 2. Fishing grounds /see Fig. 1/ where the squid density is believed to be uniform /black rectangles A and B/.

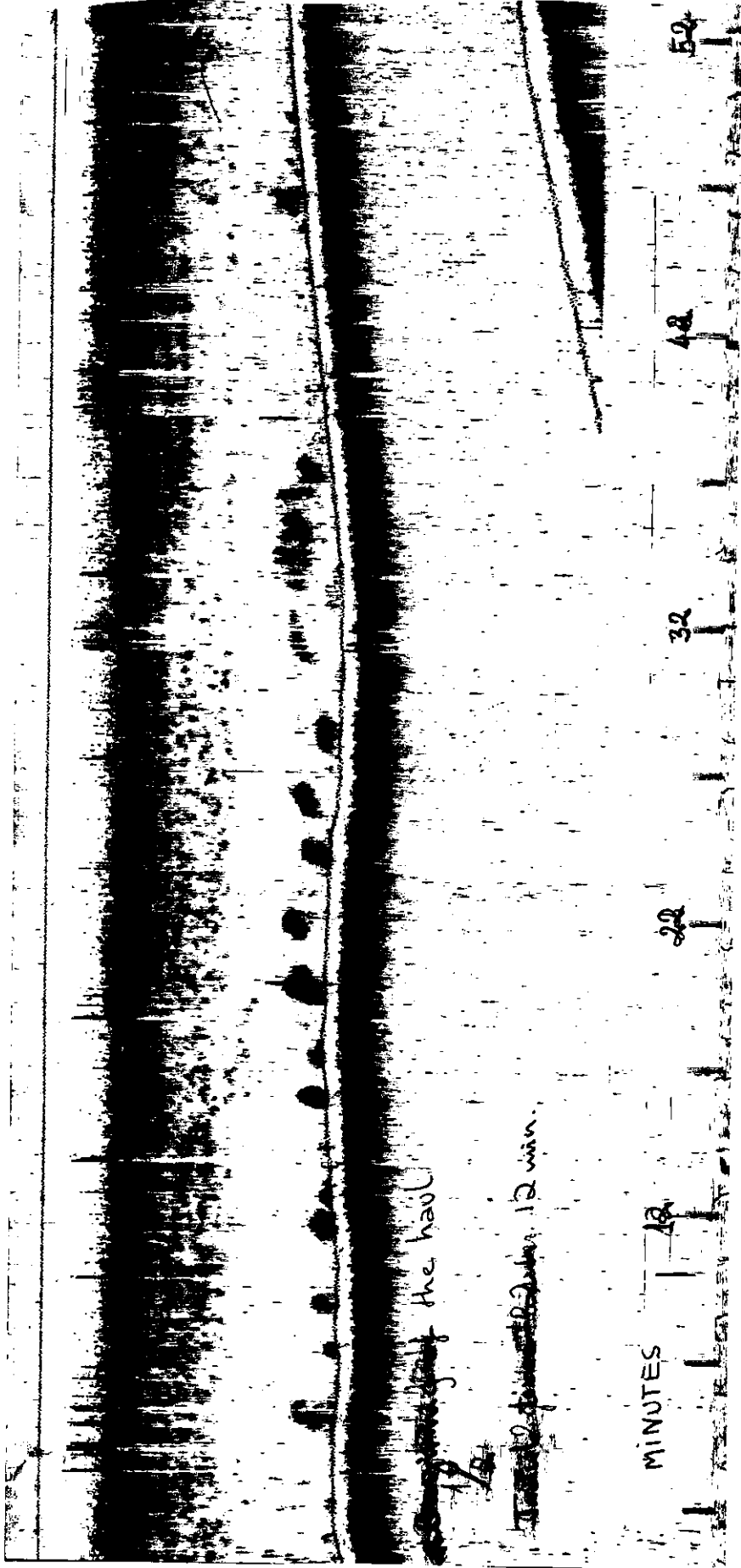


Fig. 3. Availability of the squid to the Polish pelagic trawl echo sounder on the bridge of the ship.

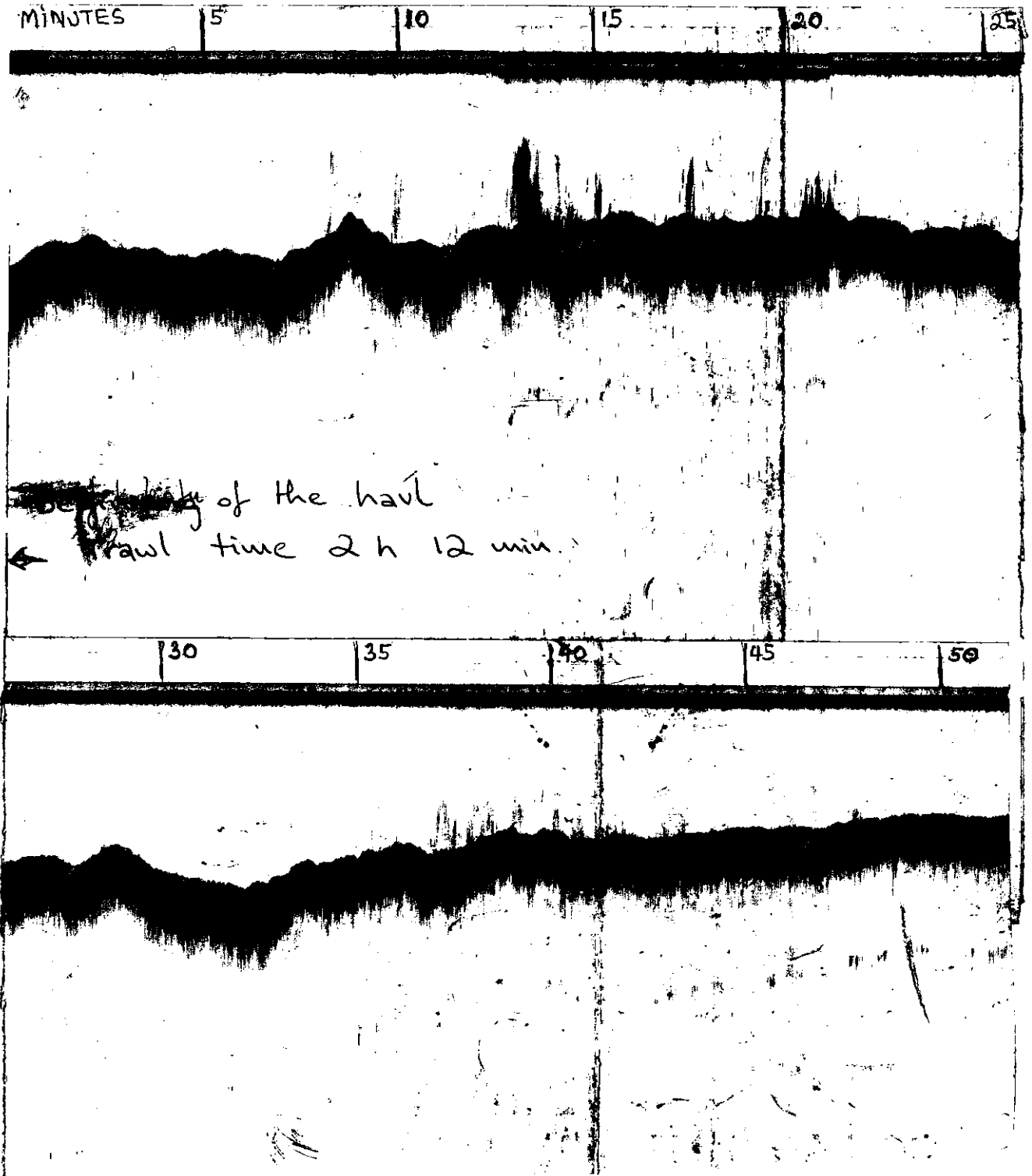


Fig. 4. Availability of squid to the Polish pelagic trawl net sounder.

