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Stock assessment of Illex illecebrosus in ICNAF Subareas 3 and 4

by

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Abstract

Using data from the Cuban Fishing Fleet during 1976 and 1977 the biomass for Illex illecebrosus was estimated using the areal expansion method in 4XW and 3LNO ICNAF divisions.

In division 4XW it was found the biomass in June-July-August for 1976 was 60972, 33106 and 10146 M.T. respectively. It was determined for June-July in 1977 in divisions 4XW and 4XW + 3LNO the biomass was 115000 and 248951 M.T. respectively.

Introduction

The present paper is aimed to a preliminary assessment of Illex illecebrosus abundance in 4XW and 3LNO ICNAF divisions.

The Cuban Fleet operations in the area of the Nova Scotia Shelf reports as by-catch in the silver hake directed fishery a considerable weight of squid Illex illecebrosus, so an assessment of this resource could help to know the size of this stock of increasing fishing importance.

Materials and Methods

Data used were taken from some Cuban vessels log books which operated in the Nova Scotia Shelf and the Grand Bank during June, July and August, 1976 and June-July 1977 (fig.1-6).

A total of 1054 trawls operations were analized, 898 carried

out by the "Atlantik" type of vessels and the restt by TACSA-95 vessels which operated in divisions 3LNO; both types of vessels belonging to > 2000 M.T.

It was taken from the log books the position, depth, trawling time in hours, speed of trawling, type of gear employed, etc.

Fishing gear used were commercial bottom trawls M-36, M-50.2 and the pelagic trawl M-95/220.

The main technical details of these three nets are shown below:

Gear name or number	M-36	M-50.2	M-95/220
Head rope length	36 m	50.2 m	95 m
Foot rope length	56.5 m	61.2 m	95.0 m
Wingspread	24 m	28 m	45 m
Length of bridles	120	120	120
Area of doors	5.5 m^2	5.5 m^2	8.0 m^2

For the estimation of the biomass it was used the areal expansion method applied by Mathews et al (1975) and modified in the present paper.

Mathews (op.cit.) stated that the catch per unit of area (Ca) can be computed from:

Ca = Co/k kilograms per hectare (kg/hect.)

where: Co: catch recorded in each trawl

k: area swept by the trawl, computed by the following equation:

$$(1) \quad k = \frac{D \times 1853 \times vt}{10\,000}$$

where D is the distance between trawl doors in meters; 1853 is the number of meters in a nautical mile; v is the average speed of the vessels in knots while trawling; t is the trawling time in hours fished and 10 000 is the number of squares meters per hectare.

The abundance or average biomass per unit of area, considering that all fishes actually in the area are caught by the net is given by:

Standing stock = H x Ca/q

where: H: area estimated in thousands of hectares

q: catchability coefficient

In order to know the area swept by the pelagic trawl and bottom trawls it was introduced a transformation to equation (1) consisting in using the average horizontal oppenning kept by nets M-36, M-50.2 and M-95/220 at trawling speeds 4.5, 4.5, and 6 knots respectively instead of considering parameter D as the distance between the doors.

For estimating the parameter H it was usedd the area of the 30' x 30' quadrangles where the trawling operation took place.

Results and discussion

It was found that the highest mean abundance (kg/hect.) during the months analized from 1976 was slightly higher than the lowest found for 1977 months (table 1).

June was the month of highest mean abundance (28.2 kg/hect.), while August had the lowest (5.3 kg/hect.) during 1976.

The following year the mean abundance reached its peak figure in division 4XW during the month of July (166.5 kg/hect.). It should be noted that this figure was obtained in intermediate depths in relation with the depth ranges occupied by the fisheries during the last two years in agreement with Scott (1976) statements.

In table 1 are shown the catchability coefficients found in different months and for each of the gears fishing. We consider that this coefficient has the highest incidence in subestimation and overestimation of the results.

Among the errors which can cause subestimations and overestimations in our results we have:

1) The majority of the data analized correspond to commercial catches obtained by "Atlantik" type of vessels with M-36 and M-50.5 trawls, both bottom gears and therefore which an appreciable ineficiency for the squid catching, Scott (op.cit.).

2) For a trawl to catch all of the individuals actually in the area it is needed the correct fitting of the trawl, doors attack angle, etc., allowing the net to reach an optimal vertical and horizontal oppening and that is not easy to achieve in commercial trawls

3) It should be noted that in the present paper are given biomass values for q = 1.0 and 0.5 and the analysis has rested heavily on the bottom trawl M-36. Individuals found in the path of the net and in the affected area but over its headrope are not caught by this gear.

4) In other hand, the squid fishery for the Cuban Fleet is mainly based on the distributional area of the silver hake so all the squids out from this area are not taken into account in this analysis.

5) Fishing intensity is not uniformly distributed over the area and it causes that the average of the abundance

overestimates the average of relative abundance in all the area considered, so in our analysis it is only used the area of the quadrangles where the fishing effort was applied.

6) It was not considered the migration of individuals out from or to the fishing zone.

7) The trawling operations considered could not be separated in periods of time during the day, to eliminate in this way the possible subestimation errors which can be observed in figures 7 and 8.

During 1977 the mean abundance obtained by the Cuban Fleet showed great variations depending on the type of net used. The maximum value was reached by the pelagic trawl M-95/220 during July 1977, as this gear meets all the required characteristics of this kind of fishery.

Values of mean depth v.s. catchability coefficient for the different months were plotted (fig.9), obtaining the following equation:

$y = 210.8 - 4.1 \times 10^5 q$

with correlation coefficient 0.84.

Despite that there is not enough information available on the stock-recruitment relation for this species, it can be considered a 20% of the biomass as sufficient to guarantee the recruitment, Ikeda et.al. (1973).

If we consider the average biomass for months of June and July 1977, this figure will be around 40,000 M.T.

In spite of the agreements observed among the estimations computed during the last year, it would be desirable, giving the nature of the method used, to have more information as an element of comparison.

Acknowledgements

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References

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Mathews C.P., J. Arvizm and J.L. Granados. 1975. Resultado de los Cruceros Exploratorios del Alejandro de Humboldt en el Golfo de California. Progr. de Invest. y Fom. Pesq. Mex/PNUD/FAO. Controbuciones al estudio de las pesquerias de México. CEPM:13.

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Table 1.- Estimated abundance of squid in subarea 3 and 4.

Year	Month	Subarea	# Tow	Gear	Ca Kg/Hect.	H (10^6) Hectare	Catchability q_1	Catchability q_2
1976	June	4	180	36	28,2	2.1	1	0,5
	July	4	216	36	23,0	1.4	1	0,5
	Agust	4	277	36	5,3	1.9	1	0,5
1977	June	4	145	36	56,3	1.6	1	0,5
	June	4	18	95	27,8	0.7	1	0,5
	Total	4	163	36+95	-	2.4	1	0,5
	July	3	156	50,2	122,9	0.9	1	0,5
	July	4	22	95	166,5	0.7	1	0,5
	July	4	40	36	26,9	0.4	1	0,5
	Total	3+4	218	36+95+50,2	-	2.1	1	0,5

Year	Month	Biomass M.T. B_1	Biomass M.T. B_2	Catchability (10^{-5}) q_3	Mean Depth Meters
1976	June	60972	121944	2,11	188
	July	33106	66212	3,87	215
	August	10146	20292	2,59	213
1977	June	95000	190000	2,51	160
	June	20000	40000	20,6	134
	Total	115000	230000	-	-
	July	115625	231250	5,19	203
	July	120342	240684	10,2	145
	July	12984	25968	28,2	114
	Total	248951	497902	-	-

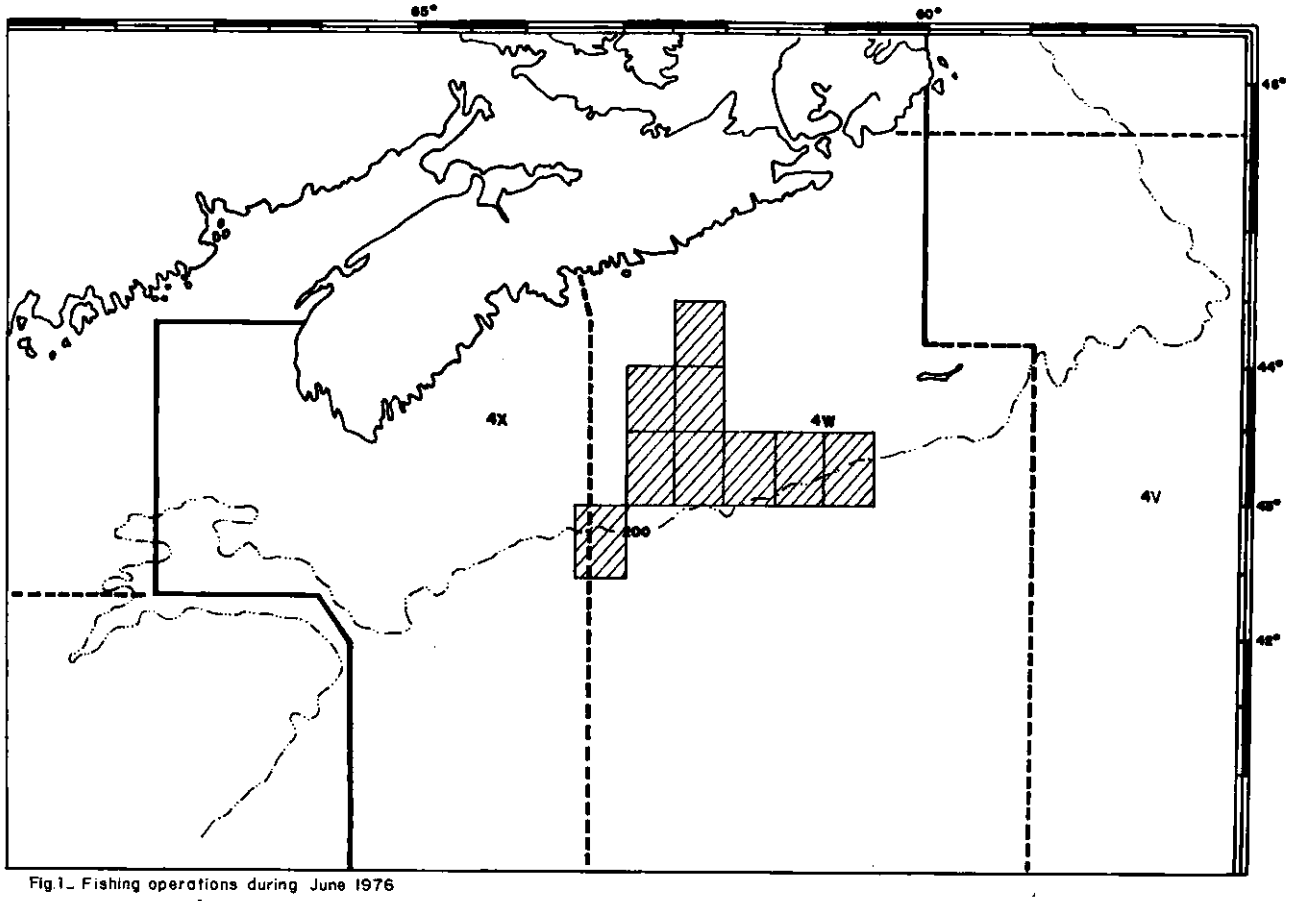

Fig.1_ Fishing operations during June 1976

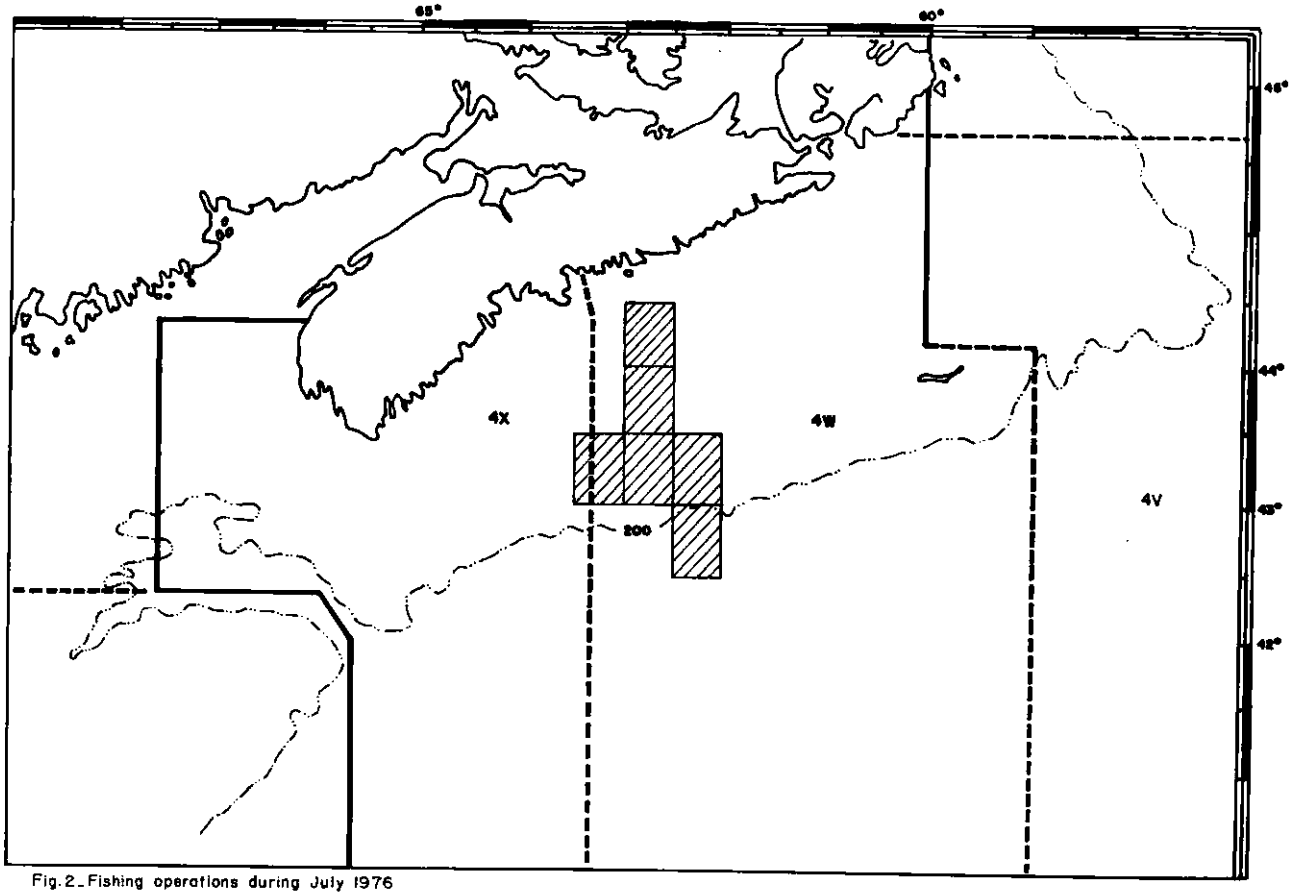

Fig.2_Fishing operations during July 1976

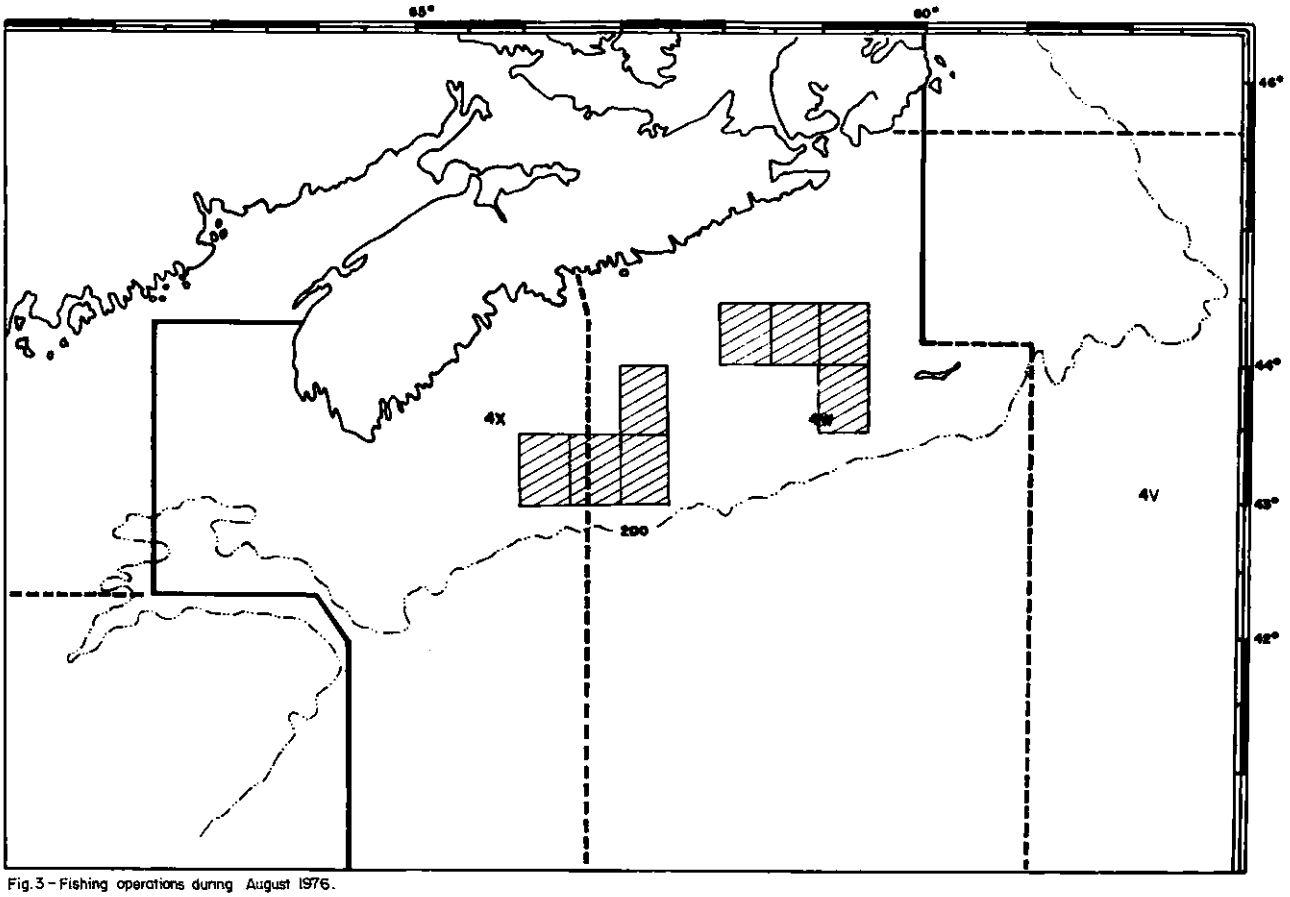

Fig. 3 - Fishing operations during August 1976.

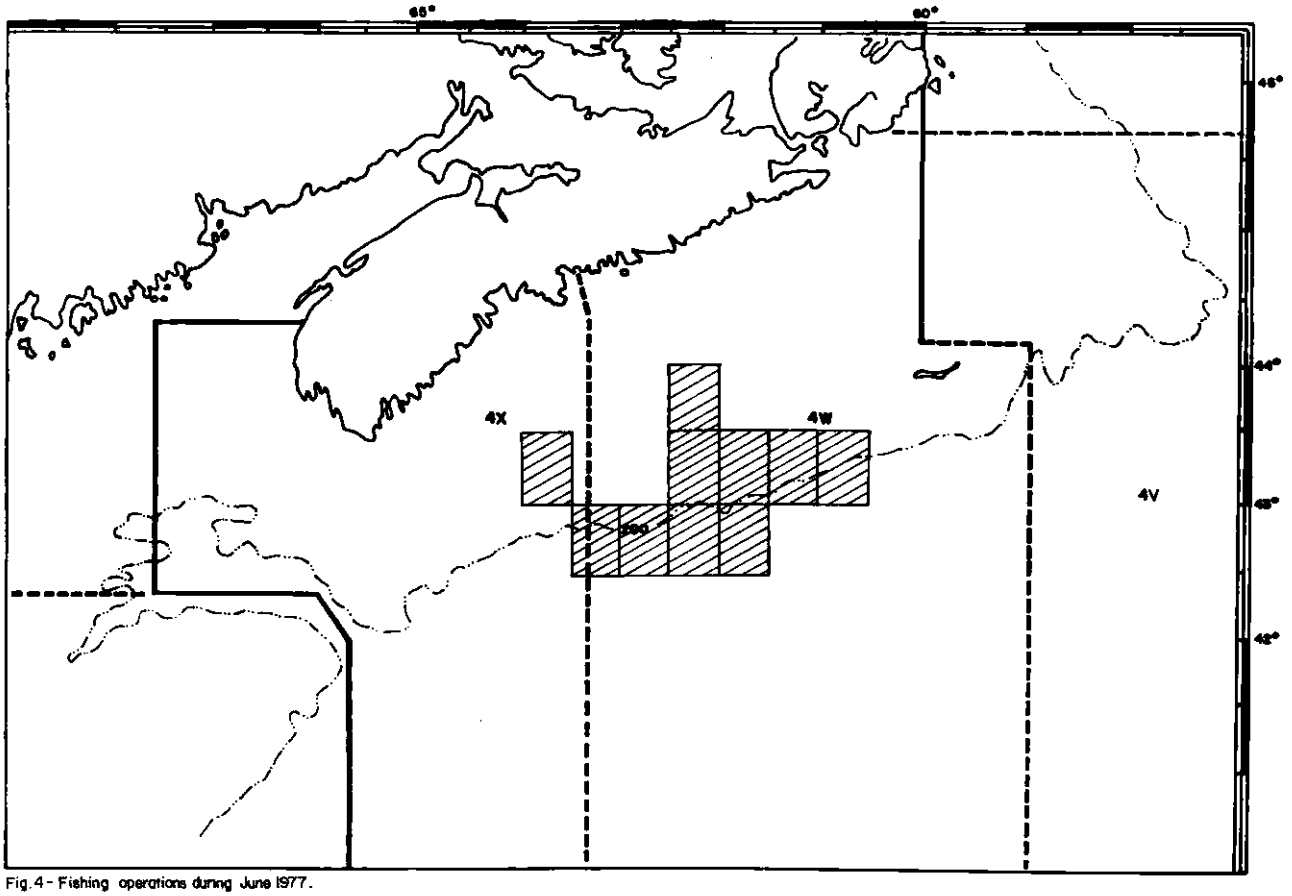

Fig. 4 - Fishing operations during June 1977.

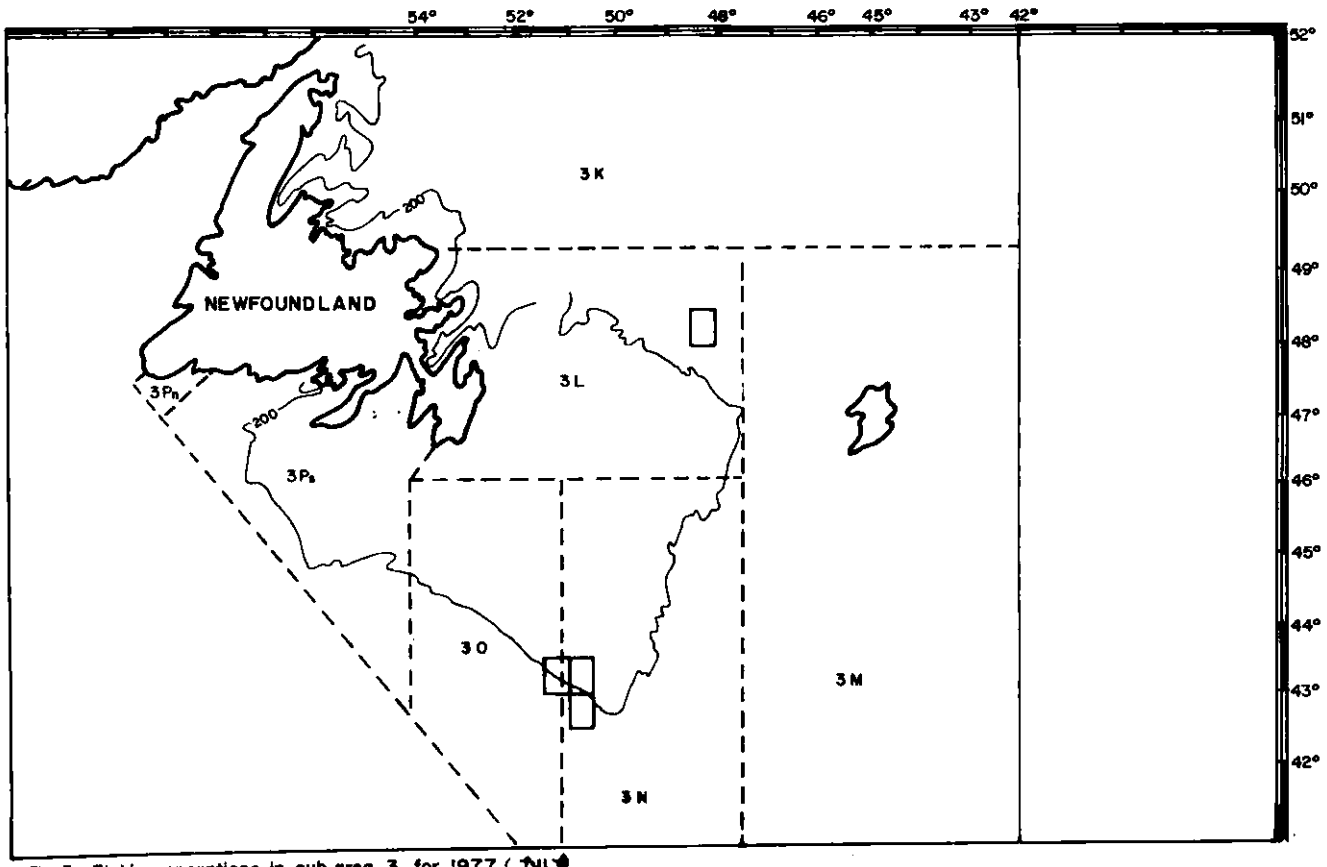

Fig. 5 - Fishing operations in sub-area 3 for 1977 (JULY)

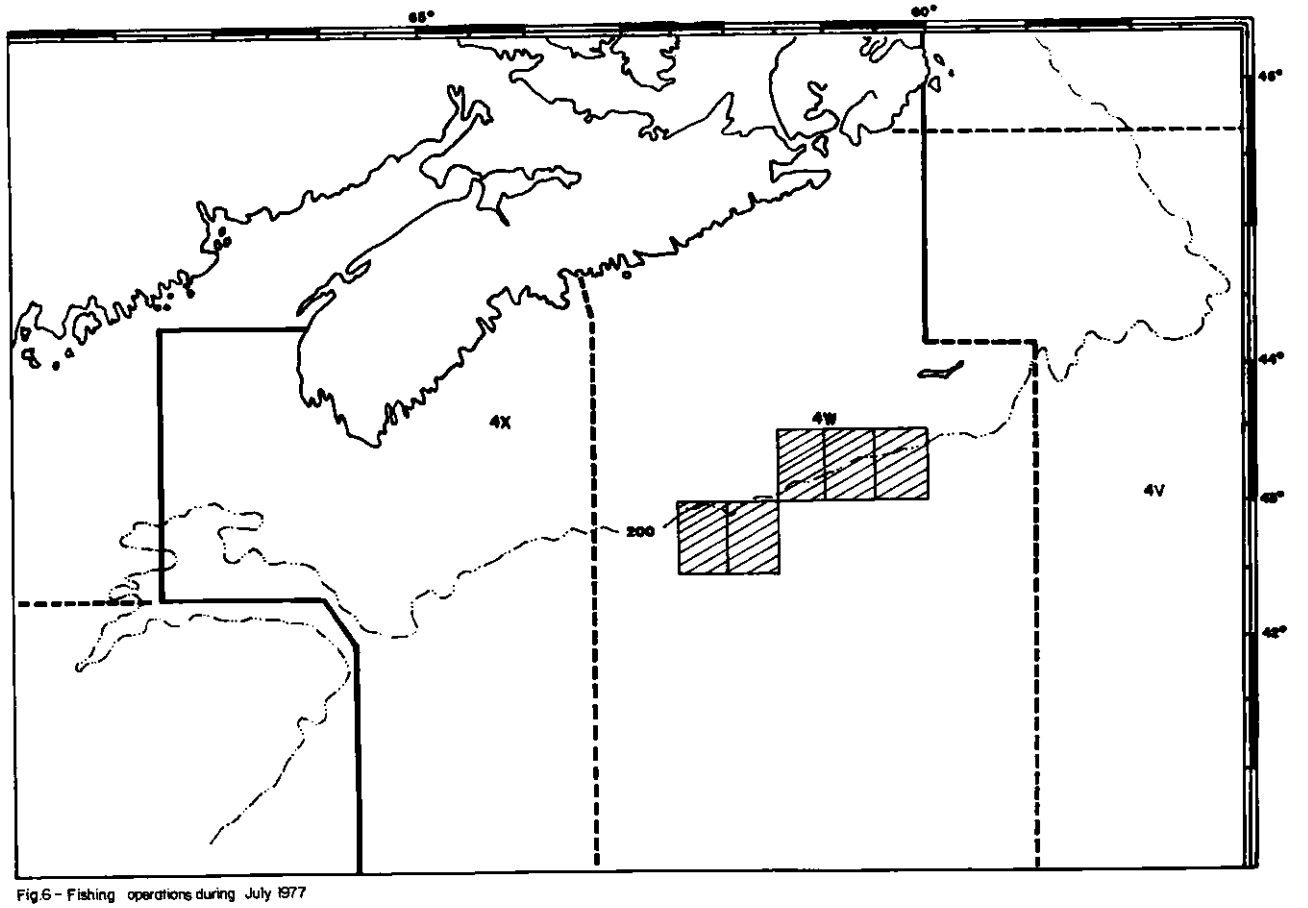

Fig.6 - Fishing operations during July 1977

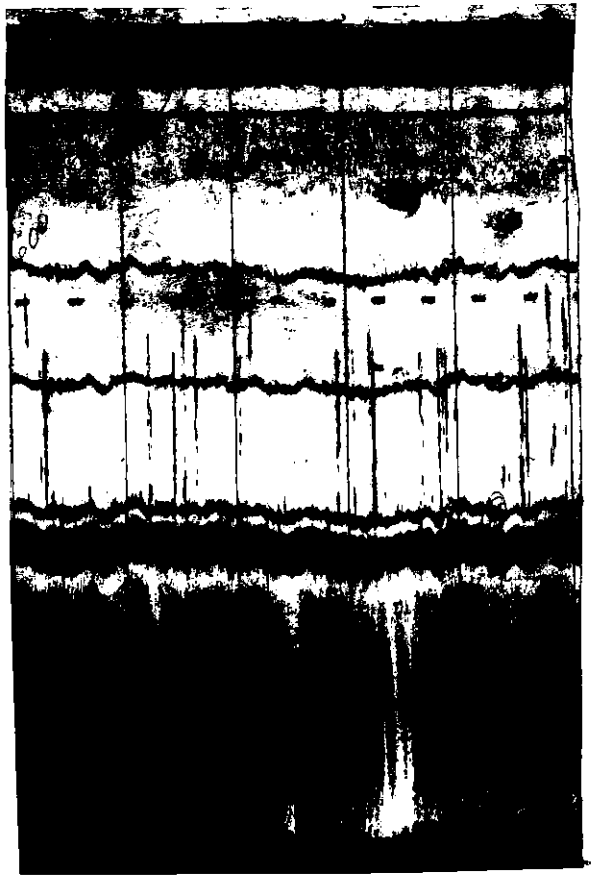

Figure 7. Echogram showing at upper layer a schoal of squid and at bottom fish concentration. Speed of the vessel 10 knots. The following settings of instruments were used during the cruise: Echo sounder EK-38: TVG 20 log R, pulse length 0,6 MS, Power 1/1 KW, mode white line, gain o dB, Bandwith 3KHz, gain 7, discriminator 5 scale 0-250 meters.

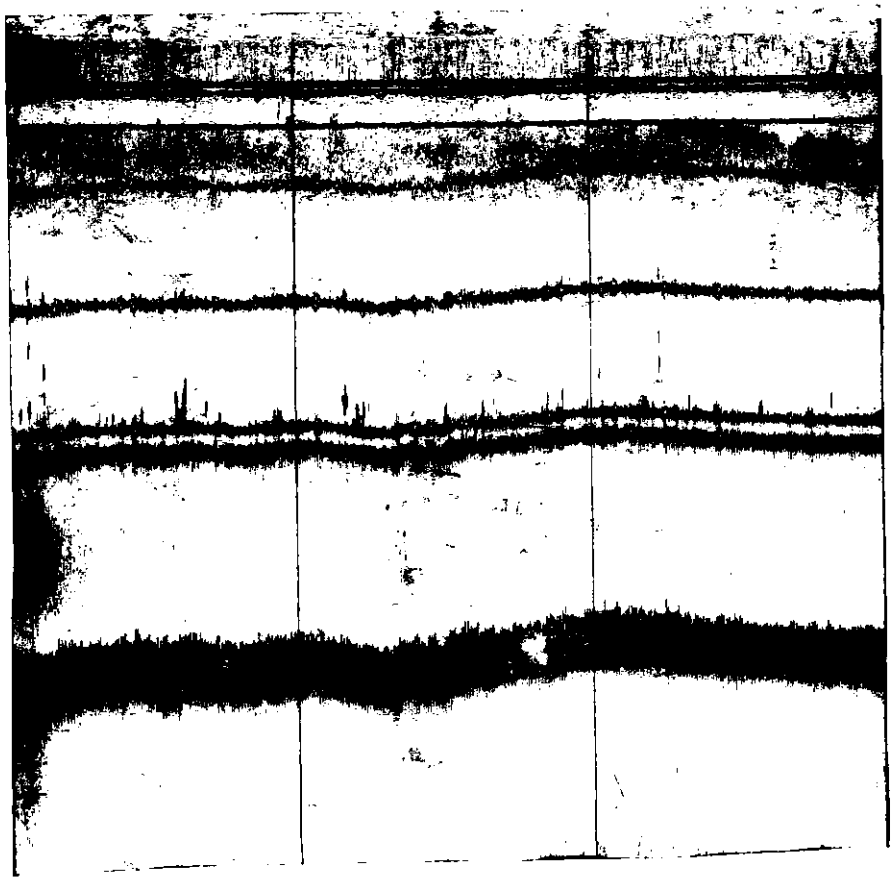

Figure 8.- Echogram showing in the first 25 meters a dense concentration of squid. Speed of the vessel 4,5 knots. The following settings of instruments were used during the cruise: Echo sounder EK-38: TVG 20 log R, pulse length 0,6 MS, Power 1/1 Kw, mode white line, gain odB, Bandwith 3KHz, gain 7, discriminator 5, scale 0-250 meters.

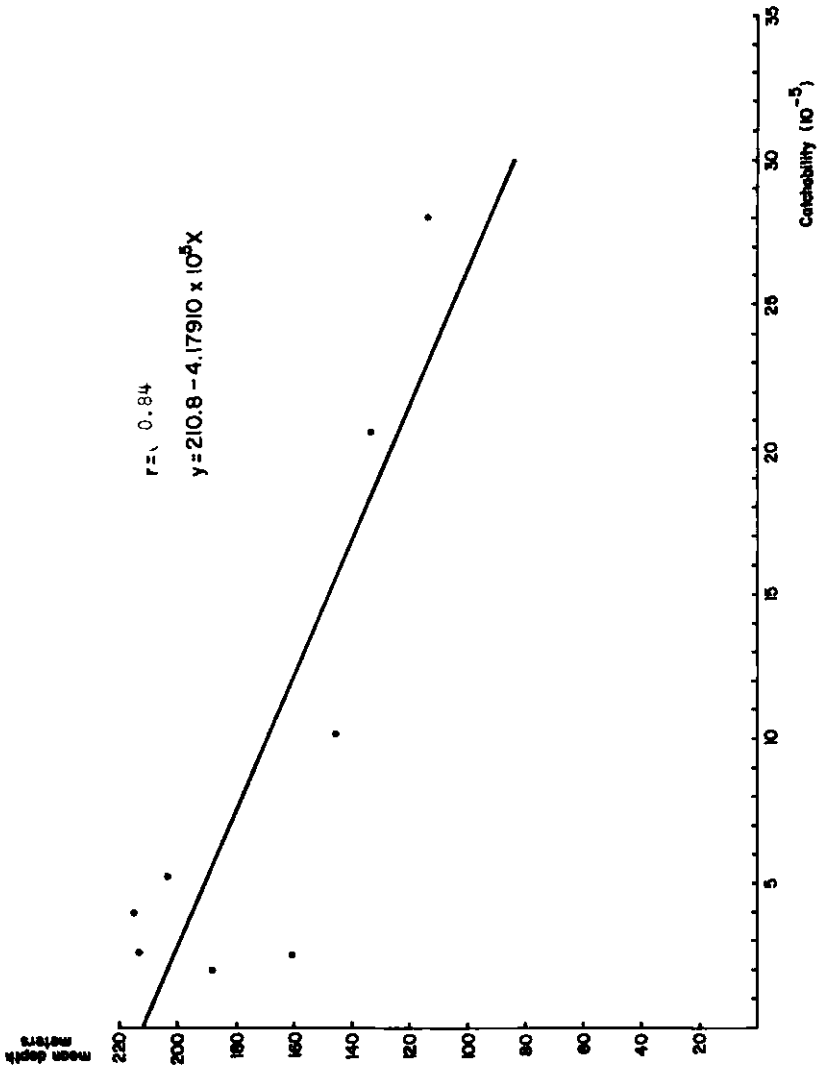

Fig.9 - Mean depth vs cacthability for the different months.