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Results of a trawl survey carried out by the USSR R/V *Argus* in June 1971

by

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Introduction

From 5 to 29 June 1971 complex investigations including a trawl survey, plankton sampling, hydrological observations, etc. were carried out from the large USSR R/V *Argus* in the area from LaHave Bank to Hudson Canyon.

Here the main results from a trawl survey of interest from the standpoint of distribution and relative abundance of commercial fish and invertebrates within the investigated area are reviewed.

Methods

In the survey the abundance of groundfish was estimated, and biological material was collected. Age and food sampling covered all fish species occurring in the catches. Bottom trawling was carried out by "hake-815" gear commonly used by the vessels of BMRT-type. The codend was provided with a fine mesh (12 mm) liner. The rigging included bobbins. Hauls lasted 30 minutes at 3.5 knots. Horizontal opening of the trawl mouth at 3.5 knots was approximately 13-14 m, the vertical opening, 4.7 m.

Location of the trawling stations was charted before putting to sea. The stations were occupied mainly in systematic order. The number of stations (103) was determined having a regard for the duration of the survey, the technical capabilities of the ship, weather conditions, etc. Hauls were made during daylight hours only. The survey covered the ICNAF Divisions and Subdivisions 4X, 5Ze, 5Zw and 6A (Fig. 1). The methods accepted in joint USSR-US surveys were used in processing the catch on deck and filling in the logs. Water temperature was measured at each station. Temperature distribution in the off-bottom layer is shown in Fig. 2.

Distribution and abundance of some commercial species of fish and invertebrates

(a) Silver hake

Silver hake was rather abundant on the southeast slope of Browns Bank, and on the slopes of LaHave Bank (Fig. 3) in June at depths above 150 m, at temperatures of 6°-8°C (Fig. 2). Silver hake was also observed in numbers on the northern, southeast and southern slopes of Georges Bank at depths above 100 m in bottom temperatures of 6°-9°C. In Subdiv. 5Zw hake was taken mainly at depths of 40-70 m, at temperatures of 6°-8°C. In Div. 6A hake occurred throughout the area, but there were no characteristic dense winter- and spring-time concentrations.

Size composition varied considerably according to the location (Table 1). Thus, in Div. 4X the bulk of the catches was represented by individuals of 13-19 and 25-31 cm long belonging to the 1968, 1969 and 1970 year-classes. In Subdiv. 5Ze mature hake of 27-33 cm long were dominant and made up pre-spawning concentrations on Georges Bank slopes. Over Nantucket Shoals the proportion of young fish increased again. The absence of the latter in Div. 6A resulted probably from low water temperatures (5°-6°C) at depths above 100 m.

The highest observed density of hake biomass was recorded in Div. 5Zw and 6A,

while the lowest appeared to be on Georges Bank (Div. 5Ze) (Table 2). The highest percentage of hake biomass in the catches of all species was recorded in Div. 6A (Table 3).

Table 1. Mean body length (cm) of the six most numerous species from the various ICNAF zones (June 1971).

Species	ICNAF zones			
	4X	5Ze	5Zw	6A
Silver hake	24.5	28.2	26.0	29.7
Red hake	-	30.1	24.6	29.5
Yellowtail flounder	29.8	32.2	28.6	26.8
Mackerel	26.4	26.7	27.5	31.7
Spiny dogfish	67.5	55.8	33.5	43.8
Squids	14.2	16.9	15.6	16.0

Table 2. Average catch of the six most numerous species in the various ICNAF zones per 30 min. haul (June 1971).

Species	ICNAF zones			
	4X kg/pcs	5Ze kg/pcs	5Zw kg/pcs	6A kg/pcs
Silver hake	39.2 / 284.0	26.4 / 131.0	46.8 / 258.0	61.3 / 385.6
Red hake	0.1 / 0.2	6.8 / 24.9	60.6 / 431.0	40.1 / 191.0
Yellowtail flounder	0.4 / 0.7	2.1 / 6.4	15.4 / 56.5	22.8 / 109.1
Mackerel	54.0 / 17.2	74.0 / 301.0	40.3 / 163.7	33.9 / 109.8
Spiny dogfish	106.4 / 135.1	11.5 / 11.1	10.7 / 32.4	95.1 / 204.8
Squids	15.0 / 36.1	15.1 / 204.0	48.8 / 656.0	52.1 / 657.0

(b) Red hake

Distribution shown in Fig. 4 is characteristic of a transition period from spring to summer. Red hake was almost absent on the slopes of the Shelf, but could still be seen in large numbers along the 100-m isobath, and within the area of summer habitat over the Nantucket Shoals where bottom temperatures reached 7°-8°C (Fig. 2).

As to the size distribution, the larger mature specimens were observed mainly within Subdiv. 5Ze and Div. 6A, while the central part of the area was primarily occupied by young fish (Table 1) of the 1969-1970 year-classes.

The absence of young fish on Georges Bank(Div. 5Ze) was a typical feature of at least the recent five years, while the absence of the young red hake in Div. 6A was evidently due to the extremely low water temperature (as was the case with silver hake).

Red hake abundance in Subdiv. 5Zw appeared to be rather high. Compared to the other species, except *Alosa aestivalis*, red hake occupied the greatest percentage of the total biomass in June (Tables 2 and 3).

Table 3. Biomass percentage of different species in the catches (June 1971).

Species	ICNAF zones			
	4X	5Ze	5Zw	6A
Redfish	18.3	11.2	-	-
Silver hake	12.5	10.9	13.2	18.7
Red hake	+	2.8	17.3	8.3
Haddock	15.7	2.2	-	-
Cod	7.9	7.5	0.2	0.3
White hake	0.5	1.1	0.5	0.2
Yellowtail flounder	0.1	0.9	4.4	5.9
4-spotted flounder	-	0.1	0.2	0.4
Witch	0.1	0.2	0.6	0.3
Plaice	0.6	0.3	1.4	-
Winter flounder	-	0.2	-	0.5
Mackerel	1.7	30.6	11.3	8.8
Longhorn sculpine	-	0.6	1.4	0.3
American sculpine	+	0.2	0.1	-
Butterfish	-	1.6	1.4	6.5
Ocean pout	-	0.5	1.3	2.4
Atlantic herring	+	4.7	+	-
Alosa aestivalis	+	3.6	25.3	5.1
Alosa pseudoharengus	+	6.9	0.6	0.2
Shad	-	0.2	0.6	0.1
Argentina	2.6	1.1	-	-
Saithe	1.3	0.5	-	-
Tilefish	-	-	0.3	0.2
Spiny dogfish	33.6	4.8	3.0	24.2
Little skate	-	0.2	0.9	1.8
Big skate	-	0.2	-	0.1
Sting ray	0.2	0.2	-	-
Goosefish	0.1	0.4	2.1	2.3
Squids	4.8	6.3	13.9	13.4
Total	100.0	100.0	100.0	100.0
Total weight (kg)	7600	11980	5020	6362

(c) Yellowtail flounder

Yellowtail flounder was found over the whole area investigated (Fig. 5). The majority of yellowtail flounder kept to a depth range of 50 to 100 m. Unlike many other species, yellowtail flounder does not migrate seasonally and its distribution in June is generally characteristic of any other season.

Yellowtail flounder was represented primarily by mature specimens. The young fish are relatively numerous in Div. 6A only which influenced the mean size of the other species in the area (Table 1).

We believe that the small number of yellowtail flounder and other flatfish (Rikhter, Vinogradov, 1969) on Browns Bank (Div. 4X) can be explained by extremely rough bottom. According to the joint USSR-US survey data, the abundance of yellowtail flounder on Georges Bank (Subdiv. 5Ze) increases, nevertheless remaining at the lower level, as compared to the area of Cape Cod-Long Island (Div. 5Zw and 6A). The results of our survey agree completely with the above conclusion.

(d) Mackerel

The abundance of mackerel - a shoaling and pelagic species - is difficult to estimate from bottom trawl sampling. However, regular catches taken primarily during daylight hours provided information on mackerel distribution in the survey (Fig. 6). The largest catches were obtained in the area between Long Island and western extremity of Georges Bank at a depth of 50 to 100 m. There were no appreciable stocks of mackerel in Div. 4X.

It is evident from Table 1 that the size of mackerel increases markedly in a southwesterly direction. The reasons for this are not clear.

The biomass of mackerel was greatest in Subdiv. 5Ze and 5Zw (Tables 2 and 3) comprising 30% of the total biomass of all species in the former Subdivision.

(e) Spiny dogfish

The distribution of spiny dogfish in June was uneven (Fig. 7). This can be attributed to shoaling behaviour and ability to perform long-distance migrations, as well as to peculiarities in the thermal pattern of the water during the survey. The most dense concentrations were observed on Browns Bank (Div. 4X) where bottom temperatures reached 8°-9°C (Fig. 2). Spiny dogfish were less numerous on Georges Bank (Subdiv. 5Ze and 5Zw), but in Div. 6A large concentrations were recorded again. When comparing the data obtained to the characteristic spring distribution of spiny dogfish recorded by Grosslein et al. (1971), we can see that after March-April this species moved eastward having reached LaHave Bank (probably more eastward). Size distribution during the survey showed interesting features (Table 1). On Georges Bank (Div. 4X) the populations were mainly represented by large mature specimens which moved there from hibernation areas in Subarea 6. Georges Bank spiny dogfish (Subdiv. 5Ze) were smaller, and in the area southwest of Cape Cod (Div. 5Zw and 6A) the catches consisted almost entirely of young fish evidently not capable of moving great distances.

Biomass was at the maximum level in Div. 4X and 6A, namely, along the boundaries of the area under survey (Tables 2 and 3). Among other species taken in these Divisions, spiny dogfish were the most important by weight, suggesting the availability of large stocks of the species.

(f) Squids

Squids were represented in the catches by *Illex illecebrosus*, with the exception of the southern extremity of the area where individual specimens of *Loligo pealei* occurred. Frequency of occurrence of squids in the catches was very high all over the area, except in western Gulf of Maine and northwest Georges Bank where they were caught at two out of fourteen stations (Fig. 8). In Div. 4X and Subdiv. 5Ze the largest concentrations were observed on the slopes of LaHave, Browns and Georges Banks. In the western part of the area (Div. 5Zw and 6A) squids were also numerous over the Shelf. The smallest specimens occurred in Div. 4X (Table 1). In the remainder of the area, larger squids were taken.

Biomass density appeared to be highest in Subdiv. 5Zw and Div. 6A (Tables 2 and 3). Percentage of squids in these zones was also considerably high, compared to other species, and quantitatively they occupied first place.

Thus, in view of the above-mentioned it may be concluded that in the Northwest Atlantic relatively large stocks of squids, *Illex illecebrosus*, were available in 1971.

Conclusion

In the survey carried out on board the USSR R/V *Argus*, new data were obtained on the distribution of many commercial species of fish and squids in June which was considered to be a transitional period from spring to summer. Spring migrations had not been completed yet, and the distribution was at times surprisingly unusual.

Survey results again show high abundance of spiny dogfish and suggest the availability of a relatively large stock of squids, *Illex*. Over the whole area of investigations, silver hake appeared to be the most numerous of the commercial species, its biomass comprising a high percentage in all the ICNAF Divisions.

Summary

In June 1971 on board R/V *Argus*, a trawl survey was carried out covering the following ICNAF zones: 4X, 5Ze, 5Zw, and 6A. The abundance of all the species of fish caught was estimated.

Some unusual characteristics in the distribution of silver hake, red hake, spiny dogfish and squids, *Illex*, were found. Biomass percentage of all species agrees, in general, with the data available.

It may be concluded that relatively large stocks of spiny dogfish and squids, *Illex*, are present in the area investigated.

References

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RIKHTER, V.A., and V.I. VINOGRADOV. 1969. Results of a trawl survey carried out on the Scotian Shelf and Georges Bank in July-August 1968. *Annu. Meet. int. Comm. Northw. Atlant. Fish.*, Research Document No. 69/52, Serial No. 2199 (mimeographed).

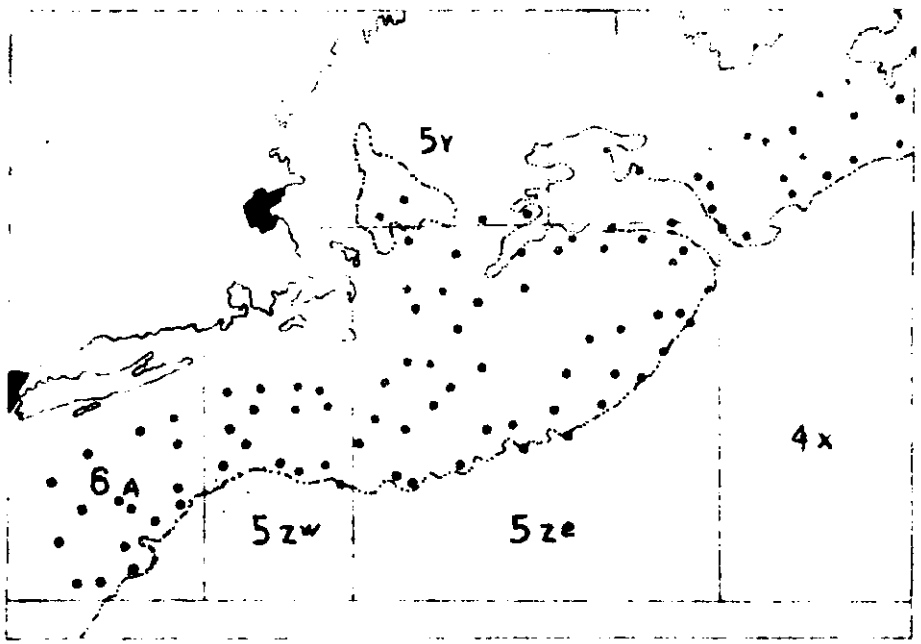

Fig. 1. Location of stations in the groundfish survey carried out in June 1971.

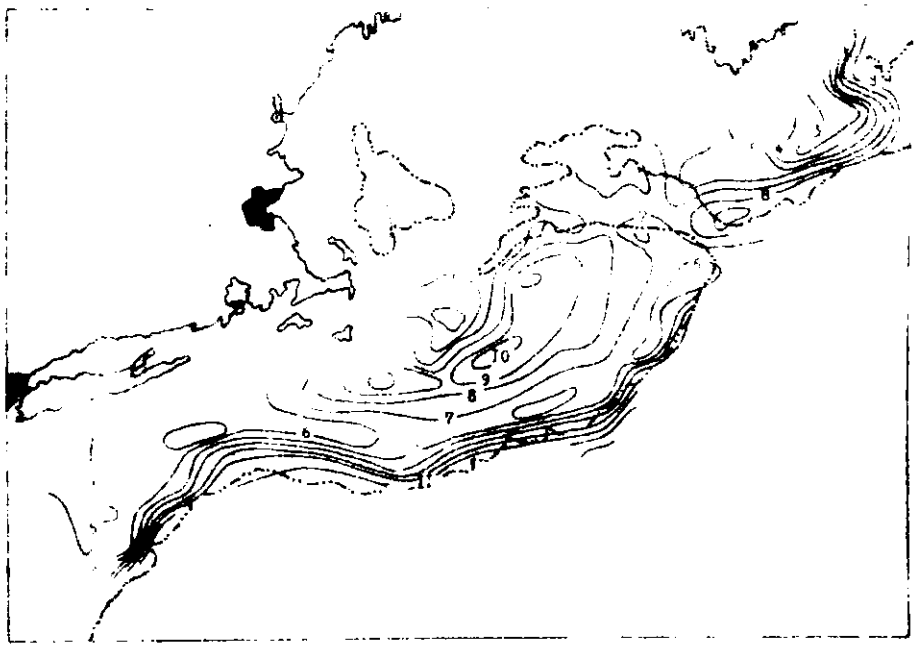

Fig. 2. Distributions of bottom temperatures in the area covered by the survey (5-30 June 1971).

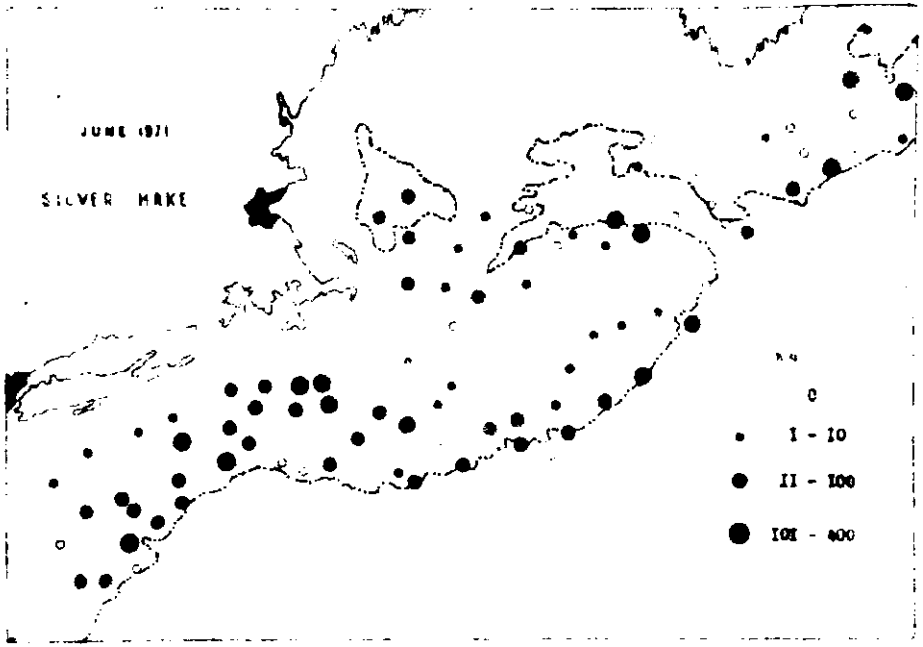

Fig. 3. Silver hake distribution in June 1971 according to survey data obtained by R/V *Argus*.

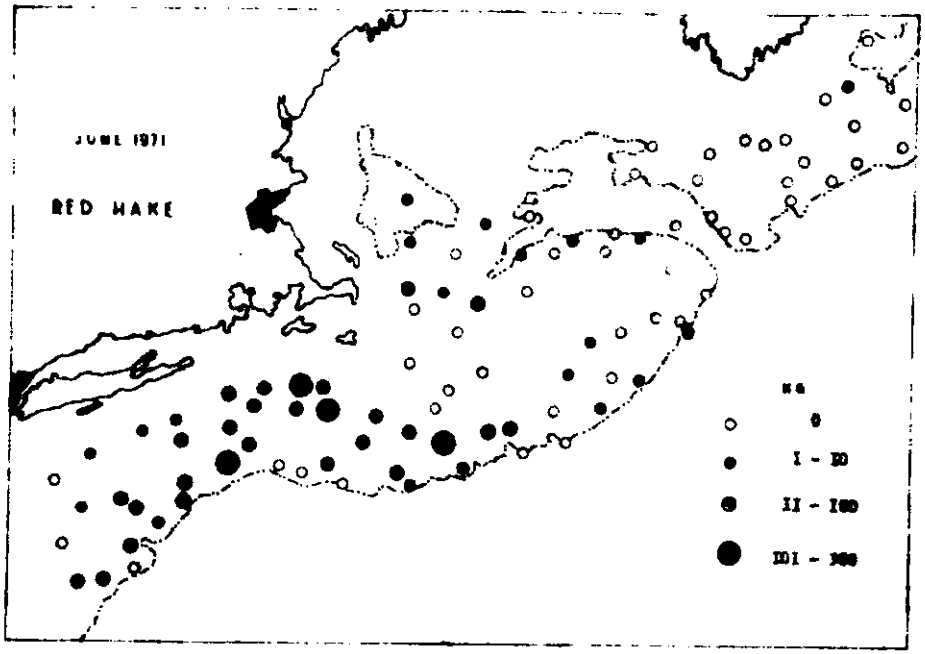

Fig. 4. Red hake distribution in June 1971 according to survey data obtained by R/V *Argus*.

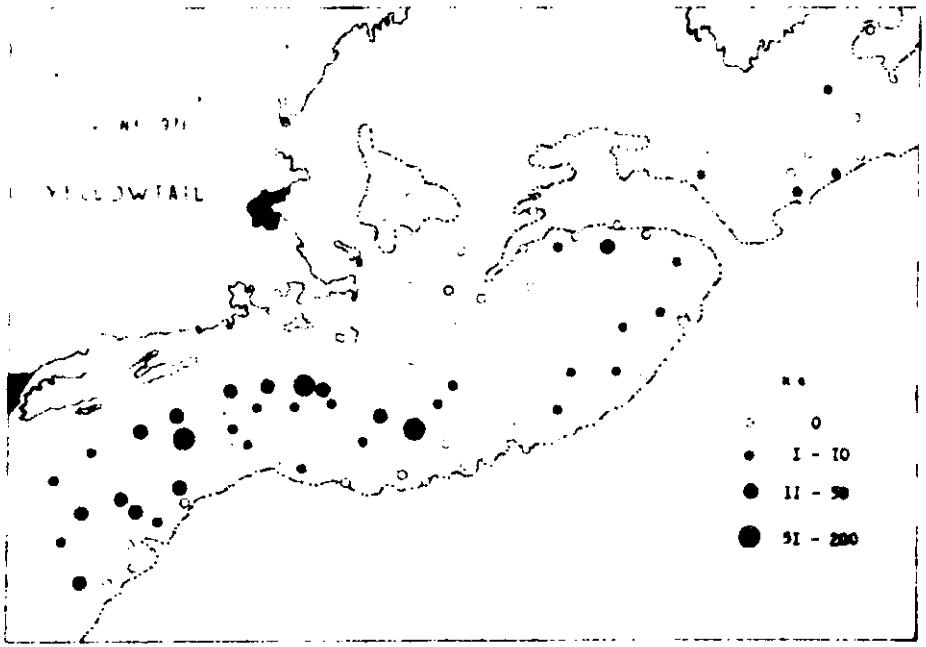

Fig. 5. Yellowtail flounder distribution in June 1971 according to survey data obtained by R/V *Argus*.

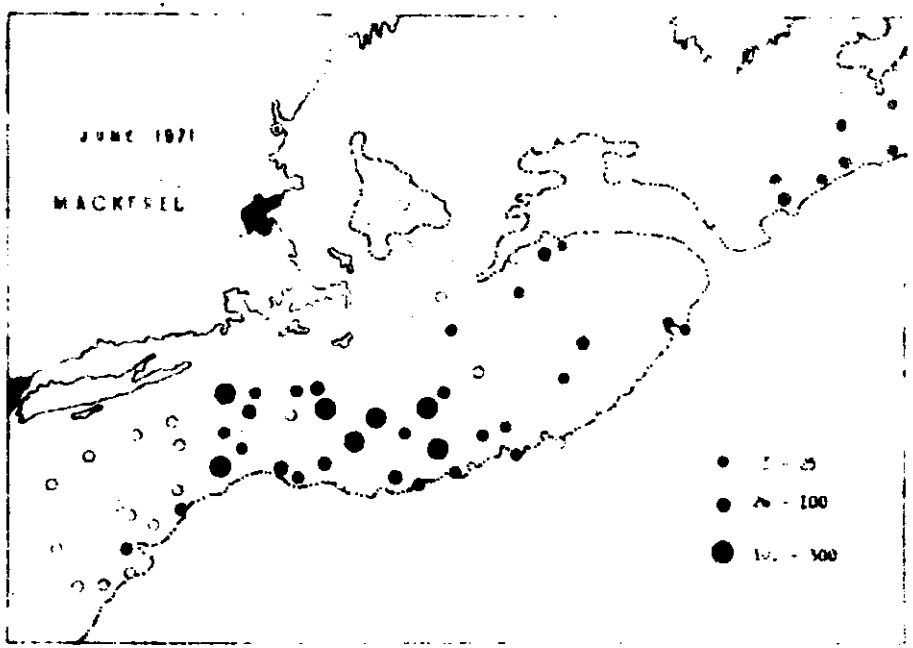

Fig. 6. Mackerel distribution in June 1971 according to survey data obtained by R/V *Argus*.

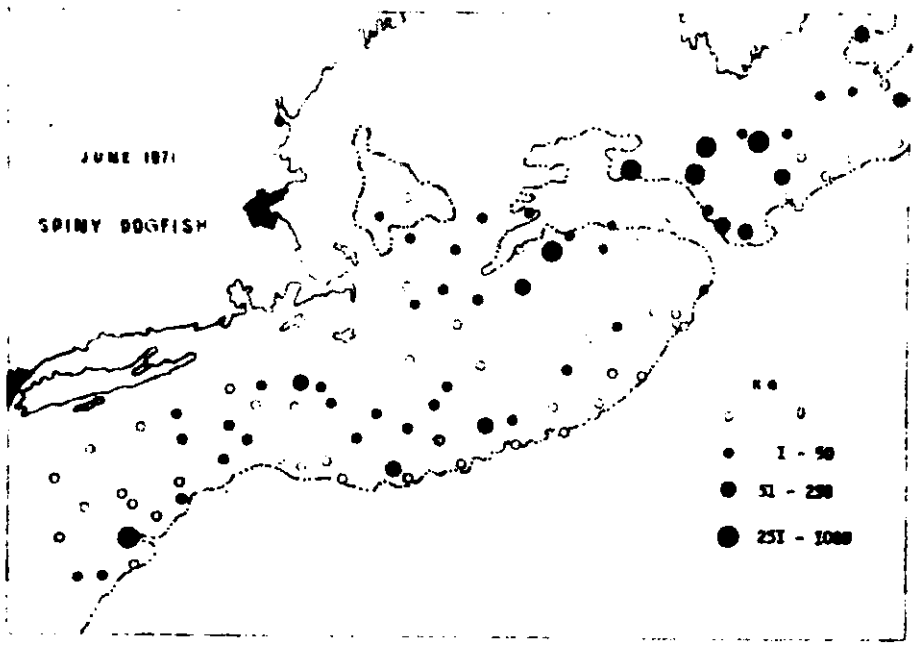

Fig. 7. Spiny dogfish distribution in June 1971 according to survey data obtained by R/V *Argus*.

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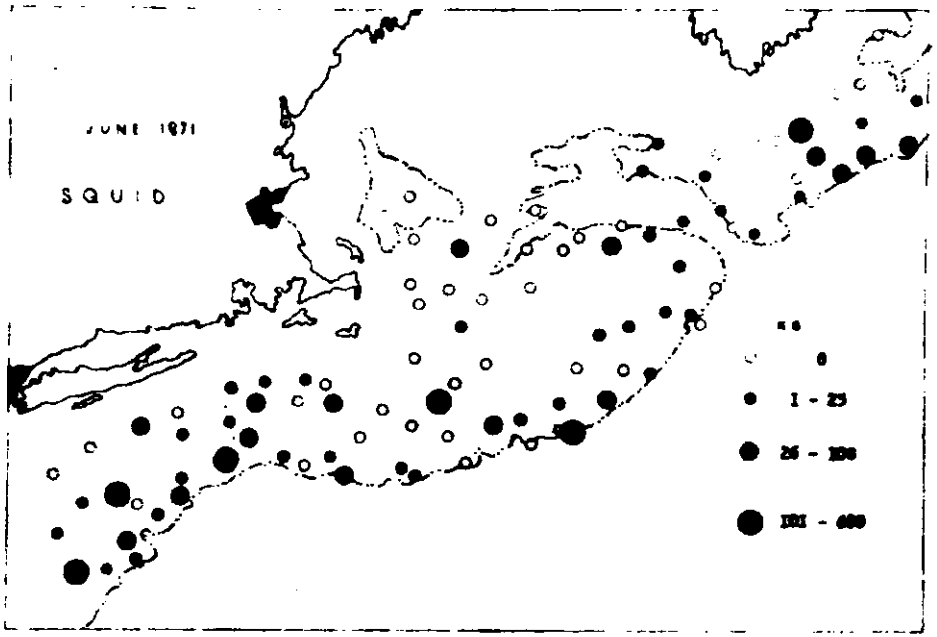

Fig. 8. Distribution of squids, *Illex*, in June 1971 according to survey data obtained by R/V *Argus*.