Review of the other flounder stocks (winter flounder, American plaice, witch flounder and windowpane flounder) off the Northeast United States, August 1978.

by

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Note: This report does not constitute a publication, and is for information only. All data herein are considered to be provisional.

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SUMMARY

The 1977 US and foreign commercial catch of winter, witch, and windowpane flounder and American plaice (referred to here as other flounder), totaled 24,534 MT (preliminary), a 45% increase over the 1976 total. This increase is due to moderate increases in winter and witch flounder catches and a 2-fold increase in American plaice catches. Catches of windowpane flounder decreased about 17% in 1977. The estimated recreational catches of winter flounders, based on the most recent angler surveys (1974) was 18,884 MT for the area from Maine to Virginia. No estimate of the recreational catch of the other three species was reported.

Relative abundance of each species of flounder from the 1977 US autumn bottom trawl survey, in the area from Cape Hatteras to Nova Scotia, appear to be at levels comparable to thos found in 1976. These indices are, however, generally lower than in prior years, since 1963.

US commercial catch per effort (from vessel trips where winter flounder made up at least 50% of the catch) in metric tons landed per day, for winter flounder was higher in 1977 than in 1976, for each vessel class-area combination, but was less than in earlier years (1970-1974). Catch per effort for American plaice and witch and windowpane flounder, however, have increased continually since the early 1970's. This rise reflects recent increases in interest in landing these species, where in the past they had been discarded. Decline of the winter flounder fishery, initiated alternative fishing patterns on yellowtail flounder in the 1930's, and subsequent declines in the yellowtail flounder fishery have resulted in greater exploitation of the other flounder stocks.

INTRODUCTION

This paper discusses the biology and distribution and presents commercial and research vessel data including: catches, catch per effort, stratified mean catches per tow in weight and number, length frequencies, mean length and size ranges and seasonal distributions for each of the flounder species considered (winter flounder, American plaice, witch, and windowpane flounder). A brief description of the four-spot flounder is also included. Each species is discussed separately to indicate the status of each major stock component of the other flounder fishery (all flounders except yellowtail and summer flounders).

Time series data presented in this paper include: research vessel survey data from 1963 to 1977; US and foreign commercial catch from 1965 to 1977; and US catch per effort data from 1965-1977. US catches have made up 89% of the total commercial catch of other flounders, during this time (1965-1977), while foreign catches have been taken incidental to their other fisheries.

Winter Flounder

Biology

Winter flounder are distributed in coastal waters from the lower Labrador shore southward to Georgia, and on offshore shoals such as Georges Bank and Nantucket Shoals (Bigelow and Schroeder 1953). To a large extent, however, this is a coastal species with most being caught from tidal waters to within a few miles from shore and to depths of 15 to 30 m. It is more common off New England than off the Middle Atlantic. In coastal areas the species prefers sandy-mud and weedy or grassy bottoms, while on Georges Bank it is found on tan to reddish-brown sands and gravels. These bottoms are reflected in the color and pigment patterns of winter flounder taken over them. On Georges Bank these fish occur primarily in depths of 27 to 55 m.

Migrations of winter flounder, determined from tagging, are not extensive (Perlmutter 1947). The fish appear to be broken up into local subpopulations that are relatively stationary. Those tagged on the south side of Cape Cod in 1964; for example, rarely were caught north of the Cape and vice versa (Howe and Coates 1975). However, there was some movement through the Cape Cod Canal of fish tagged near the canal entrance. Similarly, there was no appreciable movement from inshore grounds to Georges Bank or from Georges Bank inshore. The inshore fish show some seasonal movement, going from shallow to deeper, cooler water in late summer and moving to the shoals again in the fall. In winter the mature fish move into bays and estuaries for spawning, emerging from these areas in the spring.

The relative geographic isolation of winter flounder groups from area to area suggest that there is little interbreeding between groups. This is borne out by counts of finrays in 1964 in New England (Lux, Peterson and Hutton 1970). North of Cape Cod the fish had an average of 64 dorsal finrays; south of the Cape, 67; and on Georges Bank, 70 rays. Also, the growth of winter flounder is more rapid on Georges Bank than on inshore New England grounds (Lux 1973).

Winter flounder spawn from mid-winter to early spring at about the time water temperature is near the annual minimum. Estuaries are the principal spawning grounds in coastal waters. Individual females produce about 500,000 eggs, on the average, but large fish may have over 2,000,000. The eggs, deposited on the bottom, are non-buoyant, in contrast to the pelagic eggs of other common New England flatfishes. They remain attached to the bottom until hatching, which occurs in 15 days at a temperature of 4°C. The larvae, although they tend to remain close to the bottom, are planktonic. During this planktonic phase many of them gradually are flushed from the estuaries by tidal currents and are scattered in shallow coastal waters. Young flounder decend to the bottom at a length of about 12 to 15 mm. Nursery areas during the first few years are the shallow bays and estuaries, particularly where there is vegetation or other bottom cover. The fish gradually disperse to deeper water as they grow larger.

Spawning also occurs offshore on Georges Bank, where ripe, partly spent, and wholly spent winter flounder have been observed in research vessel catches coincident in time with spawning inshore. This, and evidence from tagging and

finray counts indicates that this stock is self-sustaining rather than being replenished through movement of fish from other areas. Nursery areas on Georges Bank are undefined, but it seems likely that the young fish, following their planktonic phase, seek the shelter of hard bottom. Young-of-the-year winter flounder are rarely caught by research vessels on Georges.

Temperature tolerance of winter flounder is great. They are found inshore year-round where the water ranges from -1°C in winter to 22°C in summer. Also, those found along the coast apparently are unaffected by marked changes in salinity, for they sometimes are cuaght in estuaries with only slightly brackish water.

Invertebrate animals are the principal foods eaten by winter flounder. In various studies sea worms, mollusks, and crustaceans were the main foods found in stomachs, in that order of abundance. Sea weed also was eaten in some seasons.

The principal species found in association with winter flounder, in fall survey catches, are spiny dogfish, little skate, winter skate, silver hake, red hake, cod, haddock, yellowtail flounder, and windowpane. These species may change somewhat with season.

Commercial Fishery

Winter flounder were of little economic importance until about 1910. The small market demand before then was satisfied by catches with traps or small beam trawls. Increasing demand led to the introduction of the European

otter trawl around 1915, and the yearly commercial catch rose to 7,000 MT and this species was the principal flounder landed. Catches continued to rise to about 23,000 MT in 1930. Since 1930 the commercial catch has dropped considerably and currently runs about 7,000 to 10,000 MT annually (Figure 1).

The reported commercial landings of winter flounder have been given separately from other flounders in US Fisheries Statistics since 1937, and in this period they have varied from about 6,000 MT to 14,000 MT (Figure 1). In general, about 85% or more of this catch has been landed at New England ports and the balance from the Middle Atlantic (New York, New Jersey, Delaware). Reported landings from Chesapeake states (Maryland and Virginia) have amounted to only a few tons per year.

The commercial catch is made mostly with otter trawls. Small vessels 30-50 ft long work inshore areas; vessels over 50 ft cover offshore grounds such as Nantucket Shoals and Georges Bank. Winter flounder are filleted for the market and usually are sold under the name "flounder." Sport fishing for this species is popular from Maine to Delaware Bay, and it is one of the most commonly occurring sport fish, due largely to its accessibility, from shore and small boats during many months of the year.

Winter flounder were for many years extensively propagated in Federal Government hatcheries at Woods Hole, Mass., and Boothbay Harbor, Maine, and the fry were released in New England coastal waters shortly after hatching. Over 3 billion eggs were hatched annually in the 1930's. This program was abandoned in the 1950's when it was decided that no significant increase in the stocks of catchable size flounder resulted from it.

The present US commercial fishery for winter flounder takes place primarily on Georges Bank, where 59% of the total catch, in 1976 and 1977, was taken. Gulf of Maine catches accounted for about 22% and Southern New England catches accounted for 13%, in each of those years. Based on catch and catch per effort data from US commercial vessels, the directed winter flounder fishery occurs during the spring and fall (April-May and October-November). Since 1965, US commercial catches have averaged 10,800 MT (Table 1), 89% of the total commercial catch. In addition, an estimated average of 16,325 MT of winter flounder is taken annually by US recreational fishermen (Deuel and Clark 1968; Deuel 1973).

US commercial catch per effort estimates (metric tons per days fished), are based on trips by otter trawl vessels, where 50% or greater of the catch was winter flounder. These values, by area and tonnage class, are presented in Table 2, for 1965-1977. There has been an overall decrease in catch per effort in all areas, since 1965. The most consistant catch per effort for all tonnage class vessels since 1965 has occurred on Georges Bank, with average catches per effort of the medium sized vessels generally higher than the other two classes. These, too, are below the earlier averages.

Research Vessel Catches

Estimates of relative abundances of winter flounder, based on data from USA bottom trawl surveys (Grosslein 1969) were made for the Middle Atlantic (strata 61-76), Southern New England (strata 1-12), Georges Bank (strata 13-25), the Gulf of Maine (strata 26-30, 36-40), and Nova Scotia (strata 31-35, 41-49) areas (Figure 2). The stratified mean catches per tow in pounds and number, from

spring and autumn surveys from 1963 to 1977 are presented in Table 3. Catches in the Gulf of Maine and Nova Scotia areas have always been relatively low, and while recent catches in the Middle Atlantic are also very low, in the late 1960's they were substantially greater. Stratified mean number caught per tow in the Southern New England and Georges Bank areas have averaged 4.88 (s^2=7.77) and 2.56 (s^2=1.64), respectively, during autumn surveys since 1963. Southern New England catches have been less than this mean since 1973, while since 1975 Georges Bank catches have exceeded the 15 year average. Recent spring survey catch in numbers per tow have been less than the 1968-1977 average since 1970 and 1975 in Southern New England (2.05) and Georges Bank (3.68), respectively.

Length frequency samples of winter flounder from each tow, during each survey since 1963 have been summarized in Table 4, by area. The mean length from Southern New England samples have consistently been around 28.7 cm (s^2=2.60) (ranging from about 12-50) though in recent years (since 1975) spring length samples from this area have had smaller means. Mean lengths from Georges Bank samples averaged 38.9 cm in the autumn, and 40.1 cm in spring (with total lengths ranging from about 10 to 65 cm), from 1963 to 1977, but have not reached this level since 1970 and 1975, respectively. However, Georges Bank winter flounder still have significantly larger mean lengths than those from Southern New England.

Prerecruit indices (stratified mean number per tow of individuals of less than recruited size 27 cm, Table 5) have been calculated for winter flounder in each of the five areas, in both spring and autumn. These indices are based

on review of winter flounder length frequencies from commercial catches (1975-1977, Figure 3) which indicate that winter flounder are recruited to the fishery at about 27 cm. From age and growth analysis (Lux 1973) this length corresponds to age 2+ individuals so it is assumed that by age 3 winter flounder are fully recruited to the fishery. These prerecruit indices may possibly be related to catches in later years, but such a relationship has not yet been established.

Seasonal distributions of winter flounders are illustrated in Figure 4 (a-c). These are plots of stations where winter flounder were taken, during the 1977 spring, summer, and autumn US bottom trawl surveys.

American Plaice

Biology

This arctic-boreal species is found in North American shelf waters from Labrador to south of Cape Cod, with waters offshore from New York being about the southern limit of its distribution (Bigelow and Schroeder 1953). (It also occurs off Greenland, Iceland, and northern Europe.) Off the US it is not common in waters shallower than 25 to 35 m and most are caught in greater depths (90 to 180 m). The US catch, taken almost entirely with otter trawls, comes from the Gulf of Maine, Georges Bank, and Nova Scotian banks. This is an important species in the Canadian catch, and it is more abundant there than off the US.

The American plaice is a common fish in the deeper waters north of Cape Cod, however, because of its rather slow growth rate, many of those caught are too small for the market. Slower growth rates of plaice from Canadian waters

suggest that the New England fish are of a separate group (Lux 1970). No tagging or racial studies have been done off the US, but tagging studies on the Grand Bank by Pitt (1969) indicate that this is a rather sedentary fish, since most tagged fish were recaught less than 30 miles from the tagging site.

In New England, plaice spawn in the spring, usually in March through May, when the bottom temperature is about 3^{o} to 6^{o}C. The eggs and larvae are pelagic. The young plaice settle out of the plankton in late summer and seek the shelter of the bottom. The Massachusetts Bay region appears to be an important nursery area for the young, although they are found in other Gulf of Maine areas as well.

The principal food of plaice caught in US research surveys consisted of sand dollars and other echinoderms, 67%; hermit crabs, shrimp, and other crustaceans, 16%; and small clams and other mollusks, 7% (Maurer and Bowman 1975). Species frequently found in association with plaice are thorny skate, cod, haddock, pollock, silver hake, white hake, red hake, redfish, and witch flounder.

Commercial Fishery

The USA commercial fishery for American plaice occurs primarily in the Gulf of Maine, where 72% of the catch in 1976 and 79% in 1977, was taken. Most of the remainder of the US catch is taken on Georges Bank, with less than 1% taken in all the other areas (Nova Scotia, Southern New England, and the Middle Atlantic). This fishery proceeds throughout the year, with March-

June as the peak season. US catches averaged 3,066 MT per year from 1965 to 1977 representing 85% of the total American plaice catch (Table 6). The 1977 US catch of 7,069 MT was 2.3 times this 13 year average, possibly reflecting greater demand for this species as a result of decrease abundance and stricter regulation of yellowtail flounder.

US commercial catch per effort (CPE) estimates (Table 7) were calculated as for winter flounder for 1973-1977 (prior to 1973, most American plaice were discarded or used for bait in other fisheries, and consequently landings rarely exceeded 50% of the total catch per trip). CPE has increased constantly during this time period, again probably reflecting an increased interest in this species as a substitute for yellowtail flounder.

Percent length composition of American plaice from the Gulf of Maine and Georges Bank, by month (1975-1977) is presented in Figure 5.

Research Vessel Catches

Estimates of relative abundances of American plaice were calculated as for winter flounder (Table 8). As with commercial catches, the greatest numbers of this species were taken in the Gulf of Maine and on Georges Bank, but good catches were also taken in the Nova Scotian area, beyond the US fishermen's usual range. Catch in numbers from 1968-1977 autumn surveys were greater, on the average, than those of spring, but this difference was not significant. The Gulf of Maine spring and autumn indices had been increasing since 1973 and were greater in 1977 than in any year since 1966, indicating

a possible increase in abundance of this stock. Comparison of mean lengths and size ranges (Table 9) for American plaice by year, season, and area, show that mean lengths of Georges Bank and Gulf of Maine survey catches averaged 29 cm in both spring and fall, while individuals from Nova Scotia averaged 27 cm.

Seasonal distributions of American plaice are presented in Figure 6, from US 1977 spring, summer, and autumn bottom trawl surveys.

Witch Flounder

Biology

This boreal species, like the American plaice, is found on both sides of the Atlantic. Off North America it is distributed from Newfoundland to Cape Hatteras, with few fish occurring south of New Jersey (Bigelow and Schroeder 1953). It is a fish of moderately deep water (few fish are taken shoaler than 25 to 35 m and most are caught in greater depths of 90 to 275 m). Small catches sometimes are made in waters as deep as 1300 m. It occurs in water of about 2^{o} to 4^{o}C in winter and 7^{o} to 9^{o} C in summer.

Witch flounder are relatively stationary fish, they are found in the same locations and depths year round. However, tagging studies to define movements have not yet been done off the New England coast. The growth rate apparently is slow, for Powles and Kennedy (1967) found that 60 cm fish on the Scotian Shelf were 18 to 20 years old. The growth rate off US may be similar, although it is probably faster, based on the comparative growth rates of other flounder.

Like other small-mouthed flounders, the witch feeds primarily on invertebrates. Its diet, based on stomach contents examined aboard US research vessels, consists of polychaete worms, 72%; echinoderms, 10%; amphipods and other

crustaceans, 5%; and squid, 3% (Maurer and Bowman 1975). Fish were seldom found in stomachs.

This species spawns in late spring and summer in the Gulf of Maine and at water temperatures of 4° to about 9°C (Bigelow and Schroeder 1953). The eggs, larvae, and post-larvae are pelagic. Metamorphosis to juvenile stage is complete at a length of about 6 cm, and they then decend to the bottom. This probably takes place in the fall. Since not many juveniles are taken in trawls, nursery grounds are not defined. It is possible that they seek the cover of rocky bottoms, where trawling is impractical. Based on US research survey data, species of fish commonly found in some abundance with witch flounder are thorny skate, cod, haddock, silver hake, pollock, white hake, redfish, and American plaice.

Commercial Fishery

The US commercial fishery for witch flounder is conducted with otter trawls in the Gulf of Maine and Georges Bank. Massachusetts Bay and the slopes of the Great South Channel that grade into the Gulf of Maine are some of the most productive grounds. In the past, occasional catches have been made on Nova Scotian shelf banks, where there is a directed fishery for witch flounder by Canadian fishermen.

The reported US commercial catch of witch flounder in 1937-1977 has ranged from a low of 1,196 MT in 1961 to a high of 5,000 MT in 1937 (Figure 2). Catches of witch flounders are reported throughout the year by US fishermen, with peak catches made between March and June. In 1976 and 1977, 55% and 70% of the catch, respectively, was taken in the Gulf of Maine, with

42 and 28% taken on Georges Bank in those years. Less than 2% is taken from the area further to the south or north. From 1965 to 1977 US catches (Table 10) averaged 2,569 MT per year, 77% of the total commercial catch during that time. The USSR is the only other country which has reported significant catches of this species, averaging 21% of the catch in the 13 years from 1965-1977 and totaling 2,837 MT (47%) in 1971.

As in the case of American plaice, there is, generally speaking, no directed US fishery for witch; they usually are caught in the course of effort for other species or for a mixture of species. Therefore, catch per effort values from the US commercial fishery are not used for witch flounder, since they are based in relatively few trips and fluctuations cannot be assumed to represent changes in abundance. Length frequencies, in percents by year, month, and area from US commercial samples are presented in Figure 7.

Research Vessel Catches

Indices of relative abundance of witch flounder from USA spring and autumn bottom trawl surveys (Table 11) show the greatest concentrations to be in the Gulf of Maine. As with the commercial catches there are also significant amounts in the Nova Scotian area. The autumn abundance index (mean number per tow) from the Gulf of Maine averaged 4.21 from 1963-1977 and while the 1977 value (5.32) was significantly greater than this average and was the highest since 1969, the spring 1977 value (4.50) was well below the 1968-1977 spring mean (6.49).

Summaries of mean length and size ranges of witch flounder (Table 12) indicate fairly uniform length modes throughout the sampling area, though size

ranges vary greatly from area to area and from year to year. Gulf of Maine samples average 42.5 cm in the autumn (1963-1977) and 43.3 cm in the spring (1968-1977).

Seasonal distributions of witch flounder, from plots of 1977 spring, summer, and autumn survey catches are given in Figure 8.

Windowpane Flounder

Biology

The windowpane is distributed in coastal waters from the Gulf of St. Lawrence to South Carolina; it is found on sandbottoms from the shoreline out to about 45 m off Southern New England and to depths of 45 to 75 m on Georges Bank (Bigelow and Schroeder 1953). It occurs in greatest numbers south of Cape Cod and on Georges Bank and relatively few are found in the Gulf of Maine. It is a common fish in Southern New England waters, though it is not found in great concentrations there.

Tagging studies of windowpane off Southern New England by Moore (1947) indicate that this species is relatively sedentary in habits. However, research survey catch data show it to be in somewhat deeper water in the coldest months where the bottom water is warmer than inshore. Thus it appears that it makes at least a short annual inshore-offshore migration.

This species spawns in spring and early summer, and the eggs, larvae, and post-larvae are pelagic (Bigelow and Schroeder 1953). Metamorphosis to the adult form is complete in late summer at a length of about 10 mm, and the juvenile fish then move to the bottom. Nursery areas during the first

year or two of bottom life remain undefined, but it is likely that the rocky areas of coastal waters are of importance in this respect. The fish reach maturity during their third or fourth year (Moore 1947). It is assumed, based on sex compositions (mostly female) of US commercial catches that females grow faster and larger than males, and that few males grow to marketable size.

Studies of food habits of windowpane indicate that they eat invertebrates and some small fishes (Bigelow and Shcroeder 1953). Stomach contents examined during US research vessel surveys contained crustaceans, 90%; echinoderms, 6%; and animal remains, 3% (Maurer and Bowman 1975).

Species found in association with windowpane in fall research vessel survey catches are spiny dogfish, little skate, silver hake, red hake, scup, butterfish, northern searobin, yellowtail, winter flounder, and longfin squid.

Commercial Fishery

The commercial fishery for this small, thin bodied flounder began because of the food shortage during World War II. Most of the fish were landed by Connecticut and New York vessels; New York landings reached about 160 MT in 1944 and 1945, but after the war demand dropped and the fishery stopped (Moore 1947). Fishermen again began landing windowpane in 1975, mostly at New Bedford and possibly due, in part, to regulations imposed on the declining yellowtail fishery. Total New Engalnd landings in 1975, 1976, and 1977 were 1,980 MT, 2,083 MT, and 1,744 MT, respectively. Much of this catch came from Georges Bank, where the largest individuals of this species are found.

The catch of windowpane varies with season, and most fish in New Bedford are landed from December to June. Fishermen indicate that they are scarce in the summer months, and it is likely that movements at that time break up the concentrations.

In addition to these above landings of windowpane for human food, there have been in many years since the late 1940's some commercial landings for reduction to fish meal, as part of the New England mixed species industrial fishery. Industrial landings of this species in the 1950's may have been as high as about 500 MT per year or so, judging from data given by Edwards and Lawday (1960).

As with witch flounder, commercial catch per effort values do not provide information on relative abundance, especially since this data is only available since 1975.

US commercial length frequencies are available since 1975 (Figure 9) for the Georges Bank and Southern New England areas.

Research Vessel Catches

Relative abundance indices of windowpane flounder, in numbers per tow (Table 13) from the Gulf of Maine are significantly higher since 1972 than in earlier years (1963-1971), averaging 19.92 individuals in autumn and 15.43 in spring (since 1972) versus 3.70 and 0.38, respectively, prior to 1972. This apparent increase in abundance may be partly responsible for the development of the windowpane flounder fishery in 1975.

The mean length of windowpane flounder autumn survey catches in the Gulf of Maine ranged from 20 to 27 cm from 1968 to 1970 (Table 14), but in 1971

the average size of individuals taken dropped to 19, then to 13 cm in 1972. This represents a decrease in mean age of individuals from about 4-5 years to 3 and then to 2 years (Moore 1947). In 1974 and 1975 the mean length dropped to about 9 cm corresponding to great increases in 1 and 2 year olds.

Figure 10 illustrates seasonal distribution patterns of windowpane flounder during spring, summer, and autumn 1977, in numbers of individuals per tow from US bottom trawl surveys.

Fourspot Flounder

Biology

Fourspot are distributed from Georges Bank to South Carolina, with greatest abundance being found from Southern New England to Delaware Bay (Bigelow and Schroeder 1953). US research survey catches indicate that this fish moves to deeper, warmer water (to a depth of about 180 m) in the coldest months and to shoal water, in warmer seasons. Survey catches of fourspot are common offshore, from Chesapeake Bay to southwest Georges Bank, and are only occasionally taken in Gulf of Maine and western Nova Scotia waters. South of Cape Cod they are found in the shallow strata (27-110 m) in the summer and in the deeper strata (56-185 m) in the winter (Figure 1).

Fourspot spawn in late spring to mid-summer; eggs, larvae, and post-larvae are pelagic; the newly metamorphosed young take to the bottom by fall,

when they are about three months old (Bigelow and Schroeder 1953). Small individuals seem to be mixed in with the larger fish in catches and so the nursery grounds for juveniles probably are about the same as adult grounds.

This flounder does not grow to a large size, adults average about 30 cm in length and the maximum length is about 40 cm. A 40 cm fourspot weighs just over a pound. While this is a fairly common flounder, it is generally not found in great concentrations.

The diet of fourspot, based on stomachs examined from US research vessel catches, consists of crustaceans (particularly shrimp and crabs), 32%; fish, 32%; and mollusks (mostly squid), 21% (Maurer and Bowman 1975). This species is found in association with silver hake, squid, and yellowtail flounder.

Commercial Fishery

The fourspot flounder is not commercially landed in US, though some catches are included in the mixed industrial catch used for reduction to fish meal. Fourspot landings from this source were about 500 MT in New England in 1958 (Edwards and Lawday 1960). Also, though foreign fisheries have taken considerable quantities of fourspot, no accurate estimates of the amount are available. There is no recreational fishery of significance since this flounder does not come into the shallow coastal waters.

Nominal catches of other, non-specified flounders are summarized in Table 15 for the years 1965-1977. These include such species as fourspot flounder, which have not been reported by species, they also include windowpane prior to 1975, and probably include some catch of all the flounder discussed in this paper that are not identified to species in reported catch.

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Table 1. Nominal catch of winter flounder from Middle Atlantic-Gulf of Maine, by country and year, 1965-1977.

Year	Can	Spa	USSR	USA	Total
1965	202	-	312	11164	11678
1966	164	-	156	16637	16957
1967	89	-	349	14117	14555
1968	59	-	1155	10694	11908
1969	115	-	6853	12475	19443
1970	64	-	470	13092	13626
1971	65	-	2060	11841	13966
1972	8	-	2531	8458	10997
1973	14	-	1519	8909	10442
1974	12	-	203	7565	7780
1975	13	-	564	8135	8712
1976	14	4	1	6742	6761
1977	-	-	11	10582	10593

Table 2. Annual catch per effort (metric tons per days fished) for winter flounder, 1965-1977, by area and vessel ton class[1] (otter trawls only).

Area	Gulf of Maine			Georges Bank			Southern New England		
Ton class	Small	medium	large	small	medium	large	small	medium	large
Year									
1965	1.451	2.164		3.252	2.930	5.207			
1966	1.706	2.522	0	2.876	2.617	3.003			
1967	2.436	2.926	0	2.685	2.159	2.309			
1968	2.767	3.048	0	3.157	2.200	2.672	2.681	3.030	2.903
1969	2.989	3.883	0	3.597	3.025	2.168	3.025	4.577	0
1970	2.472	4.073	0	3.343	2.835	2.458	3.207	4.323	0
1971	2.994	1.828	0	3.370	2.458	2.268	2.758	3.044	2.268
1972	2.481	2.327	1.161	2.762	2.109	1.125	2.558	2.694	0
1973	1.615	2.454	0	2.590	1.873	2.223	2.390	3.057	5.316
1974	1.560	2.245	0	2.268	2.018	2.722	1.787	.526	0
1975	1.451	1.674	2.359	1.601	2.118	2.903	1.306	2.173	0
1976	1.610	1.973	0	1.669	1.982	2.037	.984	1.683	4.822
1977	1.728	1.896	0	1.969	2.300	3.470	1.488	1.955	0

[1] Vessel ton classes

Small - 0-49 tons
Medium - 50-99 tons
Large - 100 tons and greater

Table 3a. Stratified mean catch per tow of winter flounder in numbers and weight (lbs) from US autumn bottom trawl surveys, 1963-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1963	-	-	5.97	5.22	1.34	4.78	0.40	0.37	1.00	1.84
1964	-	-	9.14	6.89	1.71	5.53	0.09	0.15	1.89	3.50
1965	-	-	10.76	6.87	1.97	4.96	0.74	1.97	0.98	1.66
1966	-	-	6.64	4.60	3.70	9.53	0.20	0.26	1.49	2.01
1967	5.34	3.81	5.05	3.27	1.30	3.46	0.04	0.09	0.64	0.64
1968	4.78	2.79	4.09	2.18	1.69	3.70	0.20	0.51	0.38	0.98
1969	1.65	1.36	5.33	2.93	2.13	4.41	0.35	0.47	0.12	0.39
1970	0.33	0.13	4.90	5.21	4.88	12.33	0.22	0.56	0.83	1.74
1971	0.84	0.37	3.08	2.15	1.32	2.59	0.20	0.22	1.09	2.35
1972	0.44	0.26	7.57	6.56	2.19	4.06	0.56	0.52	0.96	1.98
1973	0.74	0.29	2.03	1.22	2.18	4.23	0.20	0.27	0.69	0.96
1974	0.00	0.00	1.47	0.95	1.97	3.88	0.98	1.12	0.90	1.57
1975	0.36	0.12	2.14	1.57	2.59	3.38	0.03	0.05	0.36	0.61
1976	0.16	0.08	1.50	1.59	4.85	7.72	0.25	0.41	-	-
1977	0.34	0.15	3.58	2.72	4.52	7.97	1.22	1.24	0.63	0.37

Table 3 b. Stratified mean catch per tow of winter flounder in numbers and weight (lbs) from US spring bottom trawl surveys, 1968-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1968	.73	1.20	.98	1.48	4.79	1.83	.84	.42	.28	.11
1969	.24	.61	6.93	4.66	7.46	2.79	.65	.42	.42	.13
1970	.51	.47	2.70	2.44	3.61	1.28	.84	.38	.06	.03
1971	.11	.20	1.37	1.78	3.48	1.34	.52	.29	.14	.08
1972	0.14	0.11	1.77	1.34	3.19	7.78	0.72	1.04	0.90	1.83
1973	0.15	0.08	1.74	2.76	1.89	5.09	0.25	0.27	0.04	0.04
1974	0.24	0.14	0.98	1.82	4.47	9.30	0.35	0.37	0.16	0.20
1975	0.00	0.00	0.92	0.68	1.32	2.13	0.03	0.03	0.07	0.15
1976	0.05	0.03	1.51	.99	3.18	4.69	.35	.57	.12	.57
1977	.28	.10	1.60	1.10	3.45	4.25	.80	1.02	.18	.25

Table 4a. Mean length and size range (in cm) of winter flounder, from US autumn bottom trawl surveys, by area and year, 1963-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1963	-	-	30.9	20.5-44.5	48.1	22.5-66.5	32.0	24.5-54.5	38.7	26.5-62.5
1964	-	-	28.7	18.5-52.5	46.2	16.5-60.5	34.2	20.5-50.5	40.3	26.5-50.5
1965	-	-	27.6	18.5-44.5	41.8	18.5-70.5	44.2	16.5-62.5	38.4	20.5-52.5
1966	-	-	28.0	14.5-42.5	40.5	14.5-62.5	33.8	16.5-56.5	34.2	22.5-52.5
1967	27.9	16.5-38.5	28.6	16.5-42.5	42.0	24.5-62.5	32.0	24.5-34.5	33.4	16.5-46.5
1968	26.5	16.5-40.5	27.1	18.5-42.5	39.5	16.5-60.5	42.0	24.5-48.5	42.3	24.5-52.5
1969	29.9	20.5-42.5	27.2	18.5-44.5	37.7	18.5-62.5	35.7	22.5-50.5	41.1	26.5-50.5
1970	27.0	12.5-38.5	31.9	12.5-56.5	41.1	4.5-70.5	39.8	14.5-52.5	38.6	22.5-50.5
1971	24.8	18.5-34.5	27.9	14.5-52.5	37.2	20.5-58.5	32.6	16.5-46.5	38.3	22.5-54.5
1972	29.5	20.5-40.5	31.2	16.5-46.5	36.5	6.5-60.5	30.8	18.5-46.5	38.8	22.5-56.5
1973	24.5	18.5-30.5	27.0	16.5-36.5	38.6	18.5-58.5	34.0	28.5-42.5	36.3	26.5-48.5
1974	-	-	27.5	14.5-40.5	38.4	6.5-60.5	33.0	20.5-58.5	37.8	18.5-54.5
1975	23.3	20.5-26.5	28.2	14.5-40.5	24.9	4.5-62.5	36.8	24.5-46.5	36.3	18.5-54.5
1976	26.0	22.5-32.5	30.5	24.5-50.5	35.6	10.5-56.5	37.8	26.5-52.5	34.5	28.5-56.5
1977	23.7	20.5-34.5	28.3	20.5-44.5	36.2	6.5-58.5	30.9	20.5-46.5	36.1	22.5-50.5

Table 4 b. Mean length and size range (in cm) of winter flounder from US spring bottom trawl surveys, by area and year, 1968-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1968	25.6	14.5-40.5	26.8	14.5-50.5	43.7	14.5-64.5	38.4	26.5-56.5	40.7	26.5-50.5
1969	24.0	10.5-42.5	35.1	18.5-54.5	43.8	26.5-64.5	35.7	18.5-46.5	39.9	26.5-52.5
1970	31.5	12.5-38.5	28.9	10.5-52.5	42.2	12.5-56.5	36.8	16.5-56.5	41.6	20.5-52.5
1971	27.9	16.5-36.5	29.5	12.5-50.5	42.4	10.5-64.5	37.0	22.5-48.5	37.1	18.5-52.5
1972	29.3	24.5-34.5	29.6	14.5-46.5	41.2	8.5-64.5	34.3	16.5-50.5	39.3	22.5-54.5
1973	26.8	18.5-34.5	27.7	10.5-50.5	44.1	4.5-62.5	32.6	20.5-48.5	37.5	26.5-52.5
1974	27.1	22.5-30.5	28.4	18.5-38.5	41.2	18.5-60.5	32.9	18.5-46.5	35.6	20.5-50.5
1975	-	-	27.7	12.5-44.5	34.7	4.5-58.5	25.9	6.5-48.5	41.3	38.5-48.5
1976	24.0	16.5-32.5	27.1	12.5-42.5	33.4	12.5-60.5	37.1	14.5-50.5	38.7	18.5-60.5
1977	20.4	14.5-30.5	25.8	10.5-50.5	33.8	12.5-56.5	33.9	10.5-50.5	35.3	18.5-50.5

Table 5a. Winter flounder prerecruit indices, stratified mean number per tow from US autumn bottom trawl surveys, 1963-1977, for individuals 27 cm and less.

Year	Mid. Atl.	So. New Eng.	Georges	Gulf Maine	N.S.
1963		1.330	.024	.081	.042
1964		3.740	.008	.036	.034
1965		5.732	.055	.031	.020
1966		3.214	.622	.072	.442
1967	2.172	1.868	.045	.007	.162
1968	2.807	2.389	.196	.009	.020
1969	.590	3.165	.360	.024	.027
1970	.097	1.639	.259	.036	.174
1971	.735	1.517	.227	.049	.094
1972	.111	1.551	.272	.214	.108
1973	.567	1.138	.136	.000	.027
1974		.745	.093	.181	.052
1975	.363	.824	1.388	.007	.040
1976	.115	.365	.367	.009	.000
1977	.296	1.758	.547	.396	.214

Table 5b. Winter flounder prerecruit indices, stratified mean number per tow of individuals less than 27 cm, from US spring bottom trawl surveys, 1968-1977.

Year	Mid. Atl.	So. New Eng.	Georges	Gulf Maine	N.S.
1968		1.114	.066	.039	
1969		.968	.016	.037	
1970		1.419	.124	.048	
1971		.703	.096	.049	
1972		.688	.271	.143	
1973		1.419	.042	.066	
1974		.726	.132	.004	
1975		.369	.501	.016	
1976	.024	.645	1.078	.037	.120
1977	.216				

Table 6. Nominal catch of American plaice, Middle Atlantic-Gulf of Maine by year and country.

Year	Can	Fra	GDR	Jap	Pol	Rom	USSR	UK	USA	Total
1965	180	-	-	-	-	-	112	-	3343	3635
1966	244	-	-	-	-	-	279	1	3343	3867
1967	209	-	-	-	10	-	1018	-	3236	4473
1968	178	2	5	-	-	-	338	-	3254	3777
1969	78	-	-	-	17	-	412	-	3432	3939
1970	92	-	10	-	-	688	945	-	2594	4329
1971	43	-	-	2	1	501	340	-	2176	3063
1972	22	-	-	-	2	-	439	-	1795	2258
1973	38	-	-	-	-	-	447	-	1603	2088
1974	29	-	-	-	-	-	35	2	2076	2142
1975	25	-	-	-	-	-	182	-	2427	2634
1976	38	-	-	-	-	-	3	-	3511	3552
1977[1]	-	-	-	-	-	-	48	-	7069	7117

[1]1977 catches are preliminary.

Table 7. Annual catch per effort (metric tons per day fished) for American plaice, 1973-1977, by area and vessel ton class (otter trawls only).

AREA		Gulf of Maine		Georges Bank	
VESSEL CLASS		Small	Medium	Small	Medium
	1973	.617	2.762	0	1.538
	1974	1.061	.667	0	1.524
	1975	1.261	2.812	1.492	1.311
	1976	1.089	2.386	2.753	1.225
	1977	2.422	2.921	3.810	1.674

Table 8a. Stratified mean catch per tow of American plaice, in numbers and weight (lbs), from US autumn bottom trawl surveys, 1963-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1963	0.06	0.03	3.91	4.54	20.56	18.17	7.46	4.65
1964	0.00	0.00	3.48	2.64	11.20	8.64	4.87	4.46
1965	1.44	0.10	1.92	0.71	18.19	13.11	21.21	7.54
1966	5.05	1.73	7.78	4.22	24.00	14.89	16.19	9.77
1967	0.47	0.29	2.76	1.69	16.24	8.55	10.76	4.45
1968	1.92	1.05	1.32	0.67	13.15	9.96	4.29	2.66
1969	0.21	0.08	2.33	1.67	10.73	7.49	6.25	4.21
1970	0.27	0.13	2.14	1.58	9.15	6.19	6.97	3.16
1971	0.08	0.04	2.17	1.40	10.76	6.13	4.67	2.61
1972	0.08	0.04	0.79	1.05	11.59	5.04	4.63	2.79
1973	0.00	0.00	2.92	1.27	8.22	6.13	12.24	5.85
1974	-	-	0.57	0.44	10.83	4.79	6.62	4.56
1975	-	-	1.99	1.18	11.94	7.95	9.22	3.82
1976	-	-	1.02	1.05	15.56	10.05	5.32	3.72
1977	0.00	0.00	1.47	1.61	22.42	17.25	10.70	6.63

Table 8b. Stratified mean catch per tow of American plaice, in numbers and weight (lbs), from US spring bottom trawl surveys, 1968-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1968	.35	.92	3.63	5.93	9.96	14.85	7.20	12.46
1969	.45	.98	4.34	5.47	6.87	10.52	5.23	7.63
1970	.65	.91	2.48	2.90	4.91	7.01	3.37	5.60
1971	.13	.29	2.55	3.00	2.91	4.30	2.13	4.19
1972	.29	.06	1.96	2.16	5.73	3.33	4.99	1.97
1973	.02	.04	1.24	1.45	10.90	5.74	7.28	6.03
1974	.00	.02	3.86	2.17	11.12	5.56	9.35	3.71
1975	.00	.00	1.66	1.65	8.43	5.17	18.13	5.90
1976	.00	.00	.55	.68	18.88	11.62	11.85	4.47
1977	.02	.06	1.02	1.18	23.03	14.17	3.31	2.11

Table 9a. Mean length and size range (in cm) of American plaice, from US autumn bottom trawl surveys, by area and year, 1963-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1963	15.7	4.5-30.5	29.9	4.5-70.5	30.7	4.5-68.5	27.6	4.5-50.5
1964	-	-	32.2	12.5-60.5	30.8	8.5-60.5	29.8	10.5-58.5
1965	18.9	6.5-24.5	23.8	4.5-54.5	30.6	12.5-56.5	22.1	8.5-62.5
1966	24.0	6.5-48.5	27.0	4.5-60.5	28.3	8.5-64.5	27.4	4.5-64.5
1967	27.4	18.5-36.5	28.1	12.5-62.5	28.4	12.5-60.5	27.4	10.5-70.5
1968	29.3	14.5-40.5	27.9	6.5-64.5	32.7	8.5-64.5	28.3	6.5-62.5
1969	26.4	14.5-38.5	30.6	4.5-62.5	31.0	14.5-54.5	27.1	8.5-58.5
1970	27.1	16.5-44.5	30.4	14.5-66.5	30.5	10.5-70.5	22.7	6.5-60.5
1971	31.6	20.5-44.5	30.2	12.5-52.5	27.8	4.5-62.5	24.8	4.5-64.5
1972	31.3	20.5-42.5	38.1	10.5-54.5	24.7	6.5-56.5	27.4	2.5-66.5
1973	-	-	20.4	.5-62.5	29.8	4.5-64.5	26.6	6.5-66.5
1974	-	-	27.3	4.5-52.5	25.5	8.5-58.5	27.3	4.5-68.5
1975	-	-	29.1	12.5-52.5	28.3	4.5-64.5	24.1	8.5-58.5
1976	-	-	35.6	14.5-60.5	28.3	4.5-70.5	36.3	6.5-66.5
1977	-	-	33.8	12.5-64.5	30.3	8.5-64.5	27.8	6.5-64.5

Table 9b. Mean length and size range (in cm) of American plaice, from US spring bottom trawl surveys, by area and year, 1968-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1968	25.9	20.5-34.5	28.0	4.5-60.5	29.5	6.5-56.5	28.2	6.5-70.5
1969	30.3	18.5-46.5	32.4	6.5-62.5	31.5	12.5-80.5	29.8	10.5-64.5
1970	31.8	8.5-48.5	32.0	6.5-62.5	32.1	6.5-56.5	28.1	4.5-80.5
1971	29.1	10.5-46.5	34.9	8.5-62.5	32.7	6.5-60.5	26.9	10.5-66.5
1972	27.9	22.5-38.5	36.5	6.5-58.5	29.2	4.5-56.5	26.7	4.5-68.5
1973	46.5	46.5	34.9	12.5-66.5	26.4	4.5-64.5	29.1	6.5-70.5
1974	-	-	28.7	8.5-62.5	23.9	4.5-60.5	24.2	4.5-66.5
1975	-	-	28.4	6.5-68.5	26.9	6.5-58.5	23.4	4.5-62.5
1976	-	-	31.6	8.5-68.5	27.4	4.5-64.5	24.0	4.5-60.5
1977	52.5	52.5	30.5	12.5-70.5	28.1	6.5-66.5	28.9	4.5-56.5

Table 10. Nominal catch of witch flounder, Middle-Atlantic-Gulf of Maine by year and country.

Year	Can	FRG	GDR	POL	SPA	USSR	USA	TOTAL
1965	22	-	-	-	-	502	2140	2664
1966	68	-	-	-	-	311	2935	3314
1967	63	-	-	-	-	249	3370	3682
1968	56	-	6	-	-	185	2807	3054
1969	80	-	-	-	-	1310	2542	3932
1970	19	-	20	-	-	110	3112	3261
1971	35	-	-	1	-	2837	3220	6093
1972	13	-	-	-	-	2568	2934	5515
1973	10	1	-	-	-	628	2434	3073
1974	9	-	-	-	-	292	1767	2068
1975	13	-	-	-	16	201	2106	2336
1976	18	-	-	-	-	2	1852	1872
1977[1]	-	-	-	-	-	-	2479	2479

[1]1977 catches are preliminary.

Table 11 a. Stratified mean catch per tow of witch flounder in numbers and weight (lbs) from US autumn bottom trawl surveys, 1963-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1963	0.47	0.81	0.34	0.40	5.94	8.26	0.27	0.58
1964	0.67	1.08	0.51	0.75	3.15	4.79	0.95	2.01
1965	0.53	0.71	0.50	0.45	4.12	5.34	3.60	4.83
1966	1.22	1.95	0.59	0.91	8.32	10.74	3.54	4.84
1967	0.11	0.15	0.31	0.39	3.14	4.65	0.42	0.54
1968	1.15	2.04	0.22	0.40	5.22	8.29	1.12	2.18
1969	0.26	0.30	0.06	0.08	6.33	10.59	1.40	2.93
1970	0.46	0.69	0.48	0.68	5.12	8.50	2.54	4.21
1971	0.41	0.77	0.24	0.35	4.64	6.95	0.56	0.35
1972	0.96	1.07	0.69	0.77	3.38	5.57	2.06	2.81
1973	0.16	0.25	1.31	1.78	2.72	3.92	5.41	7.17
1974	0.03	0.02	0.20	0.20	2.48	3.62	2.03	2.92
1975	0.06	0.02	0.32	0.42	1.75	2.38	1.46	2.18
1976	0.03	0.01	0.10	0.19	1.45	2.24	0.94	1.68
1977	0.13	0.18	0.33	0.51	5.32	7.82	2.64	4.70

Table 11 b. Stratified mean catch per tow of witch flounder in numbers and weight (lbs) from US spring bottom trawl surveys, 1968-1977.

	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1968	.74	.46	.19	.16	7.93	5.15	1.72	2.27
1969	.29	.25	.31	.31	5.94	4.00	3.48	2.56
1970	.82	.60	.52	.34	10.56	6.84	1.43	.78
1971	.90	.65	.41	.37	4.79	2.87	3.83	2.29
1972	.60	.41	.24	.27	5.76	9.49	3.76	5.79
1973	.73	1.28	.60	.89	8.86	14.76	3.59	5.38
1974	.40	.33	.61	.78	6.65	8.44	4.62	7.22
1975	.09	.14	.24	.36	4.00	6.46	.79	1.41
1976	.40	.29	.34	.44	5.89	8.74	3.01	3.76
1977	.61	.73	.27	.29	4.50	4.63	.55	.69

Table 12 a. Mean length and size range (in cm) of witch flounder from US autumn bottom trawl surveys, by area and year, 1963-1977.

Year	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1963	45.1	34.5-54.5	40.6	28.5-54.5	39.8	4.5-66.5	47.8	40.5-54.5
1964	46.7	32.5-62.5	44.9	36.5-56.5	44.3	8.5-64.5	47.0	16.5-60.5
1965	42.3	24.5-56.5	36.9	20.5-54.5	40.9	16.5-64.5	42.8	20.5-60.5
1966	45.1	28.5-64.5	43.7	24.5-58.5	41.2	10.5-64.5	40.6	14.5-58.5
1967	39.7	24.5-48.5	41.4	12.5-58.5	43.5	8.5-64.5	36.3	22.5-48.5
1968	46.8	30.5-60.5	46.2	32.5-60.5	44.8	16.5-64.5	47.8	30.5-60.5
1969	42.2	22.5-58.5	44.6	34.5-54.5	43.6	18.5-64.5	48.5	28.5-64.5
1970	43.2	8.5-58.5	44.8	32.5-60.5	45.0	12.5-62.5	44.6	10.5-56.5
1971	46.5	34.5-64.5	44.3	26.5-58.5	42.0	4.5-62.5	29.3	4.5-52.5
1972	41.4	20.5-56.5	40.5	4.5-60.5	43.9	6.5-64.5	39.8	4.5-62.5
1973	41.4	10.5-56.5	44.0	10.5-62.5	43.4	16.5-58.5	42.2	12.5-62.5
1974	36.2	24.5-38.5	37.4	6.5-54.5	41.2	4.5-62.5	42.0	10.5-62.5
1975	27.2	16.5-40.5	38.1	4.5-56.5	40.1	4.5-60.5	44.0	22.5-58.5
1976	31.2	24.5-34.5	42.2	24.5-54.5	42.0	6.5-58.5	46.6	6.5-50.5
1977	44.0	30.5-58.5	45.2	28.5-60.5	42.0	4.5-64.5	46.7	22.5-64.5

Table 12 b. Mean length and size range (in cm) of witch flounder from US spring bottom trawl surveys, by area and year, 1968-1977.

Year	So. New England		Georges Bank		Gulf of Maine		Nova Scotia	
	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1968	40.1	22.5-56.5	41.8	26.5-58.5	42.5	4.5-64.5	35.7	20.5-58.5
1969	38.8	16.5-52.5	39.6	22.5-52.5	45.4	16.5-62.5	44.3	28.5-64.5
1970	39.3	6.5-60.5	43.1	6.5-60.5	44.7	16.5-60.5	47.6	36.5-60.5
1971	44.2	8.5-60.5	43.3	28.5-52.5	46.5	22.5-62.5	45.8	26.5-60.5
1972	24.9	2.5-54.5	40.9	28.5-62.5	45.7	6.5-64.5	44.3	8.5-58.5
1973	44.8	26.5-68.5	43.4	24.5-58.5	44.8	8.5-60.5	44.0	22.5-58.5
1974	36.8	20.5-52.5	42.1	28.5-58.5	39.2	4.5-64.5	45.4	20.5-58.5
1975	42.7	24.5-56.5	43.1	26.5-58.5	43.8	8.5-62.5	47.3	18.5-56.5
1976	33.4	22.5-52.5	41.1	22.5-56.5	42.3	8.5-64.5	41.0	12.5-60.5
1977	38.5	22.5-56.5	39.5	26.5-52.5	37.1	8.5-64.5	44.5	22.5-54.5

Table 13a. Stratified mean catch per tow of windowpane flounder in numbers and weight (lbs) from US autumn bottom trawl surveys, 1963-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1963	-	-	27.89	4.38	2.67	1.11	0.07	0.04
1964	-	-	4.27	1.91	1.19	0.44	0.04	0.01
1965	-	-	4.00	1.72	1.89	0.84	0.00	0.00
1966	-	-	5.47	2.46	6.29	2.32	0.01	0.01
1967	3.02	1.01	5.55	2.44	5.72	2.71	0.00	0.00
1968	6.26	2.75	2.57	1.31	2.46	1.28	0.00	0.00
1969	1.36	0.39	2.51	1.15	7.36	3.15	0.00	0.00
1970	1.42	0.47	2.02	0.84	2.64	0.90	0.04	0.01
1971	1.63	0.71	2.07	1.01	3.07	0.76	0.04	0.01
1972	2.30	0.82	3.77	1.60	14.00	2.74	0.10	0.05
1973	5.52	1.96	1.56	0.69	19.60	7.55	0.04	0.00
1974	0.95	0.42	1.40	0.69	43.40	4.01	0.04	0.01
1975	0.22	0.07	1.52	0.52	13.52	1.91	0.00	0.00
1976	0.30	0.15	3.33	1.34	12.93	5.75	0.03	0.01
1977	0.99	0.47	3.59	1.78	16.08	7.54	0.13	0.08

Table 13b. Stratified mean catch per tow of windowpane flounder in numbers and weight (lbs) from US spring bottom trawl surveys, 1968-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine	
	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow	No./tow	Wt./tow
1968	.55	.94	2.96	1.48	.47	.82	.04	.08
1969	.64	1.75	2.06	3.65	.19	.42	.00	.02
1970	.06	.28	1.74	3.41	.31	.48	.15	.29
1971	.16	.51	1.52	3.65	.56	1.37	.00	.04
1972	2.11	1.12	6.95	2.93	1.49	.84	.09	.02
1973	6.87	3.82	14.78	6.79	4.18	2.83	.03	.00
1974	7.40	3.07	6.03	2.74	5.82	3.46	.07	.02
1975	3.30	1.66	6.31	2.91	5.37	3.74	.00	.00
1976	2.39	1.33	8.92	3.81	60.64	29.29	.06	.03
1977	2.09	1.08	3.77	1.66	15.07	7.28	.08	.02

Table 14a. Mean length and size range (in cm) of windowpane flounder US autumn bottom trawl surveys, by area and year, 1963-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1963	-	-	11.6	2.5-36.5	25.9	6.5-34.5	29.0	14.5-34.5
1964	-	-	26.0	6.5-34.5	27.6	6.5-48.5	25.8	22.5-28.5
1965	-	-	24.9	2.5-36.5	25.7	6.5-36.5	-	-
1966	-	-	24.6	8.5-34.5	22.6	2.5-32.5	32.5	32.5
1967	25.1	20.5-30.5	24.4	2.5-36.5	25.7	2.5-36.5	-	-
1968	24.3	16.5-30.5	26.9	12.5-36.5	26.8	2.5-36.5	-	-
1969	24.0	20.5-32.5	26.5	12.5-38.5	20.7	2.5-40.5	30.5	30.5
1970	23.9	14.5-28.5	24.9	12.5-34.5	20.8	4.5-38.5	25.2	20.5-28.5
1971	24.7	20.5-30.5	25.9	2.5-44.5	18.6	2.5-36.5	27.2	22.5-30.5
1972	24.8	14.5-32.5	25.6	6.5-34.5	13.4	2.5-36.5	24.0	18.5-28.5
1973	23.3	16.5-30.5	24.9	16.5-34.5	22.7	2.5-44.5	27.4	26.5-28.5
1974	25.4	22.5-28.5	24.8	4.5-32.5	8.9	2.5-48.5	24.9	20.5-30.5
1975	26.5	22.5-30.5	23.8	8.5-34.5	9.3	2.5-38.5	-	-
1976	25.9	18.5-32.5	24.4	10.5-32.5	22.9	2.5-40.5	25.8	22.5-28.5
1977	24.5	16.5-32.5	25.4	4.5-38.5	24.9	2.5-40.5	28.2	18.5-32.5

Table 14b. Mean length and size range (in cm) of windowpane flounder from US spring bottom trawl surveys, by area and year, 1968-1977.

	Mid-Atlantic		So. New England		Georges Bank		Gulf of Maine	
Year	Mean length	range	Mean length	range	Mean length	range	Mean length	range
1968	26.2	22.5-30.5	27.5	4.5-38.5	28.4	4.5-34.5	32.0	26.5-34.5
1969	23.8	4.5-32.5	27.7	10.5-38.5	28.5	6.5-34.5	26.5	26.5
1970	24.3	22.5-24.5	25.0	8.5-56.5	29.5	14.5-42.5	26.9	18.5-32.5
1971	24.7	20.5-30.5	26.0	2.5-38.5	26.8	6.5-38.5	24.8	22.5-26.5
1972	26.6	22.5-30.5	24.5	4.5-38.5	26.7	2.5-36.5	26.5	22.5-30.5
1973	26.7	8.5-38.5	25.3	10.5-38.5	28.0	6.5-40.5	28.0	26.5-28.5
1974	24.5	12.5-32.5	24.5	4.5-38.5	25.6	4.5-38.5	27.0	24.5-32.5
1975	25.8	20.5-32.5	24.8	6.5-36.5	27.4	4.5-44.5	20.5	20.5
1976	26.5	2.5-32.5	24.2	4.5-38.5	26.0	4.5-38.5	24.0	16.5-38.5
1977	26.3	20.5-32.5	25.1	8.5-34.5	27.2	12.5-38.5	27.7	26.5-30.5

Table 15. Nominal catch of flounders (non-specified) in Middle Atlantic -Gulf of Maine, by country and year (1965-1977).

Year	Bul	Can	Cuba	GDR	Ire	Ita	Jap	Pol	Rom	Spa	USSR	USA	Total
1965	0	153	0	0	0	-	0	75	3	0	13	2162	2406
1966	0	110	0	0	0	-	0	2	0	0	95	972	1179
1967	0	386	0	9	0	-	23	2	0	0	15	994	1429
1968	0	193	10	4	0	-	43	2	0	0	0	579	831
1969	0	96	52	0	0	-	394	1	8	0	0	616	1167
1970	0	67	0	0	0	-	300	9	107	0	0	734	1217
1971	0	38	0	0	0	-	32	0	22	0	0	1002	1094
1972	8	39	118	0	0	-	13	0	0	0	0	898	1076
1973	0	38	0	0	0	-	65	0	0	0	0	1638	1741
1974	0	35	0	0	0	-	73	0	0	37	0	2054	2199
1975	0	38	161	14	4	-	0	0	0	0	0	3118	3335
1976	39	0	0	73	0	0	0	0	0	0	0	2335	2447
1977[1]	-	-	1	-	-	4	1	-	-	14	50	2392	2462

[1] 1977 catches are preliminary.

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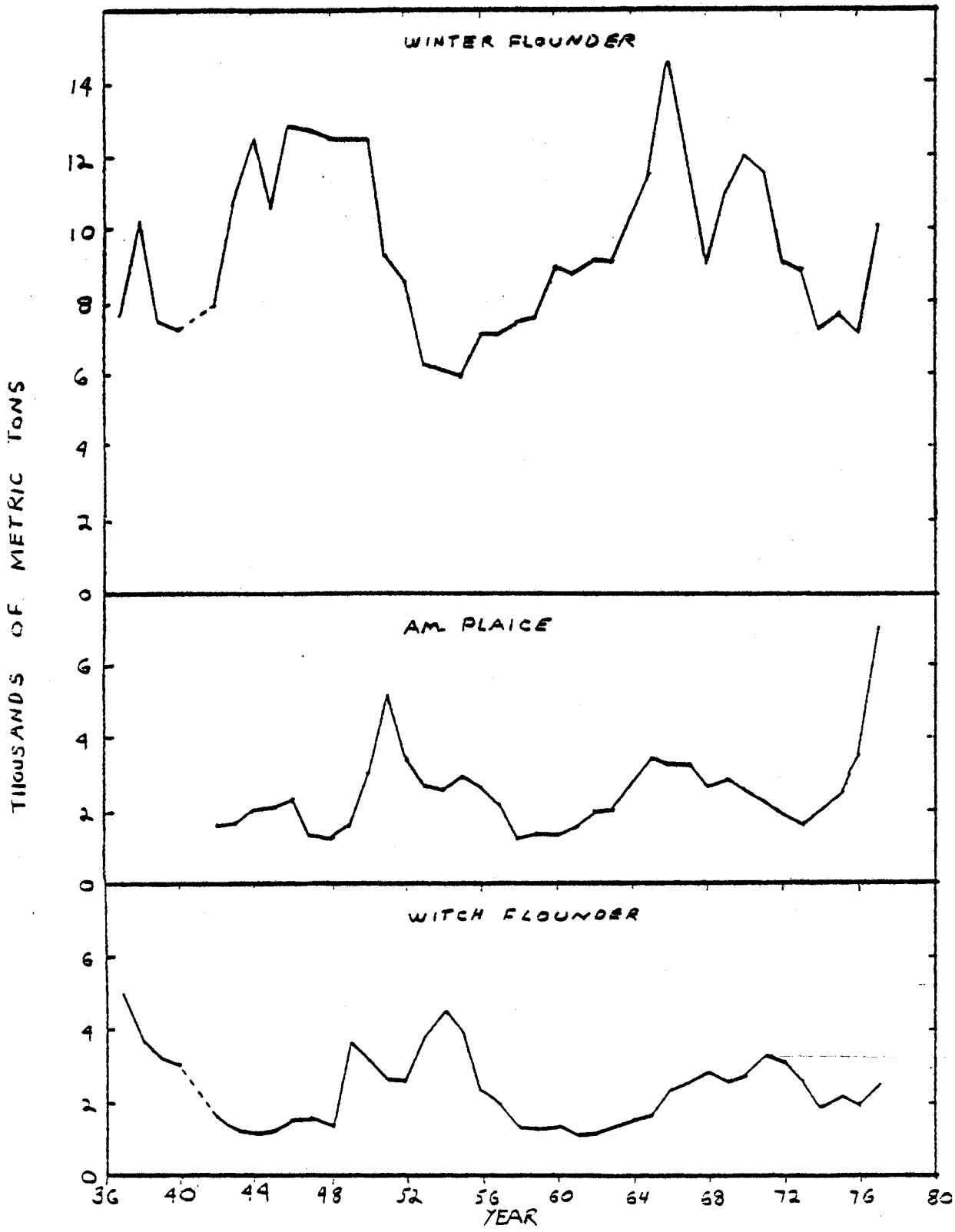
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48
52
56
60
64
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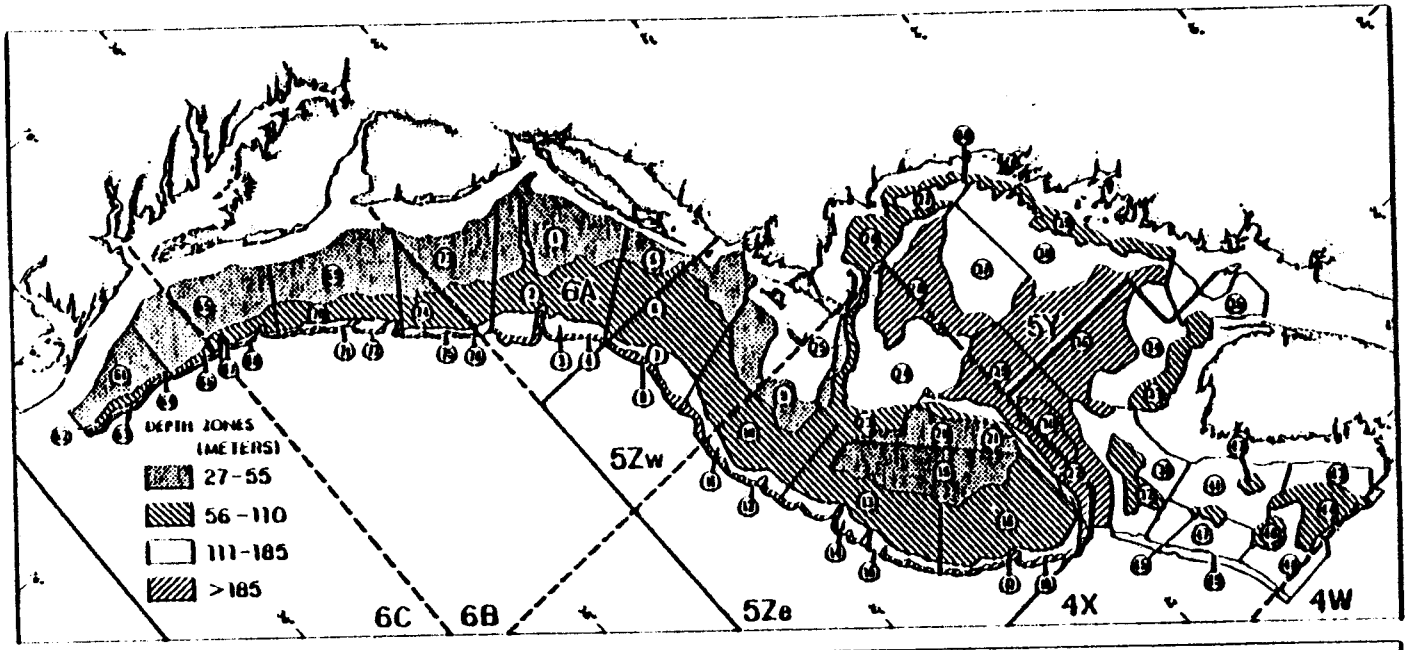
72
76
80
YEAR

A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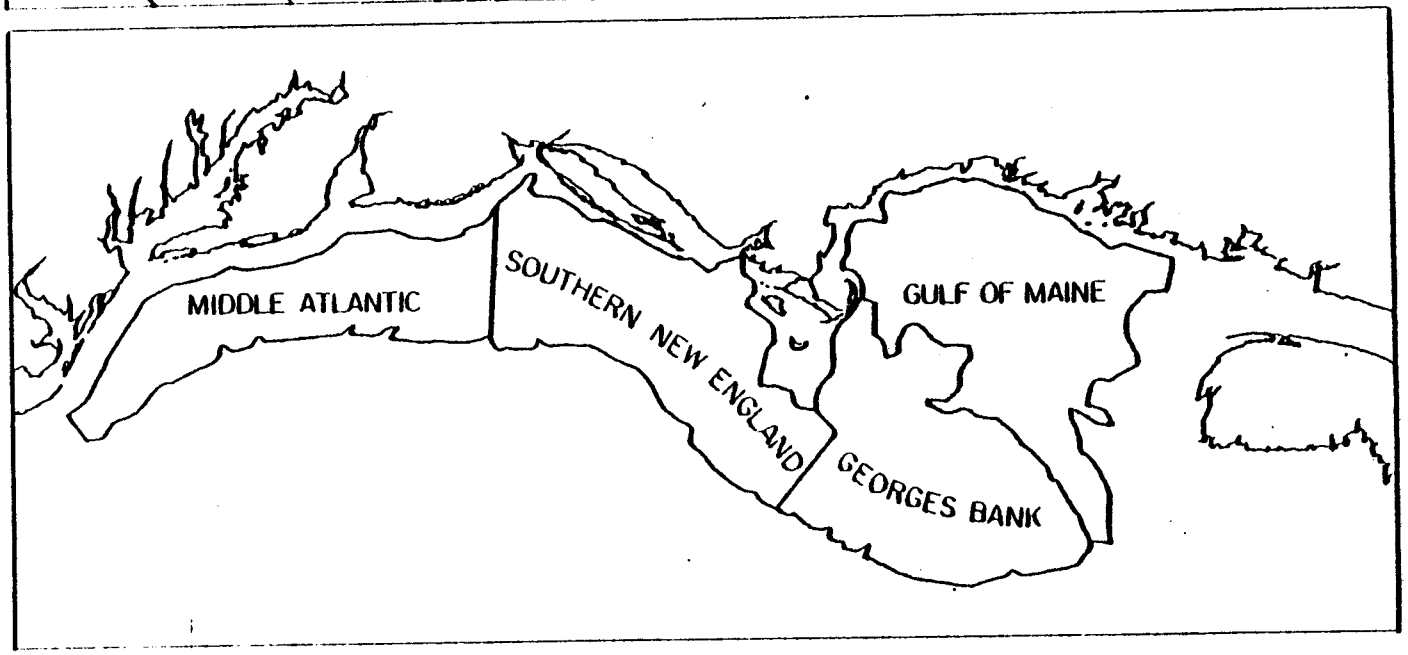
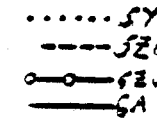
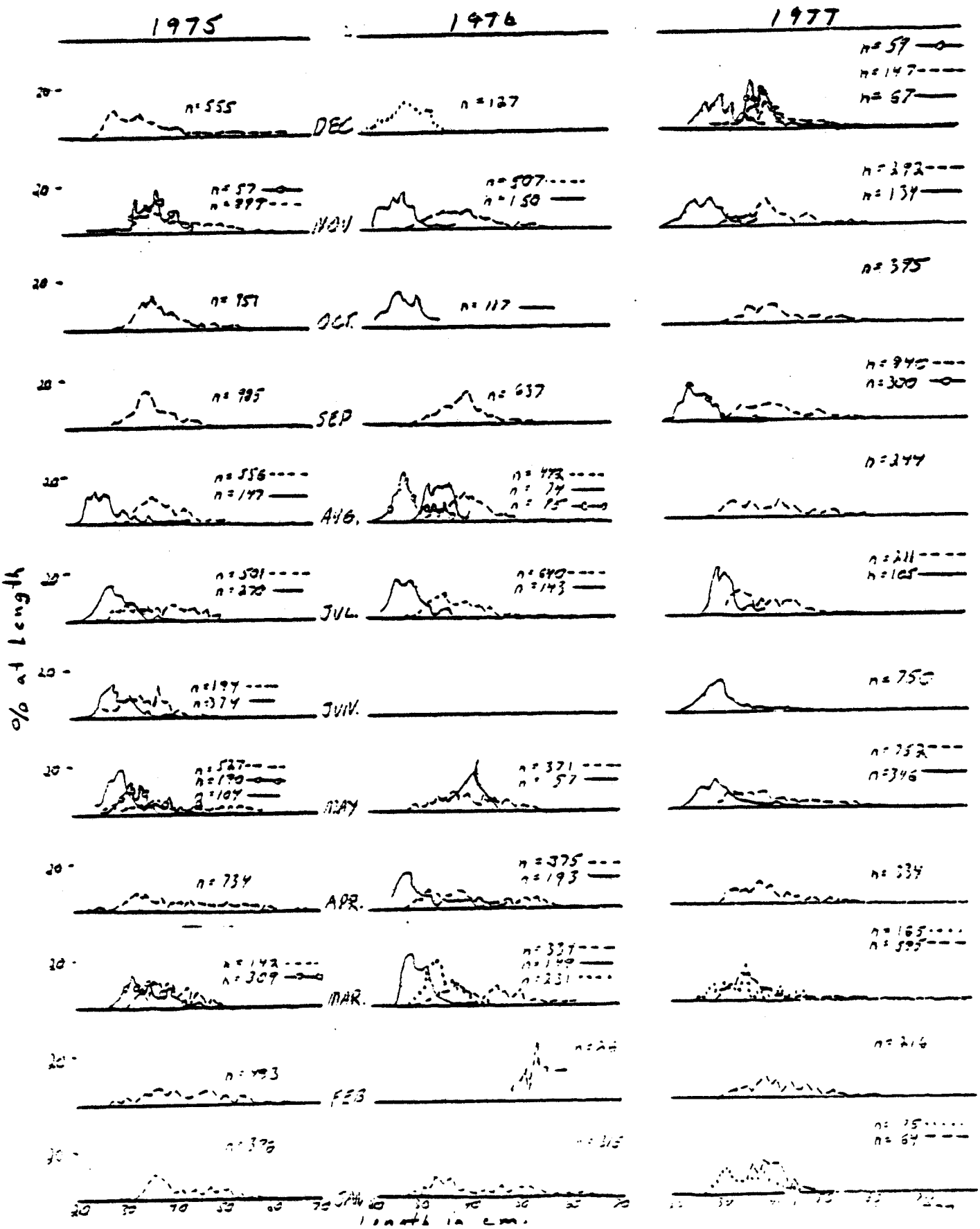
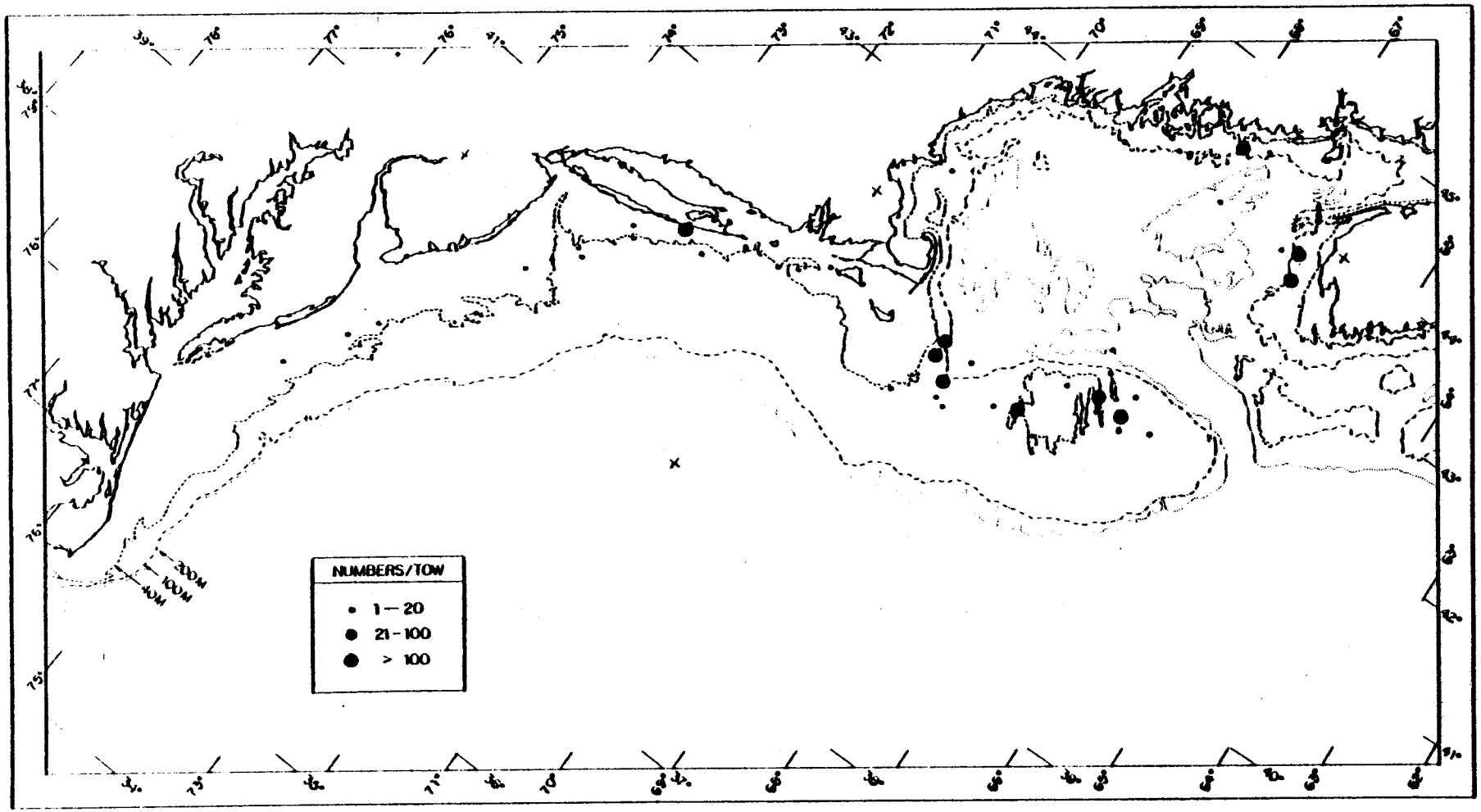

MIDDLE ATLANTIC
SOUTHERN NEW ENGLAND
GULF OF MAINE
GEORGES BANK

3. US commercial winter flounder length frequency samples, by area, 1975-1977.



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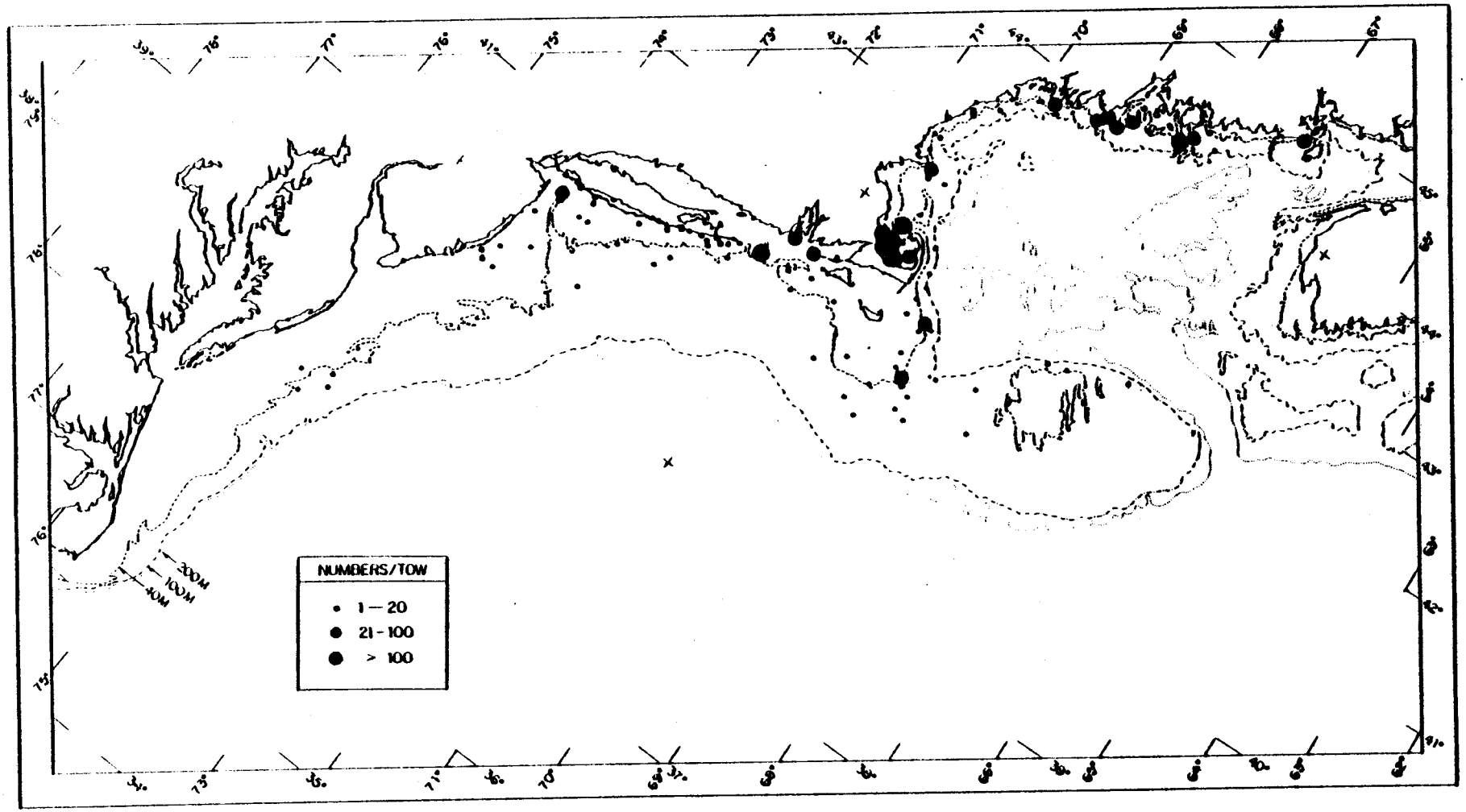
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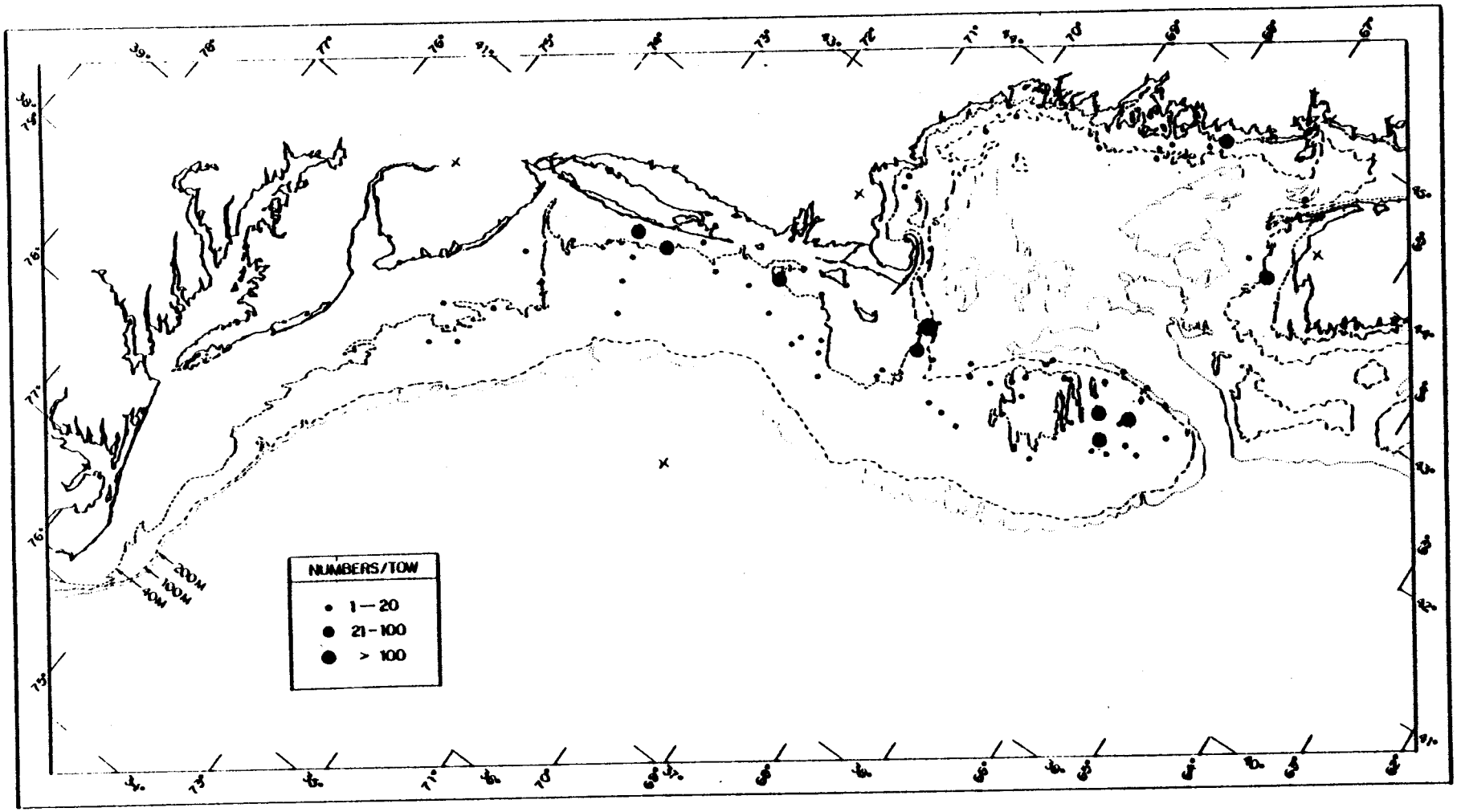
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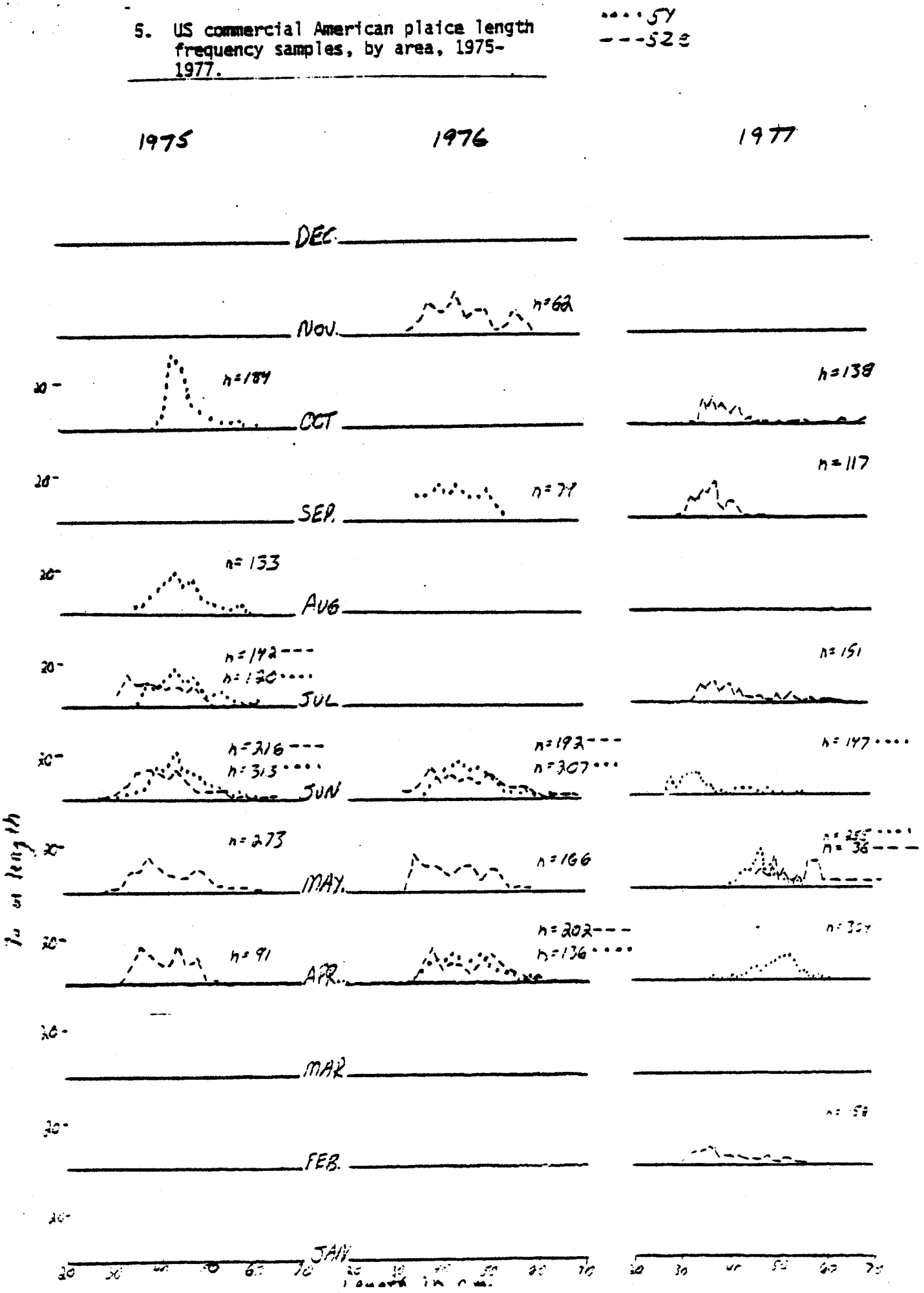
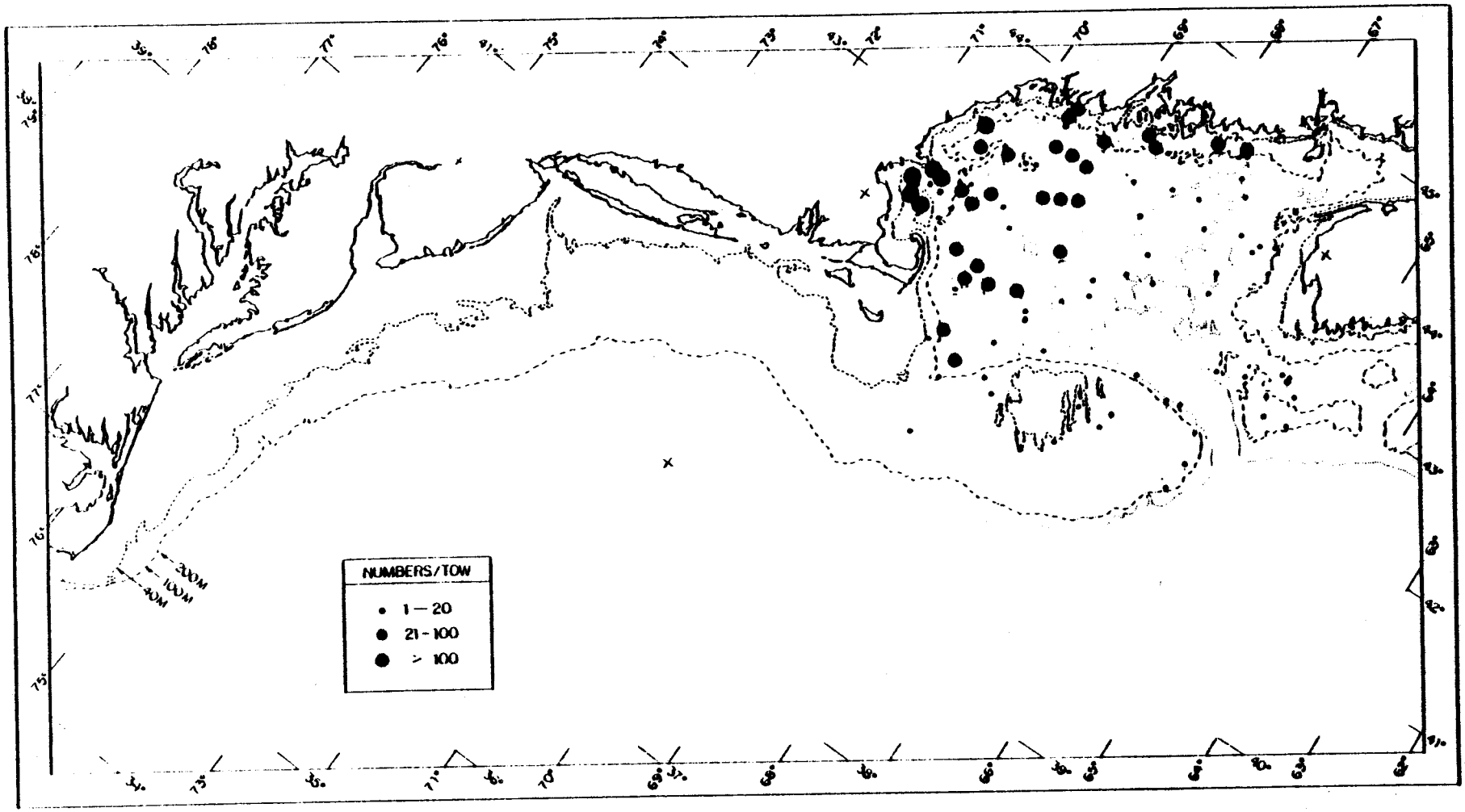
5. US commercial American plaice length frequency samples, by area, 1975-1977.

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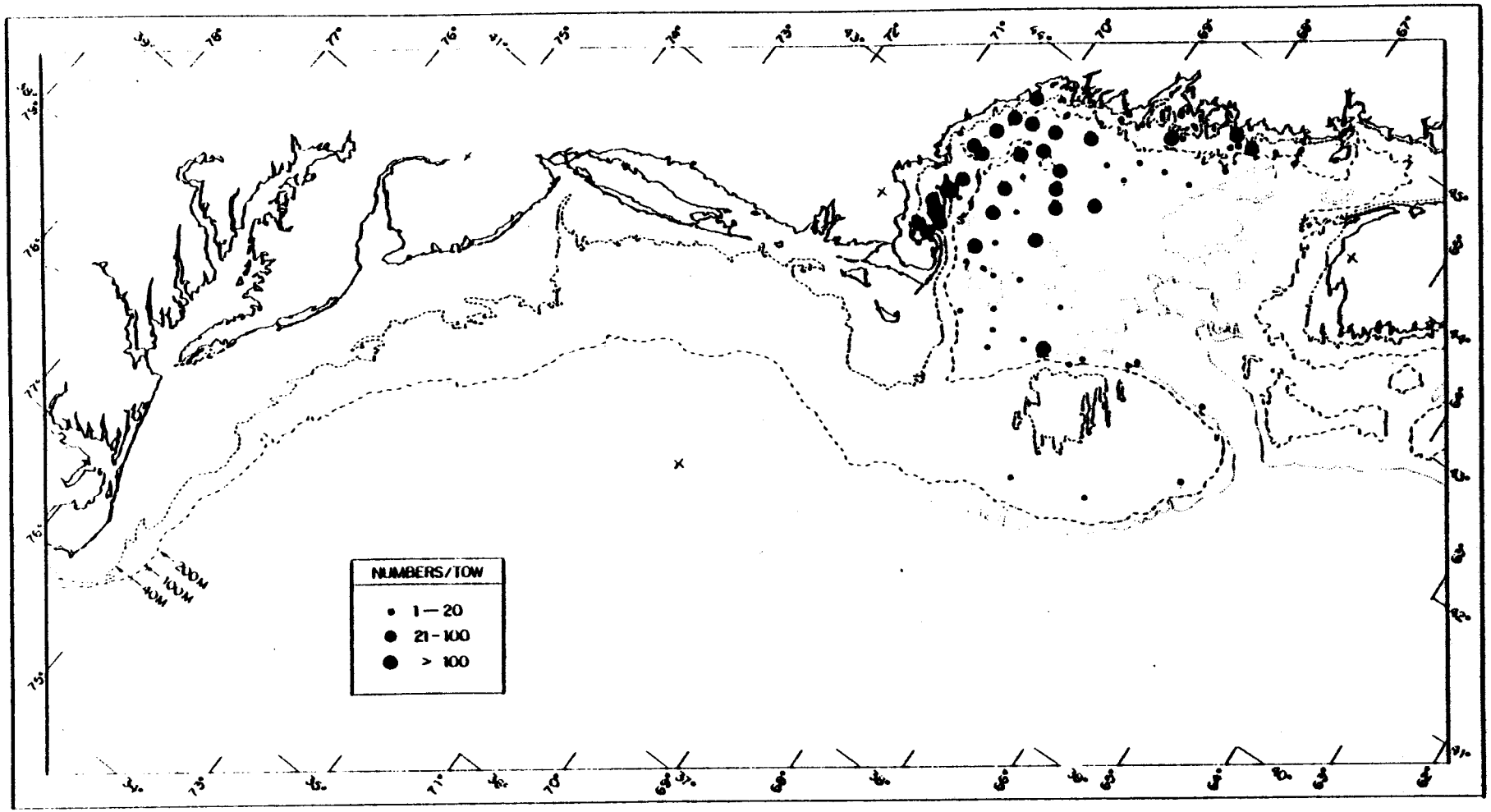
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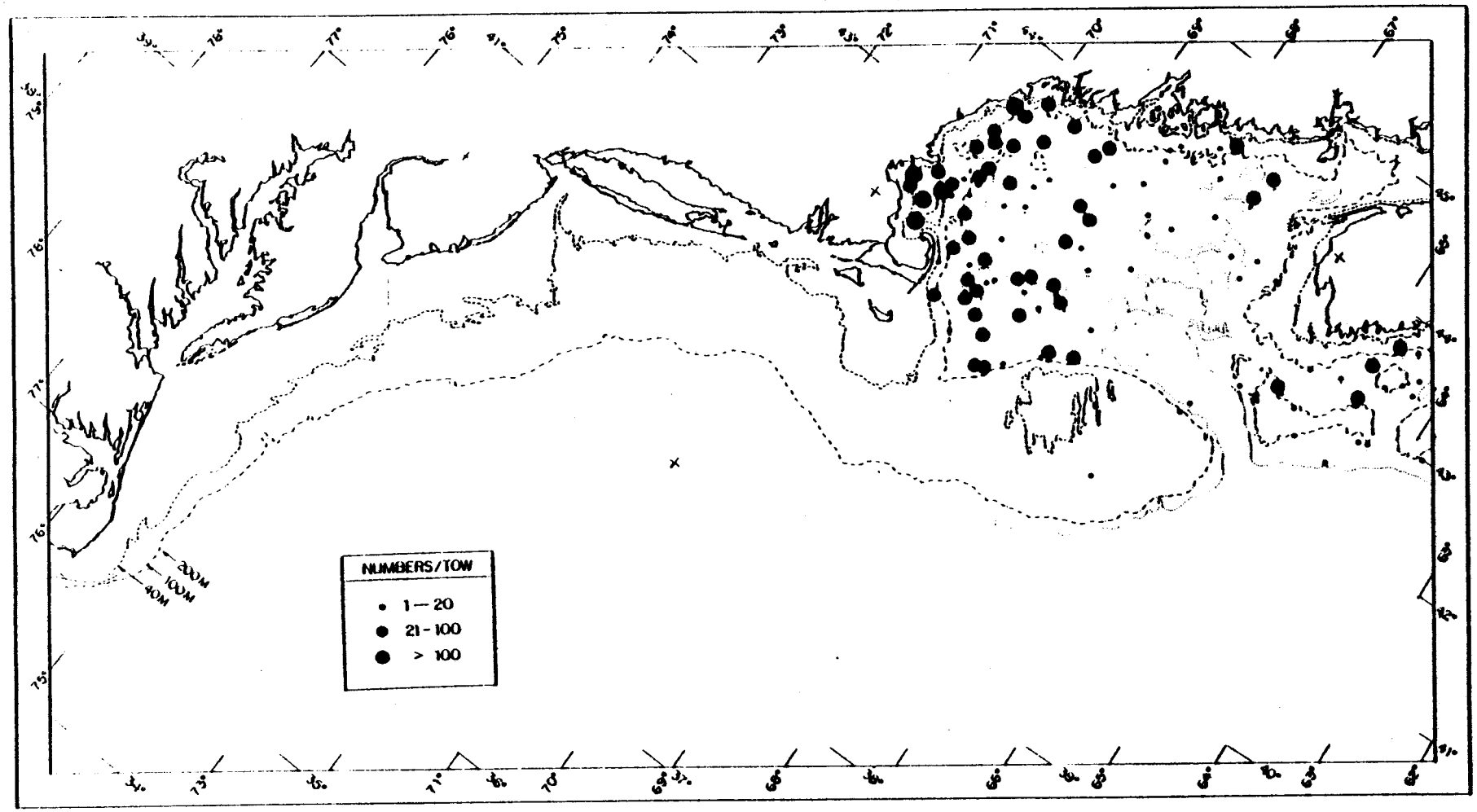
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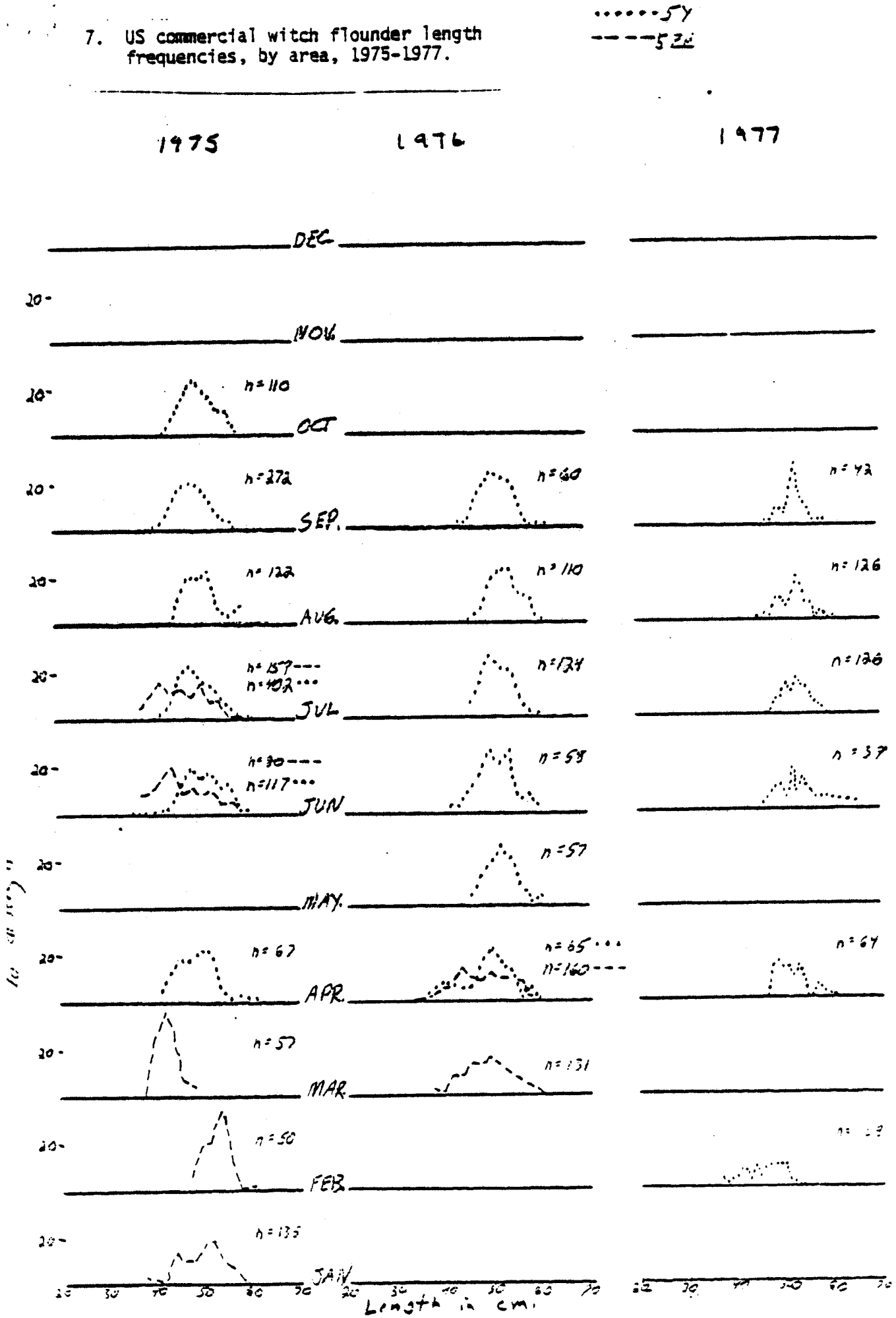
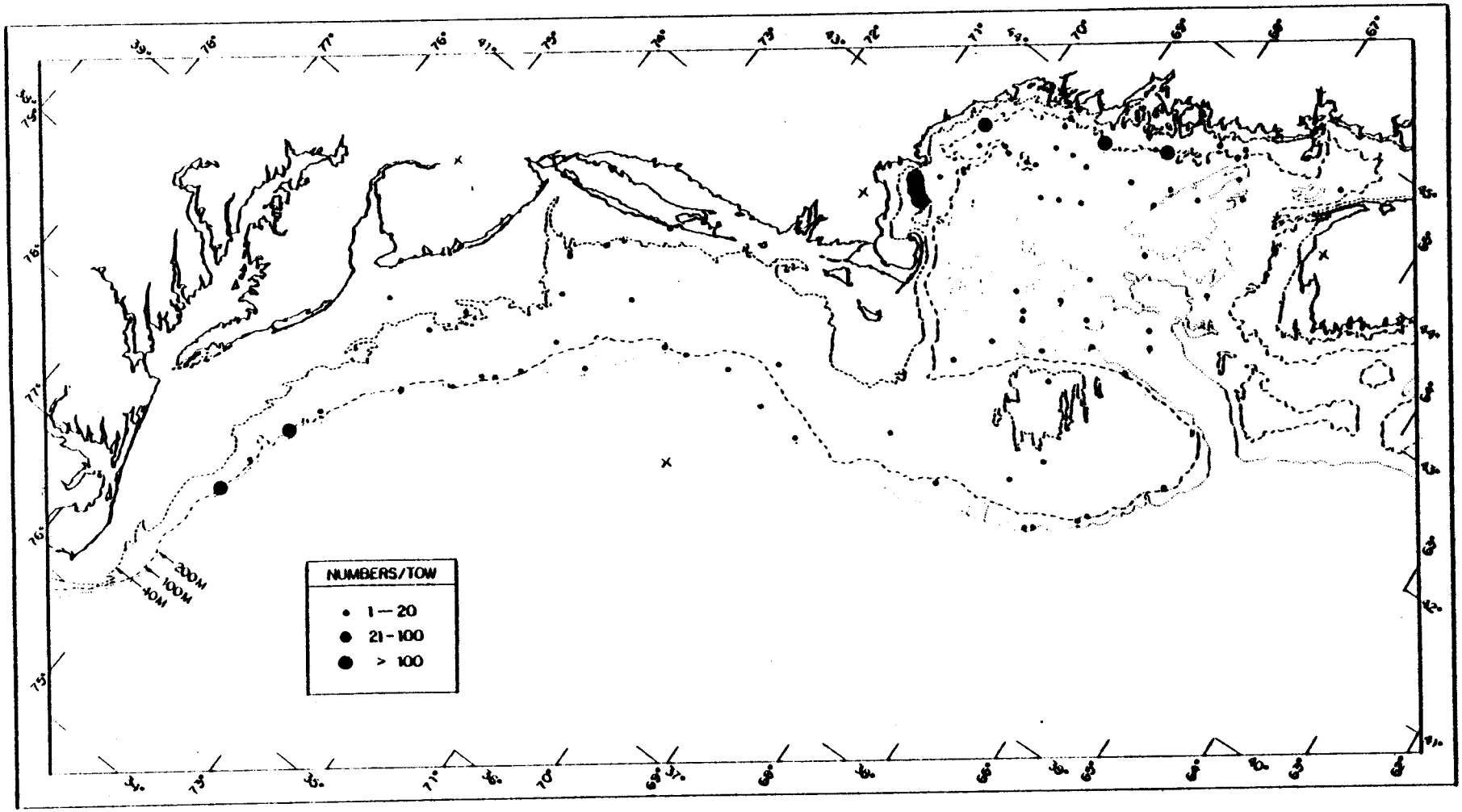
7. US commercial witch flounder length frequencies, by area, 1975-1977.

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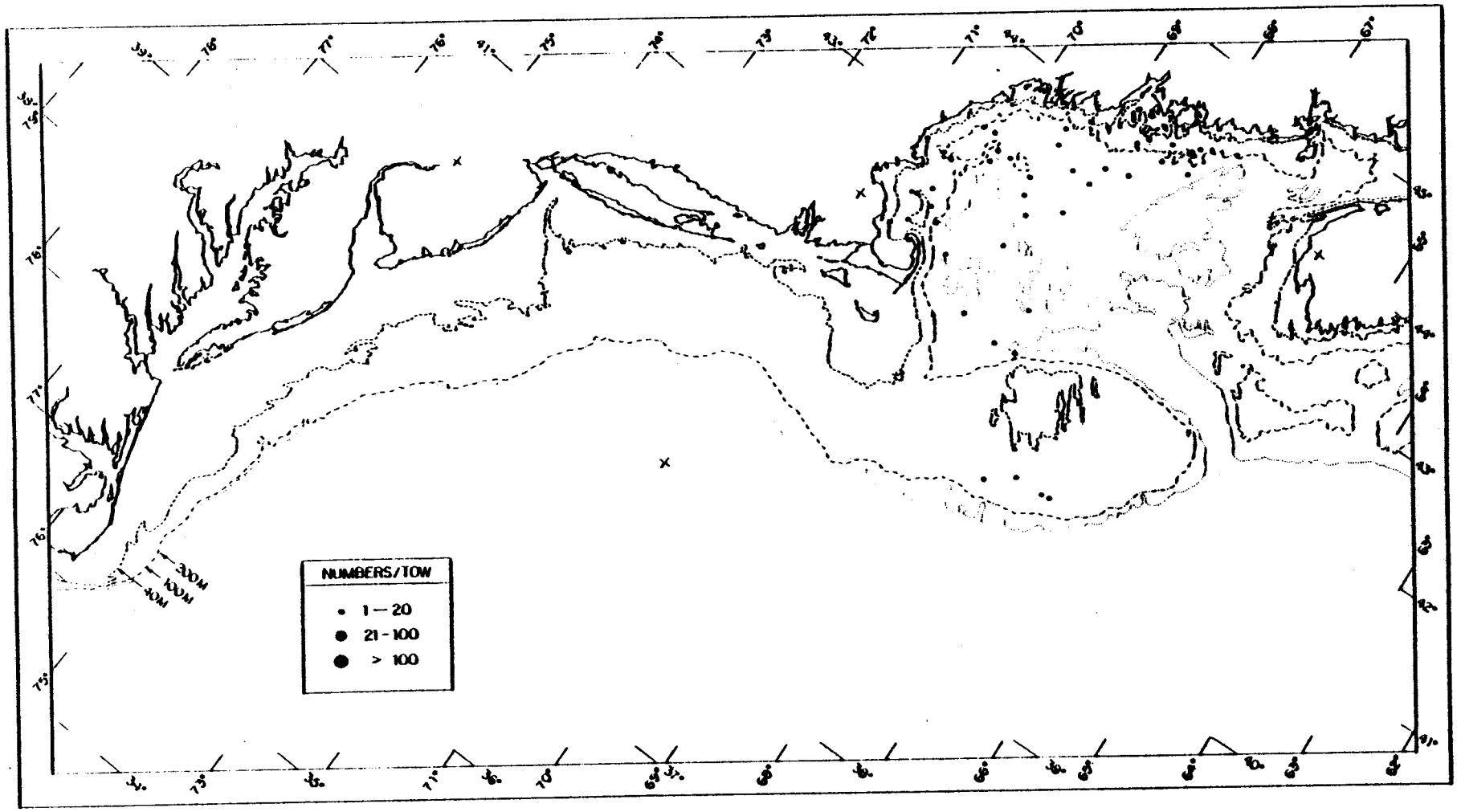
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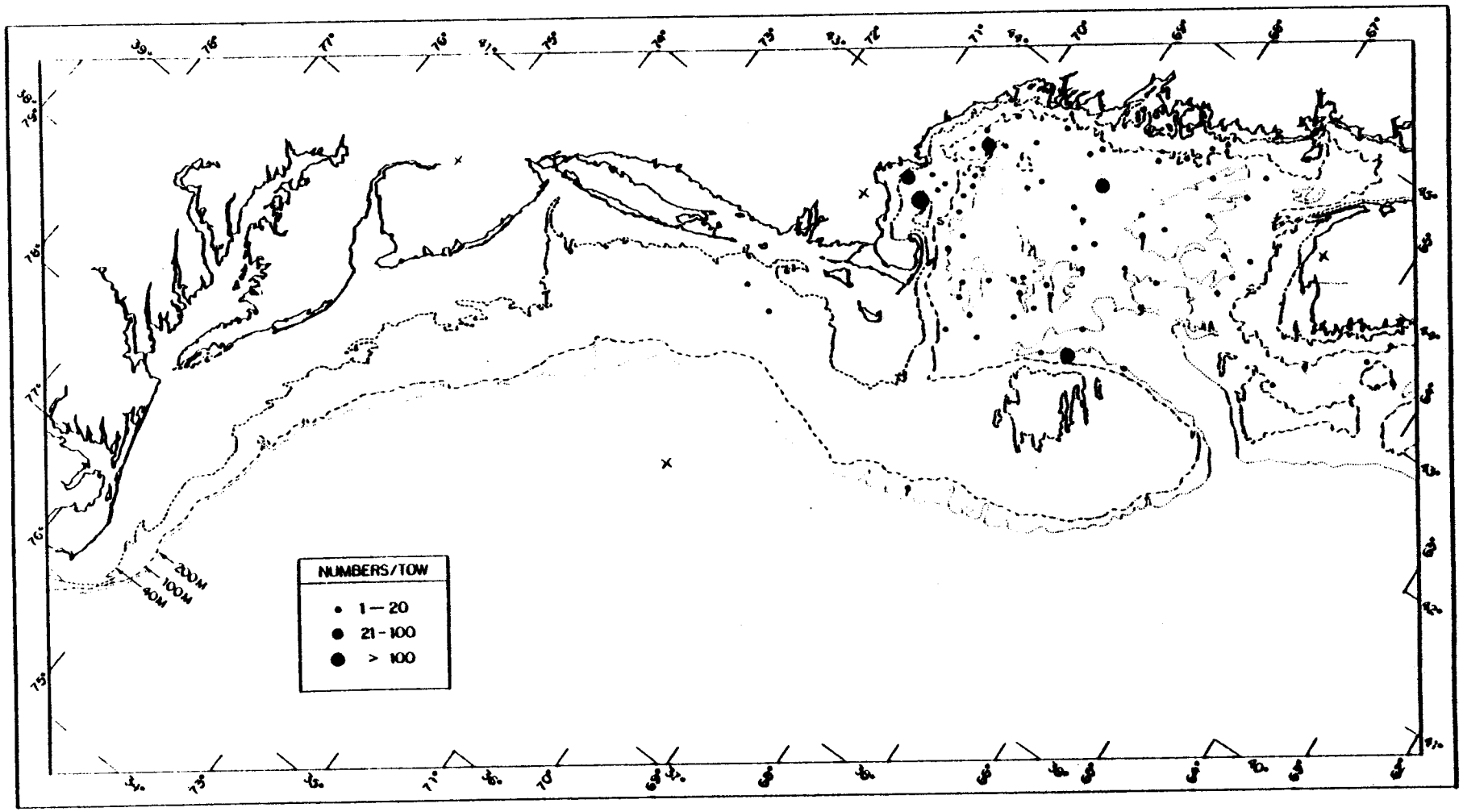
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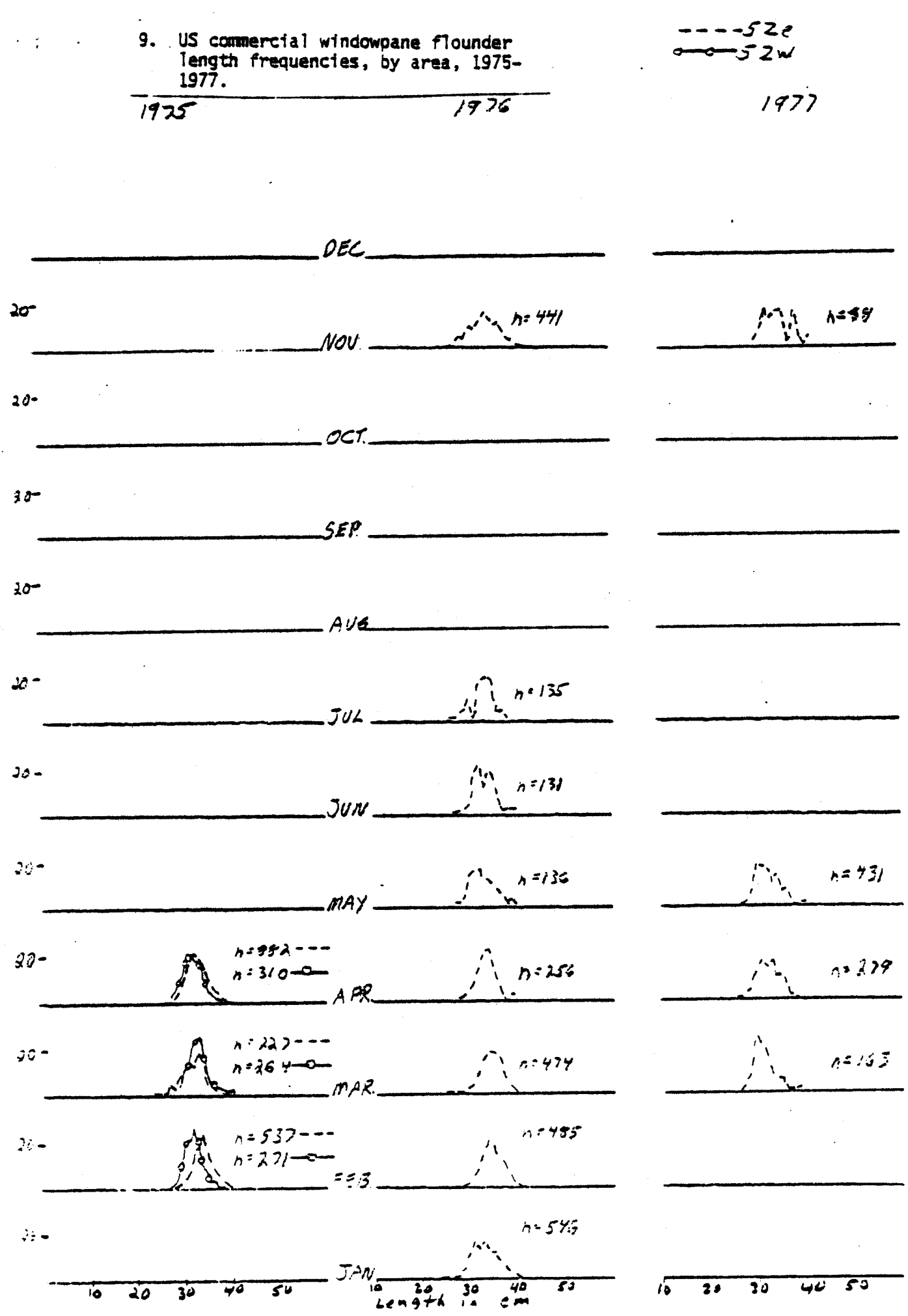
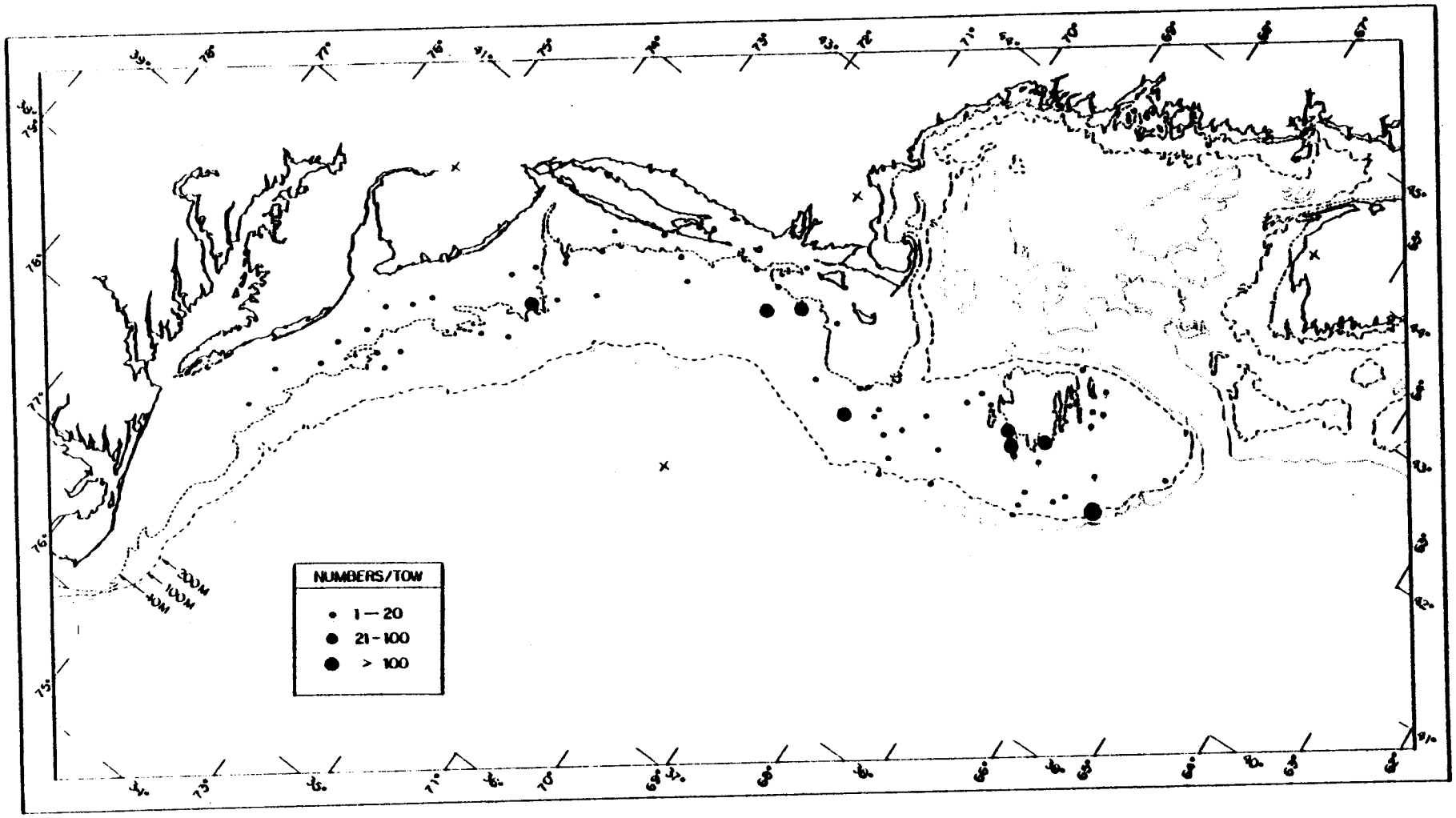
9. US commercial windowpane flounder length frequencies, by area, 1975-1977.

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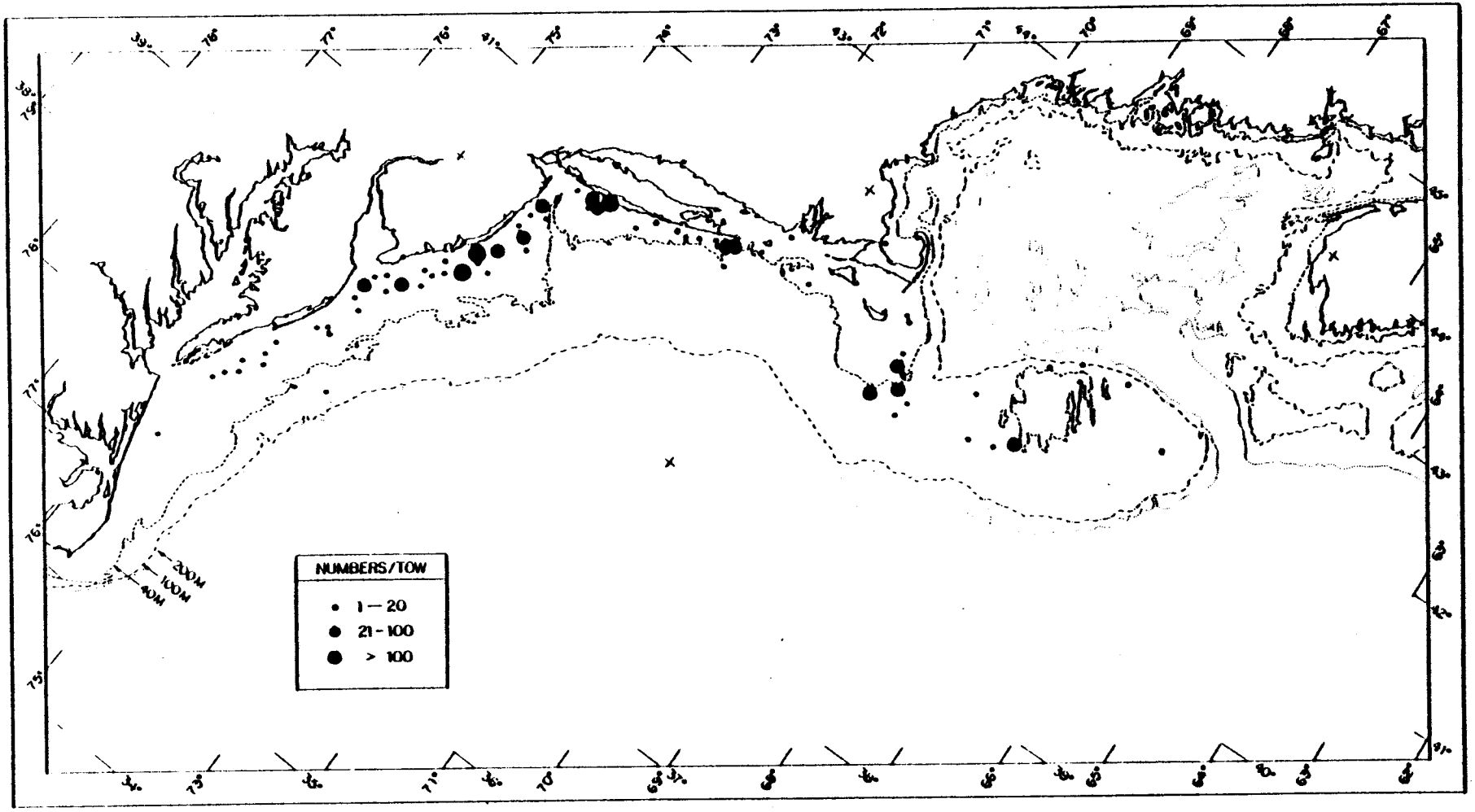
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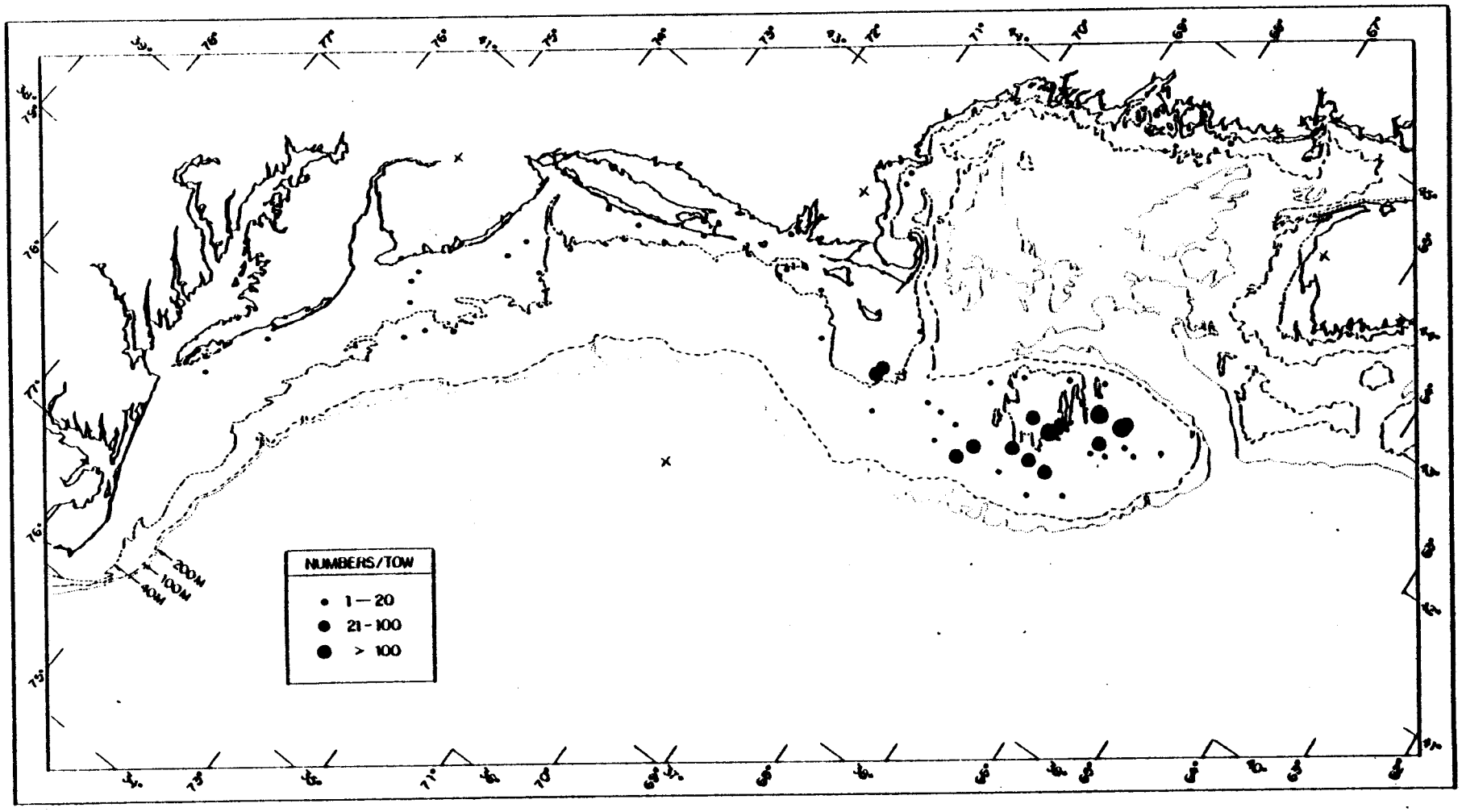
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