Squid (*Loligo pealei* and *Illex illecebrosus*) stock status: June, 1978

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Introduction

This document presents an updated status report of the squid stocks, *Loligo pealei* and *Illex illecebrosus*, from the Gulf of Maine to the Middle Atlantic (ICNAF areas 5+6). The data and results include: autumn 1977 and spring 1978, USA research bottom trawl survey abundance indices, monthly catches of squid from the 1977-1978 winter squid fisheries and US (inshore) monthly catch per effort in 1977.

For additional information regarding these stocks, the reader is referred to Lange (1978), Lange and Sissenwine (1977), and the squid FMP.

Results and Discussion

The directed *Loligo* fishery begins offshore in November and continues through March, while the inshore (US) fishery takes place primarily in May and June, with only incidental catches prior to May. The foreign offshore squid fishery, primarily for *Illex*, begins in June (by US regulation) with significant inshore US catches not occurring until August. US autumn bottom trawl surveys provide indices of abundance (stratified mean numbers per tow) for

these species from the Gulf of Maine to the Middle Atlantic (Table 1). Prerecruit indices (Table 1), catches of individuals too small to have been recruited prior to the survey, are also obtained from these survey data and may be useful in predicting availability to the winter (Loligo) and possibly the summer (Illex) fisheries.

Autumn 1977 survey results:

The overall 1977 Loligo abundance index (Table 1) was up 43% over the previous 10 year (1967-1976) average, but was 5.5% less than the 1976 value. The Loligo prerecruit index (stratified mean number, 8 cm and less, per tow), however, only increased 19.7%, lowering the proportion of prerecruited to recruited individuals from a 10 year average of 0.92 to 0.72, in 1977. The overall biomass estimate (Table 2) for Loligo, based on areal expansion of stratified mean weights per tow, dropped 24% from the 10 year average and 47% from the 1976 estimate, indicating smaller average weights per individual. Preliminary analysis of length-weight data from autumn 1977 also shows a decrease in mean weight at length, when compared with other 1975 or 1976 samples.

The 1977 Illex abundance index (Table 1) was 2.7 times the 1967-1976 average, but only 55% of the high 1976 value. The 1977 prerecruit index (for individuals 10 cm and less) for Illex represented a 34.5% decrease from the 10 year average, however, if the exceptionally high 1975 value is excluded, the 1977 index is 37.5% greater than the other 9 years' average. The 1977 autumn biomass estimate (Table 3) was 2.1 times the previous 9 year (1968-1976) average (21,747 MT), but again only 50% of the 1976 estimate.

Figures 1a and 1b show the distribution of squid catches from the 1977 USA spring, summer, and autumn bottom trawl surveys.

Commercial fishery results:

Preliminary data on monthly catches from the winter offshore squid fishery and total 1977 US and foreign catches are presented in Table 4. Offshore Loligo catches peaked in November-December, dropped dramatically in January, and increased again in February. The January decrease is probably due, in part, to closure of the more northern grounds (Window 5) during that month, when in past years as much as 80% of January catchs have come from this general area (Southern Georges Bank). Illex catches during the traditional Loligo fishery were comparable to past years in November and December, but January through March catches were much less than in recent years, again partially due to closure of traditional areas and subsequent effort reductions. The total 1977 foreign Loligo catch (16,045 MT) was 43% less than the 1970-1976 average, while the Illex catch (21,389 MT) increased 78% over the 7 year average.

US inshore catches of Loligo remained fairly constant from October through March, averaging 62 MT per month, while Illex catches dropped from 328 MT in October to 0 in March. This trend in the US winter fishery is consistant with that exhibited since 1970. The total 1977 US Loligo catch(1,476 MT) was 54% less than the 1976 catch and 24% greater than the 1963-1976 average, while the 1977 Illex catch of 1,080 MT was the greatest since 1963 (the first year that estimates of squid by species was made).

Monthly catch per effort (CPE) in metric tons per day fished for the 1976 and 1977 US squid fisheries are presented in Table 5. These figures are based on individual trips in which 50% or greater of the total catch was squid. The 1976 and 1977 Loligo fishery occurred primarily in Southern New England, with medium size (50-149.9 GRT) vessels accounting for 58% and small vessels (0-49.9 GRT) 42% of the total catch from that fishery in both years. C.P.E. was greatest in May through July, corresponding to the period of greatest Loligo catches. The second period of increased C.P.E., in November and December 1977, is based on single trips each month and, therefore, does not necessarily represent an increase in abundance at that time. The annual C.P.E. for the Southern New England Loligo fishery dropped 36% for small and medium sized vessels, respectively, from 1976 to 1977, while the total number of trips involved increased 86 and 91%, respectively.

Estimates of catch per effort for Illex (Table 5) are based on relatively few observations. Although a modest directed fishery occurred in 1976, when Illex was in great abundance in the Gulf of Maine, it has been a less marketable species than Loligo, and was therefore not landed as frequently. Catch per effort of Illex, from trips where Illex made up 50% or more of the total catch, was greatest in the Gulf of Maine, especially in October and November, for both years. The 1977 annual C.P.E. by small vessels dropped 58.6% from the 1976 C.P.E. in the Gulf of Maine, but this may be related to a decrease in interest caused by market conditions.

Spring 1978 survey results:

Stratified mean catches per tow, in pounds, of Loligo from US spring bottom trawl surveys (Table 6) show a 20.1% drop from the previous 10 year (1968-1977) average, but a 153.8% increase from the 1977 index, in 1978, in the Middle Atlantic area. In Southern New England Loligo catches decreased 42.6% from the 1968-1977 average but again, were greater (by 58.6%) than the 1977 value. Stratified mean numbers of Loligo per tow were 3.6 and 2.1 times greater in 1978 than in 1977 in Southern New England and the Middle Atlantic, respecitvely. On southern Georges Bank Loligo decreased 43% in weight and 65% in number from 1977 values, and 81% in weight from the 1968-1977 average.

The stratified mean catch per tow, in pounds, of Illex from the 1978 spring survey in Southern New England was 12.6% greater than the 1968-1977 average and 2.7 times the 1977 value. In the Middle Atlantic and on southern Georges Bank these indices dropped 65.1% and 83.6%, respectively, from the 10 year average and 5.0% and 90%, respectively, from the 1977 indices. However, since spring surveys are conducted prior to major onshore movements of Illex, variability in these indices may reflect changes in availability, rather than in abundance.

Conclusions

The downward trend in Loligo abundance, as reflected by US 1977 autumn bottom trawl survey indices and 1977 US inshore commercial catch per effort; the trend toward smaller individuals (which probably suffer high natural

mortality) in the recruited portion (greater than 8 cm) of the stock; and continued low levels of abundance in the spring (1977 and 1978 US bottom trawl survyes); may indicate a more conservative approach toward Loligo management. However, catch per effort and length frequency data from the 1977 foreign offshore Loligo fishery, when it becomes available, will provide more information on the status of this stock. If, in fact, the catch per effort and the mean weight of individuals in the winter Loligo fishery decreased from past years, and if the spring 1978 US landings remain low, adjustments in OY levels for Loligo may be appropriate.

Understanding of the present status of the Illex stock off the northeastern US is based on very little data. Although the Illex abundance index from the 1977 US autumn bottom trawl survey was above historic (1968-1975) levels, it was only half the 1976 value. While US commercial catches reflect market conditions as much as Illex abundance, 1977 foreign catches reflect changes in fishing areas due to closures of historic areas by the US, under the FCMA. However, rapid expansion (from 17,760 MT in 1975 to 80,630 MT in 1977) of the Illex fishery in Canadian waters may adversely affect the population off the US, which is presently considered to be a component of the same stock. Therefore, a conservative management strategy is probably merited for this species as well.

Literature Cited

Lange, A.M.T. MS 1978. Catch, effort and biological data from the 1977 directed squid fishery in the US Fishery Conservation Zone. Int. Comm. Northw. Atlant. Fish., Res. Doc. No. 78/II/8, Serial No. 5160.

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Table 1. Pre-recruit indices of squid. (Stratified mean number per tow of *Loligo* and *Illex* of all sizes and of *Loligo* ≤ 8 cm and *Illex* ≤ 10 cm mantle length in autumn bottom trawl survey, Middle Atlantic to Georges Bank.)

Year	*Loligo* (#/tow)		*Illex* (#/tow)	
	all sizes	≤ 8 cm	all sizes	≤ 10 cm
1967	134.5	126.9	2.1	0.7
1968	176.5	159.9	2.3	0.6
1969	237.3	217.4	0.8	0.3
1970	85.6	79.3	3.4	0.2
1971	163.3	161.5	1.9	0.6
1972	271.4	258.5	3.5	1.8
1973	372.0	353.9	1.3	0.3
1974	251.7	233.3	3.0	2.1
1975	614.4	593.3	12.4	9.6
1976	410.9	302.5	28.7	0.6
1977	388.5	297.7	15.8	1.1

Table 2. Loligo Biomass Estimates (mean weights in kg and numbers per tow by strata set)

Year	Area	Total			Day			Night			B_1 wt MT	B_1 # $X10^6$	B_2 wt MT	B_2 # $M10^6$
		# tows	$\bar{wt}$/tow	#/tow	# tows	$\bar{wt}$/tow	#/tow	# tows	$\bar{wt}$/tow	#/tow				
1968	SNE-MA	124	10.86	267.57	40	16.23	362.6	43	2.51	30.58	28073	692.6	29114	1211.9
	Geo. Bank	69	.40	10.73	22	.77	17.13	25	.02	.12				
	G. Maine	50	.01	.09	18	.01	.10	15	.00	.11				
1969	SNE-MA	119	13.99	347.5	38	27.32	777.3	39	3.29	51.29	37643	931.6	48053	2393.1
	Geo. Bank	73	1.56	36.7	25	2.49	60.37	32	.54	9.70				
	G. Maine	51	.03	.40	17	.06	.90	16	.00	.00				
1970	SNE-MA	122	4.13	105.4	38	5.55	168.1	40	2.98	63.70	12095	337.9	19640	1946.2
	Geo. Bank	70	1.12	49.4	23	2.99	133.73	24	.22	6.40				
	G. Maine	53	.05	1.46	18	.06	1.55	16	.00	.00				
1971	SNE-MA	125	4.04	234.2	43	8.55	515.7	41	.27	11.29	11752	641.4	14050	1106.1
	Geo. Bank	73	1.06	34.1	27	1.51	63.75	24	.51	9.69				
	G. Maine	55	.03	.57	16	.08	1.08	20	.01	.42				
1972	SNE-MA	114	9.41	398.9	31	13.14	524.9	40	1.24	31.25	25400	1065.1	21039	1533.3
	Geo. Bank	73	1.13	39.3	29	1.70	68.71	21	.28	5.08				
	G. Maine	55	0.0	0.2	18	.0	.0	18	.00	.02				
1973	SNE-MA	111	14.2	542.9	38	17.47	817.1	35	3.68	66.94	42338	1460.9	44252	3092.0
	Geo. Bank	73	4.53	60.9	27	7.16	96.15	28	2.31	30.44				
	G. Maine	54	.05	.91	16	.08	1.56	21	.02	.48				
1974	SNE-MA	108	11.41	355.9	33	16.33	886.1	38	5.38	130.0	32014	989	46442	4757
	Geo. Bank	74	2.21	62.07	20	2.67	96.2	26	2.93	22.1				
	G. Maine	57	.03	.78	19	.03	.63	21	.03	.23				
1975	SNE-MA	115	15.55	895.50	41	20.27	1548.4	36	6.11	115.2	41912	2412	48636	4789
	Geo. Bank	73	1.00	102.56	23	1.64	142.7	25	.47	1.82				
	G. Maine	65	.81	.81	19	.03	1.56	23	.02	.40				
1976	SNE-MA	123	15.79	579.79	37	22.05	979.9	40	3.65	90.74	44935	1632	51436	4372
	Geo. Bank	67	3.14	103.52	27	5.82	207.53	19	2.18	54.94				
	G. Maine	55	.36	12.67	14	.51	16.0	21	1.37	8.58				
1977	SNE-MA	119	11.92	577.89	46	14.20	729.54	35	1.89	94.67	31600	1526	27421	3157
	Geo. Bank	101	.95	43.76	38	1.34	84.06	33	.23	7.31				
	G. Maine	71	.06	.81	23	.04	.48	22	.02	.11				

Table 3. Illex Biomass Estimates (mean weights (in kg) and numbers per tow).

		TOTAL			Day			Night				
Year	Area	#tows	$\bar{wt}$/tow	#/tow	#tows	$\bar{wt}$/tow	#/tow	#tows	$\bar{wt}$/tow	#/tow	B_1 wt 3T	B_1 # X10^6
1968	SNE-MA	124	.48	2.62	40	.28	1.69	43	.13	.60	1845.4	9.7
	Geo. Bank	69	.34	1.68	22	.72	2.35	25	.04	.25		
	G. Maine	50	.10	.46	18	.18	1.49	15	.04	.25		
1969	SNE-MA	119	.10	.98	38	.17	1.64	39	.06	.50	418.8	3.5
	Geo. Bank	73	.04	.48	25	.04	.57	32	.06	.43		
	G. Maine	51	.07	.27	17	.14	.51	16	.00	.07		
1970	SNE-MA	122	.29	3.33	38	.21	4.53	40	.14	1.54	1523.6	14.6
	Geo. Bank	70	.24	2.62	23	.60	4.89	24	.05	.56		
	G. Maine	53	.29	.82	18	.50	1.36	16	.02	.11		
1971	SNE-MA	125	.28	1.95	43	.24	1.94	41	.13	.71	2024.1	10.1
	Geo. Bank	73	.46	1.70	27	.55	2.23	24	.25	.93		
	G. Maine	55	.43	1.81	16	1.21	4.44	20	.16	.85		
1972	SNE-MA	114	.45	4.36	31	.42	8.12	40	.27	1.57	1716.1	15.0
	Geo. Bank	73	.2	1.07	29	.15	.83	21	.15	.72		
	G. Maine	55	.19	.75	18	.34	1.5	18	.04	.09		
1973	SNE-MA	111	.07	.62	38	.08	.66	35	.03	.30	1262.0	8.2
	Geo. Bank	73	.50	2.51	27	.70	2.51	28	.44	3.29		
	G. Maine	54	.63	2.02	16	1.57	5.19	21	.09	.25		
1974	SNE-MA	108	.18	4.07	33	.11	7.98	38	.20	1.23	2500	18.02
	Geo. Bank	74	.16	1.12	20	.22	1.19	25	.09	.58		
	G. Maine	57	1.16	3.92	19	1.76	5.88	21	.46	1.41		
1975	SNE-MA	115	.99	15.74	41	1.11	23.08	36	.23	1.58	3306	60.25
	Geo. Bank	73	1.11	6.41	23	1.85	13.01	25	.76	2.03		
	G. Maine	65	2.71	7.31	19	3.34	9.17	23	.29	.60		
1976	SNE-MA	123	6.23	19.79	37	2.60	11.23	40	3.90	10.49	42929	134.34
	Geo. Bank	57	14.78	45.03	27	8.06	23.33	19	3.54	9.32		
	G. Maine	55	4.20	13.75	14	5.25	16.83	21	1.35	3.47		
1977	SNE-MA	119	4.46	15.79	46	3.93	16.21	35	2.32	7.71	21747	73.34
	Geo. Bank	101	5.02	15.81	38	4.09	15.23	33	5.31	16.23		
	G. Maine	71	2.21	7.24	23	4.25	14.82	22	.40	1.29		

Table 4. US and foreign monthly catches from the winter squid fishery, October 1977 - March 1978, by species, in metric tons.

	US (inshore)		Foreign (offshore)	
	Loligo	Illex	Loligo	Illex
Oct	65	328	44	3
Nov	88	71	2582	953
Dec	78	11	3236	932
Jan	61	2	716	18
Feb	40	3	2153	17
Mar	37	0	1388	20

1977 Total squid catches, in metric tons

	US	Foreign
Loligo	1476	16045
Illex	1080	21389
Total	2534	37434

Table 5. Monthly and annual catch per effort (metric tons per days fished) in the US directed[1] squid fisheries, by area and vessel size[2], 1976-1977, including total annual number of days fished.

Area	Vessel size	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total	Total # days
Illex																
Gulf of Maine																
	small	1976								4.55	6.66	13.61	5.63		9.30	10.0
		1977							1.76	0.78	1.81	7.43	9.85		3.85	4.5
	medium	1976													-	-
		1977								2.83	7.62	15.31	11.83		7.77	3.5
So. New England																
	small	1976														
		1977							2.59						4.06	2.3
	medium	1976							6.39						6.39	1.2
		1977														
Loligo																
Georges Bank																
	medium	1976														-
		1977					1.51		4.27						2.5	7.0
So. New England																
	small	1976					6.66	7.33		3.44	0.76				6.62	41.6
		1977					5.31	3.53		0.59	1.24	1.24	0.23	6.89	4.57	35.0
	medium	1976				1.56	7.79	5.34							6.41	58.8
		1977				1.	6.33	2.49	4.57			0.50	4.66		4.57	55.7
Mid-Atlantic																
	small	1976			1.84	14.97			1.33		2.10				3.38	2.4
		1977														
	medium	1976			1.41	1.48									1.47	4.0
		1977														

[1] Individual trips with *Loligo* or *Illex* comprising 50% or more of the total catch.
[2] Small vessels - 0.0-49.9 gross registered tons
Medium vessel - 50.0-149.9 gross registered tons

Table 6. *Loligo* stratified mean weight (pounds) per tow (1968-1978) from USA spring bottom trawl surveys.

Year	Mid Atlantic	So. New England	So. Georges Bank
1968	5.49	2.74	2.45
1969	3.82	.62	11.60
1970	2.75	2.35	1.61
1971	6.22	2.98	3.94
1972	6.69	13.08	6.11
1973	6.23	10.76	7.42
1974	6.09	2.144	.29
1975	10.71	16.73	4.49
1976	15.89	16.81	1.90
1977	2.15	2.56	1.36
1978	5.28	4.06	0.77

Table 7. *Illex* stratified mean weight (in pounds) per tow (1968-1978) from USA spring bottom trawl surveys.

Year	Mid Atlantic	So. New England	So. Georges Bank
1968	.09	.00	.00
1969	.02	.30	.00
1970	.02	.24	.00
1971	.57	.06	.02
1972	.00	.00	.02
1973	.02	.01	.17
1974	.26	.17	.13
1975	.03	.06	.12
1976	.04	.07	.05
1977	.04	.04	.10
1978	.11	.04	.01

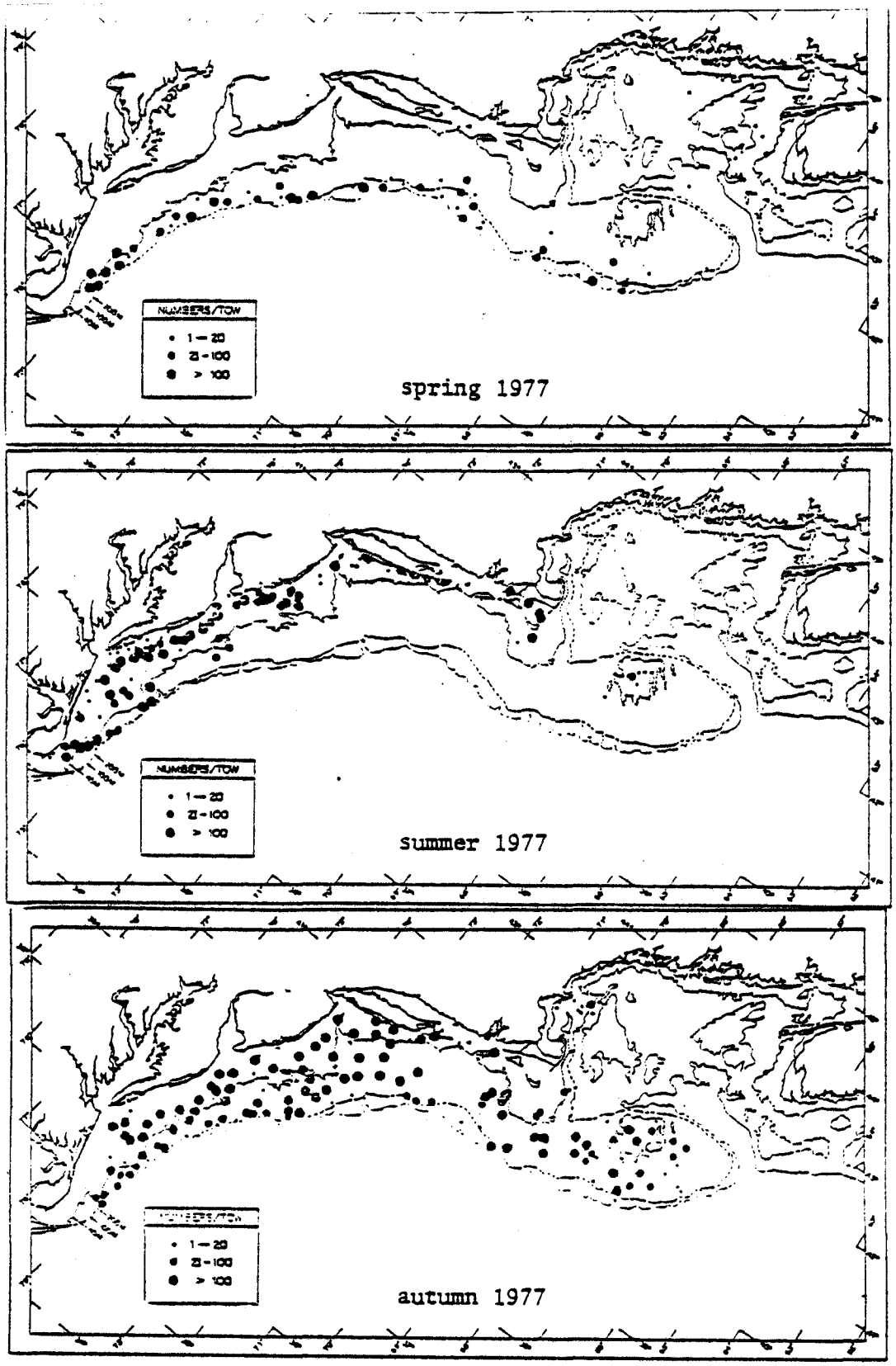

Figure 1. Distribution of Loligo pealei. Locations of stations where Loligo were taken, during 1977 U.S.A. bottom trawl surveys, by season.

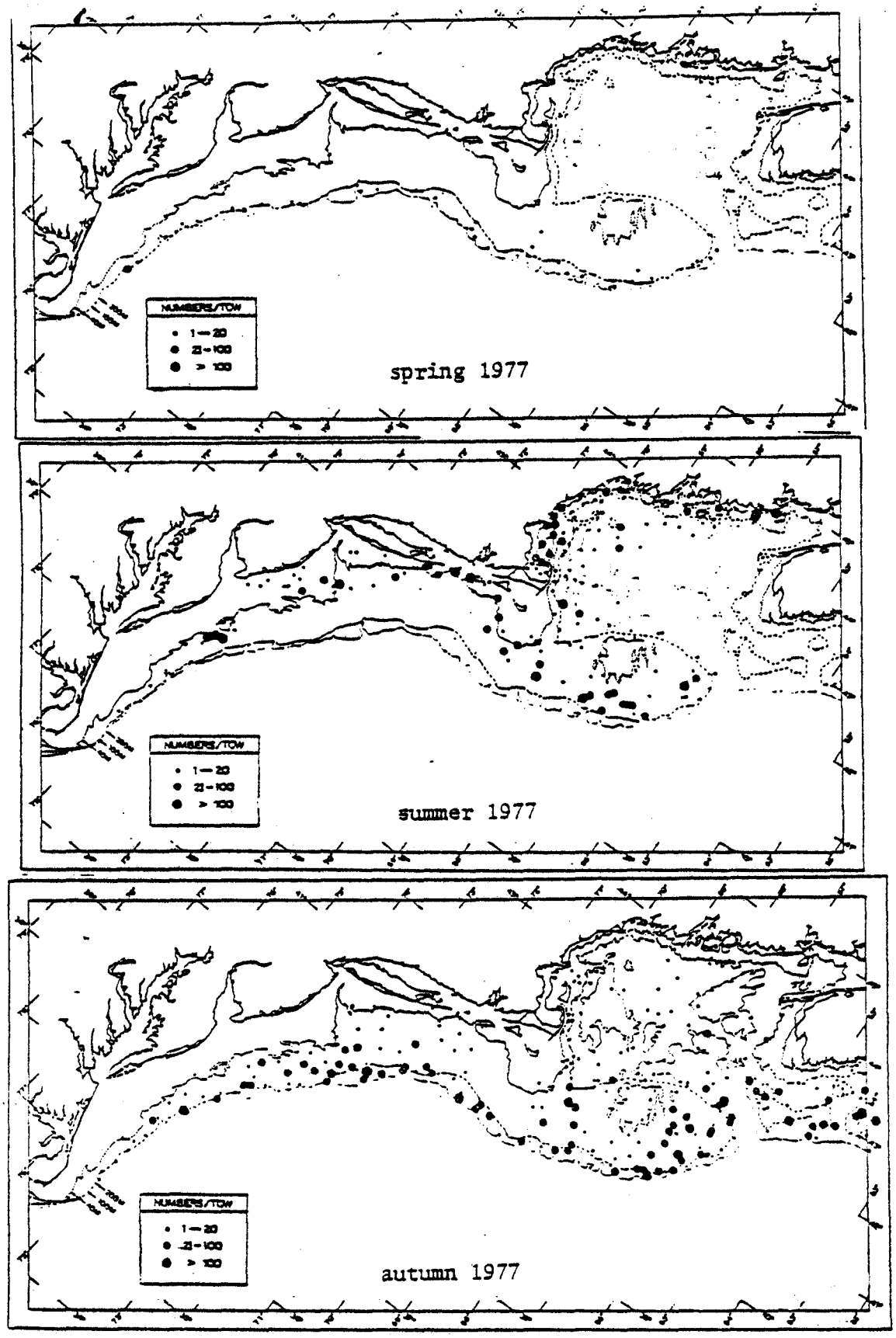

Figure 2. Distribution of Illex illecebrosus. Locations of stations where Illex were taken, during 1977 U.S.A. bottom trawl surveys, by season.

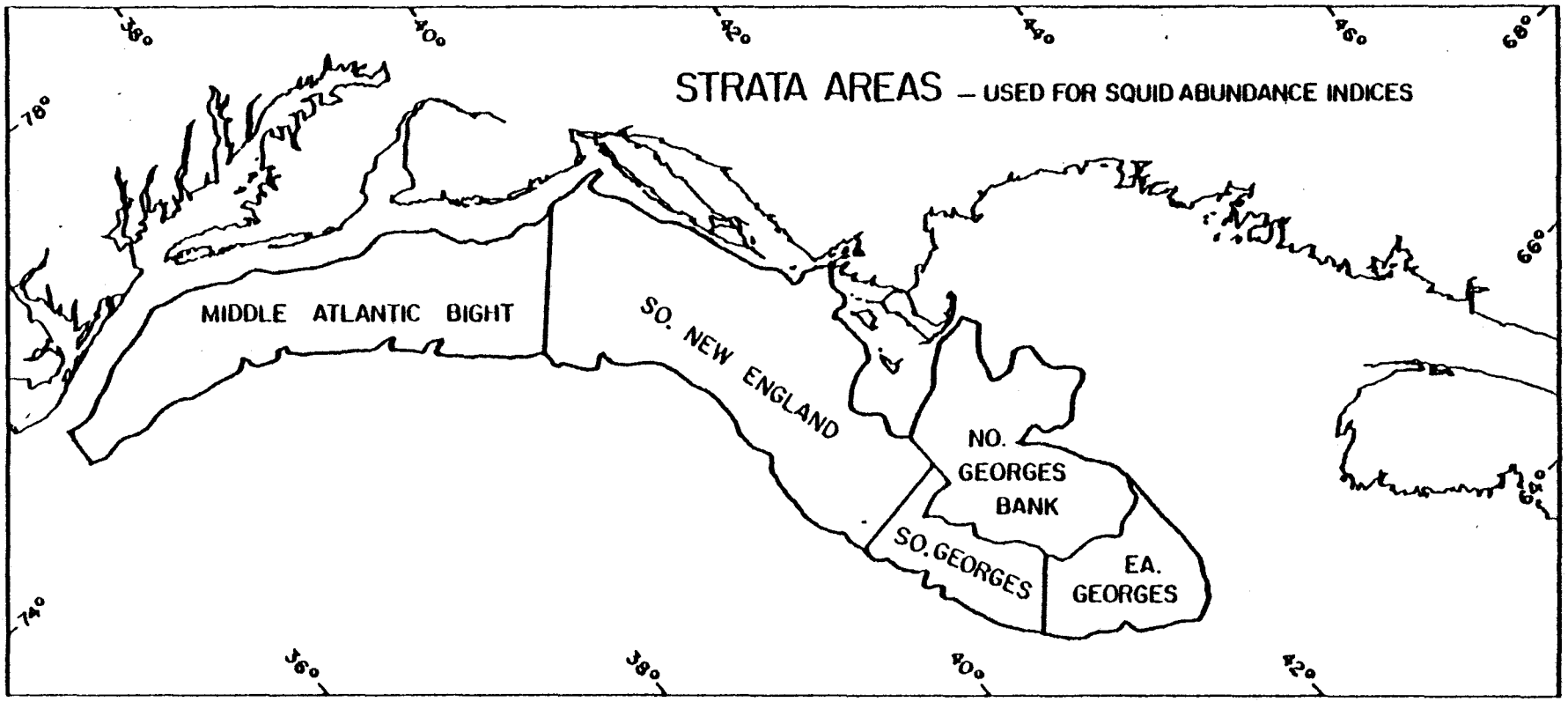

Figure 3. Areas used for squid abundance indices.