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Catch, effort and biological data from the 1977 directed squid fishery in the US Fishery Conservation Zone

by

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INTRODUCTION

Catch and effort statistics and biological data from both commercial and research vessel sources provide insight into the status of fish stocks and their management. The following is a summary of catch and effort statistics for the 1977 directed squid fishery which occurred in the 5 squid windows (Figure 1) as described in the USA squid preliminary management plan (1977). Also included is information on by-catches in this and other fisheries, to indicate potential impacts of the directed squid fishery on other species and the additional harvest of squid as by-catch in other fisheries. Summaries of Illex length frequencies obtained during this fishery are also presented.

The 1977 Illex biomass estimate, from the USA bottom trawl survey abundance indices is given in Table 7. USA preliminary catch and catch per effort data is also presented.

COMMERCIAL FISHERY

The USA's Fishery Conservation and Management Act of 1976 established the Fishery Conservation Zone and provided exclusive US regulation of the fishery resources within this zone. As part of the management process allowed for in the Act, the USA (the National Marine Fisheries Service), established an observer program, where by US observers were placed aboard a number of foreign vessels participating in allowed fisheries, within the US Fishery Conservation Zone. These observers monitored the fishery and provided biologists with a new source of information. Data which they collected during each observation period, includes: catch of each species (directed and by-catch), days fished, days on ground, number of hours fished and length frequency samples of the directed species. The catch per effort and length frequency data presented here are

from these observer reports. The total catch data is provided to the National Marine Fisheries Service by the individual countries in bi-weekly reporting periods, by fishery.

Catch per effort

Foreign catch per effort in metric tons (CPE) in the 1977 directed squid fishery, in each of the 5 squid management areas (Figure 1) is presented for bi-weekly periods, by country, in Table 1 (beginning March 1 when the Act went into effect).

This table provides the CPE of each species of squid as well as the CPE of 6 by-catch species groups (silver hake, red hake, herring, mackerel, butterfish, and other fish). The 5 individual species are those which have allowed directed fisheries while the other fish category contains all other species for which there is no foreign allocation.

Observer coverage refers to the percent of the total vessel days which a fleet was participating in the fishery, for which there was a US observer aboard. However, during March no observers were deployed, so these CPE figures are from US Coast Guard Boarding reports which summarize the vessel's own logs. These estimates are not as useful as the observer reports, since they may be summed over much greater periods of time and several different areas. The hours per day information may be useful in determining potential increases in catch per day, as when more hours may be added to the daily fishing.

The final, 'Total Reported', category gives the total number of vessels and days on ground in the area, as reported by the country.

It should be noted that the time periods of vessel coverage by each observer vary from about 5 to 17 days and do not coincide with the countries' reporting periods. Therefore, some catch and effort data may be included in more than one of the 2 week periods presented in Table 1. However, this should not effect the usefulness of these catch per effort indices.

By-catch

The total reported catch in metric tons of each species group, from the directed squid fishery is presented in Table 2, by country, reporting period (not bi-weekly) and squid area. The by-catch ratios which are given are: the metric tons of the given species, per metric ton of the total squid catch for that time, area and country. Again, the 5 species with allowed fisheries (silver hake, red hake, herring, mackerel and butterfish) are reported separately while all other species are combined in the other fish group. The total catch, by species (including

breakdown of the other fish category) and country in each of 5 squid management areas, for the period in 1977 when the Management Act was in effect (1 March-31 December) are given in Table 3. The by-catch ratios in this table represent the total by-catch in metric tons, all species, in the squid fishery per metric tons of squid.

The catch of squid in other fisheries is also important in managing these stocks. Therefore, reported catch of each species, including squid, in the other allowed fishery areas (Hake A & B, Herring 1 and Mackerel 1) is presented in Table 4, by reporting period, country and fishing area.

Length frequencies

Commercial length frequencies of Illex obtained by US observers aboard foreign vessels participating in the directed squid fishery are presented in Table 5. These are random samples of the Illex catch summarized by country, month and squid area.

USA DATA

Commercial

USA preliminary catch (Table 6) and catch per effort (Table 7) data for Illex is presented by month and area (Gulf of Maine, Georges Bank, Southern New England and Mid-Atlantic). The catch data is total catch in metric tons from both the food and the industrial fishery. The catch per effort data is based on trips by small and medium (0-49.9 and 50-149.9, respectively) bottom trawlers which reported Illex as the main species caught (greater than 50% of the trip total).

Research

The 1977 Illex abundance indices for the Middle-Atlantic - Southern New England, Georges Bank and Gulf of Maine areas, based on the USA autumn bottom trawl survey provides biomass and population size estimates of this stock (Table 8). These are based in areal expansion of stratified mean weights and numbers per tow and can be compared with past biomass estimates (Land and Sissenwine, 1977).

Literature Cited

- Lange, A. M. T. and M. P. Sissenwine. 1977. Biological considerations relevant to determining the optimum yield of squid (Loligo pealei and Illex illecebrosus) of the Northwest Atlantic. NMFS, NEFC Lab. Ref. No. 77- . . .

Table 1

1977. Biweekly catch per day (in metric tons) of squid and by-catch species from squid fishing areas. Estimates are from observer reports and do not include the entire catch (see text for explanation).

Biweekly period	Squid area	Country	Observer coverage(c)		Silver hake	Red hake	Herring	Mackerel	Butter-fish	Loligo	Illex	Other fish	Total reported(d)		
			No. days fished	Hrs./day									No. Vessels	No. days on ground	
3/01-3/31(a)	2	Japan	96.2	N/A	0.04				0.78	3.70	0.22	0.24	2	52	
		Spain	51.5	N/A			1.47	1.41		8	33				
	3	Japan	96.7	N/A					1.78	.90	2.88	0.05	4	60	
		Spain	73.9	N/A		2.94	0.12	17		46					
	4	Japan	3.75	N/A					0.76	3.53	0.06		3	45	
5	Japan	5.3	N/A					3.75	1.25			5	75		
4/01-6/15	All squid areas closed.														
6/16-6/30(b)	2	Spain	63.5		0.04				0.02		9.33	0.20	14	85	
7/01-7/15	2	Japan	46.2	9.8					0.01		21.50	0.08	2	26	
		Spain	34.1	7.5	0.02			8.05		0.19	25	299			
		USSR	52.5	11.0				21.31		0.10	15	99			
7/16-7/31	5	USSR	31.7	12.5	1.24	0.13				8.24	0.13		17	120	
		2	Italy	18.2	9.3									3	33
7/16-7/31	2	Japan	96.8	9.8							16.00	0.17	7	94	
		Spain	15.0	7.5							8.36	0.22	25	240	
		USSR	38.0	11.0							6.47	0.19	15	216	
											17.96	0.15	15	216	
8/01-8/15	2	Italy	100.0	9.3							14.80	0.13	8	103	
		Japan	88.3	17.3							8.36	0.22	10	53	
		USSR	49.1	10.5							16.04	0.19	3	46	
8/16-8/31	2	Italy	32.6	9.3						14.8	0.13				
9/15-10/31	All squid areas closed.														
11/01-11/15	1	Japan	50.8	16.7	0.11	0.08			0.34	5.02	0.24	4.19	11	122	
		2	Japan	8.7	16.4						1.00	1.00		6	23
			Spain	20.8	11.0	0.24	0.15		0.24	0.03	0.48	6.88	0.39	27	159
11/01-11/15	3	Italy	60.9	10.6	0.46	0.07		0.50	0.46	1.86	3.11	0.57	6	46	
		Japan	69.7	13.8	0.09				0.04	0.22	0.13	0.74	5	33	
		Spain	9.2	12.7	0.76	0.04		0.20	0.16	1.92	1.16	0.76	25	271	
11/16-11/30	1	Japan	41.7	16.7	0.05	0.03				0.38	2.09	0.12	12	100	
		Spain	23.3	11.7	0.14					1.86	0.21	2.21	14	60	
		2	Japan	100.0	16.4	0.20				0.50	1.10	0.20	5.10	4	10
11/16-11/30	2	Spain	28.8	11.0	0.13			0.07	0.07	0.13	9.00	0.13	8	52	
		3	Japan	47.2	13.8	0.47			0.12	0.06	1.09	0.18	0.41	11	72
			Spain	8.2	12.7	0.54	0.04			0.25	0.75	1.86	0.61	28	340
12/01-12/15	1	Japan	13.8	15.0	0.19				1.75	1.94	1.44	4.19	13	116	
		2	Japan	66.7	4.5	0.25				0.63	1.13	0.50	6.13	3	7
			3	Italy	19.2	12.2	0.16			0.56		1.28	0.40	0.56	8
12/01-12/15	2	Japan	46.7	12.2	0.64			0.14	0.64	1.00	1.64	1.14	5	30	
		Spain	14.1	15.6	0.07			0.25	0.14	12.36	0.05	1.05	29	312	
		3	Spain	11.1	12.2	0.07			0.26	0.14	12.60	0.05	1.07	25	389

(a) Catch per day based on boarding data--days fished may include time prior to beginning of stated period.
 (b) Catch per day based on observer information, not the entire catch of the fleet in the area.
 (c) Subsample of entire fishery, basis of catch per effort estimates.
 (d) Total reported fleet size and days on ground, may involve overlap with other areas and time periods.

Table 2. Reported by-catch and by-catch ratios¹ of allocated species and other fish in the allowed squid fishing areas for 1977, by reporting period, area, and country (1 March-31 December, under extended jurisdiction).

Reporting period	Squid area	Country	Silver hake	Red hake	Herring	Mackere1	Butterfish	Loligo	Illex	Other fish
3/02-3/31	3	Japan					124 .359	344	1	15 .043
	4	Japan					81 .276	276	17	12 .041
	5	Japan					212 .648	306	21	39 .119
3/12-3/31	3	Spain	2 .007			44 .158	14 .050	254	24	17 .061
	4	Spain						49	3	3 .059
	5	Japan					53 .421	118	8	7 .056
		Spain	5 .008			11 .018	25 .041	519	94	38 .062
6/15-6/30	2	Spain							248	1 .004
6/23-7/09		Spain	1 .001						1,911	13 .007
	5	USSR	3 .002						137	
7/01-7/16	2	Italy							99	
		Japan							513	
		Spain							340	
		USSR	29 .010	4 .001					2,900	2 .001
	5	USSR	3 .015						196	
7/10-7/30	2	Italy							399	
		Japan							646	
		Spain							2,274	3 .001
		USSR	2 .001						2,885	2 .001
	7/19-8/11	2	Japan						360	5 .014
	Spain							433		
	USSR		1 .004					271		

¹By-catch ratios expressed as metric tons by-catch per metric tons squid (both species).
²Other fish are all other species for which there is no allocated foreign catch.

Table 2 Reported by-catch and by-catch ratios¹ of allocated species and other fish in the allowed squid fishing areas for 1977, by reporting period, area, and country (Contd.) (1 March-31 December, under extended jurisdiction).

Reporting period	Squid area	Country	Silver hake	Red hake	Herring	Mackerel	Butterfish	Loligo	Illex	Other fish
7/31-8/20	2	Italy							469	
		Japan							784	3 .004
		Spain							425	
8/14-8/27	2	Italy							398	
		Japan							1,704	7 .004
		Spain							58	
8/22-9/03	2	Italy							8	
		Japan							334	1 .003
		Spain							415	
9/04-9/17	2	Japan							162	1 .006
		Spain						1	657	
11/01-11/12	1	Japan					8 .037	211	5	9 .042
		Spain								
	2	Japan						3	2	1 .200
		Spain	3 .011			1 .004	1 .004	30	239	15 .056
	3	Italy	20 .541			30 .811		18	19	13 .351
		Japan						20	1	9 .429
		Spain	33 .050			10 .015	6 .009	430	234	39 .059
11/06-11/26	1	Japan	11 .011	5 .005			45 .044	991	39	327 .317
		Spain	1 .007					76	65	7 .050
	2	Spain	3 .009					61	270	5 .015
		3	Italy	26 .081	4 .012		20 .062	12 .037	146	175
	Japan		1 .200					5		
	Spain	43 .047				14 .015		507	401	63 .069

¹By-catch ratios expressed as metric tons by-catch per metric tons squid (both species).
²Other fish are all other species for which there is no allocated foreign catch.

Table 2. Reported by-catch and by-catch ratios¹ of allocated species and other fish in the allowed squid fishing areas for 1977, by reporting period, area, and country (1 March-31 December, under extended jurisdiction).

Reporting period	Squid area	Country	Silver hake	Red hake	Herring	Mackerel	Butterfish	Loligo	Illex	Other fish
11/20-12/17	1	Japan	36 .044	2 .002		7 .009	279 .342	685	131	181 .222
		Italy	10 .011			197 .222	9 .010	406	480	65 .073
	3	Japan	7 .063			3 .027	22 .196	69	43	43 .384
		Spain	6 .009					542	92	47 .074
		Japan					13 .260	48	2	2 .040
12/11-12/24	3	Spain	4 .006			13 .020	41 .063	627	20	137 .212
		Japan					14 .264	45	8	4 .075
12/18-12/31	1	Japan								
		Italy	4 .017			115 .485	21 .089	166	71	47 .198
	3	Japan	2 .005	1 .003		4 .011	57 .150	314	65	115 .303
		Spain				3 .009	4 .011	347	1	44 .126
		Japan								
4	Japan			25 .556			38	7	2 .044	

¹By-catch ratios expressed as metric tons by-catch per metric tons squid (both species).
²Other fish are all other species for which there is no allocated foreign catch.

Table 3.

Total reported 1977 by-catch in the five squid fishery areas; by area, country, and species, and total by-catch ratios by area and country. Dates when these areas were opened in 1977 are given below.¹

Species	SQU 1		SQU 2				SQU 3				SQU 4		SQU 5		
	Japan	Spain	Italy	Japan	Spain	USSR	Cuba	Italy	Japan	Spain	Japan	Spain	Japan	Spain	USSR
Silver hake	47	1			7	34		60	10	87				5	3
Red hake	7					6	1	4	1						
Atlantic halibut										3					
Summer flounder	1							52	79	10			6		
Flounder (NS)							1	3	1	12				2	
American angler								12	1	7			1	7	
Atlantic searobin										12					
Scup	1							5	4	1					
Tautog										1					
Tilefish										14		11		23	
White hake	10									1	7				
Groundfish (NS)	19				4					1	36				
Atlantic herring							47					25			
Atlantic mackerel	7				1			342	7	70				11	
Butterfish	359				1			42	203	79		81		217	25
Bay anchovy	20									1					
Bluefish	68									10					
Swordfish				1											
Atlantic bonito	1														
Atl. little tunny	16														
Pelagics (NS)	117									36					
Black sea bass	11									1	2				
Squeteague										1	2				
Spiny dogfish	3				13					5	12				
Dogfish (NS)	11									3	39				6
Sharks (NS)	27			5		1			1	4	2	1		12	2
Skates (NS)										1					
Finfish (NS)	218	7		12	20	3		68	20	197	2	3	4	21	
Total by-catch	943	8	0	18	46	44	49	602	403	579	120	3	263	80	3
<u>Loligo</u>	1,980	76		2	92		10	754	752	2,668	314	49	424	519	
<u>Illex</u>	185	65	1,193	4,341	6,908	5,891	3	745	110	771	24	3	29	94	196
Total squid	2,165	141	1,193	4,343	7,000	5,891	13	1,499	862	3,439	338	52	453	613	196
Total catch	3,108	149	1,193	4,361	7,046	5,935	62	2,101	1,265	4,018	458	55	716	693	199
By-catch ratio	0.436	0.057	0.000	0.004	0.007	0.007	3.769	0.402	0.468	0.168	0.355	0.058	0.581	0.131	0.015

¹Fishing area Opened periods
 SQU 1 November 1-December 31
 SQU 2 March 1-31; June 15-September 15; November 1-December 31
 SQU 3 March 1-31; November 1-December 31
 SQU 4 March 1-31
 SQU July 1-August 15

Table 4. 1977. Reported catches of allocated species and other fish from allowed fisheries, other than the squid fisheries, by reporting period, fishing area, and country.

Reporting period	Fishing area	Country	Silver hake	Red hake	Herring	Mackerel	Butterfish	Loligo	Illex	Other fish
3/01-3/12	Hak-A	USSR	3,062	387	41					935
3/12-3/31			2,991	161	11				1	1,132
	Hak-B	USSR	290	17						217
3/27-4/09		USSR	3,331	220	2				1	825
4/10-4/16		USSR	307	5						98
4/15-4/23		USSR	60	8						185
4/24-5/07		USSR	3,801	201						
5/08-5/11		USSR	27	3						5
5/11-5/21		USSR	294	4					1	2
5/22-6/04		Bul	290						2	36
		USSR	5,507	58				2	13	368
6/05-6/18		Bul	424	2					6	21
		USSR	9,838	120				2	31	1,058
6/15-6/30		Bul	224	20					6	2
		USSR	4,979	1,162					18	326
9/04-9/17	Her-1	GDR								2
		Pol	2						20	16
11/20-12/17	Mac-1	Bul			1					1
12/11-12/24		Bul			1					1
12/18-12/31		Bul				2				120

Table 5. Illex length frequencies from USA observer reports from the 1977 offshore fishery by month, squid fishing area,¹ and country.

Length (cm)	Month: Jul				Month: Aug			Month: Sep	Month: Nov			Month: Dec		
	Area: 2	Area: 5	Area: 2	Area: 2	Area: 1	Area: 3	Area: 3	Area: 1	Area: 3	Area: 3	Area: 3	Area: 3		
Country:	Italy	Japan	Spain	USSR	USSR	Italy	Japan	USSR	Japan	Spain	Japan	Spain	Italy	Spain
1														
2														
3														
4														
5												2	3	
6		1										9	13	8
7		2					8					10	12	61
8		4									3	16	23	98
9		1									7	23	19	108
10		6						1			22	24	28	110
11		3	5	1	2						35	43	20	122
12		10	3		3						48	45	16	135
13		10	7	6	4					1	71	30	21	92
14		25	12	9	14		4			5	52	29	12	85
15		50	37	15	63		9			4	45	14	10	80
16	1	69	77	46	77		56	5	2	2	23	9	15	90
17	1	142	115	53	46	4	319	12	5		29	5	29	92
18	10	256	242	62	67	22	644	34	10		22	5	31	81
19	19	530	491	90	96	19	639	55	4	1	14	3	30	80
20	63	1,520	795	157	155	80	575	89	21	7	6	1	40	78
21	82	1,463	756	119	113	249	530	115	41	5	4	1	22	70
22	74	780	422	65	43	405	717	83	59	9	3		12	72
23	34	394	208	42	23	379	425	70	61	3	4		10	34
24	11	225	96	22	23	231	206	32	25	8	5		11	19
25	15	145	41	13	10	135	136	25	12	7	3	1	3	18
26	15	80	17	6	5	92	111	15	15	7	3		1	13
27	3	15	5	2		84	70	6	9	1	1		2	14
28	1	12	6			60	40	2		1			1	10
29		2	17	1		21	10	1					1	18
30		1	75			8	5			1			1	8
31			90			2	1						1	6
32			38			2								
33			26											8
34			14											
35			4											
36			4											
37														

¹USA squid management areas 1-5 (Figure 1).

Table 6. Preliminary USA Illex catch in metric tons, January-October 1977, by month and ICNAF division.

Month	ICNAF Division			
	5Y	5Ze	5Zw	6A
January			(1)	0.1
February				
March				
April				
May			0.1	
June			(1)	(1)
July	18.0	3.5	15.6	(1)
August	204.7	39.9	6.8	
September	319.2	45.4	4.1	(1)
October	298.2	18.6	0.7	

(1) Catch is less than 0.05 metric tons

Table 7. Preliminary USA Illex catch (MT) per day ⁽¹⁾ January-October 1977, by month and ICNAF division.

ICNAF Division	5Y		5Zw	
Tonclass (2)	2	3	2	3
Month				
January				
February				
March				
April				
May				
June				
July	1.8		2.6	6.4
August	0.8	2.8	7.4	
September	1.8	7.6		
October	7.4	15.3		
Total	2.9	7.4	4.1	6.4

(1) Catch per day, based on bottom trawl vessels only.

(2) Tonclasses: 2- 0-49.9 Gross Registered Tons
3- 50-149.9 Gross Registered Tons

Table 8. Preliminary abundance indices (stratified mean number and weight per tow) and biomass estimates (in number $\times 10^6$ and metric tons) for Illex in the Southern New England - Middle Atlantic; Georges Bank and Gulf of Maine areas.

Area	Number/tow	Weight/tow	Population size No. $\times 10^6$	Biomass MT
SNE-MA	15.09	4.73	38.2	11968
Georges Bank	15.24	5.33	21.2	7411
Gulf of Maine	6.11	2.22	9.95	3616
Total			69.35	22995

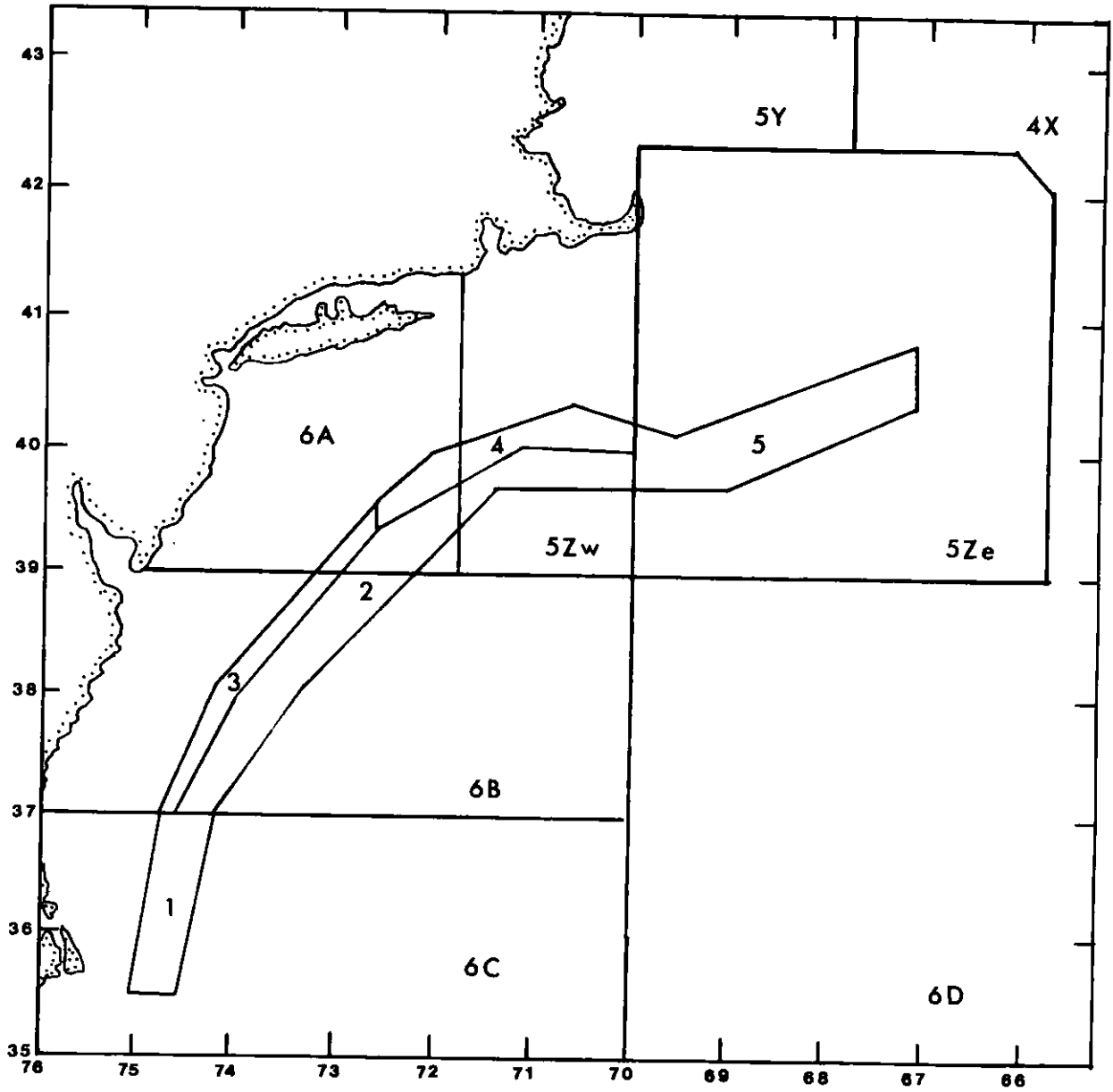


Fig. 1. Squid windows in the US Fishery Conservation Zone.