

Distribution of selected fish species and status of
major fisheries in the Northwest Atlantic

Technical Reference Document for Bilateral Negotiations
between USA and Canada
July 1976

by

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I. Introduction

This reference document is arranged in three sections plus two appendixes. A brief historical synopsis of major US fisheries for cod, haddock, redfish, herring, and sea scallops is presented in Appendix I; also in Appendix I are tables and figures of recent U.S. and Canadian landings for these species including the Northeast Peak of Georges Bank, the disputed area. In Section II, relevant summary statistics of landings are presented for US and Canada, for all major species of mutual concern to these countries; landings statistics of distant-water countries and distribution of fishing activity in the area of dispute are also presented in Section II.

In Section III, synopses of major species are given including information on population distribution, migrations, stock divisions, and fisheries, and current status of stocks and management (Total Allowable Catch Quotas - TAC's). Figures and charts in this section are at the end of the narrative descriptions. Literature cited is given in Appendix II.

Section IV contains only distribution maps of 13 miscellaneous species, based on US research vessel surveys. The density distribution of each species shown in plots of survey catches may be examined conveniently, in relation to the disputed boundary areas and to statistical divisions, by use of transparent overlays provided with this document.

II. Summary statistics of major fisheries of mutual concern to U.S. and Canada in the northwest Atlantic

Major historical fisheries by the U.S. include cod, herring, and haddock for which landings statistics go back at least to the 1890's. Large quantities of cod and haddock were taken by U.S. fishermen as far east as the Grand Banks off Newfoundland, and herring fisheries were concentrated in the Gulf of Maine. In the middle 1930's a major U.S. fishery for redfish was established, and U.S. vessels fished the Newfoundland banks, Gulf of St. Lawrence, and Nova Scotia as well as the Gulf of Maine. Landings statistics for these species and also "other groundfish" in years prior to ICNAF are summarized in Appendix I. The area within which these fisheries were conducted and the subsequent statistical divisions established by ICNAF are illustrated in Figure 1.

Statistics are more complete since 1952 after ICNAF was established and landings have been recorded by statistical subareas and divisions (Figure 2). US landings from the Gulf of St. Lawrence and Nova Scotian Shelf are summarized for the period 1952-1975 in Table 1. In addition to cod, haddock, and redfish, five species of flounders were taken along with pollock, several species of hake, swordfish, sea scallops, and a variety of other groundfish (Table 1).

During the same period Canadian fisheries have been conducted for a number of the same species in the Gulf of Maine, on Georges Bank, and southern New England - including cod, haddock, redfish, herring, pollock, sea scallops, lobster, swordfish, and bluefin tuna (Table 2).

An overall summary of average annual landings (by 5-year means) of major species by U.S., Canada, and all countries combined is presented in Table 3, for Subareas 3-6 and including the Northeast Peak of Georges Bank. The contribution of the Northeast Peak to Subarea 5 landings is illustrated with histograms for the major species (Figures 3-10).

Beginning in the 1960's significant fisheries were established by distant water fleets and have included fisheries for herring, mackerel, cod, red and silver hake, and squid. Catch statistics for distant water countries for Divisions 5Ze (Georges Bank) and 4X (western Nova Scotia) are given for the period 1968-1974 in Table 4. Total catches from Georges Bank (ICNAF Div. 5Ze) by the distant water fleets ranged from about 240,000 tons in 1969 to a high of 523,000 tons in 1972, and averaged about 385,000 tons annually. Data is not available on the precise amount of the distant water catch that is taken from the Northeast Peak of Georges Bank. However, the conclusion that a significant portion of the distant water catch is taken from this area is supported by U.S. aerial surveillance of foreign fleet activity. Catches by distant water fleets were much smaller in 4X (western Nova Scotia) ranging from 5,000 tons in 1968 to a high of 63,000 tons in 1973, for an average of about 27,000 tons annually. Distant water fishing activity in and adjacent to the disputed area on eastern Georges Bank is summarized below for the period 1973-1975, based on foreign

vessel observations by the NMFS Division of Enforcement and Surveillance. Bimonthly distribution of major vessel concentrations by country and species sought are given in Figures 11-16, and a synopsis of fishing activity for each country follows:

USSR: During 1973-1975 the bulk of Soviet effort has been concentrated in southern New England and mid-Atlantic waters, where large numbers of factory stern trawlers fish for mackerel and herring. Beginning in March a shift to the east occurs, and some of these large stern trawlers enter the southeast region of Georges Bank to fish for herring, mackerel, and hakes. At the same time, small to moderate concentrations of vessels have appeared in the Fundian Channel-Georges Basin areas in pursuit of redfish, hakes, and argentine. Also in March and April side trawlers rigged for purse seining (herring) begin to enter the area and are well established on Georges Bank in May.

During May-July fleets of approximately 100 vessels have actively fished for herring from the Great South Channel through Cultivator Shoals and onto the Northern Edge and Northeast Peak. Mass movements of these vessels occur on occasion between Georges and Browns Bank from May to July in both 1974 and 1975, apparently in attempts to locate concentrations of herring. At the same time smaller numbers of large factory stern trawlers (10-40) have fished on the southeastern part of Georges Bank and to some degree along the Northern Edge for herring and hake.

During July and August the purse seine fleet gradually withdraws from the area, although anywhere from 20-40 stern trawlers remain to fish for hake, herring, and mackerel from Cultivator Shoals eastward along the Northern Edge and the Northeast Peak as well as on the eastern slope. During the remainder of the year, anywhere from 20 to 40 stern trawlers have remained to fish for hake and herring in these areas.

It is therefore obvious that the disputed area is of high importance to the Soviets. Estimates of yield are difficult in that precise statistics for these areas are not available; but judging from the effort expended, it is likely that at least 60% of the USSR Georges Bank catch may be taken in these waters.

Poland: During winter and spring Polish vessels, like those of the USSR, tend to concentrate in southern New England and middle Atlantic waters, although 20-30 vessels moved onto eastern Georges Bank and the Northern Edge-Northeast Peak areas in May and June of 1974 in search of herring and hakes. Small numbers of vessels (<10) have been observed on the Northern Edge on occasion during July and August, apparently in pursuit of herring.

In early fall the number of Polish vessels in this area increases sharply with anywhere from 20-40 vessels engaged in fishing for herring from Great South Channel to and along the Northern Edge from September into November. During the latter month, a southward shift occurs and by December Polish vessels have completely withdrawn from this area.

The disputed area appears to be of considerable importance to Poland as a fishing area for herring, possibly providing 40-50% of the Polish Georges Bank catch.

FRG: Limited numbers of West German vessels appear in the Great South Channel area in July. During August through October an average of 15-20 vessels has fished primarily from the Great South Channel eastward onto the Northern Edge; catches have been almost exclusively herring although mackerel and pollock were also taken in 1975. West German vessels withdraw from the area by the end of November.

Vessel distributions indicate the disputed area to be of some importance to West Germany, providing perhaps 25% of the total herring catch.

GDR: East German vessels fish with Soviet and Polish fleets in the Southern New England-Middle Atlantic region during winter and spring. In August and September, effort on Georges Bank increases sharply, and from September into November as many as 40-60 vessels have fished for herring from Great South Channel eastward along the Northern Edge. This fishery is terminated completely by the end of November.

The disputed area is again of some consequence to this fishery, providing perhaps 25% of the total catch.

Spain: Spain has conducted a fairly intensive cod fishery, entirely within the disputed area (on and near the Northeast Peak) in late winter and again during summer and autumn. Presumably this pattern occurs in response to regulations prohibiting bottom trawling in the area during the spring months. As many as 40 vessels have been observed, all fishing for large cod.

Other: Small numbers of Bulgarian, Romanian, French, Japanese, and Cuban vessels (<5) have fished on occasion in and near the disputed area during summer and fall.

Table 1a. United States landings from Subarea 3 (Grand Bank) for 1952-1975 in metric tons round fresh.

YEAR	COD	HADD	REDFISH	HALIBUT	FLDRS	OTHER SPECIES	S HAKE	R HAKE	POLLOCK	AM PLAICE	WITCH FLDR	Y TAIL	WINTER FLDR (N.S.)	CUSK	W HAKE	WOLF	GROUND FISH (N.S.)	SWORD FISH	SEA SCALLOPS	TOTAL	
1952	64	4	31,464	-	88	24															31,644
53	116	334	33,114	12	40	19															33,635
54	36	390	31,269	21	85	33															31,834
55	3	14	13,406	41	22	96							NA								13,582
56	15	190	13,304	25	15	42															13,591
57	22	10	4,748	6	22	1															4,809
58	-	6	10,211	9	1	22															10,249
59	13	26	16,483	18	5	25															16,570
1960	-	1	15,231	7	2	4			NA	2					NA		NA	NA	NA		15,245
61	2	1	16,703	11	1	-			1	-	1				3		-	3	-		16,725
62	2	2	14,225	2	1	-			2	-	1				-		-	19	-		14,283
63	-	1	12,098	-	-	-			-	-	-				-		-	119	-		12,218
64	-	1	4,694	2	-	1			2	-	-				-		-	22	-		4,722
65	-	-	772	-	-	-			-	-	-				-		-	26	-		798
66	-	-	347	-	-	1			-	-	-				-		-	17	-		365
67	-	-	149	-	-	-			-	-	-				-		-	-	-		149
68	-	-	198	1	-	-			-	-	-				-		-	10	-		209
69	40	-	33	-	2	-			-	-	-				-		1	-	-		76
1970	55	-	-	-	-	-			-	-	-				-		-	-	-		55
71	-	-	-	-	-	-			-	-	-				-		-	-	-		-
72	-	-	-	-	-	-			-	-	-				-		-	-	-		-
73	-	-	-	-	-	-			-	-	-				-		-	-	-		-
74	-	-	198	-	-	-			-	-	-				-		-	-	-		198
75	-	-	-	-	-	-			-	-	-				-		-	43	-		43

Source 1. ICHAF Bulletins 1952-1974
 2. 1975 preliminary landings from NEFC data bank

NA = not available
 NS = not specified

NOTE: breakdown of "flounders" and "other species" did not begin until 1960

Table 1b. United States landings from Subarea 4 (Gulf of St. Lawrence and the Nova Scotian Shelf) for 1952-1975 in metric tons round fresh.

YEAR	COD	HADD	REDFISH	HALIBUT	FLDRS	OTHER SPECIES	S HAKE	R HAKE	POLLOCK	AM PLAICE	WITCH FLDR	Y TAIL	WINTER FLDR	FLDR (N.S.)	CUSK	W HAKE	WOLF	GROUND FISH (N.S.)	SWORD FISH	SEA SCALLOPS	TOTAL	
1952	5,558	25,009	31,345	53	1,578	3,594															67,137	
53	3,524	18,339	19,574	45	3,219	2,291																46,991
54	3,653	18,034	38,123	47	3,485	3,222																66,564
55	2,228	13,901	44,069	21	2,529	1,678						NA										64,426
56	1,856	14,024	41,138	33	860	2,635																60,546
57	1,553	8,951	37,529	50	836	1,276																50,195
58	1,283	12,639	38,963	35	352	3,221																56,493
59	2,097	10,544	29,917	44	526	3,538																46,666
1960	1,703	8,466	37,592	37	230	132	187	NA	1,946	62	142	14	7	5	NA	105	154	NA	NA	NA	50,552	
61	1,306	9,330	29,160	41	211	-	2	24	2,404	73	126	9	3	-	134	174	75	10	-	22	42,871	
62	1,257	6,440	29,437	17	316	-	29	-	1,841	85	200	20	6	5	68	-	90	195	-	-	39,690	
63	1,347	7,286	28,161	21	349	-	5	6	1,981	117	174	30	27	1	126	229	157	-	-	62	39,730	
64	1,452	8,541	27,919	27	448	-	-	-	1,238	194	189	36	29	-	172	190	119	-	-	135	40,241	
65	890	3,693	30,181	7	299	-	27	-	387	179	94	21	5	-	65	116	49	20	-	-	35,734	
66	983	2,492	29,445	13	152	-	-	88	779	110	20	14	8	-	72	-	24	43	-	-	34,091	
67	1,453	5,019	21,996	21	301	-	1	167	528	162	92	29	18	-	100	-	53	4	-	-	29,643	
68	860	3,157	21,072	15	132	-	1	77	295	67	29	23	13	-	43	-	68	3	-	-	25,723	
69	448	1,830	13,264	15	105	-	-	-	569	51	28	19	7	-	37	43	41	15	-	-	16,357	
1970	615	2,319	9,541	14	141	-	-	-	385	55	57	21	8	-	48	73	88	9	-	-	13,233	
71	335	1,248	10,967	6	153	-	1	-	164	70	64	12	7	-	28	66	71	10	-	-	13,049	
72	323	448	5,702	5	193	-	-	1	486	56	120	4	13	-	16	91	23	14	-	-	7,302	
73	184	442	12,378	5	56	-	-	1	572	8	45	1	2	-	33	30	19	1	73	-	13,794	
74	409	674	9,923	8	78	-	-	-	676	13	55	3	7	-	20	45	23	-	789	-	12,645	
75	497	2,162	5,464	6	184	1	6	3	741	40	34	63	44	3	29	48	29	-	726	-	9,896	

Source: 1. ICAF Bulletins 1952-1974
 2. 1975 preliminary landings from NEFC data bank

NA = not available
 NS = not specified

NOTE: breakdown of "flounders" and "other species" did not begin until 1960

Table 2. Landings (metric tons, live weight) by Canada from ICNAF Divisions 5ZE, 5ZW, 5Y, 6A-6C.

Canadian Catches in ICNAF 5ZE^{1/}

Year	Sea scallops	Pollock	Cod	Herring	Haddock	Cusk	Lobster	Bluefin tuna	Redfish	Swordfish	Other	Total
-----Metric Tons-----												
1950												
1951												
1952												
1953												
1954	NA	NA	--	NA	--	NA	NA	--	--	--	NA	1,148
1955	NA	NA	8	NA	31	NA	NA	--	--	--	NA	1,388
1956	317	NA	--	NA	--	NA	NA	--	--	--	NA	3,391
1957	758	--	--	--	--	--	--	--	--	--	--	--
1958	12,247	NA	--	NA	--	NA	--	--	--	--	--	12,294
1959	22,669	NA	--	NA	--	NA	NA	--	--	--	NA	19,696
1960	28,237	--	19	--	77	NA	--	--	--	--	NA	28,905
1961	37,889	34	223	--	133	4	--	--	25	471	27	38,806
1962	47,434	389	2,404	--	3,461	25	--	--	3	455	257	54,428
1963	48,957	900	7,832	--	8,379	43	--	--	89	2,909	1,038	70,147
1964	49,156	1,823	7,108	--	11,625	72	--	230	54	3,216	1,017	74,301
1965	36,803	1,885	10,598	--	14,889	203	--	48	17	1,874	1,175	67,492
1966	40,489	3,938	15,597	--	18,159	1,038	--	--	128	1,818	1,188	82,355
1967	41,657	4,754	8,232	1,306	13,040	1,702	--	--	119	1,388	1,629	73,827
1968	40,002	1,666	9,122	13,674	9,292	1,092	--	--	169	1,423	1,338	77,778
1969	35,836	2,403	5,997	945	3,990	725	--	--	235	1,438	1,103	52,672
1970	34,006	825	2,583	7	1,978	812	--	--	251	1,080	558	42,100
1971	32,434	1,556	2,979	12,863	1,630	1,032	101	50	149	--	519	53,313
1972	34,535	1,199	2,540	53	609	761	204	--	110	--	211	40,222
1973	35,053	1,466	3,220	5,083	1,563	580	228	--	--	--	387	47,582
1974	50,932	2,857	1,373	217	462	513	177	--	--	--	383	56,920

^{1/} Subarea 5Z for 1954-67.

Canadian Catches in ICNAF 5ZW

Year	Redfish	Cod	Pollock	Cusk	Bluefin tuna	Shipjack tuna	Swordfish	Haddock	Other	Total
-----Metric Tons-----										
1968	6	5					26	31	23	91
1969		--			--		154		25	179
1970	--	--	--	--			37		1	38
1971					374	123			0	497
1972		5	20	7					0	32
1973										--
1974									0	1

Canadian Catches in ICNAF 5Y

Year	Pollock	Cod	Herring	Haddock	Redfish	Halibut	Cusk	Other	Total
-----Metric Tons-----									
1950									
1951									
1952									
1953	NA	4	NA	11	--	--	NA	61	76
1954	--	--	--	--	--	--	--	--	--
1955	NA	12	NA	150	--	--	NA	322	484
1956	NA	8	NA	29	--	--	NA	309	346
1957	NA	21	NA	25	--	--	NA	9,336	9,382
1958	NA	64	NA	285	4	--	NA	465	814
1959	NA	132	NA	163	--	--	NA	1,403	1,698
1960	2,211	129		383	2	--	NA	49	2,774
1961	324	18	--	56	--	--	--	2	400
1962	212	83	144	107	--	--	--	1	547
1963	53	3	--	3	--	--	--	0	59
1964	119	25	636	70	2	--	--	25	877
1965	159	148	30	159	51	--	--	7	554
1966	72	384	47	1,125	292	--	10	69	1,999
1967	533	297	5,226	589	75	--	3	69	6,792
1968	74	61	21,497	120	22	7	8	16	21,805
1969	40	59	7,394	59	25	--	1	65	7,642
1970	28	26	5,005	38	87	--	--	31	5,215
1971	80	119	15,518	85	120	1	8	48	15,979
1972	147	53	11,638	23	14	--	--	12	11,887
1973	261	68	4,107	49	--	--	--	30	4,515
1974	679	120	4,044	198	--	--	--	98	5,139

Canadian Catches in ICNAF 6A^{1/}

Year	Bluefin tuna	Skipjack tuna	Sea scallops	Swordfish	Other	Total
-----Metric Tons-----						
1965						
1966			23,165		453	23,168
1967			50	611	86	747
1968			3,475	47	20	3,542
1969			15	73	11	99
1970	515			98	202	815
1971	382	69			0	451
1972	--		64		0	64
1973	102				0	102
1974	103				19	122

^{1/} Statistical Area 6 for 1966-67.

Canadian Catches in ICNAF 6B

Year	Sea scallops	Swordfish	Other	Total
-----Metric Tons-----				
1965				
1966				
1967				
1968	42	250	33	325
1969	--	211	21	232
1970		177	24	201
1971				--
1972	71		0	71
1973				--
1974			5	5

Canadian Catches in ICNAF 6C

Year	Bluefin tuna	Skipjack tuna	Swordfish	Sharks	Other	Total
-----Metric Tons-----						
1965						
1966						
1967						
1968			370		34	404
1969			174		20	194
1970	645		159	1	225	1,030
1971	104	12			0	116
1972	165				0	165
1973						--
1974						--

Table 3 Average annual landings in metric tons (by 5-year periods) of major species by USA, Canada, and all countries, for ICNAF Subareas 3-6, and including landings by USA and Canada from Northeast Peak of Georges Bank.

Species	Period	SA 3			SA 4			SA 5			NE Peak			SA 6		
		USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries
Cod	50-54	72*(3)	217,419*(4)	346,046*(4)	4,245*(3)	105,256*(4)	135,385*(4)	12,624*(3)	4*(1)	14,319*(4)	-	-	-	-	-	-
	55-59	13*(4)	191,524	395,523	1,803	129,224	194,430	14,265	45	14,314	3,851*(1)	8*(1)	-	-	-	-
	60-64	2*(2)	171,858	473,600	1,413	123,050	219,800	16,572	3,569	23,456	6,425	3,517	-	-	-	727*(2)
	65-69	40*(1)	133,314	606,400	927	136,296	217,644	19,050	10,101	47,365	3,633	9,911	-	-	-	325
	70-74	55*(1)	84,792	489,000	373	112,400	210,600	22,890	2,632	33,883	3,433	2,824*(4)	-	-	-	358
Haddock	50-54	243*(3)	14,548*(4)	35,994*(4)	20,461*(3)	27,838*(4)	47,607*(4)	48,925*(3)	11*(1)	50,008*(4)	-	-	-	-	-	-
	55-59	49	34,377	66,473	12,012	34,768	48,902	49,604	104	49,921	19,819*(1)	31*(1)	-	-	-	-
	60-64	1	18,790	41,800	8,013	33,580	49,714	50,444	4,859	57,400	20,086	4,733	-	-	-	32*(2)
	65-69	-	2,002	8,400	3,238	37,953	57,600	40,309	12,317	81,619	12,315	11,901	-	-	-	13*(4)
	70-74	-	1,112	4,120	1,026	18,896	22,400	5,891	1,327	8,600	2,118	1,420*(4)	-	-	-	2*(2)
Silver hake	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	126*(1)	-	-	-	-	-
	60-64	-	-	-	56*(4)	-	42,644	45,173	-	108,600	128*(4)	-	-	-	-	-
	65-69	-	540*(1)	328*(2)	10*(3)	3*(2)	22,800	33,977	-	150,943	2*(3)	-	-	-	-	2,880*(2)
	70-74	-	-	106*(3)	1*(1)	11*(1)	161,400	13,259	1*(1)	98,109	202*(4)	-	-	-	-	3,512
Red hake	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60-64	-	-	1,102*(1)	15*(2)	-	1,184*(3)	8,363*(4)	-	10,129*(4)	-	-	-	-	-	635*(2)
	65-69	-	22*(1)	1,741*(1)	111*(3)	2,731*(3)	4,021	7,338	22*(3)	54,605	-	-	-	-	-	584
	70-74	-	-	-	1*(2)	-	1,789	2,689	-	34,278	-	-	-	-	-	1,040
Pollock	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	1,372*(1)	-	-	-	-	-
	60-64	2*(3)	835	2,919	1,882	28,136	31,055	6,207	1,213	7,979	1,256	787*(4)	-	-	-	3*(2)
	65-69	-	212	1,078	512	16,349	20,046	3,461	3,105	8,035	598	2,930	-	-	-	14*(4)
	70-74	-	157	726	457	16,711	19,879	5,468	1,824	12,072	566	1,267*(4)	-	-	-	3*(3)
Yellowtail	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60-64	-	124	124	22	3,312	3,315	25,461	130*(3)	25,538	2,265*(1)	-	-	-	-	-
	65-69	-	5,009	9,768	21	4,560	6,735	31,645	188	37,279	8,258	-	-	-	-	2,051*(2)
	70-74	-	24,287	32,663	8	826	1,906	25,343	44	23,496	7,715	-	-	-	-	3,371
Redfish	50-54	31,949*(3)	12,601	36,571*(4)	29,681*(3)	7,482*(4)	50,436*(4)	17,052*(3)	-	20,308*(4)	-	-	-	-	-	-
	55-59	11,630	5,047	99,385	38,323	16,685	55,008	15,671	93*(2)	15,672	14*(1)	-	-	-	-	-
	60-64	12,550	14,868	82,600	30,454	14,632	49,211	10,927	35	11,589	20	-	-	-	-	-
	65-69	300	14,414	85,200	23,192	66,323	95,600	6,646	228	9,328	45	-	-	-	-	-
	70-74	198*(1)	10,069	106,600	9,902	103,969	131,800	13,118	168	16,584	68	-	-	-	-	1*(1)
Other flounder	50-54	71*(3)	14,910*(4)	-	2,761*(3)	-	-	19,644*(3)	-	-	-	-	-	-	-	-
	55-59	13	19,248	-	1,021	-	-	22,613v	2*(1)	-	-	-	-	-	-	-
	60-64	2*(3)	29,743	37,956	600	26,188	31,748	14,390	208	14,581	1,390	617*(1)	-	-	-	-
	65-69	2*(1)	75,659	119,465	374	37,225	48,531	17,937	559	21,427	1,378	-	-	-	-	5,190*(2)
	70-74	-	73,172	119,907	240	33,457	45,909	14,340	141	18,108	656	-	-	-	-	6,780

() Data available only for the # of years listed in parentheses. The mean was computed using this number.
 v For 1952-1959, other flounder included yellowtail.

Table 3 (cont.)

Species	Period	SA 3			SA 4			SA 5			NE Peak			SA 6		
		USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries	USA	CAN	All Countries
White hake	50-54	-	-	-	-	-	-	-	-	-	-	-	241*(1)	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	71	-	-	41*(2)
	60-64	3*(1)	153*(2)	132*(3)	174*(4)	5*(2)	183*(4)	2,167	45*(3)	1,154	65	-	22*(4)	-	-	22*(4)
	65-69	-	216	651	79*(2)	5,714	5,835	1,126	107	3,021	54	-	41*(4)	-	-	65*(4)
	70-74	-	3,545	5,162	61	10,309	12,065	2,816	-	-	-	-	-	-	-	-
Cusk	50-54	-	-	-	-	-	-	-	-	-	-	-	56*(1)	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	88	-	-	-
	60-64	-	18*(3)	42*(4)	125*(4)	3,211*(4)	3,319*(4)	773*(4)	36*(4)	812*(4)	134	-	952	36*(4)	2*(1)	2*(1)
	65-69	-	5*(4)	58	63	3,967	4,030	698	956	1,655	27	-	798*(4)	1*(1)	-	1*(1)
	70-74	-	22	180	29	4,753	4,808	938	743	1,601	-	-	-	-	-	-
Lobster	50-54	-	-	-	-	-	-	11,525*(1)	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	12,083	-	-	-	-	-	-	-	870*(2)
	60-64	-	-	-	-	-	-	12,100	-	-	-	-	-	-	-	1,408
	65-69	-	-	-	-	-	-	12,513	-	-	-	-	-	-	-	1,631
	70-74	-	537*(4)	537*(4)	-	14,980*(4)	14,980*(4)	10,884	203*(3)	10,600*(4)	108*(4)	178*(3)	136*(4)	-	-	1,631*(3)
Sea scallop	50-54	-	-	-	-	-	-	-	-	-	-	-	982*(1)	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	8,723*(4)	-	-	13,355*(2)
	60-64	-	824*(4)	1,099*(3)	73*(3)	6,981*(4)	7,031*(4)	79,103*(4)	45,859*(4)	118,962*(4)	37,309	40,218	37,309	8,950	9,695	8,950
	65-69	-	592*(4)	479	-	10,458	10,458	11,801	38,962	50,753	2,520	37,014	50,753	34,993	135*(1)	44,689
	70-74	-	727	436	-	8,061	8,061	12,153	37,393	49,546	637	32,307*(4)	637	9,475	-	9,502
Sculd	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	700*(2)	-	-	-	-	-	-	-	818*(2)
	60-64	-	-	-	-	-	-	627	-	-	-	-	-	-	-	849
	65-69	-	-	-	-	-	-	729	2*(2)	17,533*(4)	-	-	-	-	771	24*(1)
	70-74	-	565*(4)	568*(3)	-	26*(4)	4,820*(4)	729	-	-	-	-	-	-	-	17,954
Herring	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60-64	-	4,575*(4)	4,575*(4)	-	108,241*(4)	110,600	49,117*(4)	390*(2)	142,670	-	-	-	-	-	169*(2)
	65-69	-	80,052	80,102	-	268,794	301,400	33,945	10,023	241,650	-	-	-	5,308*(3)	1,148	18,873
	70-74	-	69,928	68,107	-	250,010	291,500	32,611	11,707	228,400	-	-	-	4,516*(4)	692	24,807
Mackerel	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60-64	-	675*(4)	723*(4)	-	6,578*(4)	6,720*(4)	1,079*(4)	-	1,464*(4)	-	-	-	-	-	249*(2)
	65-69	-	164	203	-	11,500	14,564	2,692	-	28,663	-	-	-	-	689	16*(1)
	70-74	-	1,574	1,635	-	15,340	28,242	1,361	27*(2)	177,405	-	-	-	807	-	145,029
TOTAL	50-54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	55-59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	60-64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	65-69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70-74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

() Data available only for the # of years listed in parentheses. The mean was computed using this number.

Table 4

Catch by distant-water countries 1/ in ICGMF Division 5ZE (Georges Bank) 1968-1974.

Country	Herring	Mackerel	Silver hake	Cod	Pollock	Other Species	Total
-----Metric tons-----							
1968							
FR Germany	70,673	119	--	--	--	305	71,097
German DR	66,846	3,252	--	2	--	656	70,756
Poland	61,961	9,087	887	2,291	--	2,582	76,808
Spain	--	--	--	14,488	358	2,867	17,713
USSR	88,997	13,907	28,013	1,397	112	38,432	170,858
Other distant-water countries 2/	2,013	283	14	34	2	891	3,237
Total	290,490	26,648	28,914	18,212	472	45,733	410,469
1969							
FR Germany	60,796	85	--	3	--	25	60,909
German DR	85	253	119	115	--	172	751
Poland	30,536	11,304	292	385	--	8,446	50,963
Spain	--	--	--	13,597	220	1,207	15,024
USSR	59,110	13,577	16,144	284	42	11,309	100,466
Other distant-water countries	12,786	--	--	1	--	4	12,791
Total	163,313	25,219	16,555	14,385	265	21,170	240,904
1970							
FR Germany	81,768	498	--	3	941	34	83,244
Japan	1,160	165	31	15	1	3,985	5,357
Poland	54,228	37,924	15	580	--	4,155	96,902
Spain	--	--	--	6,843	4	845	7,692
USSR	31,651	25,237	20,548	224	51	15,963	93,674
Other distant-water countries	489	562	73	126	--	926	2,176
Total	169,296	64,366	20,667	7,791	997	25,908	289,045
1971							
Bulgaria	3,939	1,632	1,393	10	--	3,612	10,586
FR Germany	54,087	566	--	--	47	42	54,742
German DR	15,038	2,109	--	--	1,202	1,100	19,449
Japan	2,428	116	82	20	5	10,378	13,029
Poland	64,482	27,011	124	137	1	9,213	100,968
Spain	601	3	--	6,393	160	678	7,835
USSR	54,358	32,093	52,191	1,055	1,088	32,595	173,380
Other distant-water countries	--	1,091	265	6	--	2,629	3,991
Total	194,933	64,621	54,055	7,621	3,503	60,247	383,980
1972							
Bulgaria	1,490	4,962	1,914	53	--	5,157	13,576
FR Germany	27,632	393	226	4	73	56	28,384
German DR	37,715	15,609	111	52	2,104	1,163	56,754
Japan	1,159	203	104	95	4	9,444	11,009
Poland	39,800	44,698	--	159	8	9,800	94,465
Spain	--	--	--	5,667	80	5,038	10,785
USSR	39,293	67,533	73,882	1,773	984	121,187	304,652
Other distant-water countries	2,555	460	396	1	--	456	3,858
Total	149,644	133,358	76,632	7,804	3,253	152,301	523,493
1973							
Bulgaria	1,153	6,267	879	40	--	963	9,302
FR Germany	31,186	512	--	--	216	593	32,507
German DR	51,293	13,429	145	35	439	12,394	77,729
Japan	1,637	86	188	3	14	6,086	8,014
Poland	39,797	44,626	251	11	1	16,712	101,398
Spain	--	--	--	5,541	794	2,682	9,017
USSR	36,704	89,559	55,042	2,042	1,150	71,108	255,605
Other distant-water countries	2,820	474	4	36	--	101	3,435
Total	164,590	154,653	56,509	7,708	2,608	110,639	497,007
1974							
Bulgaria	835	1,155	740	--	--	412	3,142
FR Germany	23,080	336	49	11	31	26	23,533
German DR	30,829	5,809	36	27	--	763	37,464
Japan	2,442	--	43	--	--	7,189	9,674
Poland	36,354	20,736	70	257	4	9,275	66,694
Spain	--	--	--	6,370	664	7,114	14,148
USSR	29,941	71,048	62,938	78	--	58,270	202,275
Other distant-water countries	1,550	1,499	204	32	46	590	3,912
Total	125,031	100,574	64,080	6,775	745	63,637	300,842

1/ Includes all countries other than Canada and the United States.

2/ France, Iceland, Romania, and Cuba.

3/ FR Germany 1968 data for 5Z was assumed to be for 5ZE.

Table 4 cont.

Country	Herring	Mackerel	Silver hake	Cod	Pollock	Other Species	Total
Metric tons							
1968							
Bulgaria	--	--	--	--	--	--	--
FR Germany	--	--	--	--	--	--	--
German DR	--	--	--	--	--	--	--
Japan	--	--	--	--	--	--	--
Poland	246	--	--	--	--	187	433
Spain	--	--	--	2,829	53	116	2,998
USSR	119	56	56	1,061	39	706	2,037
Other distant-water countries	--	--	--	24	2	40	66
Non-members	--	--	--	--	--	--	--
Total	365	56	56	3,914	94	1,049	5,534
1969							
Bulgaria	--	--	--	--	--	--	--
FR Germany	1,010	--	--	--	--	--	1,010
German DR	--	--	--	--	--	--	--
Japan	--	--	--	--	--	--	--
Poland	262	12	--	--	--	67	341
Spain	--	--	--	8,217	195	480	8,692
USSR	23	11	1,554	1	53	507	2,129
Other distant-water countries	--	--	--	5	--	19	22
Non-members	30	1	--	1	1	1	34
Total	1,325	24	1,554	8,222	229	1,074	12,428
1970							
Bulgaria	--	--	--	--	--	--	--
FR Germany	--	--	--	--	--	--	--
German DR	--	--	--	--	--	--	--
Japan	67	--	88	152	39	3,188	3,534
Poland	--	--	--	--	--	--	--
Spain	--	--	--	3,647	59	370	4,076
USSR	454	95	4,903	10	2	824	6,288
Other distant-water countries	--	--	--	--	--	--	--
Non-members	--	--	--	--	--	--	--
Total	521	95	4,991	3,809	100	4,382	13,898
1971							
Bulgaria	--	--	--	--	--	--	--
FR Germany	--	--	--	--	--	--	--
Germany DR	--	--	--	--	--	--	--
Japan	766	--	2	6	10	3,273	4,057
Poland	--	--	--	--	--	--	--
Spain	--	--	--	2,615	74	347	3,036
USSR	172	507	6,118	337	492	3,481	11,107
Other distant-water countries	--	--	--	--	--	--	--
Non-members - A	57	--	--	--	--	--	57
Total	995	507	6,120	2,958	576	7,101	18,257
1972							
Bulgaria	--	--	--	--	--	--	--
FR Germany	--	--	--	2	3	6	11
German DR	91	--	--	--	--	13	104
Japan	919	--	57	--	--	142	1,118
Poland	--	--	--	--	--	--	--
Spain	--	--	--	1,547	18	546	2,111
USSR	7,393	436	5,117	30	439	5,036	18,451
Other distant-water countries	--	15	30	--	8	30	83
Non-members	--	--	--	--	--	--	--
Total	8,403	451	5,204	1,579	468	5,773	21,878
1973							
Bulgaria	--	--	--	--	--	--	--
FR Germany	237	--	--	--	34	6	277
German DR	--	--	--	--	--	--	--
Japan	886	8	63	5	799	276	2,032
Poland	--	--	--	--	--	63	63
Spain	--	--	--	1,519	3	134	1,656
USSR	17,889	1,612	30,022	562	46	9,274	59,465
Other distant-water countries	--	--	--	--	--	--	--
Non-members	--	--	--	--	--	--	--
Total	19,012	1,620	30,085	2,046	822	9,763	63,473
1974							
Bulgaria	--	--	--	--	--	--	--
FR Germany	101	383	230	15	--	225	954
German DR	--	--	--	--	--	--	--
Japan	1,043	--	--	--	--	--	1,043
Poland	98	1	--	--	--	23	1,064
Spain	--	--	--	1,640	--	822	921
USSR	12,157	6,605	7,874	119	378	363	2,581
Other distant-water countries	137	--	--	5	576	19,146	46,777
Non-members	--	--	--	--	--	--	14
Total	13,536	6,999	8,104	1,679	954	20,677	44,859

1/ Includes all countries other than Canada and the United States.
 2/ France, Iceland, Romania, and Cuba.
 3/ FR Germany 1968 data for 72 was changed to be for 73.

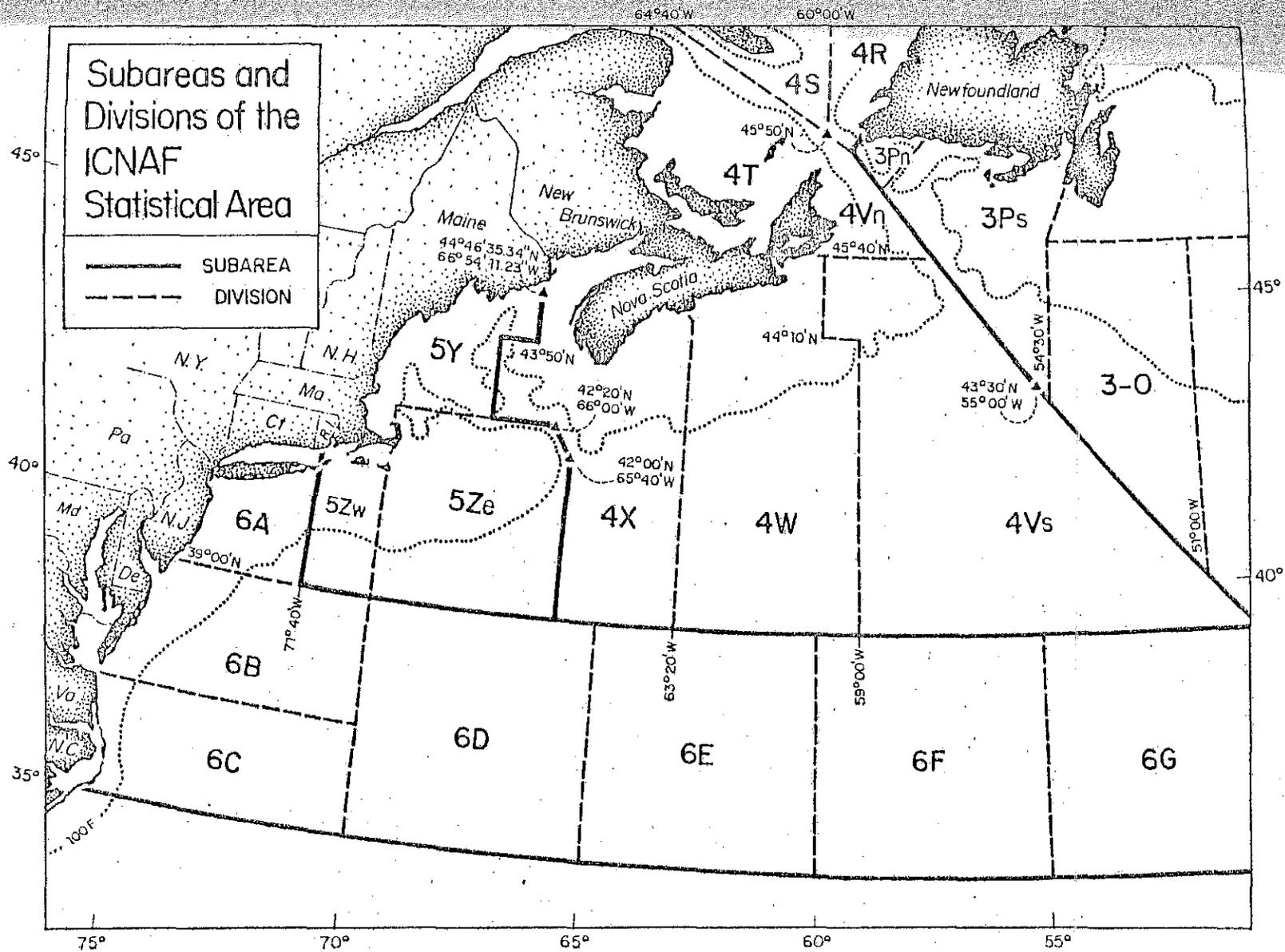


Figure 1. ICNAF Subareas and Divisions within region where historical US fisheries have occurred.

STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

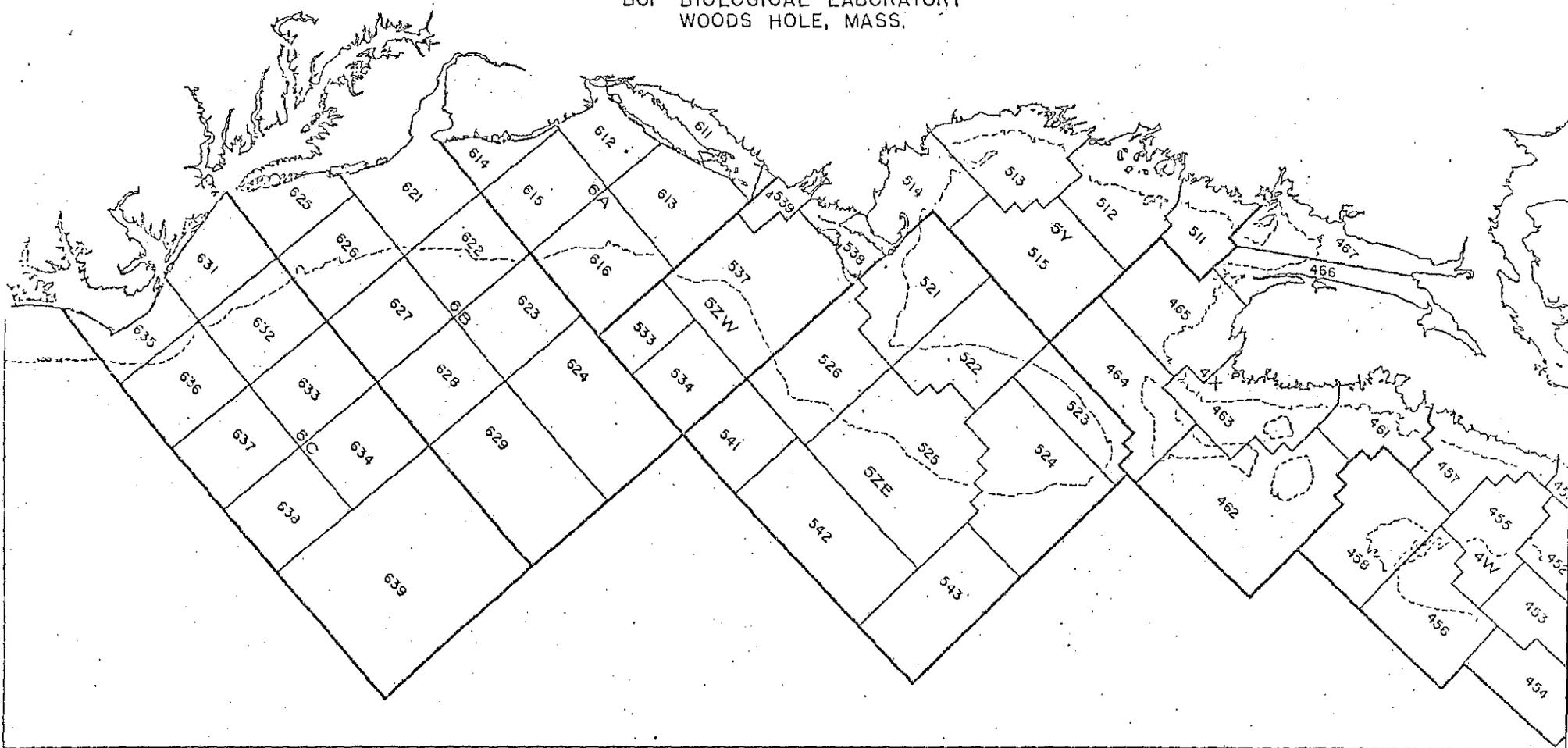


Figure 2. ICNAF Statistical Divisions and statistical areas within Divisions in Subareas 4-6.

COD

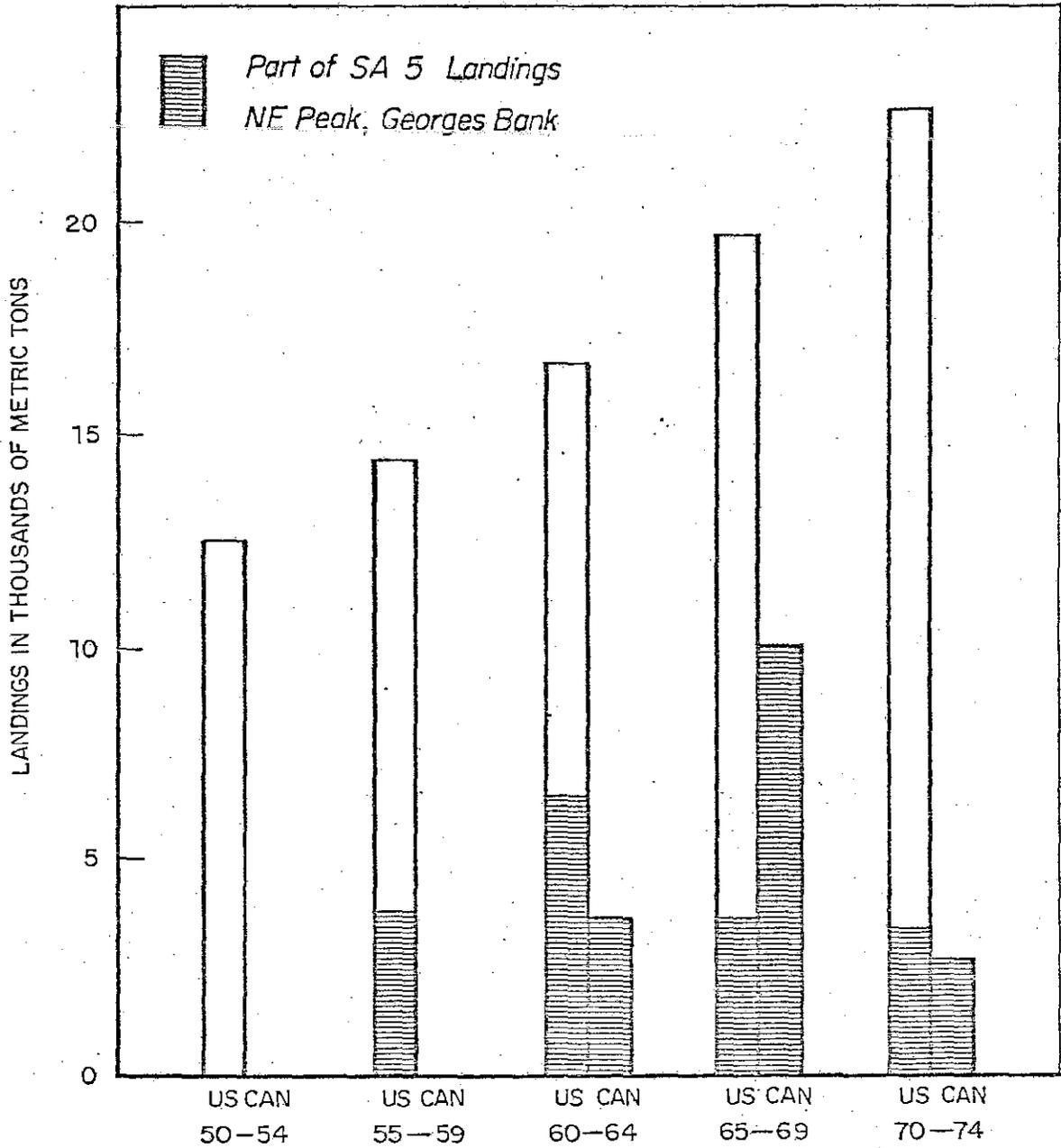


Figure 3. US and Canadian Subarea 5 Cod Landings.

HADDOCK

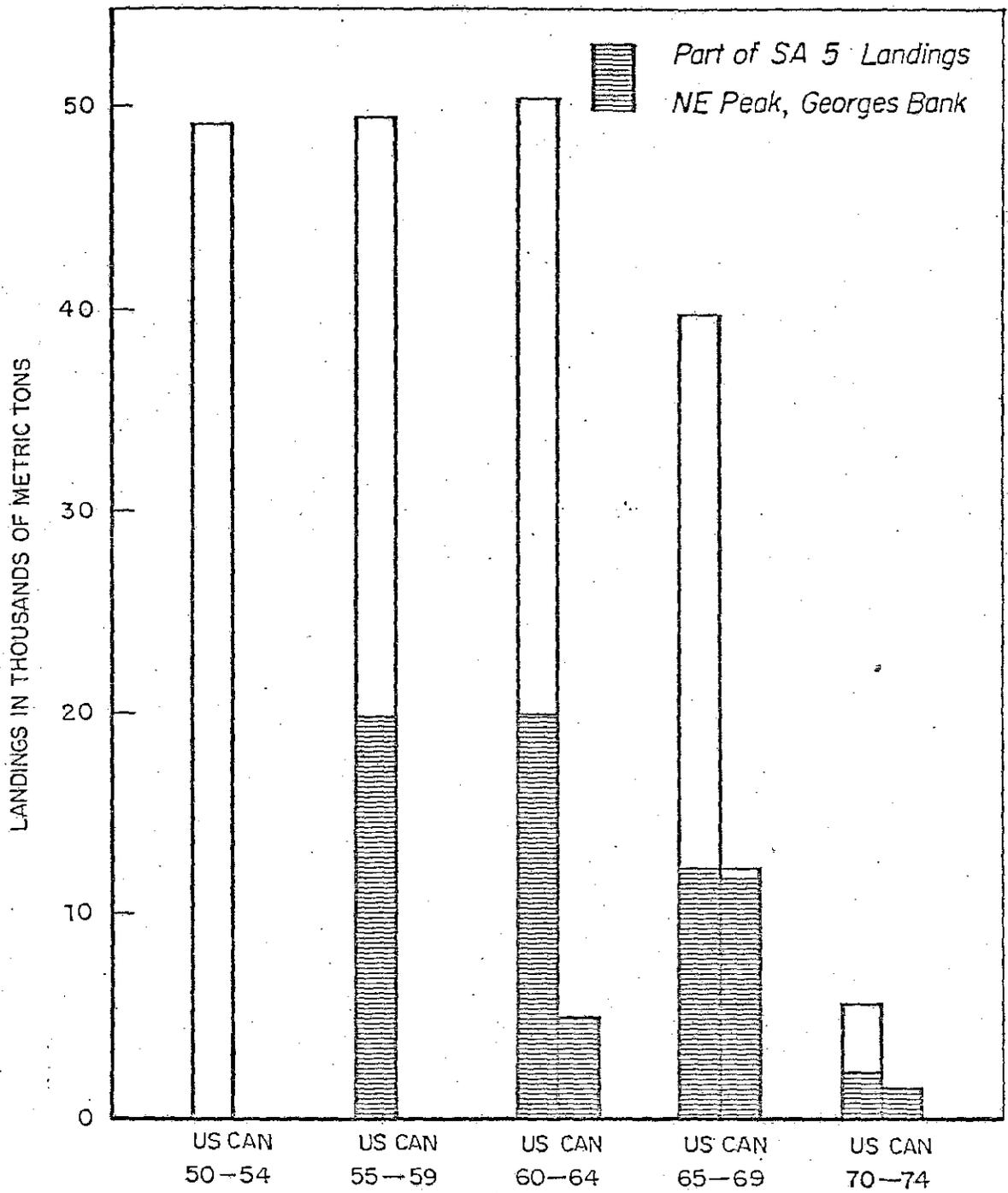


Figure 4. US and Canadian Subarea 5 haddock landings.

SEA HERRING

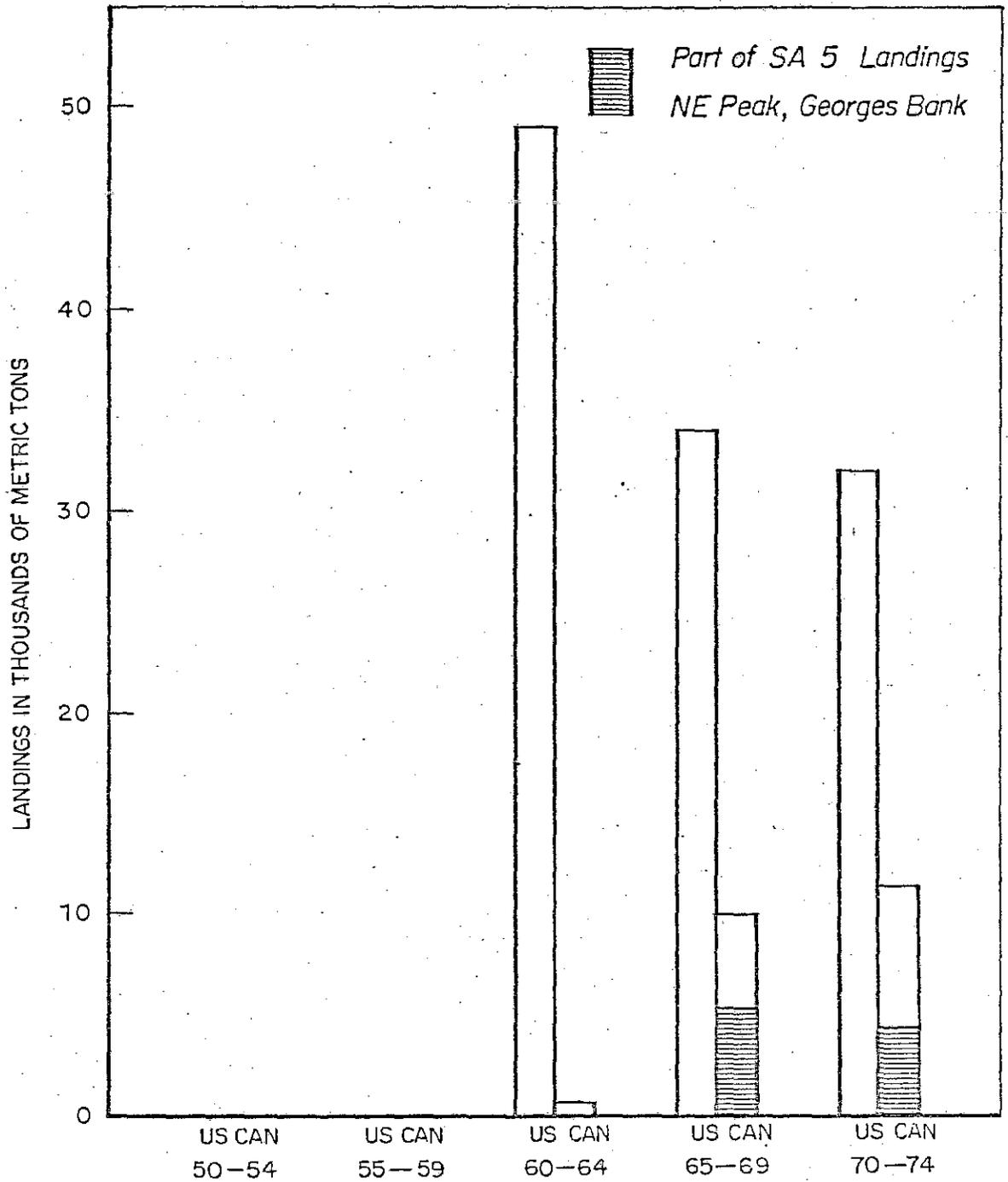


Figure 5. US and Canadian Subarea 5 herring landings.

POLLOCK

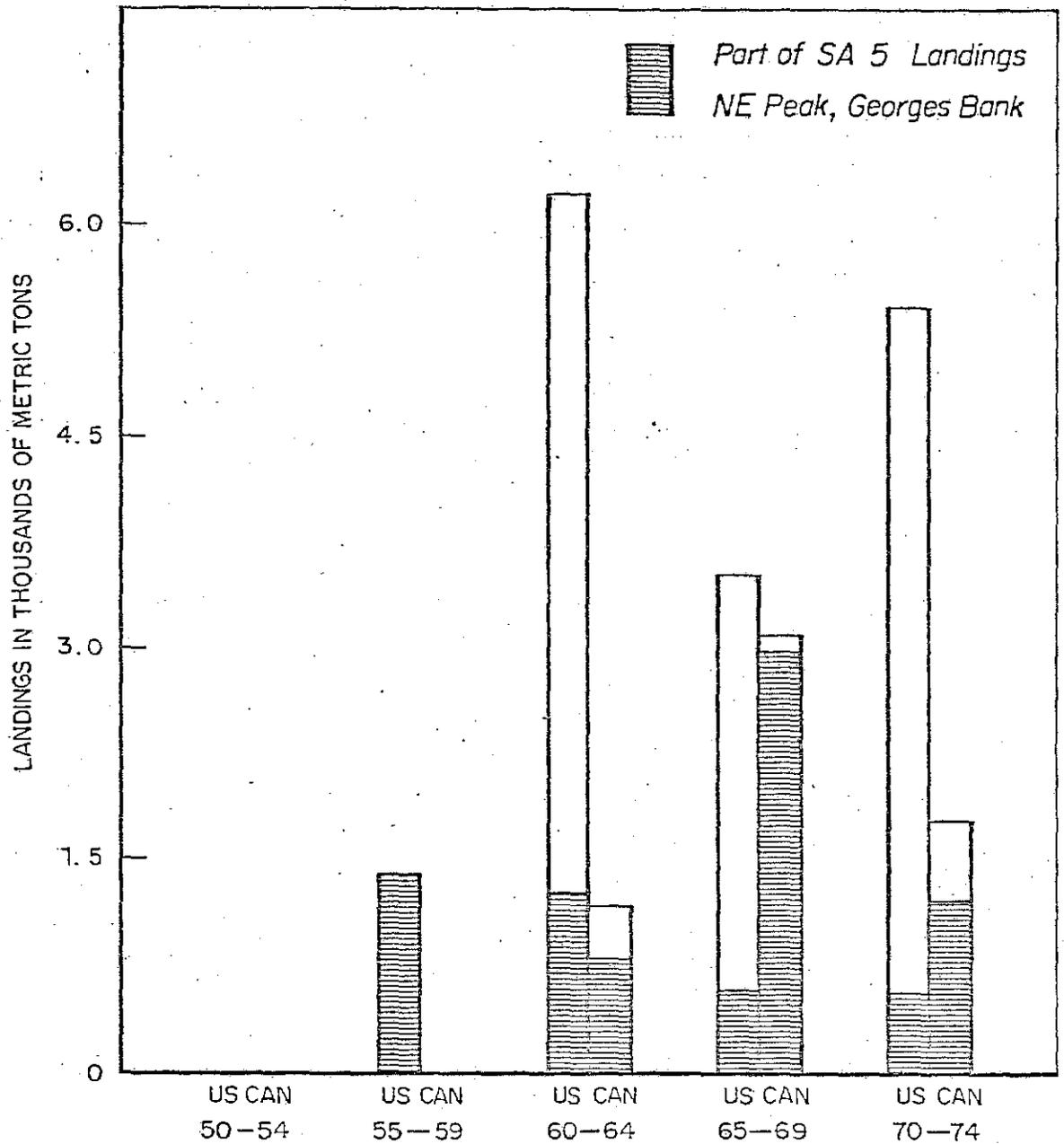


Figure 6. US and Canadian Subarea 5 Pollock landings.

SEA SCALLOP

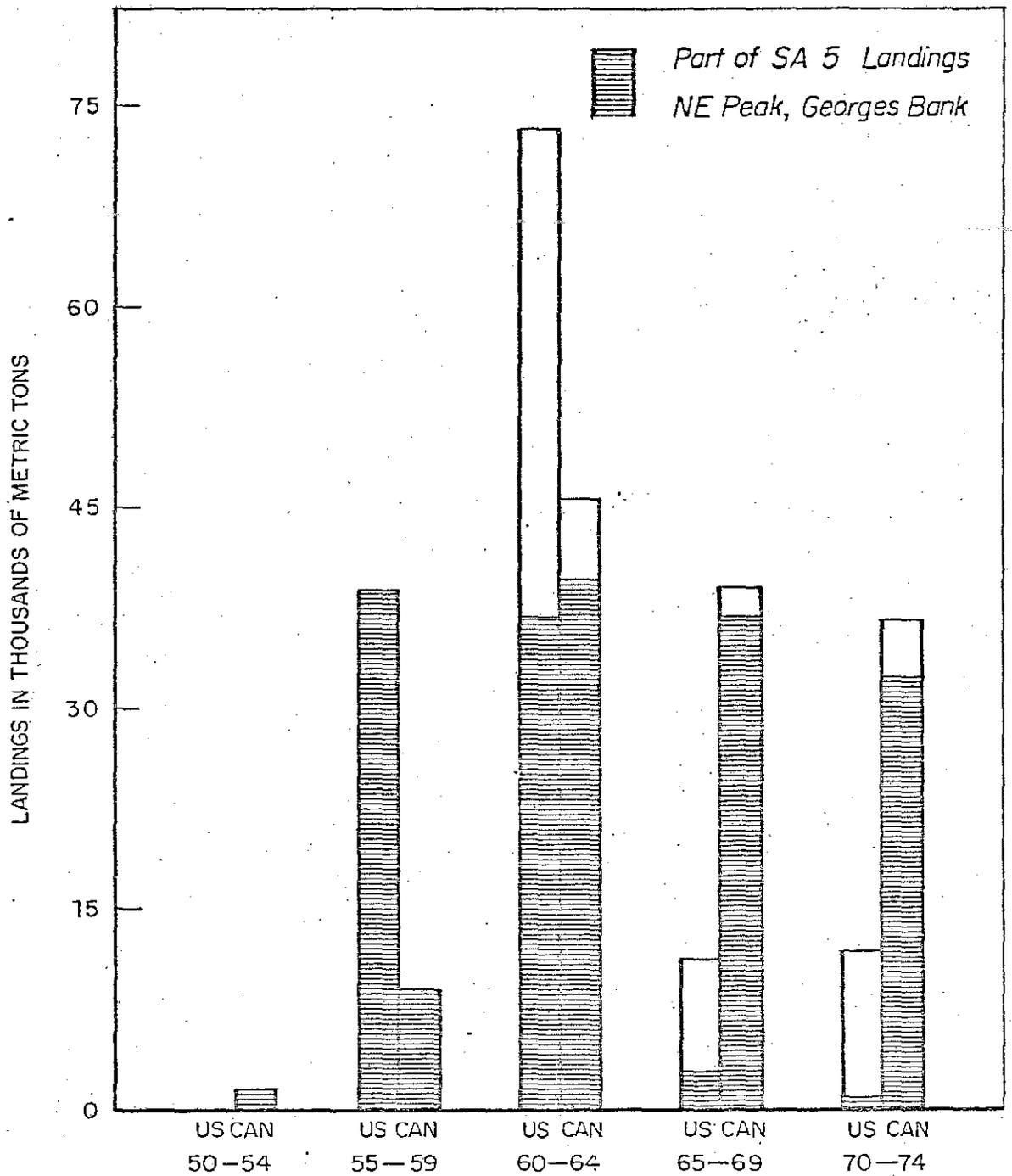


Figure 7. US and Canadian Subarea 5 sea scallop landings.

YELLOWTAIL

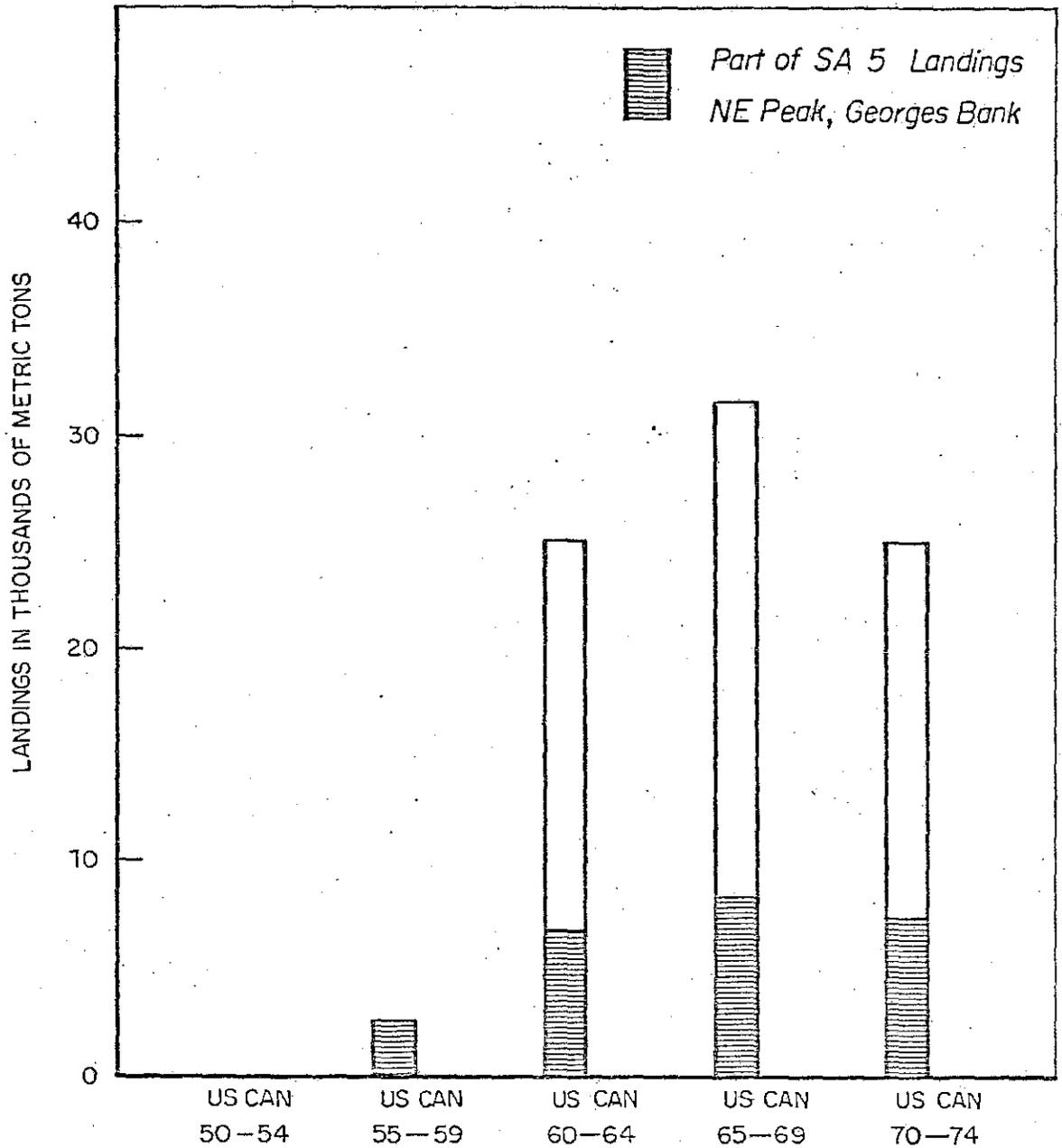


Figure 8. US and Canadian Subarea 5 yellowtail landings.

OTHER FLOUNDER

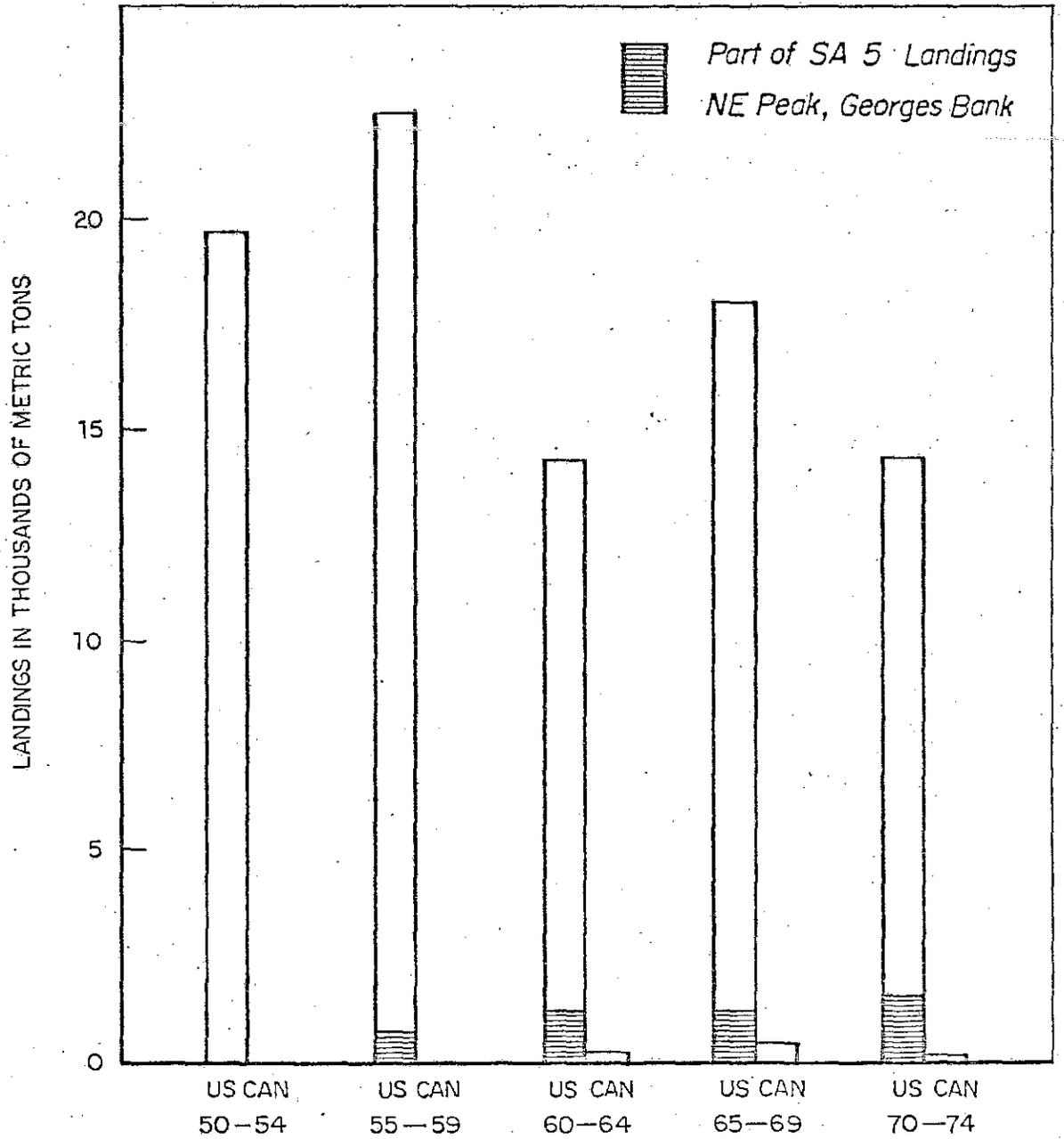


Figure 9. US and Canadian Subarea 5
Other flounder landings.

LOBSTER

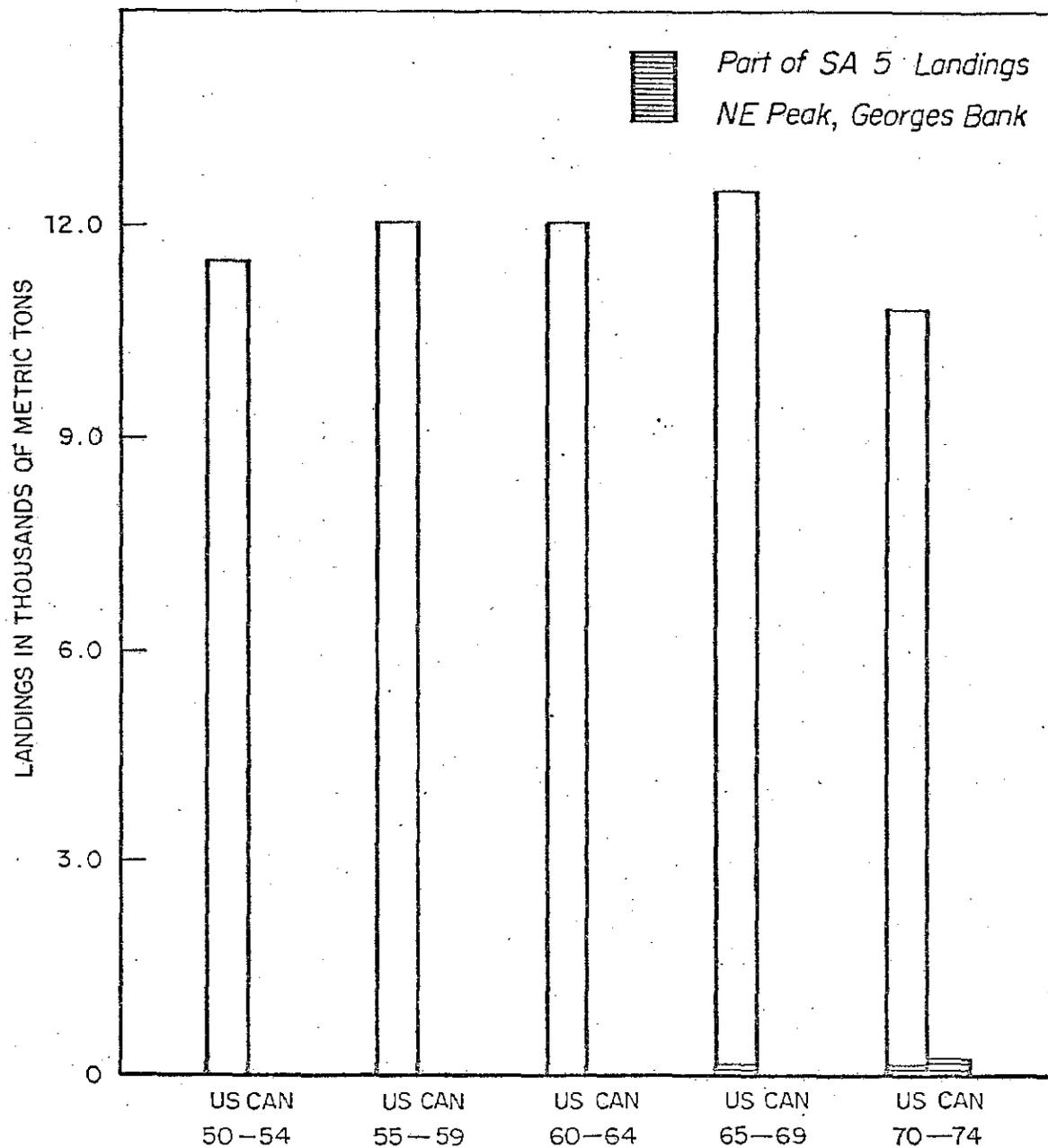
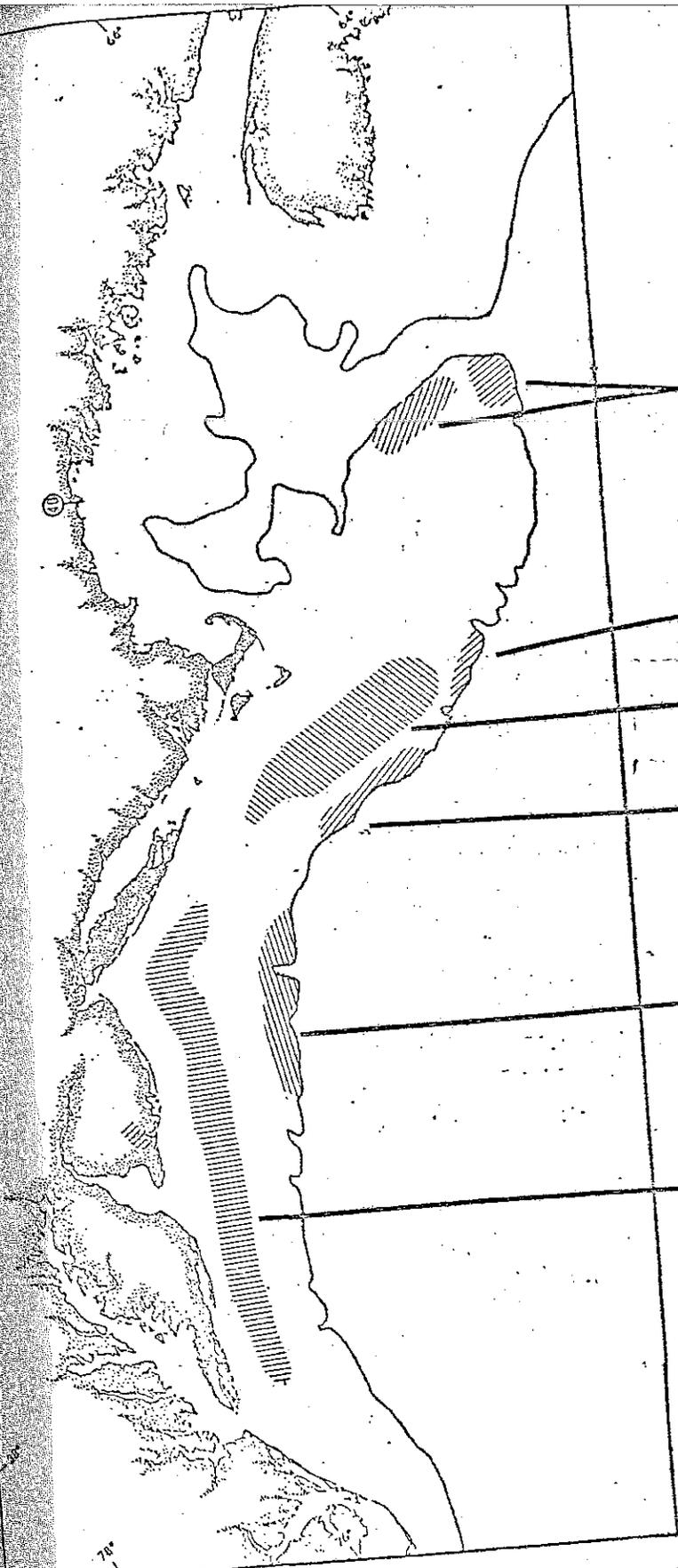


Figure 10. US and Canadian Subarea 5 Lobster landings.



Spain (Cod)

Spain, Japan (Squid)

U.S.S.R., Poland
(Mackerel, herring, hakes)

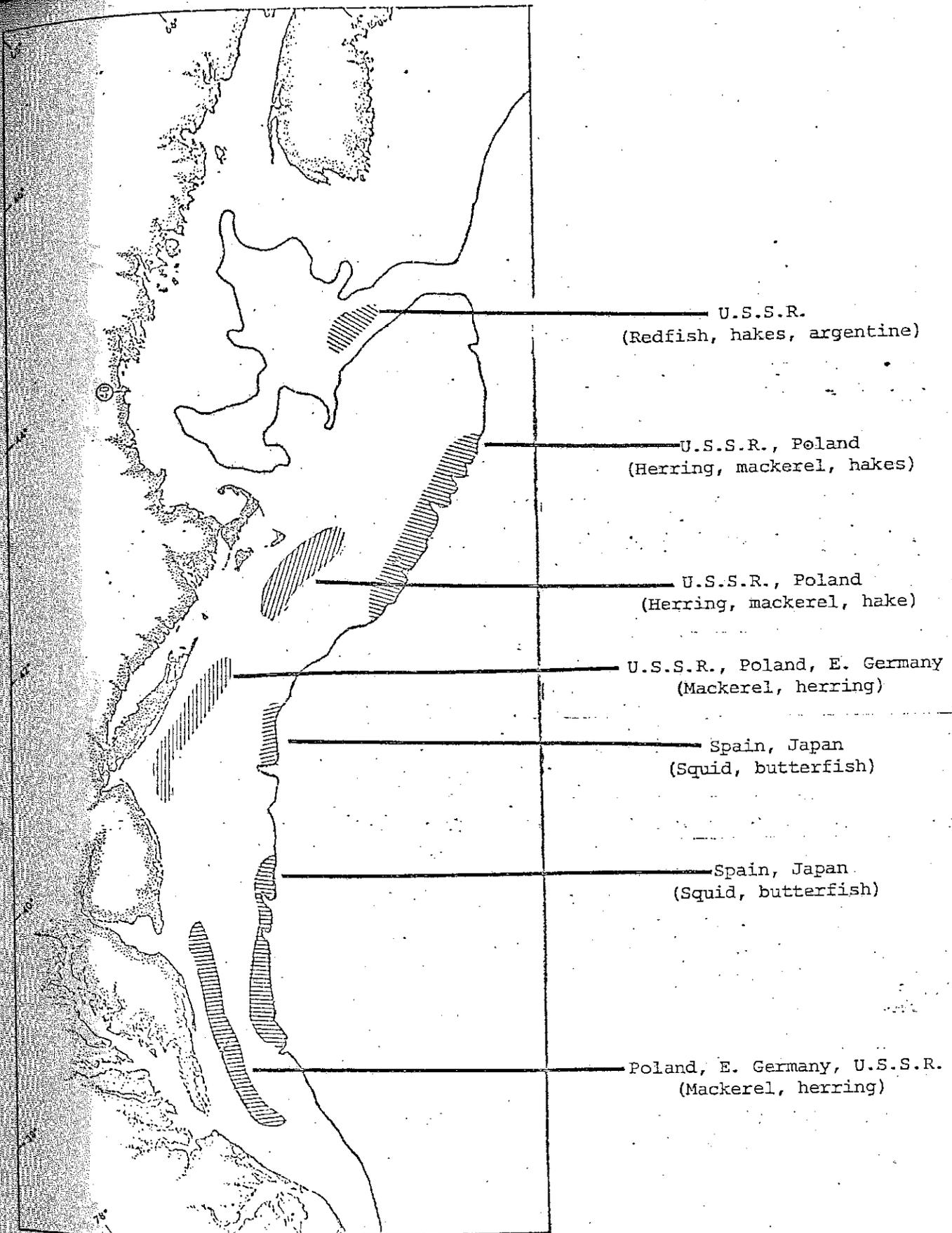
Spain, Japan (Squid)

Spain, Japan (Squid)

U.S.S.R., Poland, E. Germany
(Mackerel, hakes, herring)

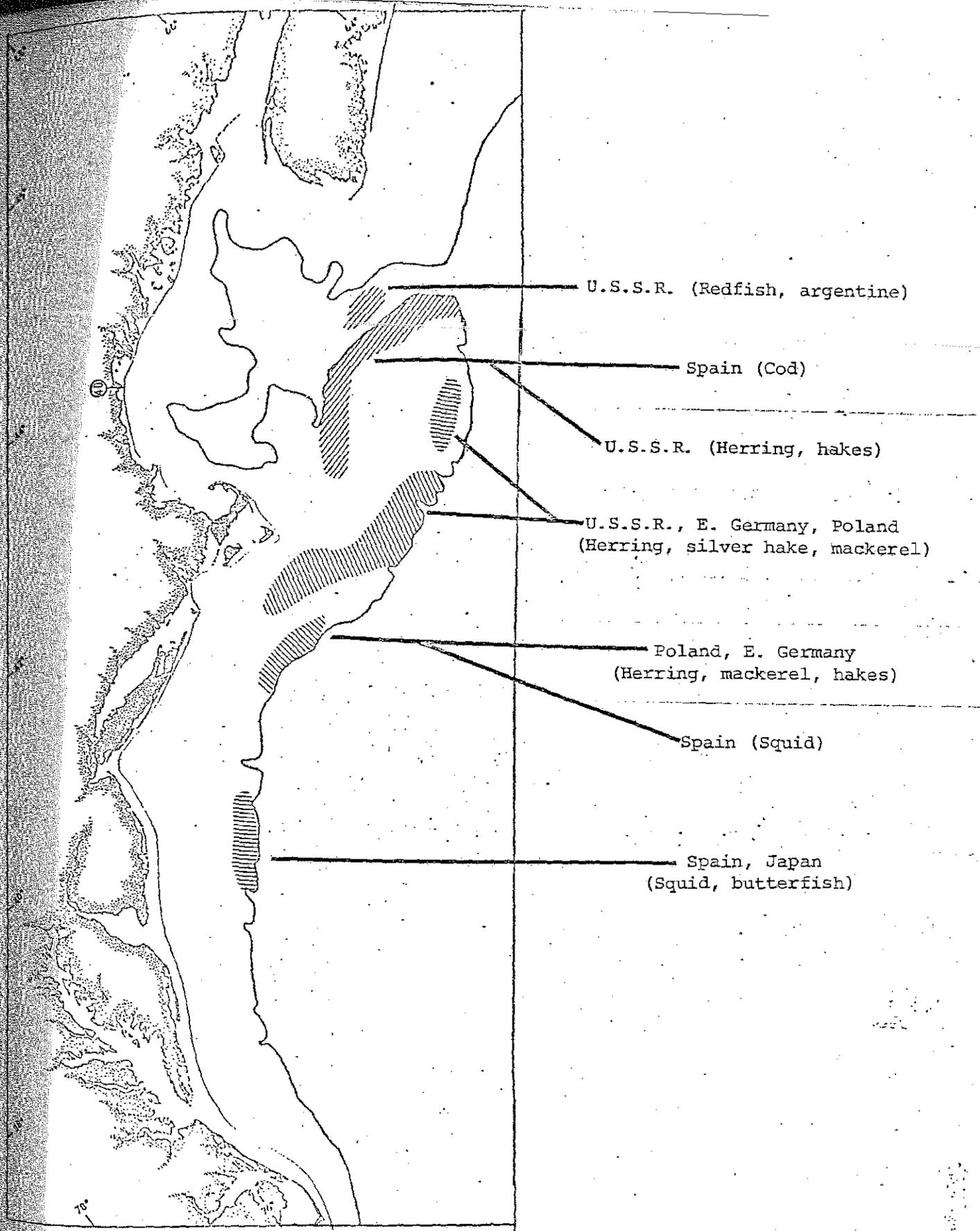
MAJOR FOREIGN FISHERIES - Figure 11.

JAN.-FEB. 1973-1975



MAJOR FOREIGN FISHERIES

— Figure 12 .



MAJOR FOREIGN FISHERIES - Figure 13.

MAY-JUNE 1973-1975



Poland, E. Germany, W. Germany
(Herring)

Spain (Cod)

U.S.S.R., E. Germany, Poland
(Herring, mackerel, hakes)

U.S.S.R. (Hakes, squid)

U.S.S.R., W. Germany,
E. Germany, Poland
(Herring)

Spain, Japan
(Squid, butterfish)

MAJOR FOREIGN FISHERIES.

— Figure 14.

JULY-AUG. 1973-1975



Spain (Cod)

U.S.S.R., Poland,
E. Germany, W. Germany
(Herring, mackerel, hakes)

U.S.S.R. (Hakes)

Poland, E. Germany, W. Germany
(Herring)

U.S.S.R. (Hakes)

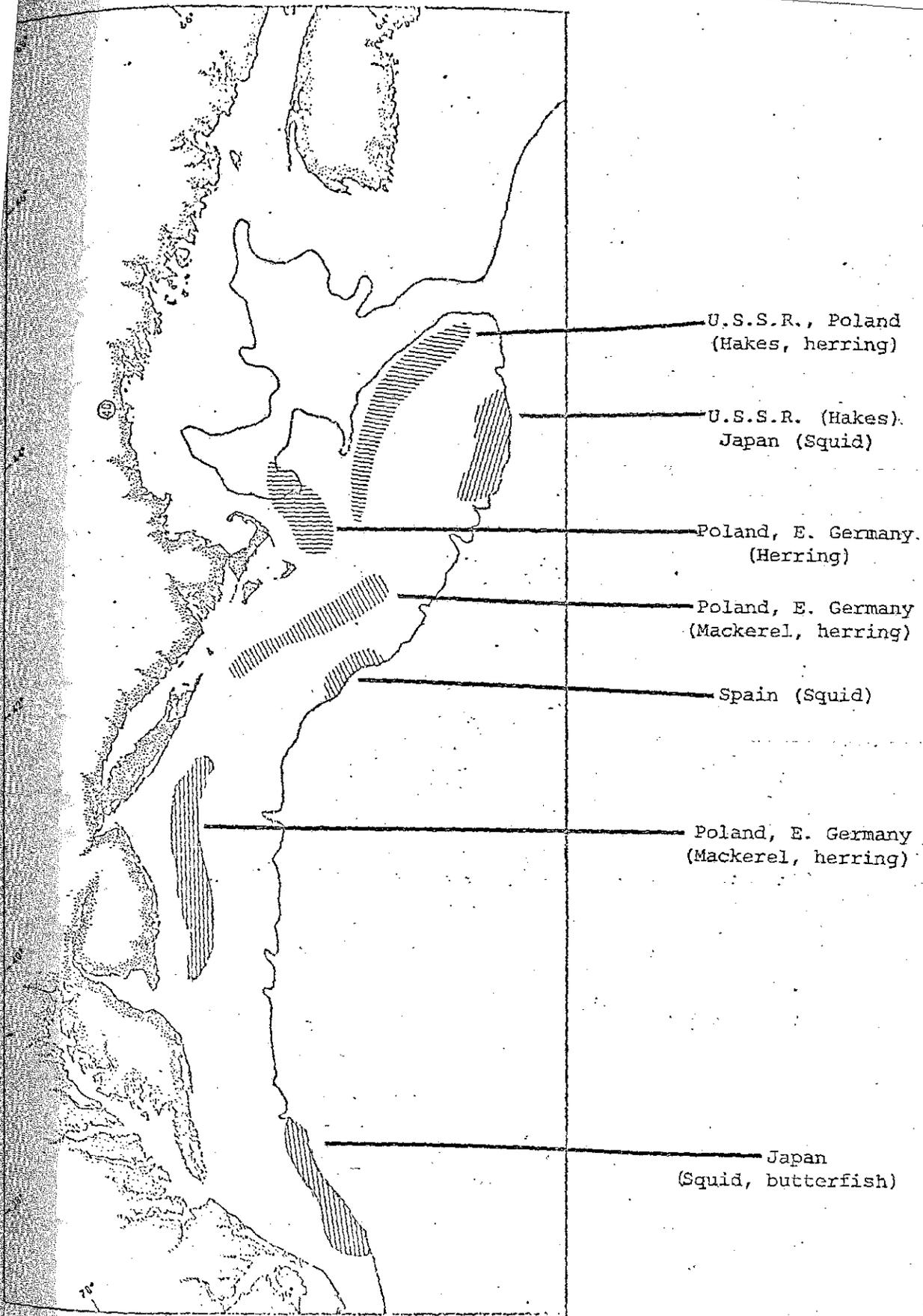
Japan (Tuna)

Japan (Tuna, squid)
Spain (Squid)

MAJOR FOREIGN FISHERIES

- Figure 15.

SEPT.-OCT. 1973-1975



MAJOR FOREIGN FISHERIES — Figure 16.

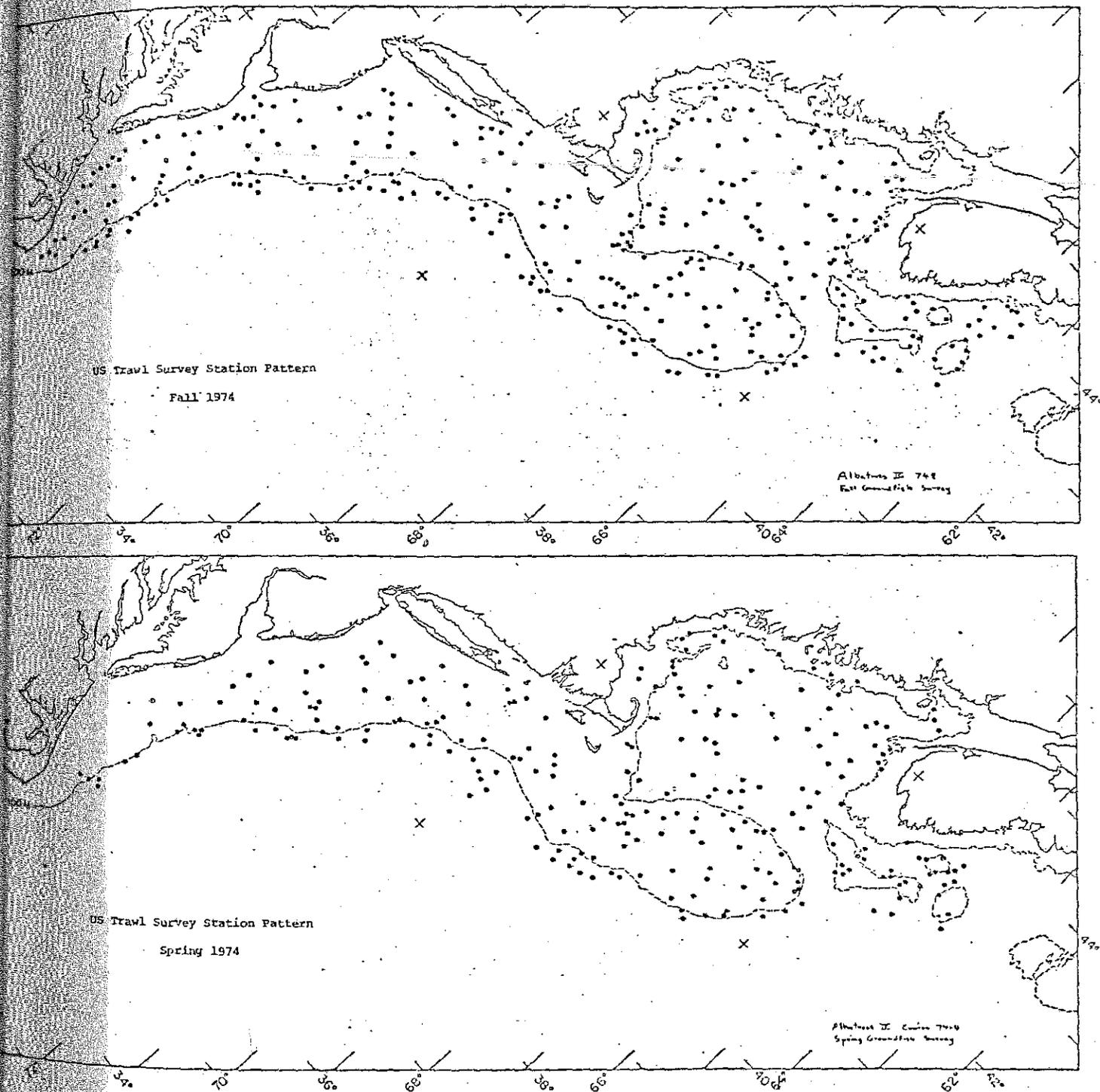


Figure 17. Station pattern of 1974 trawl surveys in autumn and Spring - R/V Albatross IV.

III. Fisheries and population distribution in disputed area for major species.

The following section summarizes information on the distribution and migrations of important species in the disputed area, reviews development of the fishery including historical and recent landings, and describes stock boundaries and current management status. Figures illustrating the relative distribution of fish and fisheries are presented at the end of the narrative. Population distributions are illustrated by USA research vessel trawl surveys conducted in the spring and fall of 1974 (see Figure 17 for station pattern). Relative distribution of fishing effort for each species by USA and Canada is illustrated by charts of average annual catch for the decade 1965-1974, by ICNAF Statistical Divisions (Canada) or the smaller statistical areas within Divisions (USA)--see Figure 2. Comparable charts of landings for other countries are shown for the period 1968-1974. Transparent overlays illustrating statistical areas and disputed boundary lines are also provided.

Atlantic cod

The cod is a demersal gadoid species attaining average lengths of 60 cm and weights of perhaps 2.5 kg in USA commercial landings; the largest on record weighed 96 kg. In the western North Atlantic it occurs from Greenland and Baffin Island south to North Carolina; commercially important concentrations exist throughout the ICNAF Convention Area although landings have historically been highest on the Grand Banks. Comparatively small concentrations occur along the Scotian Shelf, on Georges Bank, and in the Gulf of Maine.

From the Scotian Shelf southward, a general onshore movement occurs in summer, followed by an offshore movement to deep water in late fall and winter. In addition, other movements have been documented; cod on eastern Georges Bank have been shown to migrate to Browns Bank and even further eastward, with only minor movements occurring in the opposite direction, while a southerly migration also occurs from the Great South Channel-Nantucket Shoals area in winter. Larger adults have been shown to move to the north and east permanently (Wise, 1963). Commercially, the cod has been of major importance for centuries and was a major economic mainstay of New England during colonial times. New England fishermen ranged as far as the Grand Banks to fish for cod in the 18th century; for SA 4, historical statistics indicate landings by both the USA and Canada back to the 1890's. Canadian catches in Div. 4W averaged approximately 13,000 MT from 1953 to 1969, declining thereafter to 8,900 MT annually in the current decade. In Div. 4X, however, Canadian landings averaged 13,000 MT from 1953 to 1963, but landings have since increased to an average of over 23,000 MT since 1964. USA landings in Div. 4W have fluctuated somewhat but in general have declined substantially (from 8,700 MT in 1954 to <100 MT in recent years), while USA landings in Div. 4X have averaged about 1,200 MT from 1955 to 1968 but have since declined to an average of 350 MT since 1969. The USSR and Spain have together accounted for most of the distant-water fleet landings in the Divs. 4WX area since the early 1960's. USSR landings in Div. 4W reached a maximum of 9,500 MT in 1963, declined to 1,000 MT in 1967, and have averaged 3,100 MT annually since 1968; landings in Div. 4X have been relatively minor since 1969. Spain's Div. 4W catch rose steadily from <100 MT in 1954 to 13,000 MT in 1961 and has averaged 15,000 MT annually since that time; in Div. 4X, Spain's catch peaked at 8,200 MT in 1969 and has since declined to 900 MT in 1975. France, Italy, the FRG, Poland, Japan, Denmark, the UK, Bulgaria, and Cuba have also reported landings from this area in recent years but these have, for the most part, been of minor consequence.

A small USA fishery has existed for decades in Div. 5Y (approximately 5,000 MT annually since 1932). Catches by other nations have been minor (<100 MT annually); most of this has been taken by Canada. The Georges Bank (Div. 5Z) fishery has been dominated by the USA, although Canada, the USSR, and Spain took significant quantities during the last decade. Canadian landings peaked at 16,000 MT in 1966, declined to 2,600 MT in 1970, and have since averaged 2,400 MT annually. Again, the USSR and Spain have accounted for most of the distant-water landings; USSR landings peaked at 16,800 MT in 1966 and have declined sharply since, while Spain's catch has steadily diminished from a peak of 14,700 MT in 1967 to 4,000 MT in 1975. Catches by other countries in Div. 5Z (and for all countries in SA 6) have for the most part been of minor significance.

Four stocks of cod have been recognized for management purposes within the area; these include two on the Scotian Shelf (the Div. 4W-Subdiv. 4Vs and the Div. 4X stocks), the Gulf of Maine (Div. 5Y), and the Georges Bank (Div. 5Z) stocks (Templeman, 1962). TAC's for all except the Div. 4X stock were initially set in 1973; a TAC for the latter stock was set in 1975. For 1976, TAC's were reduced for all of the above stocks except the Div. 5Z unit.

Haddock

The haddock is a demersal gadoid species averaging 36-60 cm in length and 1.5-2 kg in weight, although individuals weighing up to 14 kg have been taken off New England. In the western North Atlantic, haddock occur from the Grand Banks south to Cape Hatteras; important concentration areas include the Scotian Shelf and Georges Bank although stocks in these areas have been decimated considerably in recent years. This species is known to make seasonal migrations in Divs. 5Y and 4X, moving northward in summer and southward in winter along both sides of the Bay of Fundy-Gulf of Maine (Halliday, 1974); also, Schroeder (1942) found some interchange between the western Gulf of Maine-Great South Channel and Georges Bank. However, it appears that by and large, haddock on Georges Bank constitute a rather localized population and little interchange occurs between Georges Bank Subdiv. 5Ze and the Div. 4X area (Grosslein, 1962); also, there is evidence that a considerable number of localized stocks exist in the Div. 4X-SA 5 area which are essentially nonmigratory (Halliday, 1974).

Haddock have been exploited in the SA 4 and 5 area by USA and Canadian fishermen for many decades. Canadian fishermen, and USA fishermen to a lesser extent, have caught haddock in Divs. 4VW for some time although in recent years stock abundance and landings have declined drastically. In Div. 4X, total landings by Canadian and USA fishermen are estimated to have averaged 18,000 MT from 1931-1940, 14,000 MT from 1941-1950, and 19,000 MT from 1951-1960 (Halliday, 1974). Since 1960, USA landings have declined drastically (8,300 MT in 1960 to <500 MT in 1972) while Canadian landings increased to a high of 32,000 MT in 1967 and subsequently declined. Spain, the USSR, and other countries have also taken haddock in SA 4 in recent years, but these catches have usually been minor except for the USSR 1966 catch (10,100 MT).

The USA haddock fishery in SA 5 came into existence around the turn of the century. Landings climbed from 15,000 MT in 1917 to a peak level of 115,000 MT in 1929, after which landings declined sharply. During the 1935-1960 period, USA landings were relatively stable, averaging around 50,000 MT annually. Recruitment of the outstanding 1963 year-class in 1965, however, attracted considerable foreign effort (primarily by USSR vessels), and catches climbed to 150,000 MT in 1965 and 121,000 MT in 1966, since which time landings for all nations have declined steadily. Canadian catches increased from <100 MT in 1960 to 18,300 MT in 1967 and have since declined. Again, Spain and the USSR have accounted for most of the foreign catch since 1966 although total amounts have usually been under 2,000 MT. Historically, Canadian fishermen have also taken small amounts of haddock from the Gulf of Maine (Div. 5Y).

Three major stocks of haddock have been recognized in the SA 4 and 5 area. Two (the Divs. 4VW and Div. 4X stocks) occur on the Scotian Shelf; the remaining one is found on Georges Bank (Subdiv. 5Ze). A small stock has also been considered to exist in Div. 5Y although catches have been of minor consequence.

In response to severe declines in abundance, TAC's have been set for the Div. 4X and Subdiv. 5Ze stocks since 1970 and the Divs. 4VW stock since 1972; in addition, known concentration areas have been closed in spring to bottom trawling in recent years to protect spawning stocks. Both the Div. 4X and Subdiv. 5Ze stocks have shown signs of recovery in recent years although abundance is still considerably below former levels.

Redfish

The redfish is distributed in the northwest Atlantic Ocean from the coast of Greenland south to Georges Bank. Redfish are a relatively long-lived, slow-growing fish compared to most species. Maximum observed lengths in the USA commercial catch vary from 40 to 44 cm, although large individuals have been noted. The species attains a maximum weight of 2-3 kg.

Redfish are thought to be distributed in small localized pockets, and a number of traditional fishing grounds exist in ICNAF Subareas 4 and 5. Those within the Gulf of Maine include the northern part of the Great South Channel areas off Cape Cod Highlands, Cashes Ledge, Fipennies Ledge, Platts Bank, Jeffreys Bank, and off the Coast of Maine along the 180 m depth contour. On the Nova Scotian Shelf, redfish have traditionally been caught on the edges of Banquereau, Middle Ground, Sable Island, Emerald, Roseway, and La Havre Banks. Redfish undergo a diel vertical migration, moving off the bottom at night and returning to a demersal existence during daylight hours. However, no extensive geographical migrations have been reported for this species.

The USA fishery for redfish is currently being conducted in SA 5 and Divs. 4VWX. Intensive fishing commenced in the mid-1930's with vessels initially fishing the closer areas in the Gulf of Maine and gradually proceeding to further grounds off Nova Scotia. Throughout the whole period, the fishery has undergone a series of expansions and contractions with vessels fishing at certain times as far as the Gulf of St. Lawrence and the Grand Banks off Newfoundland. The USA fishery is currently in a period of contraction.

Within SA 5, the USA catch rose from 500 MT in 1934 to 59,800 MT in 1941, and subsequently declined to 30,100 MT in 1951, 11,400 MT in 1961, and 9,100 MT in 1975. Recent catches from nations other than the USA increased the total to 20,000 MT in 1971, dropping to 17,400 MT in 1973 and 10,600 MT in 1975. The USA catch per unit of effort declined from 6.9 MT/day in 1942 to 3.3 MT/day in 1949, remained relatively stable until 1964, and increased to 14.7 MT/day in 1968. The catch per unit of effort has subsequently declined to 4.0 MT/day in 1975.

Participation in the SA 5 redfish fishery by nations other than the USA began in 1958 with small catches by Canadian vessels. Since then, the USSR and Canada have been the major non-USA participants in this fishery. In 1975, approximately 1,600 tons out of a total catch of 10,700 MT were taken by these other countries, almost exclusively in Div. 5Z.

In the fishery in Divs. 4VWX, large catches did not occur until 1963 when 7,200 MT were landed by USA fishermen. The period of initial exploitation was complete by 1951 with a maximum catch of 77,100 MT occurring in 1949. This was followed by a longer period extending from 1952 to 1970 which was characterized by lower catches with fluctuations between 10,000 and 40,000 MT per year. Canadian catches did not become significant until 1961.

Catches by distant-water fleets caused a sharp rise in the total redfish catch from this area to 62,400 and 50,300 MT in 1971 and 1972, respectively. This total has subsequently declined to 32,800 MT in 1974 and 27,900 MT in 1975 under catch limitations. Within Divs. 4VWX, the major participants in addition

to the USA have been Canada, USSR, Japan, and Poland. In 1975, out of a total redfish catch of 27,900 MT, Canada accounted for 17,200 and was followed by the USA with 5,500, USSR with 4,800, and Poland with 200 MT.

Because of the clumped nature of the redfish's distribution throughout its geographical range, and their tendency to remain in rather small locales, many stocks may exist. However, for management purposes under ICNAF, only two stocks in SA 4 and 5 have been identified. The SA 5 stock is composed of those fish which inhabit the Gulf of Maine, the deeper portions of the Northern Edge of Georges Bank, and the Great South Channel, while the Divs. 4VWX stock consist of those fish which are found on the Scotian Shelf.

A recent USA assessment of the SA 5 redfish stock (Mayo, 1975, 1976) indicates a MSY of 17,000-19,000 metric tons. The total catch in 1974 and 1975 averaged 10,000 metric tons. USA autumn bottom trawl survey length-frequency data show an increase in abundance of prerecruit fish which began to enter the commercial fishery in 1974. Recruitment of these fish will continue for the next few years, but thereafter recruitment will be considerably lower. A TAC of 9,000 metric tons has been agreed to for 1977 to allow for rebuilding of stock size. Given the slow growth rate of this species, reduced TAC's may have to be in effect for a number of years to achieve recovery.

A recent joint Canadian-USA assessment of the Divs. 4VWX redfish stock indicated a MSY of 32,000 tons (Mayo and Miller, 1976). General production models suggest that the catch in 1977 would be about 26,000 tons; however, to allow for a rebuilding of the stock, a TAC of 20,000 has been agreed to. Population size of both the SA 5 and Divs. 4VWX stocks has declined from former levels since the beginning of the fisheries.

Silver hake

Silver hake are strong swimming predators ranging throughout the water column in depths of from less than 90 to 600 m. Strictly speaking, they are not a schooling species, although they often swim together in large groups. The species is distributed from the Newfoundland Banks to South Carolina, with major center of abundance between New York and Cape Sable. Silver hake attain maximum lengths of about 60 cm; the maximum reported weight for this species is 2.3 kg.

Spawning migrations occur in the spring, when dense concentrations move into shallow regions along the continental shelf and into the Gulf of Maine. Between May and November, major spawning concentrations exist in the Gulf of Maine from east of Cape Cod, north to Cape Ann; along the southeastern and southern slopes of Georges Bank, and around Nantucket Shoals and Martha's Vineyard.

Silver hake are caught in the area ranging from the Grand Banks to Cape Hatteras; greatest catches are taken from Divs. 4W and 5Z. Fishing in Divs. 4VWX began in 1961, with landings increasing to 123,000 MT in 1963; this has been almost exclusively a USSR fishery, with Canada, France; Japan, GDR, and USA also reporting very small incidental catches since that year. Catches declined to 2,500 MT in 1967 but increased to 299,000 MT in 1968 after averaging 137,000 MT from 1970-1972.

The 5Y silver hake fishery has been conducted solely by the USA since the 1840's, developing to a directed fishery in the 1930's. Only incidental by-catch has been reported from Div. 5Y by other nations (USSR, FRG, GDR, and Bulgaria) in recent years. Catches of silver hake in 5Y have been declining since the mid-1950's, though they increased from 5,200 in 1974 to 9,100 MT in 1975.

The Subdiv. 5Zw-SA 6 area has also supported a USA fishery since the early 1930's, with catches fluctuating between 4,100 and 25,000 MT. USSR catches began in 1963 with 4,200 MT, peaked in 1966 at 126,200 MT, and have since leveled off to about 50,000 MT in the last three years. Total catches for this stock decreased from 58,400 MT in 1974 to 53,700 MT in 1975.

Four stocks of silver hake have been delineated for management purposes; these are the Scotian Shelf (Divs. 4VWX), Gulf of Maine (Div. 5Y), Georges Bank (Subdiv. 5Ze) and Southern New England-Middle Atlantic (Subdiv 5Zw-SA 6) stocks. Though there is evidence of two distinct stocks in the Gulf of Maine and south of Cape Cod (from USA morphometric studies) and between Georges Bank and Cape Cod to Cape Hatteras (from USSR serological analysis), definitive data for further stock delineation between Georges Bank and the Gulf of Maine are lacking at the present time (Anderson, pers. comm.).

TAC's have been set as follows: Divs. 4VWX--90,000, 108,000, and 82,000 MT for 1974 through 1976, respectively; Div. 5Y--10,000, 10,000, 15,000, and 10,700 MT for 1973 through 1976; Subdiv. 5Ze--80,000 MT for 1973 through 1975 and 50,000 MT for 1976; and Subdiv. 5Zw-SA 6--80,000 MT for 1973 through 1975 and 43,000 MT for 1976. For 1977, apparent reductions in abundance have led to reduced TAC's for the Divs. 4VWX and Div. 5Y stocks, while improvement in the remaining stocks has led to recommended TAC increases.

Red hake

The red hake is a demersal gadoid species attaining a total length of approximately 76 cm and a maximum weight of approximately 3 kg although average weight approximates 1 kg or less. It so closely resembles the white hake in appearance that the two species have often been confused in commercial landings, particularly in former years; in fact, red and white hake have only been reported separately in USA commercial fishery statistics since 1944. Red hake are found in continental shelf waters from the Grand Banks of Newfoundland south to Virginia; in the SA 4-6 area, commercially important concentrations exist in the Gulf of Maine and on eastern Georges Bank although the species appears most heavily concentrated from the southwestern part of Georges Bank to the Hudson Canyon.

Red hake undergo significant seasonal inshore-offshore movements correlated with seasonal temperature changes. During winter they aggregate in deeper offshore slope areas; Edwards, Livingstone, and Hamer (1962) found them to be most abundant in depths of from 180-460 m off southern New England. In late spring an onshore movement occurs and during summer red hake are common in depths of less than 110 m off southern New England and on southwest Georges Bank. In autumn adults are generally dispersed both inshore and offshore.

Red hake have been taken commercially by USA fishermen for decades; the fishery has been conducted inshore during warmer months. USA landings in the Gulf of Maine averaged only 328 MT from 1944 to 1949 but rose sharply to a high of 11,500 MT in 1957 (Anderson and Au, 1972), after which catches have declined considerably; during the period 1965-1974, landings averaged only 280 MT annually. USA landings on Georges Bank have been insignificant, averaging 160 MT since 1968. The principal USA fishery for red hake has operated in the Southern New England-Middle Atlantic area, where landings increased dramatically in the late 1940's and 1950's due to the development of the New Bedford industrial fishery. USA landings peaked at 32,600 MT in 1964 (Anderson and Au, 1972) but have since declined markedly and averaged only 4,200 MT annually from 1966 to 1974.

Canadian landings in all areas have been relatively insignificant, with the exception of landings totalling 6,829 MT in SA 4 in 1965. The USSR has fished extensively for red hake on Georges Bank and in the Southern New England-Middle Atlantic region since 1965; combined landings for these areas increased from 4,000 MT in 1963 to a peak of 108,600 MT in 1966, after which landings have declined. Annual USSR landings have averaged 38,700 MT since 1967. Bulgaria, Spain, Poland, Japan, Romania, and the GDR have also reported landings of red hake from the SA 4-6 area in recent years, Bulgaria accounting for most of the total.

On the basis of morphometric and meristic studies, Rikhter (1970) has proposed the existence of two separate stocks in the SA 5-6 area, the first inhabiting the southern and southwestern portions of Georges Bank and the second extending southwesterly from Cape Cod. Anderson (1974) assumed the existence of three stocks in the same area, these being a small Gulf of Maine (Div. 5Y) stock, a Georges Bank (Subdiv. 5Zc) stock, and a Southern New England-Middle Atlantic (Subdiv. 5Zw-SA 6) stock. It is also possible that one or more distinct stocks of red hake exist in areas to the east, although definitive information is unavailable at present.

To date, assessments have been prepared only for the Subdiv. 5Ze and Subdiv. 5Zw-SA 6 stocks; for both, most recent analyses indicate sharp reductions in abundance in the late 1960's, followed by recent increases associated with better than average recruitment. For the Subdiv. 5Ze stock, TAC's have been set at 20,000 MT for 1974 and 1975 and 26,000 MT for 1976; a TAC of 16,000 MT has been agreed to for 1977. For the Subdiv. 5Zw-SA 6 stock, TAC's of 40,000, 50,000, 45,000, and 16,000 MT were set for 1973, 1974, 1975, and 1976, respectively; a TAC of 28,000 MT has been agreed to for 1977.

Yellowtail

The yellowtail is a medium-sized flatfish attaining lengths of perhaps 55 cm and weights of 1 kg or so although the average is typically smaller. The species is distributed from Labrador south to the New York Bight and occurs at depths to 110 m; important concentrations exist on the Grand Banks, on Georges Bank, and off Southern New England. The species is known to make localized seasonal movements in SA 5 but does not appear to migrate extensively (Lux, 1963).

The USA yellowtail fishery began in the late 1930's, coincident with a decline in abundance of winter flounder. Catches in the SA 5 and 6 area climbed to 31,100 MT in 1942, declined to a low of 5,800 MT in 1954, and subsequently climbed again to 37,600 MT in 1964. Landings increased sharply to 52,000 MT in 1969 due to heavy fishing by foreign fleets (the USSR caught 19,400 MT in that year); since that time, landings have dropped steadily. The 1975 catch from SA 5 and 6 was approximately 20,000 MT.

Historically, the Georges Bank area (Div. 5Z east of 69° W longitude) has contributed the bulk of the USA landings, with smaller amounts being taken off Southern New England; landings from other areas have been of minor significance. In all areas in SA 5 and 6 the USA has accounted for most of the landings, although USSR catches have also been significant in recent years. Four distinct stocks have been recognized in the SA 5 and 6 area for management purposes, these being the Georges Bank (Div. 5Z east of 69° W longitude), Southern New England (Div. 5Z west of 69° W longitude and south of Cape Cod), Cape Cod, and SA 6 stocks (Lux, 1963; Parrack, 1974). In response to reduced stock abundance, TAC's and increases in mesh size were implemented in 1971. A TAC of 16,000 MT was imposed for the Georges Bank stock (Subdiv. 5Ze) and the population stabilized somewhat; however, fishing mortality has increased on younger fish in recent years, and it appears that stock abundance may decline further. A TAC of 7,000 MT has been agreed to for Subdiv. 5Ze for 1977 in an effort to rebuild this stock.

The Cape Cod and Southern New England stocks of yellowtail have been under a collective TAC since 1971; the SA 6 stock has been included since 1975, when a zero-level TAC was imposed. However, these stocks still show signs of decline, and a zero-level TAC has again been agreed to for 1977. If catch is held at the lowest possible level and recruitment improves, the stocks may recover.

Other flounder

A number of bottom-dwelling flatfish species are fished commercially in the SA 4-6 area. The most important of these species are winter flounder, summer flounder, witch, and American plaice; in SA 4, witch and American plaice are of primary importance, while in SA 5 and 6, winter and summer flounder have predominated in the landings. In USA waters, however, increasing numbers of winter and summer flounders have been taken by sport fishermen in recent years and it now appears that recreational catches may well exceed commercial landings for both species. Collection of improved sports fish catch data for these species will be of vital importance in future assessment work.

A brief treatment of each species is given in subsequent sections. However, these species have been considered together for management purposes, and for convenience this approach will be used in discussing stock status and management trends.

American plaice

This flatfish reaches lengths of up to 82 cm and weights of 6 kg although the average weight attained is closer to 1.5 kg; it occurs from Labrador south to New York, with important concentrations occurring on the Grand Banks and in the Banquereau-Gulf of St. Lawrence area, with smaller concentrations occurring along the Scotian Shelf and into the Gulf of Maine. It is sedentary in habit and appears to move very little (Bigelow and Schroeder, 1953).

Little is known concerning historical landings trends, as USA data prior to 1940 are likely to be erroneous and Canadian landings were not reported separately for this species prior to 1946. It appears, however, that somewhere in the order of 1-2,000 MT has been landed annually from SA 5 by USA fishermen since 1940. Smaller amounts (<100 MT) have been taken in Div. 4X since 1960, while Canadian fishermen landed similar amounts annually from SA 5. Canadian landings from the Scotian Shelf area (Divs. 4VWX) increased from 2,800 MT in 1960 to 10,500 MT in 1967 and have since declined steadily, as have USA landings in Div. 5Z. USSR vessels have made appreciable catches on the Scotian Shelf (Divs. 4VWX) in recent years (e.g., 10,600 MT in 1968).

Stock relationships for this species are uncertain; on the Scotian Shelf American plaice have been considered simply as a stock complex which has been treated as a unit for management purposes.

Witch

The witch is a somewhat smaller species, attaining an average length of perhaps 40 cm and weights of approximately 1 kg. It occurs from Labrador to Rhode Island; important concentrations occur on the Grand and Banquereau Banks, with lesser concentrations along the Scotian Shelf and Georges Bank and on the Gulf of Maine. Again, this species appears to be very sedentary in habit.

Canada and the USSR have accounted for most of the witch landings on the Scotian Shelf (Divs. 4VWX) in recent years. Canadian landings have been

virtually stable, averaging approximately 6,000 MT since 1960 (Halliday, 1973); USSR landings have fluctuated greatly, reaching 13,700 MT in 1968. USA landings from SA 4 have been small (<200 MT in most years) and have declined considerably since 1964. In SA 5, the USA has accounted for most of the landings; landings have averaged approximately 2,000 MT since 1963. Canada and the USSR have also taken small amounts of witch in recent years.

As for American plaice, stock boundaries in SA 4 and 5 are uncertain although localized distinct populations may exist.

Winter flounder

This flatfish is the most important member of the group in USA commercial catches. It commonly attains a mean length of 40 cm and weights of 1 kg although individuals exceeding 60 cm and weights of 3 kg have been reported; it occurs from Newfoundland to Georgia, with major concentrations occurring in the Gulf of St. Lawrence, the Gulf of Maine, and on Georges Bank. South of Cape Cod, winter flounder migrate inshore in winter and offshore in late spring; these movements are not as pronounced in colder waters. The species is also known to make local spawning movements.

Statistics prior to 1940 are likely to be erroneous, although a pronounced decline in abundance appears to have occurred during the previous decade. Even more recent data are subject to reporting inaccuracy, but it appears that for the USA fishery in SA 5 from 1940-1960 landings averaged somewhere around 6,000 MT annually. Since 1963, USA landings have come primarily from the Georges Bank-Great South Channel area (Subdiv. 5Ze). Canada and the USSR have landed small quantities, primarily from Georges Bank. Landings from Subdiv. 5Ze from all countries have declined since the mid-1960's. On the Scotian Shelf, Canada has taken most of the catch although quantities have been small (<1,000 MT annually). The USSR has also landed small quantities from the area in recent years.

Again, we have no definitive evidence for this species concerning stock boundaries.

Summer flounder

Summer flounder are relatively large flatfish, commonly attaining lengths of 90 cm and weights of up to 7 kg; they occur from Maine to South Carolina and are most common off southern New England, Long Island, and New Jersey. This species is known to make inshore movements during summertime.

Commercially, summer flounder have been taken primarily by USA fishermen off Southern New England (Subdiv. 5Zw-SA 6); the USSR has also taken small catches from this area in recent years. USA commercial landings were relatively stable from 1950-1962 (approximately 8,000 MT annually) but have since declined (Chang and Pacheco, 1976).

In SA 5 and 6, all flounders except yellowtail have been managed under a collective TAC since 1973. Initially this was set at 25,000 MT; this figure was maintained for 1973-1975 but was reduced to 10,000 MT for 1976 due to declining commercial catches and research vessel survey abundance indices. Landings for "other flounder" species have declined steadily in recent years, from 30,400 MT in 1969 to 21,000 MT in 1974. In SA 4, a collective TAC of 32,000 MT was set for American plaice, witch, and yellowtail in 1974 and 1975; this was reduced to 28,000 tons for 1976 in response to declining abundance of yellowtail. However, commercial abundance indices for witch and American plaice have remained relatively stable from 1965-1974.

Pollock

The pollock is a gadoid species attaining a maximum total length of approximately 107 cm and weights of perhaps 16 kg although 3-4 kg is the usual average. In the northwest Atlantic pollock are distributed from Labrador and West Greenland south to Cape Hatteras. Commercial landings indicate the center of its distribution to lie in Div. 4X although substantial quantities are also found in Divs. 4W, 5Y, and 5Z. Pollock are known to migrate extensively and to make a seasonal spawning migration from the Bay of Fundy south to Massachusetts Bay and possibly to the Scotian Shelf in late autumn (Steele, 1963).

Contemporary landings data for pollock in Divs. 4VWX and SA 5 reveal that the fishery has been dominated by Canada and the USA (85% of the total since 1960), although other nations, notably the GDR and the USSR, have made significant catches on occasion. USA landings fluctuated between 10,000 and 20,000 metric tons annually from 1935 to 1960, declined to a low of 3,300 MT in 1967, and then increased gradually to 8,900 MT in 1975 (Clark, Burns, and Halliday, 1976). The USA fishery is chiefly incidental in nature, with the exception of a Jeffreys Ledge winter fishery in Div. 5Y, and approximately 90% of the total USA landings for the last decade have been taken in SA 5. Canadian landings (from a somewhat more directed fishery) increased rather steadily from approximately 2,000 MT in 1932 to 31,700 MT in 1962, followed by a decline to 10,800 MT in 1970. Landings have since increased to 26,500 MT in 1975 (Clark, Burns, and Halliday, 1976). From 1964-74 an average of 74% of the total Canadian landings was taken in Div. 4X. Total pollock landings for SA 4-6 (all countries) fluctuated between 34,300 and 41,300 MT annually during the period 1960-66, declined to approximately 23,000 MT annually from 1967-1970, and increased again to a peak of 43,200 MT in 1973. In 1975 38,400 MT were landed.

Current evidence (distribution of larvae and ripe adults, tagging studies, and trends in commercial landings) suggests that pollock in the Divs. 4VWX-SA 5 area constitute a unit stock (Clark, Burns, and Halliday, 1975). Pollock catches were totally unregulated prior to 1973 when a TAC of 50,000 MT was established for the Div. 4X-SA 5 area. This was subsequently revised to 55,000 MT for Divs. 4VWX and SA 5 for the 1974-1976 period. A reduced TAC of 20,000 MT has been recommended for 1977 due to apparent declines in stock abundance and recruitment.

White hake

The white hake closely resembles the red hake in appearance but is somewhat larger, attaining a maximum length of 120 cm and weights of up to 18 kg; the average weight is approximately 3 kg (Bigelow and Schroeder, 1953). The species is known from the Grand Banks south to North Carolina; it differs in distribution from red hake in that the species is basically temperate, reaching its highest levels of abundance in the Southern New England-Middle Atlantic area, while white hake are basically boreal in distribution and are most abundant in the Gulf of St. Lawrence and on the Grand Banks (Musick, 1967). However, commercially important concentrations also exist in the Gulf of Maine and on the Scotian Shelf. Information on migratory behavior is limited; in the northern Gulf of Maine adults move onshore in summer and offshore in late fall and winter, but to the south most individuals are concentrated at depths exceeding 180 m (Musick, 1974).

The white hake so closely resembles the red hake that commercial statistics for former years have been biased, and the two species have only been distinguished since 1944 in USA commercial landings. USA historical statistics indicate landings fluctuating between 4,600-7,100 MT from 1944-1953, followed by a decline to an average of approximately 2,800 MT for the period 1954-1965. During the 1965-1971 period catches declined even lower (to an annual figure of approximately 1,500 MT) but have since recovered somewhat. Most of the USA catch has been taken in the Gulf of Maine (Div. 5Y) although small amounts have also been taken in Div. 5Z and SA 4 (primarily in Div. 4X), and SA 6. In all areas the USA fishery for this species has been incidental.

The major Canadian fishery for white hake in the SA 4-6 area has been conducted in the Gulf of St. Lawrence (Div. 4T) where a directed fishery has existed for decades; landings have averaged 5,300 MT annually since 1965. Smaller amounts have been taken incidentally elsewhere in Subarea 4, primarily in Divs. 4W and 4X; however, amounts taken have increased in recent years (from under 1,000 MT in 1965 to 5,800 MT in 1974). Canadian fishermen have also taken small amounts of white hake incidentally in SA 5 in recent years. Catches by distant water fleets in SA 4-6 have been very minor and have again been incidental.

At present we do not have sufficient information to delineate stocks in this area (Kohler, 1968). This species has not been managed directly but has been included as part of the "other finfish" stock in SA 5 and 6 for which a TAC of 150,000 MT has been set since 1974. USA autumn bottom trawl surveys indicate a pronounced increase in abundance in the Gulf of Maine since 1968.

Cusk

The cusk is a demersal gadoid species inhabiting subarctic and boreal waters. In the northwest Atlantic the species is distributed from the Grand Banks south to New Jersey; its center of abundance appears to be the Scotian Shelf (Oldham, 1972). Cusk attain a maximum length of 107 cm and weights of approximately 12 kg although weights of 4 kg appear to be average. They are rather solitary in habit and do not appear to undertake migrations of any consequence (Bigelow and Schroeder, 1953). It is a fish of at least moderately deep water, being captured most commonly on the Scotian Shelf at depths of from 90-270 m (Oldham, 1972).

Historically, cusk have been taken by USA fishermen in the western Gulf of Maine and along the northern section of Georges Bank (Divs. 5Y and 5Z); small amounts (<100 MT annually) have also been taken in SA 4, primarily in Div. 4X. From early times USA landings increased gradually to a high of 4,600 MT in 1937, after which landings declined sharply to 1,600 MT in 1942 and more gradually thereafter. During the 1965-1974 period USA landings averaged 870 MT annually, of which 825 MT were taken in SA 5.

Canadian landings in the SA 4-6 area have been taken primarily in Div. 4X, where an average of 3,900 MT has been landed annually since 1965. Smaller amounts have been taken in Divs. 4W and 5Z (averaging approximately 400 and 800 MT annually, respectively). Landings in other areas of SA 4 and 5 have been of negligible importance. Cusk have not been taken in appreciable quantities by distant water fleets in the SA 4-6 area.

We do not have sufficient knowledge to delineate separate stocks for this species in the northwest Atlantic. Catches of cusk have not been regulated directly, although the species has been included as part of the "other finfish" stock in SA 5 and 6 for which a TAC of 150,000 MT has been set since 1974.

Atlantic mackerel

The Atlantic mackerel is a pelagic, schooling species, reaching lengths of up to 45 cm and weights of up to 1.1 kg. This species is highly migratory; two contingents, northern and southern, have been recognized, both of which migrate northward in the spring and summer and southward in fall. Both contingents overwinter in the deep waters near the edge of the continental shelf, primarily within the area from Georges Bank to Cape Hatteras. Because of their migratory patterns, the two contingents intermingle in SA 5 and 6 twice each year.

The northern contingent, overwintering in the offshore waters from the Hudson Canyon to Sable Island, begins an inshore migration in May, during which time a portion of this contingent comes inshore off southern New England and intermingles with the southern contingent. The contingent progresses northward to the Gulf of St. Lawrence where it spawns during June and July and remains until September-October. Available evidence (including recent Canadian tagging work) indicates that mackerel belonging to this contingent then leave the Gulf of St. Lawrence and travel in a southwesterly direction, again mixing with the southern contingent, and continue on into offshore waters in SA 5 and 6 to overwinter (Beckett, Stobo and Dickson, 1974).

The southern contingent overwinters offshore from Long Island to Chesapeake Bay. These fish begin an inshore-northward migration in March and April and spawn during late April and May, primarily between New Jersey and Long Island. They then continue northward into the Gulf of Maine where they spend the summer. In October this contingent leaves the Gulf of Maine and again moves toward the overwintering waters near the edge of the shelf (Anderson and Almeida, 1976; Berrien, 1976; Sette, 1950; Anderson, 1975).

Until 1961 this species was exploited only by Canada and the United States. With an increasing number of countries participating in the fishery since that time, the landings increased almost exponentially from 6,800 MT in 1961 to 419,300 MT in 1973, with the greatest increases coming from SA 5 and 6. Since 1973 the landings have dropped to 279,700 MT in 1975 although fishing effort has remained high (Anderson, 1976).

Since the first statistics indicating location of catches became available in 1871, the USA caught an average of 5,300 MT in the Gulf of St. Lawrence from 1873-1895, before catches declined and operations ceased in that area in 1923. From 1893-1926 the USA landed an average of 2,600 MT from the Nova Scotia-Bay of Fundy area before catches declined and operations ceased in 1958 (Hoy and Clark, 1967).

Thirteen nations have reported catches of mackerel since 1961 in SA 3-6; most has been taken in SA 5 and 6. Four foreign countries (USSR, Poland, GDR, and Bulgaria) have dominated the fishery since 1967. USSR landings increased from <1000 MT in 1963 to 162,500 MT in 1973; Polish landings increased from 100 MT in 1962 to 142,200 MT in 1972. GDR landings increased from 200 MT in 1967 to 80,600 MT in 1972; Bulgaria reported landings of 2,100 MT in 1969 and increased her catch to 31,700 MT in 1973. All of these countries have shown recent declines in landings. Other countries (FRG, Romania,

Spain, Cuba, Italy, and France) have reported smaller quantities in recent years.

Due to the degree of mixing the two contingents of mackerel undergo in SA 5 and 6, the entire population is now considered to be a unit stock and has been assessed as such since 1975.

Management under ICNAF began in 1973 when a TAC of 450,000 MT was established for SA 5 and 6. Subsequent total TAC's for the SA 3-6 area were as follows: 1974, 359,000 MT; 1975, 355,000 MT; and 1976, 310,000 MT. Accumulating evidence indicating severe depletion of this stock, together with severe reductions in the percentage of older fish in commercial landings has led to a recommended zero-level TAC for 1977.

Sea herring

The herring is a pelagic, schooling species attaining lengths of perhaps 39 cm and weights of up to .4 kg. The species ranges from Greenland and Labrador south to Cape Hatteras; commercially important concentrations occur in the Gulf of St. Lawrence, on the Scotian Shelf, in the western Gulf of Maine, and on Georges Bank. It is migratory to some degree; the full extent of migratory activity is uncertain although the species is known to make clearly defined spawning and seasonal migrations on the Scotian Shelf, in the western Gulf of Maine, and between Georges Bank and southern New England (ICNAF, 1972). Other migratory patterns involving movements between SA 4 and 5 are becoming evident from recent Canadian tagging studies (Stobo, 1975; Stobo, Scott and Hunt, 1976), and further work is currently in progress to more clearly define migratory pathways and stock relationships.

Herring fisheries have been in existence in the SA 4 and 5 area since the 17th century. Up to the present, catches in Div. 4V and Subdiv. 4Wa have been entirely Canadian and have included primarily juvenile fish; in Div. 4X and Subdiv. 4Wb more adults have been taken and distant-water fleets have also been involved. There has been no USA fishery for herring in these areas. Landings for Div. 4VWa have averaged 30,900 MT annually since 1963; landings from Div. 4XWb have averaged 47,800 MT from 1945-1962 and 150,000 MT since 1963 due to the presence of distant-water fleets. USSR vessels have accounted for over 90% of the total distant-water catch in this area since 1963; the FRG, GDR, Japan, and Poland have landed minor quantities.

The fisheries of the Gulf of Maine (Div. 5Y) include a USA juvenile fishery along the coast of Maine and an adult fishery in the Jeffreys Ledge area in autumn. Landings for the USA juvenile fishery averaged 60,000 MT from 1940-1960 and have declined considerably since that time; since 1963, catches have averaged 25,000 MT or less. The Jeffreys Ledge fishery began in 1967 with landings totalling 7,800 MT; landings rose rapidly to 42,900 MT in 1972, due in part to catches by Canada (11,600 MT), the FRG (2,900 MT), and the GDR (9,300 MT). Landings from 1973-1975 have averaged 18,000 MT.

The Georges Bank fishery (Div. 5Z-SA 6) was initiated by the USSR in 1961 (67,700 MT). Catches by all nations (USSR, Poland, Romania, Japan, FRG, GDR, Canada, and USA) peaked at 373,600 MT in 1968, after which landings have steadily declined; 1975 landings totalled 144,600 MT. From 1961-1975 USSR catches averaged 112,100 MT; Poland and the GDR entered this fishery in 1965 and then catches averaged 46,300 MT and 31,000 MT from 1965-1975. In addition, FRG, Canada, Japan, Romania, and Bulgaria have participated in this fishery since 1967; average landings for the 1967-1975 period were as follows: FRG, 36,600 MT; Canada, 3,400 MT; Japan, 1,100 MT; Romania, 900 MT; and Bulgaria, 1,000 MT. The USA fishery is confined to the Point Judith, Rhode Island area in winter; since 1970, catches have been very small (2,000-4,600 MT annually).

Until recently, four stocks (the Banquereau, Div. 4V-Subdiv. 4Wa; the Nova Scotia, Div. 4X-Subdiv. 4Wb; the Gulf of Maine, Div. 5Y; and the Georges Bank, Div. 5Z-SA 6) have been recognized from the Scotian Shelf south. However recent tagging studies (Stobo, 1976) indicate a new alignment for the Scotian Shelf (i.e., Div. 4V and Divs. 4XW). TAC's for the 4VWa and 4XWb stocks have averaged 75,000 and 90,000 MT respectively since 1973. The 5Y and 5Z-SA 6 stocks have been severely depleted in recent years, and TAC's have been set at $\leq 25,000$ MT and 150,000 MT since 1973 in attempts to improve stock abundance or at least to prevent further declines.

Bluefin tuna

The bluefin tuna is a highly migratory species occurring from Argentina to above the Arctic Circle on both sides of the Atlantic. It is an extremely large fish; adults have attained lengths of perhaps 4.3 m and weights of perhaps 680 kg, and individuals weighing as much as 450 kg are not rare. "Giant" bluefin (over 123 kg) spawn in the area extending from the Caribbean to the Bahamas in spring and then follow the Gulf Stream northward, appearing off New Jersey to Cape Cod Bay in June and July and from the Maine coast to Newfoundland shortly thereafter. "Medium" bluefin (32-123 kg) are believed to spawn off the New York Bight area in June, after which they move inshore; juveniles (2-32 kg) have appeared inshore in this area in recent years during summer. In autumn, all of these groups depart from inshore waters and are thereafter taken in widely separate areas. Tagging studies indicate that tuna make transatlantic migrations at least in certain years; some evidence exists that giants cross the Atlantic during the warmer months, while juveniles do so in winter (Schuck, MS).

Prior to the mid-1950's demand for the species was low; catches throughout the western North Atlantic were modest, and the population appeared to be stable. However, demand has increased substantially in recent years, and the species is now heavily exploited in both the North and South Atlantic. In the ICNAF Convention Area, bluefin have been landed almost exclusively by the USA and Canada. In SA 3 and 4 Canadian landings have been taken primarily in Div. 4X; since 1960, landings increased from 35 MT in 1961 to 303 MT in 1965, after which no landings were recorded until 1973 and 1974 (89 and 321 MT, respectively). In the remainder of SA 4, Canadian landings were small (≤ 25 MT) prior to 1973; 1973-1974 landings were 61 and 380 MT, respectively. In SA 3, Canadian landings averaged 39 MT from 1963 to 1969. Catches by USA fishermen have been negligible in SA 3 and 4.

In SA 5, USA annual landings in Divs. 5Y and 5Z averaged 519 MT and 409 MT respectively, from 1961-1974; Canadian landings were reported only in Div. 5Z and only for 1963-1965 and 1971 (the average being 258 MT for these years). In SA 6, USA landings averaged 929 MT from 1966-1974; Canada reported landings only for 1970, 1971, 1973, and 1974 (averaging 463 MT for these years). Catches by distant-water fleets have been negligible in SA 3-6. USA sport fishermen took an estimated 294 MT of bluefin in 1974 and 122 MT in 1975 in SA 5 and 6.

Due to substantial increases in fishing mortality and subsequent declines in numbers of "giant" spawners, the status of the population in the Northwest Atlantic area is considered to be serious (Mather, 1973). Since 1974, measures have been taken by the International Commission for the Conservation of Atlantic Tunas (ICCAT) to prevent further increases in fishing mortality, but available evidence suggests that current levels are in fact excessive and a substantial reduction will be necessary to prevent a collapse of the stock.

Swordfish

The swordfish is a highly migratory pelagic species attaining weights of perhaps 550 kg although commercial weights typically average from 54-120 kg depending upon method of capture (i.e., harpooning or long-lining). In the northwest Atlantic geographical distribution varies considerably on a seasonal basis; in summer, the species ranges along the edge of the continental shelf from Cape Cod north to the Grand Banks and the Gulf of St. Lawrence, while in winter it is confined to waters of the Gulf Stream in warmer latitudes (Beckett, 1974). The species is known to spawn in winter and early spring from the Caribbean north at least to the Straits of Florida, after which both adults and younger fish migrate northward and eastward; a return southwesterly movement occurs in autumn.

The Canadian swordfish fishery came into existence around the turn of the century (Tibbo, Day, and Doucet, 1961). Landings increased steadily from 65 MT in 1909 to 8,560 MT in 1963; landings from 1964-1970 averaged 4,770 MT per year. Canadian fishermen were prohibited from landing swordfish in 1971 due to mercury content and since that time landings have not been recorded officially; however, considerable amounts are still caught at sea and transferred directly to US vessels. During the 1961-1970 period, Canada landed an average of 1,629 MT from Div. 5Z; during 1966-1970, an average of 525 MT was landed from SA 6.

Swordfish have been taken commercially by USA fishermen since the early 19th century. In the present century, USA landings rose from approximately 470 MT in 1910 to 2,320 MT in 1929 and subsequently declined to a low of 34 MT in 1971, presumably reflecting public concern over mercury levels. Since that year, USA landings have risen sharply, presumably reflecting (1) reduced public concern over mercury content, and (2) offloading at sea from Canadian to USA vessels. Reported USA landings in SA 3 and 4 since 1960 have been small, with the exception of 789 MT from Div. 4X in 1974.

Lobsters

Lobsters are benthic crustaceans attaining maximum weights of perhaps 18 kg although weights of 1 kg or less are most common in the inshore commercial fishery. The species is distributed from Labrador south to Cape Hatteras from shoal waters to depths of 700 m; inshore, important concentrations occur in the Gulf of St. Lawrence, along the Scotian Shelf (Div. 4X), and in the Gulf of Maine (Div. 5Y); offshore, significant quantities are found on Georges Bank (Subdiv. 5Ze) and along continental slope areas extending to the south.

While migrations of lobsters are not fully understood, recent work suggests a general southwesterly movement of Maine lobsters into New Hampshire and Massachusetts waters (Dow, 1974). Lobsters in offshore areas appear to migrate extensively along the shelf edge; also, shoalward migrations occur south of Cape Cod and on Georges Bank in spring and summer, with a return to deeper water in the fall (Cooper and Uzmann, 1971). No movements of offshore lobsters into the Gulf of Maine have been reported. Canadian lobsters may migrate south, as a lobster recently tagged in Canadian waters was reported to have been recaptured in New Hampshire (no details available).

Historically, lobsters have been taken for the most part by Canada and the USA, with only minor incidental catches by distant-water fleets. As of January 2, 1974, the lobster has been declared a continental shelf fishery resource, excluding all foreign nations. Total Canadian and USA landings showed a general increase from 18,100 MT in 1942 to 32,200 MT in 1951. Thereafter, catches fluctuated from 28,100 to 37,200 MT annually until 1972 when landings dropped sharply to 26,300 MT. Landings have since remained at this level with no recovery. Canadian landings constitute 60-65% of the total lobster catches in SA 4-6, and about 90-95% of their catch is taken in SA 4.

The bulk of the USA inshore catch is taken in Div. 5Y (7,300 - 9,100 MT annually for the last ten years). Historically USA landings of offshore lobsters were first reported in 1950 (approximately 100 MT). During the following decades, landings increased gradually and by 1969 the annual catch had increased to 32,00 MT. Landings peaked at 3,900 MT in 1972 and have since declined to 2,700 MT in 1975.

The Canadian offshore fishery has only developed recently (about 1972) and has been limited primarily to the northeast peak of Georges Bank, with an average annual catch (1972-74) of 200 MT.

Lobsters in coastal areas from Maine to New Jersey are probably over-exploited in all areas, and the need to control and reduce fishing mortality has been evident for some time. Critical assessment of offshore lobster stocks cannot be accomplished until more reliable statistics are available and stock boundaries have been defined. However, current reported catches for offshore areas are probably within sustainable limits.

Sea scallop

The Atlantic sea scallop occurs from the Gulf of St. Lawrence south to the Virginia Capes, generally in depths of from 40-100 m; fishable concentrations have occurred from time to time in the Scotian Shelf, on Stellwagen Bank, and in the Mid-Atlantic Bight although the most consistent source has been the Georges Bank area. Adult sea scallops are capable swimmers but demonstrate no migratory tendencies and consequently adult concentrations tend to remain rather localized.

Fisheries in Divs. 4W and 4X have been exclusively Canadian. Landings in Div. 4W have been of no significance; Div. 4X landings have declined steadily from about 5,000 MT in 1968 to 600 MT in 1974. The 1975 catch rose to 4,400 MT.

Sea scallops have been landed by USA fishermen since the late 1800's. USA landings from Georges Bank averaged 63,000 MT live weight annually from 1950-1964, peaking at 89,000 MT in 1961; since 1965 annual landings have been about 9,500 MT. Canada began fishing scallops in this area in the early 1950's; from 1957 to 1962 landings rose from 800 to 47,000 MT. From 1962-1973 annual catches have averaged 42,000 MT; in 1974 and 1975 landings exceeded those of any previous year (50,900 MT and 61,500 MT respectively).

The Mid-Atlantic area (SA 6) has been fished primarily by USA vessels, although Canadian landings were significant in 1965, 1966, and 1968. Rapid declines in stock abundance occurred in this area in the late 1960's and since 1970 the population in this area appears to have stabilized at a very low level.

To improve yield per recruit, Canada in 1972 proposed a regulation prohibiting the taking of scallops of 95 mm total length or landings of meats totalling >40 per lb. in Div. 5Z; this was accepted by ICNAF. Both Canada and the USA later took reservation to this regulation and consequently the measure is at present non-binding.

Squid

Two species of squid, Loligo pealei (long-finned squid) and Illex illecebrosus (short-finned squid), are commercially important in the north-west Atlantic. Loligo is a demersal, schooling species which occurs from Cape Hatteras to New Brunswick, with greatest concentrations occurring from Cape Hatteras to southern Georges Bank; it is found from shallow waters down to depths of about 400 m. It lives an estimated 1-2 years and attains lengths of about 30 cm and weights of approximately 600 gm. Loligo spawns from about May through September in shallow (0-90 m) inshore to shallow areas to spawn, primarily from Long Island to Cape Cod (ICNAF Div. 5Zw + 6A). An offshore movement subsequently occurs with declining temperatures in fall.

Illex is a pelagic, schooling species, which occurs from Greenland to Florida in depths of from 50-700 M; the species is most abundant in the Newfoundland region, with smaller concentrations occurring in the area south of Newfoundland to New Jersey. It is known to be highly migratory (Voss, 1973). Individuals live approximately one year, attaining lengths of about 30 cm with monthly increments of about 2 cm for both sexes. Little is known of the reproductive habits of Illex; they are known to spawn from December to June on the continental slope off Newfoundland and there is also evidence of possible spawning off the northeast US in August.

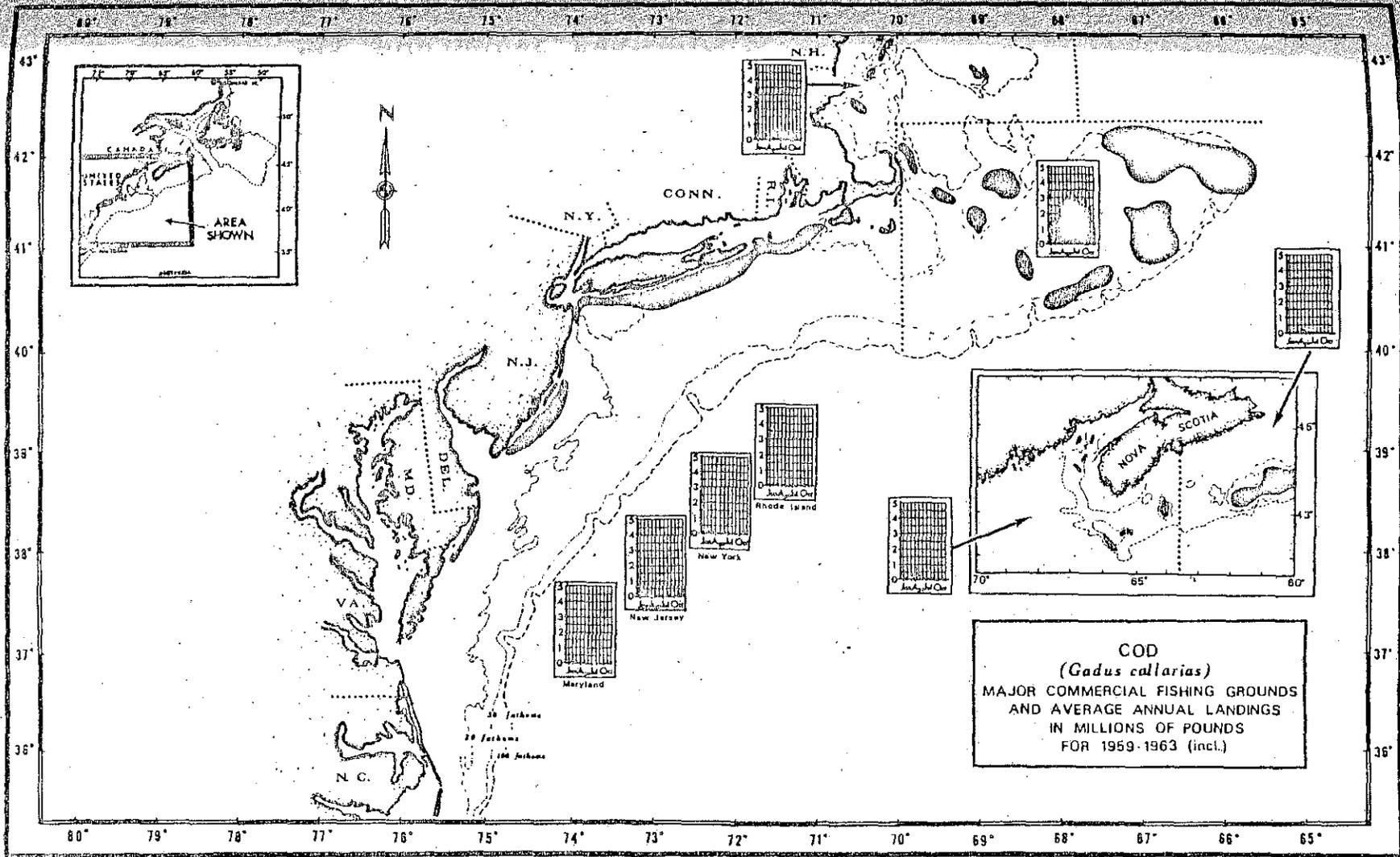
The major fishery for Loligo occurs from November through March along the edge of the continental shelf in ICNAF Divs. 6A, 5Zw, and 5Ze. In the case of Illex, inshore migrations along the coast of Newfoundland have allowed for a small, traditional summer and fall Canadian fishery, but the major fishable concentrations occur offshore along the edge of the continental shelf in ICNAF Divs. 5Ze, 6A, and 6B, in May through September.

US catches of squid in northwest Atlantic waters have been reported since the late 1800's, averaging 1,000-2,000 MT per year. Until recently, these catches have not been separated to species. Newfoundland has had a small bait fishery for Illex at least since the 1800's, ranging from 1-3,000 MT. By-catch of squid from other fisheries of the distant-water fleets were first reported in 1964, and have increased steadily with increased effort in those fisheries. In addition, directed fisheries have been instituted by Japan (in 1967) and Italy (in 1972) primarily for Loligo, and by Spain (in 1970) for Loligo in the winter and Illex in the summer. These fisheries occur primarily in the area from south of Hudson Canyon north to Lydonia Canyon (SA 6 - Subdiv. 5Ze) along the edge of the continental shelf.

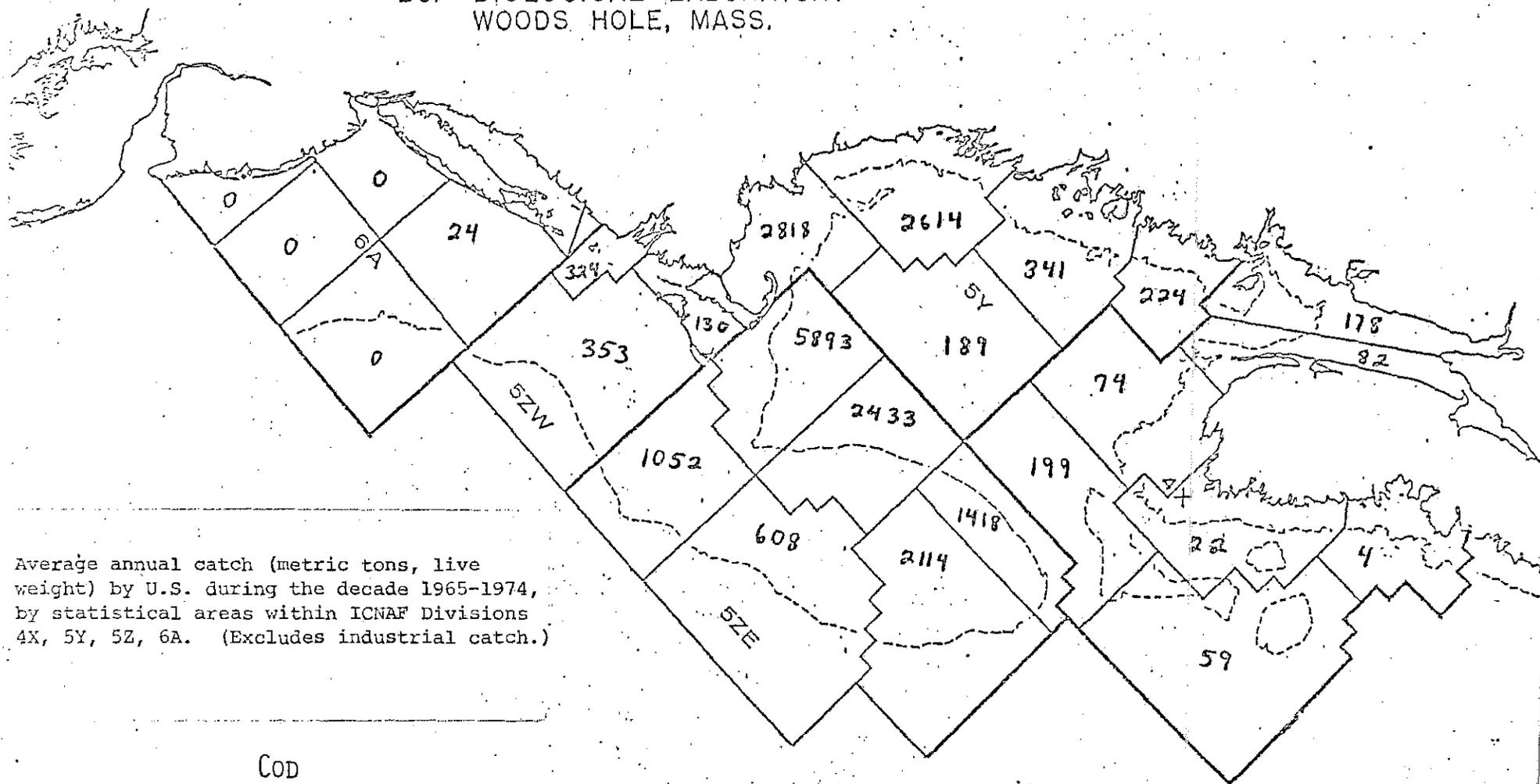
Total squid catches in SA 5 and 6 increased from 1,000 to 56,000 MT (1974) and dropped to about 46,000 MT in 1975. At present Japan, Spain, Italy, and the USA are prosecuting directed fisheries, with Poland, USSR, FRG, GDR, Canada, Bulgaria, Romania, and France also reporting incidental catches. Estimates of annual catches in SA 5 + 6 for the period 1964-1975 range from 500 to 36,000 MT for Loligo and from 700 to 27,000 MT for Illex. In SA 4, Illex has predominated in commercial catches; the USSR has accounted

for the greatest amounts. Soviet catches averaged 1,000 MT for the 1963-1972 period, increasing thereafter to 13,200 MT in 1975. Canada, Spain, Japan, and Poland have also reported small catches for this area in recent years; in 1973-1975, Canada recorded landings of 14, 65, and 91 MT, respectively. For the 1963-1972 period, total SA 4 landings ranged from 65 to 1,842 tons and averaged 1,145 MT. Landings in 1973 through 1975 were 9,250, 390, and 12,724 MT, with USSR and Spain reporting most of the catches.

Loligo is believed to comprise one stock throughout this region; stock boundaries for Illex are uncertain. Management of squid stocks in the north-west Atlantic was initiated in 1974 when a TAC of 71,000 MT was set for both species for SA 5 + 6. On the basis of research vessel survey data and stock-recruitment studies, TAC's have been set at about the same level for succeeding years. For 1976, the following TAC's are in effect: Illex, 25,000 MT in SA 3 and 4 and 30,000 MT in SA 5 and 6; Loligo, 44,000 MT in SA 5 and 6.



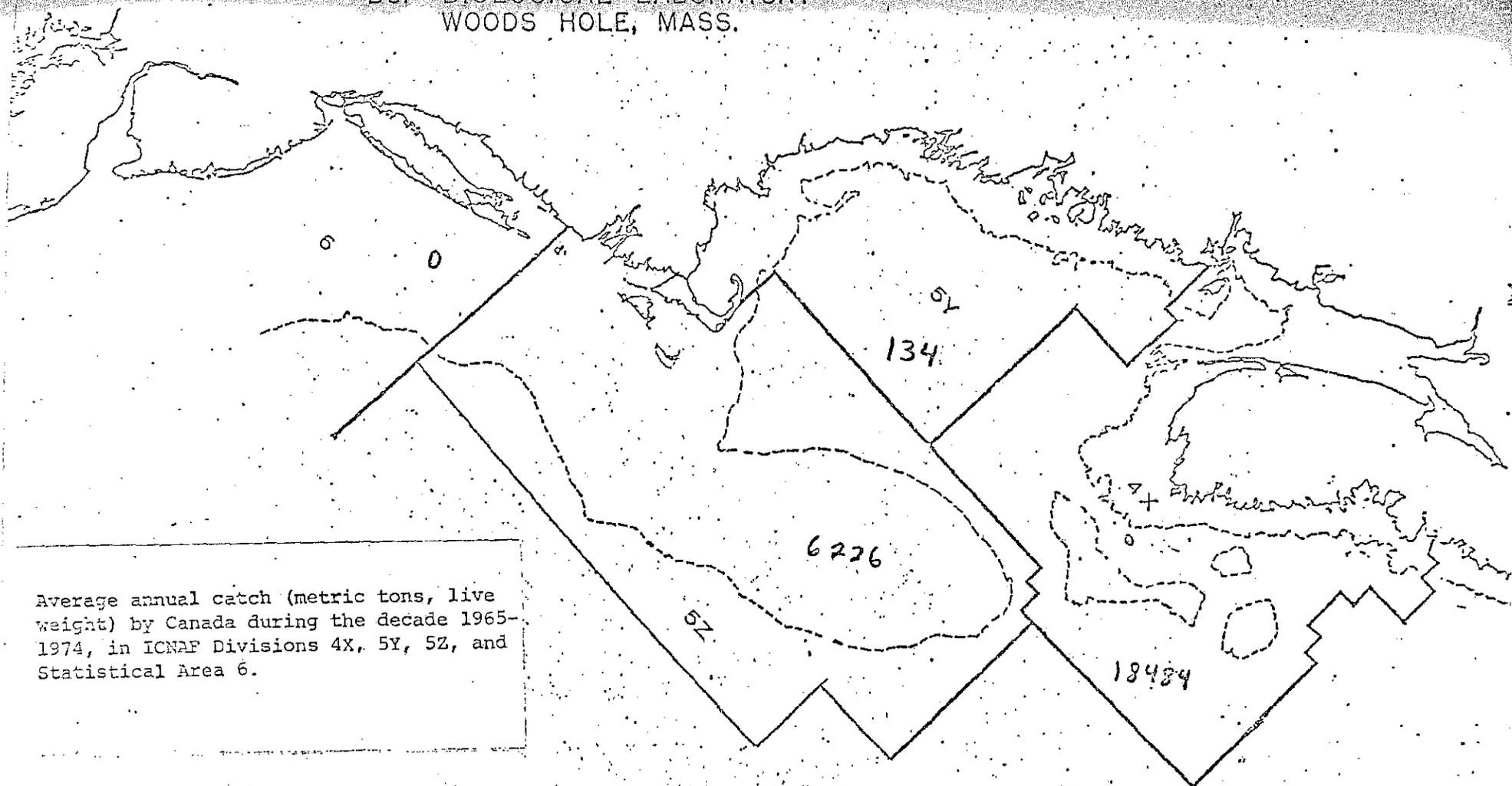
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

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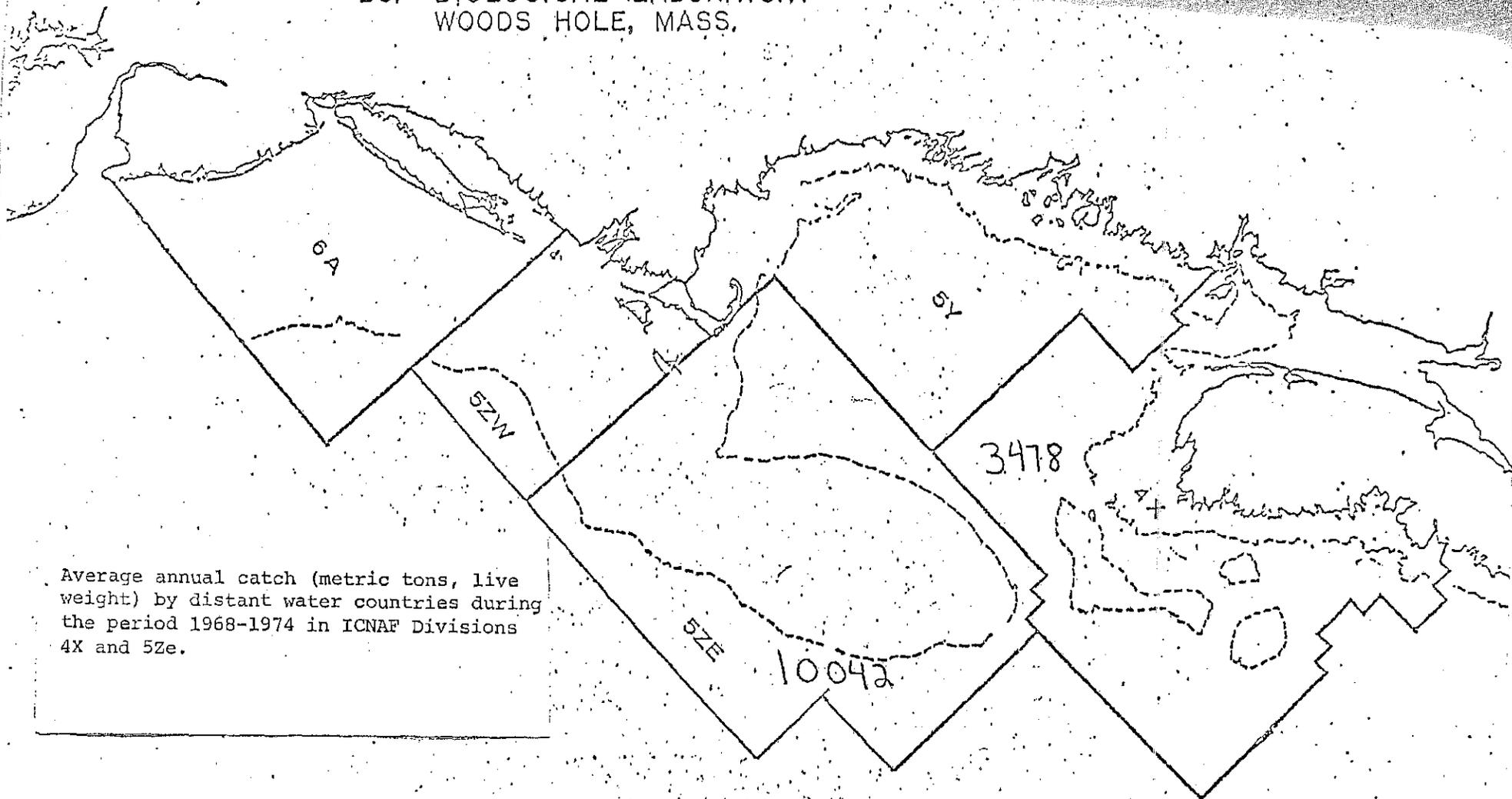
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

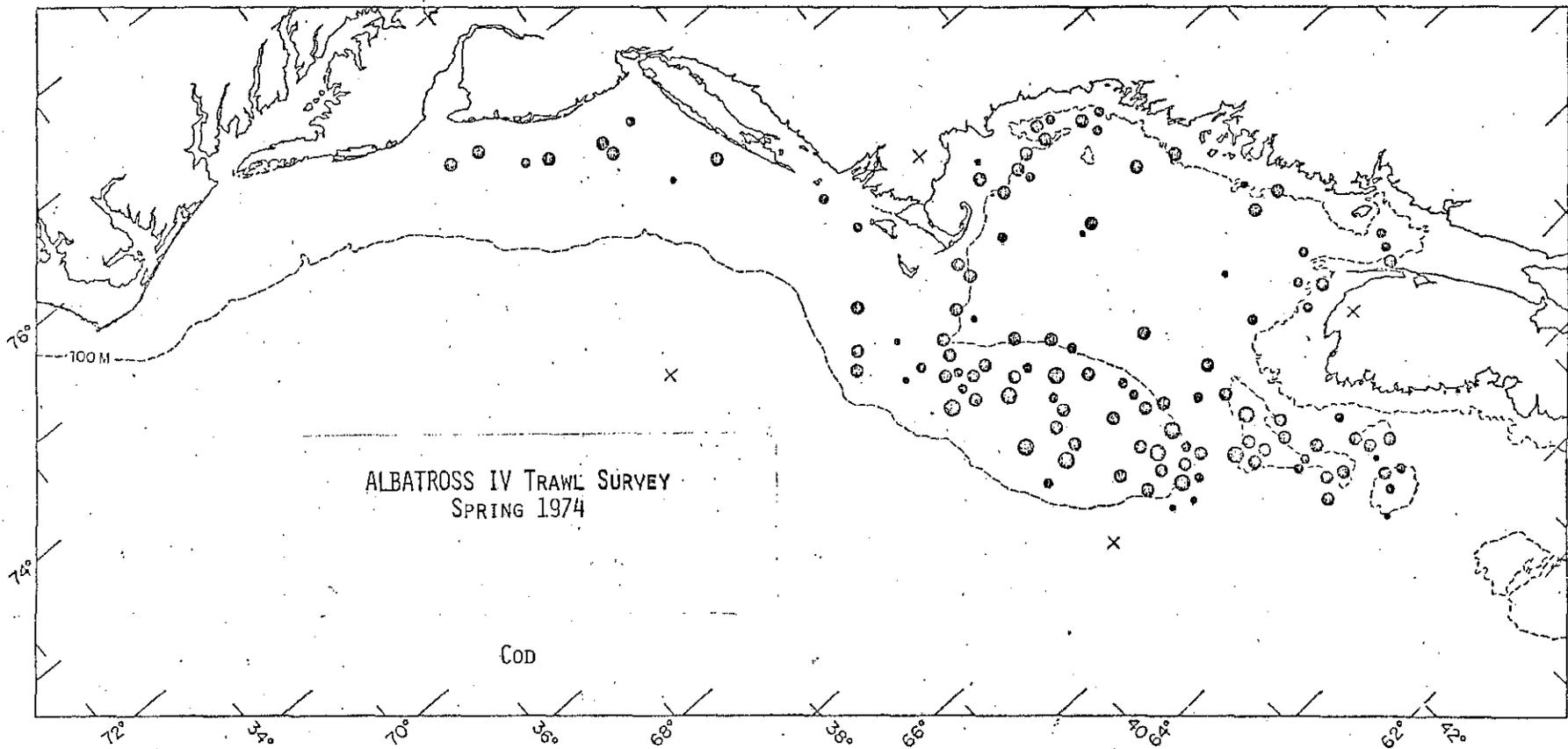
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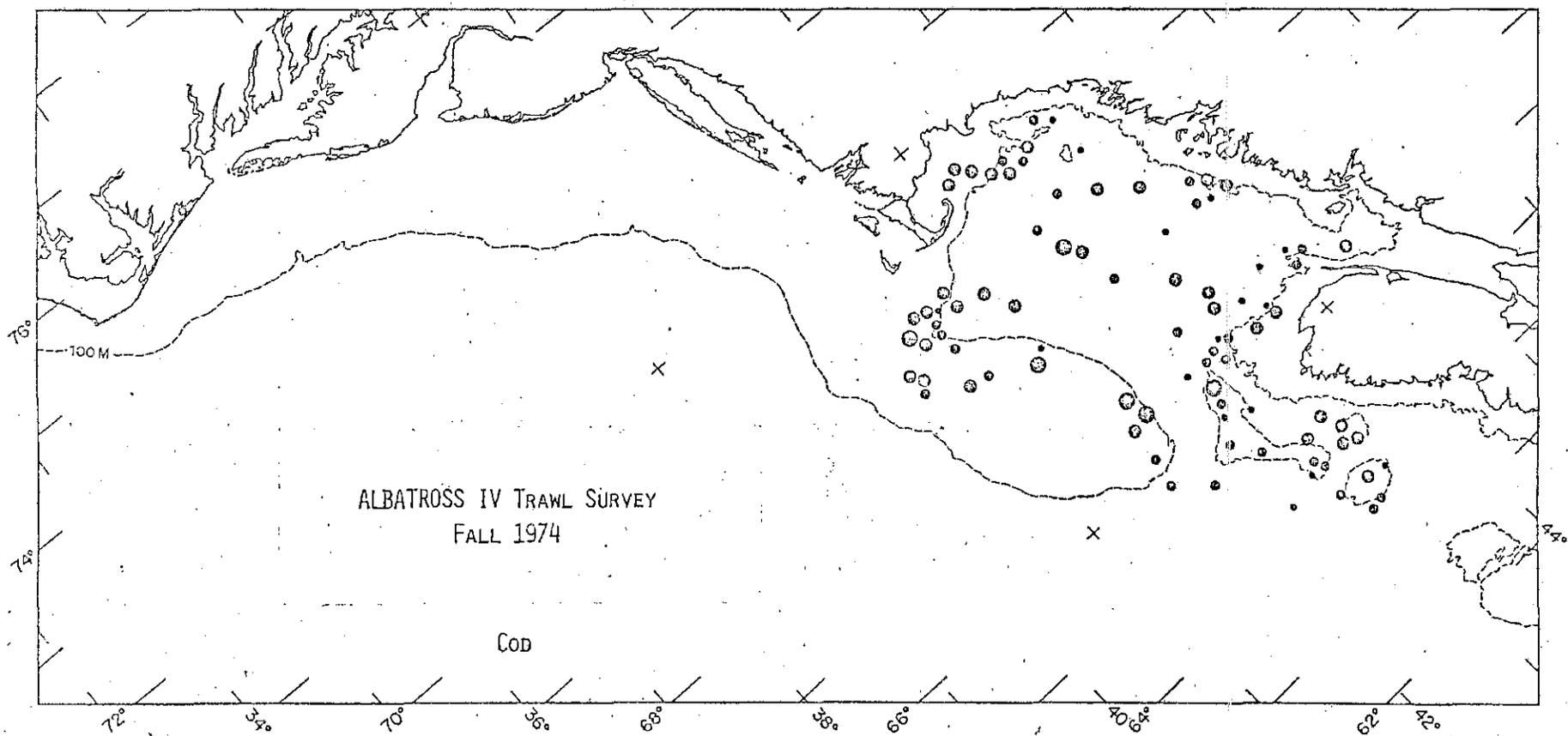
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WOODS HOLE, MASS.

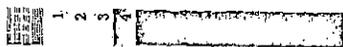
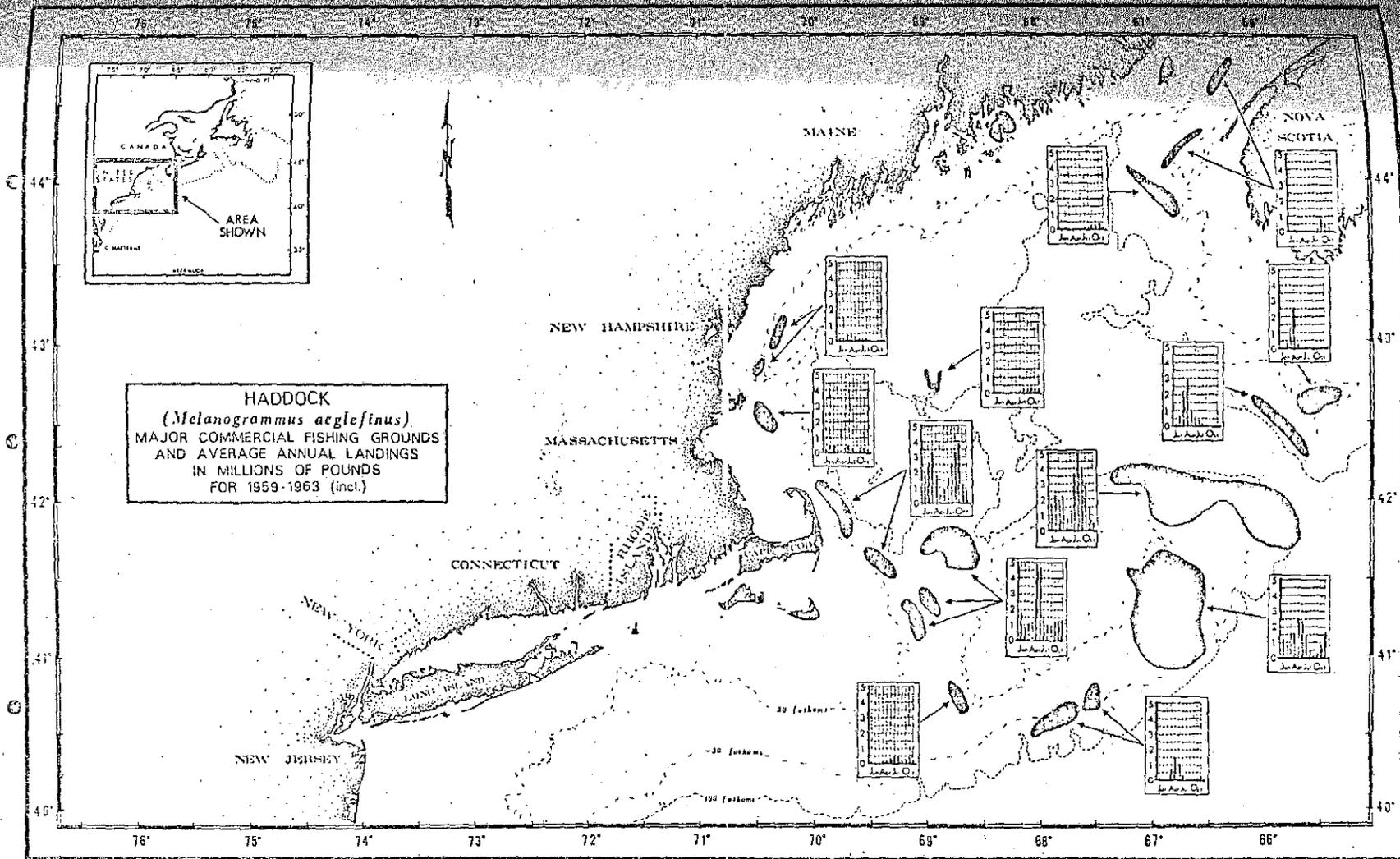


Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

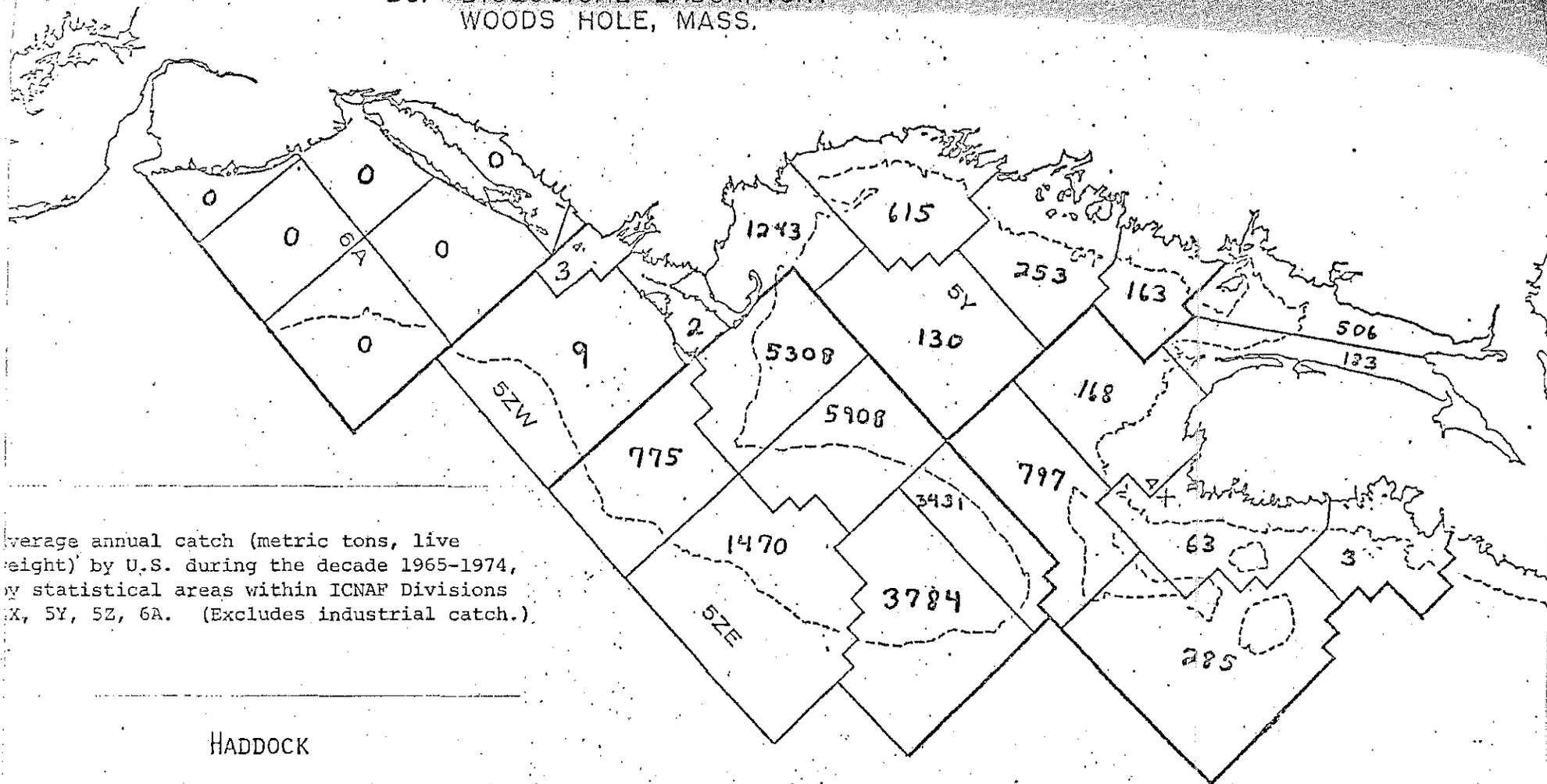
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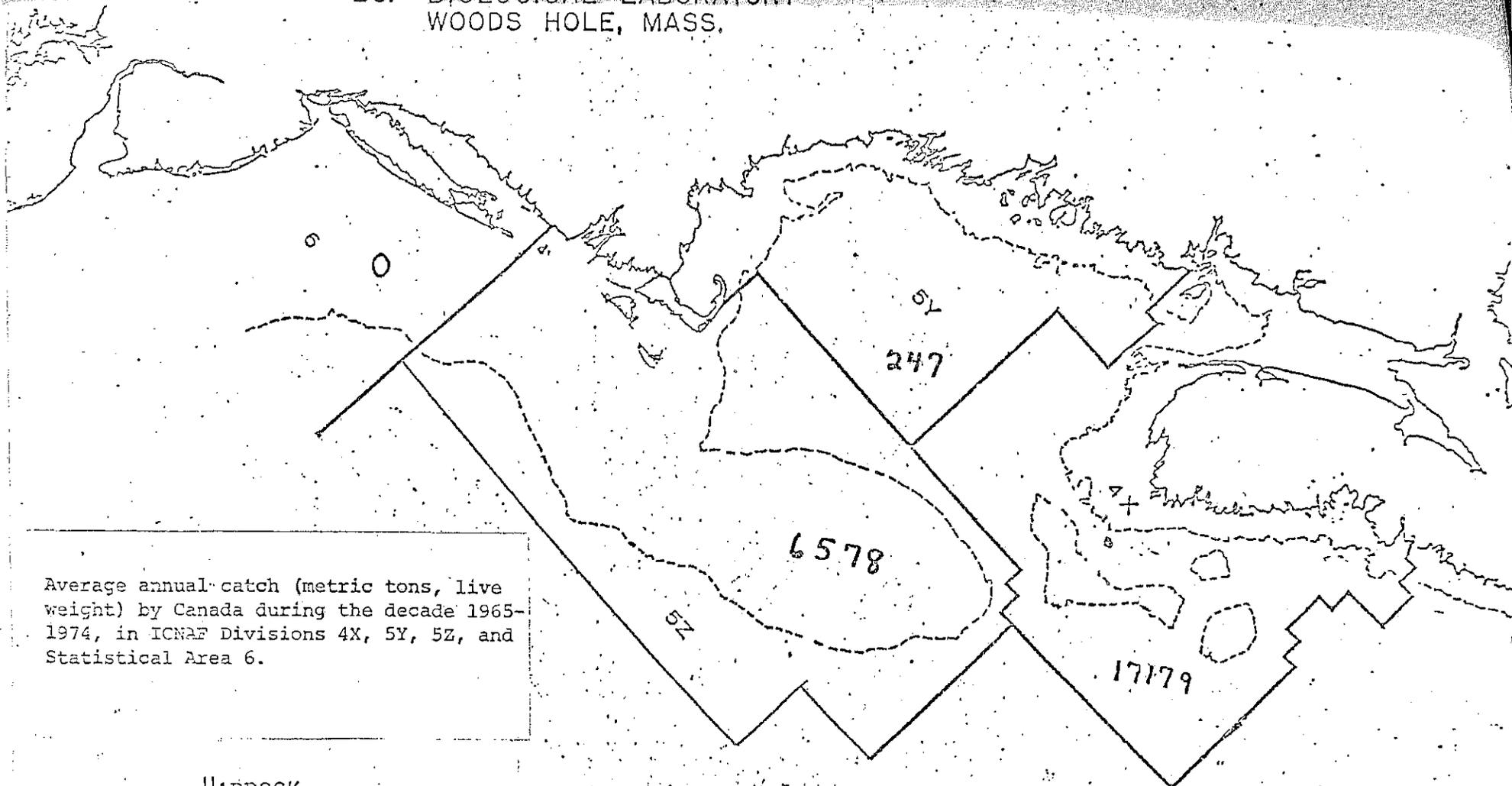
STATISTICAL AREAS
 BCF BIOLOGICAL LABORATORY
 WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions X, 5Y, 5Z, 6A. (Excludes industrial catch.)

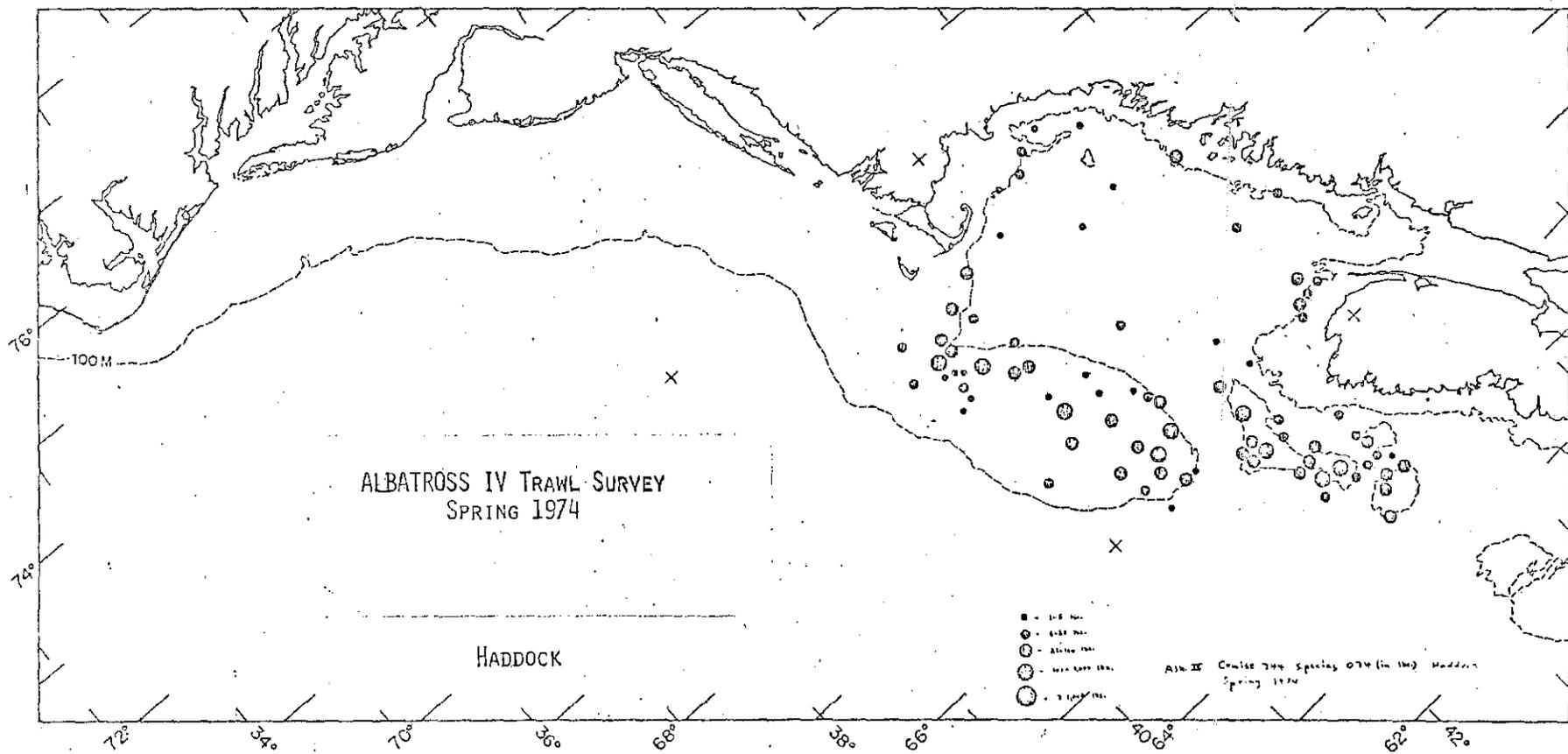
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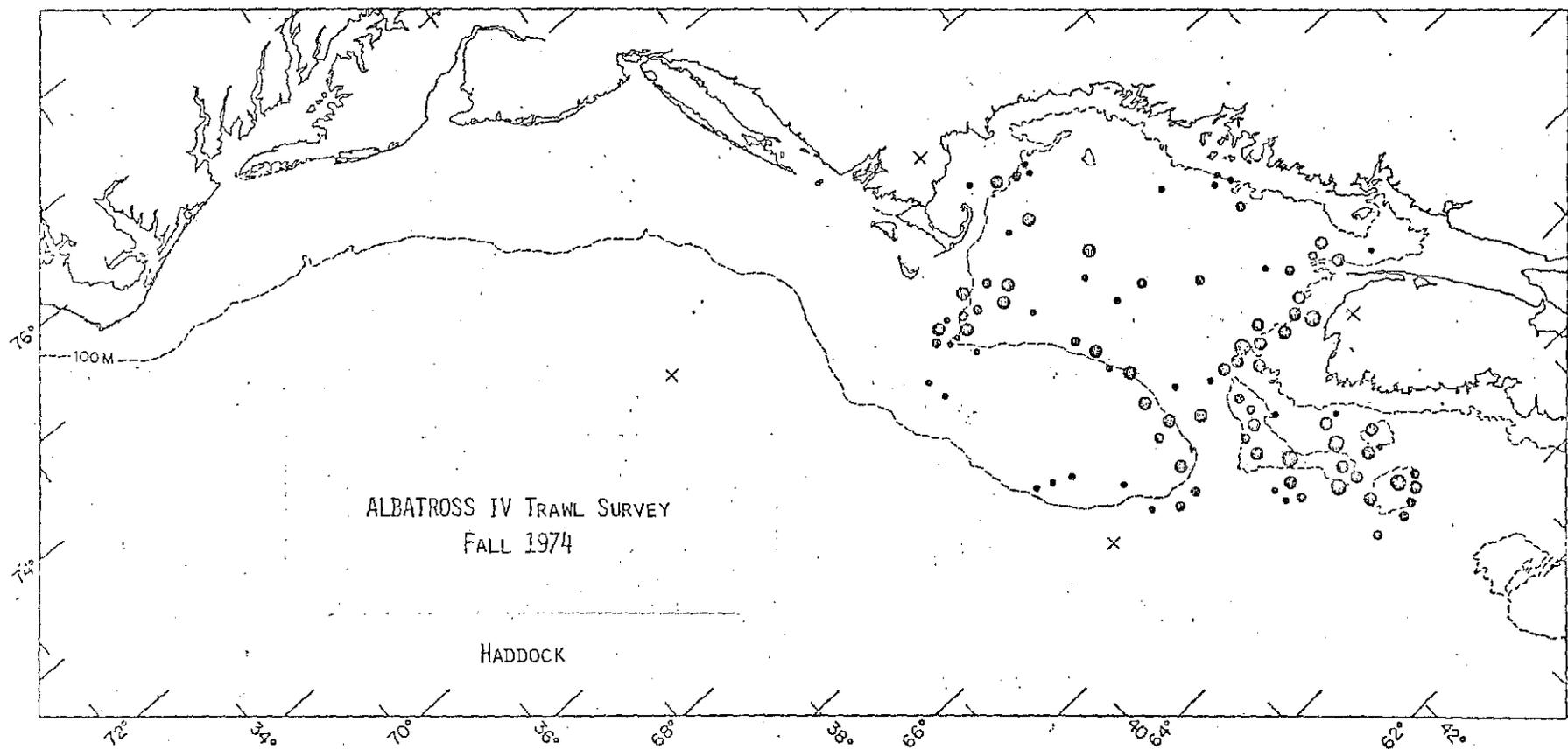
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BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

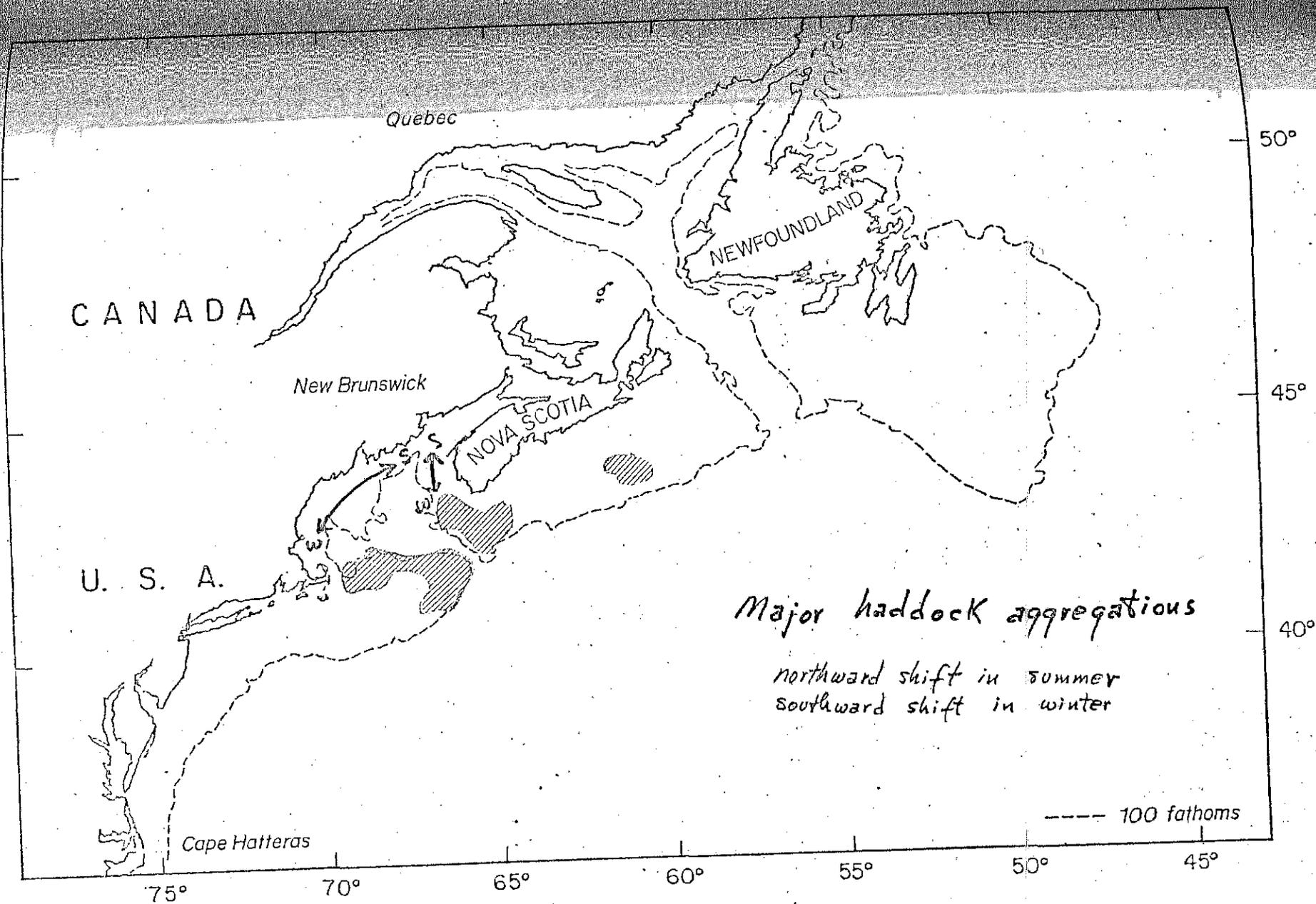


Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

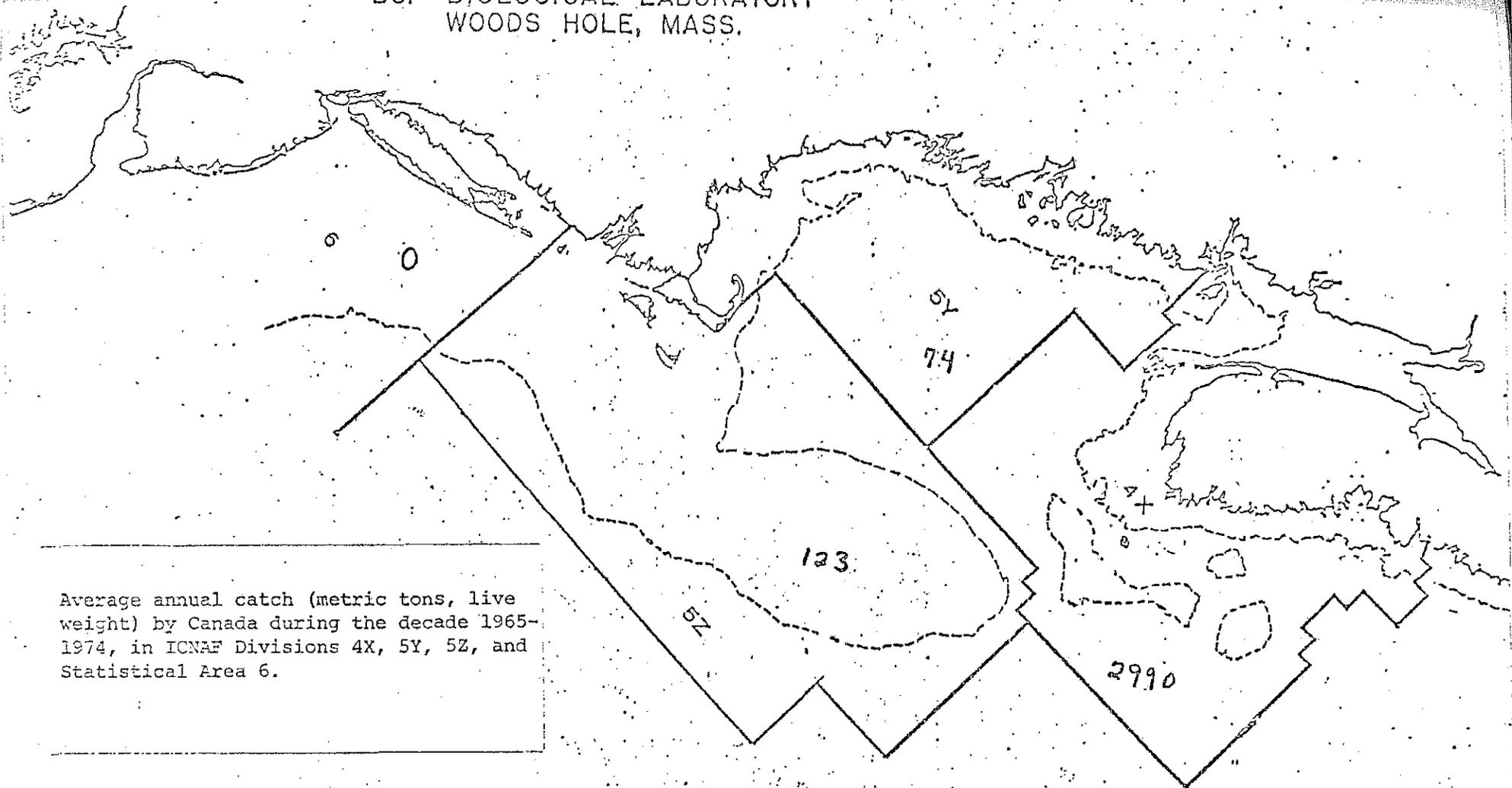
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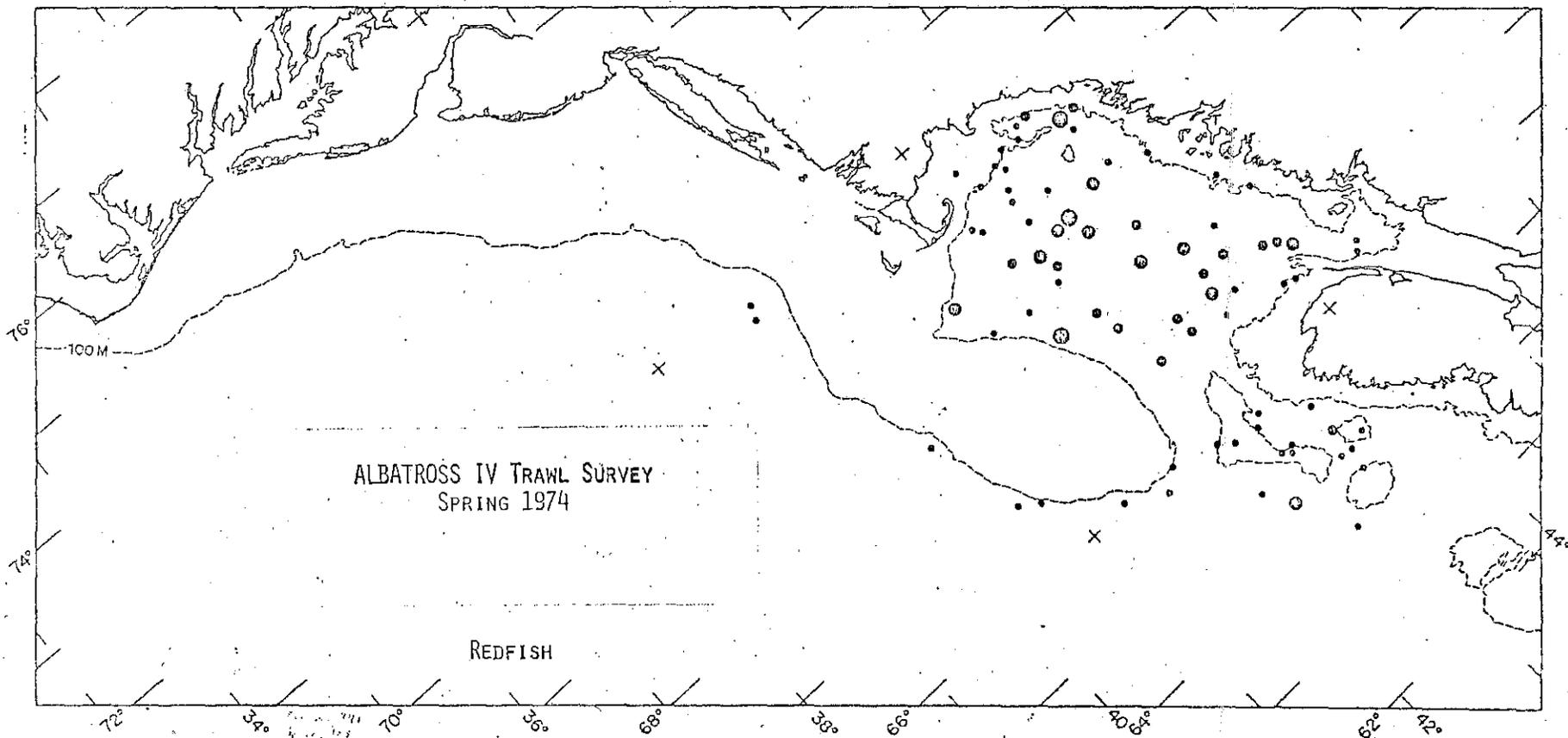


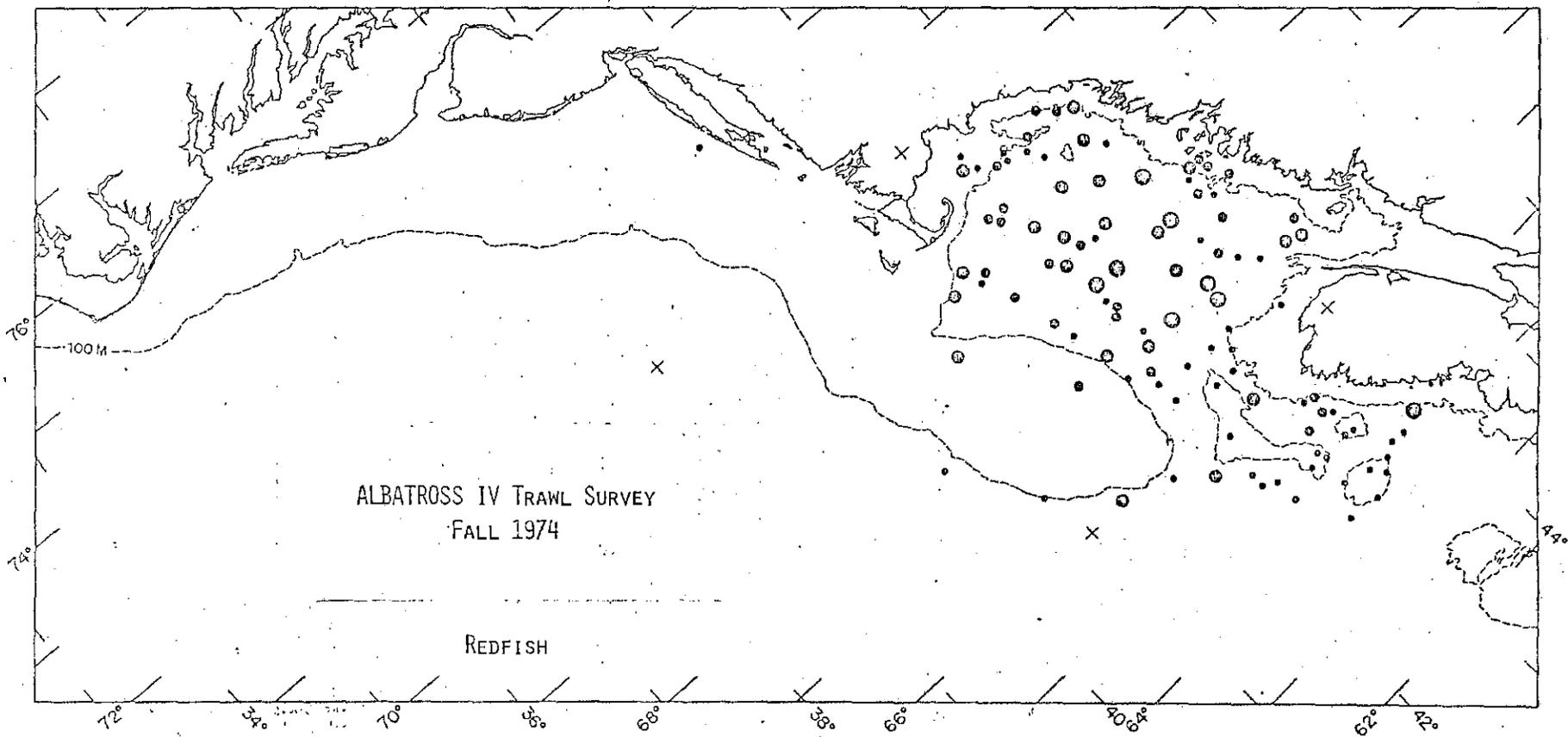
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



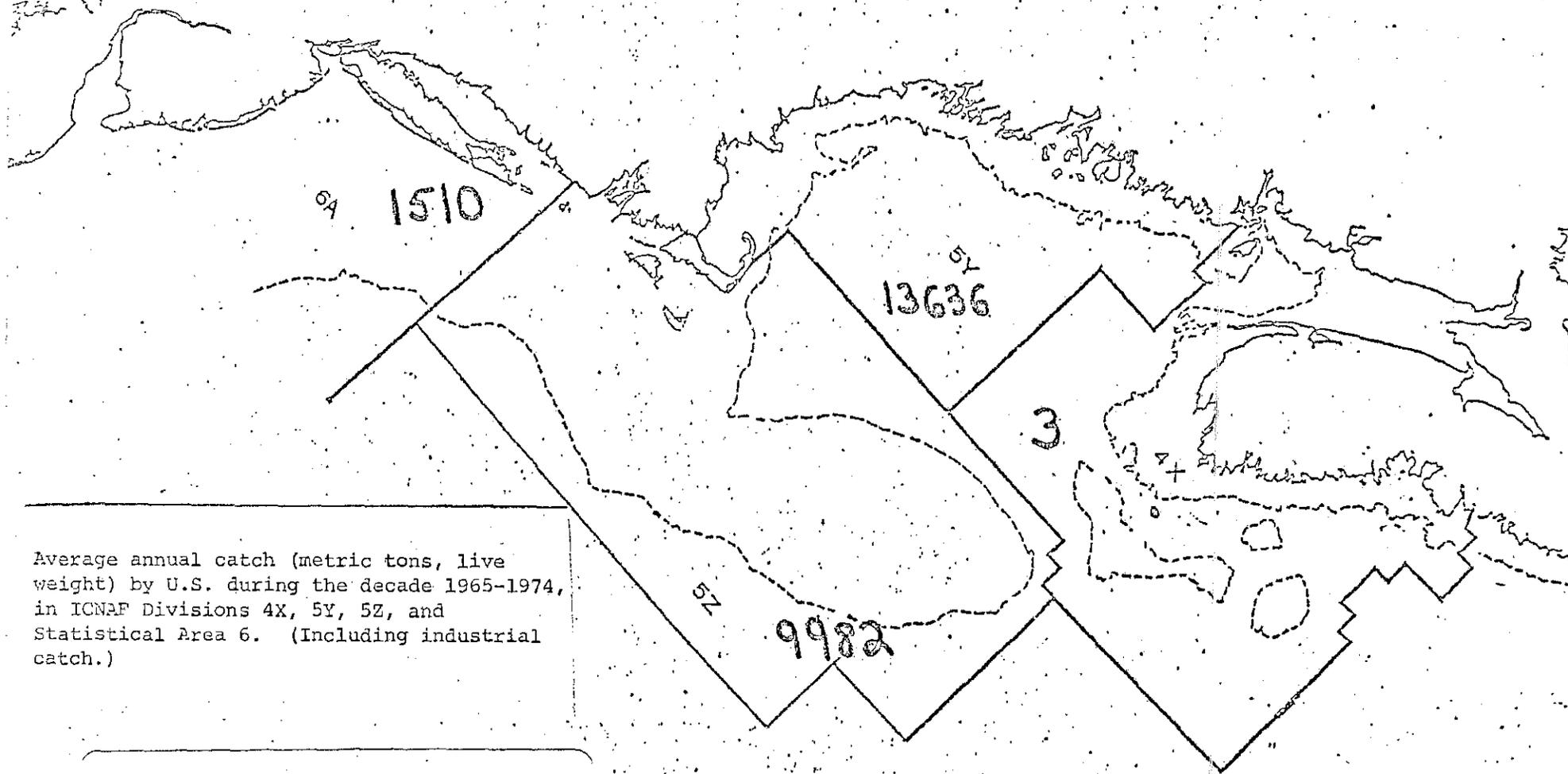
Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

REDFISH





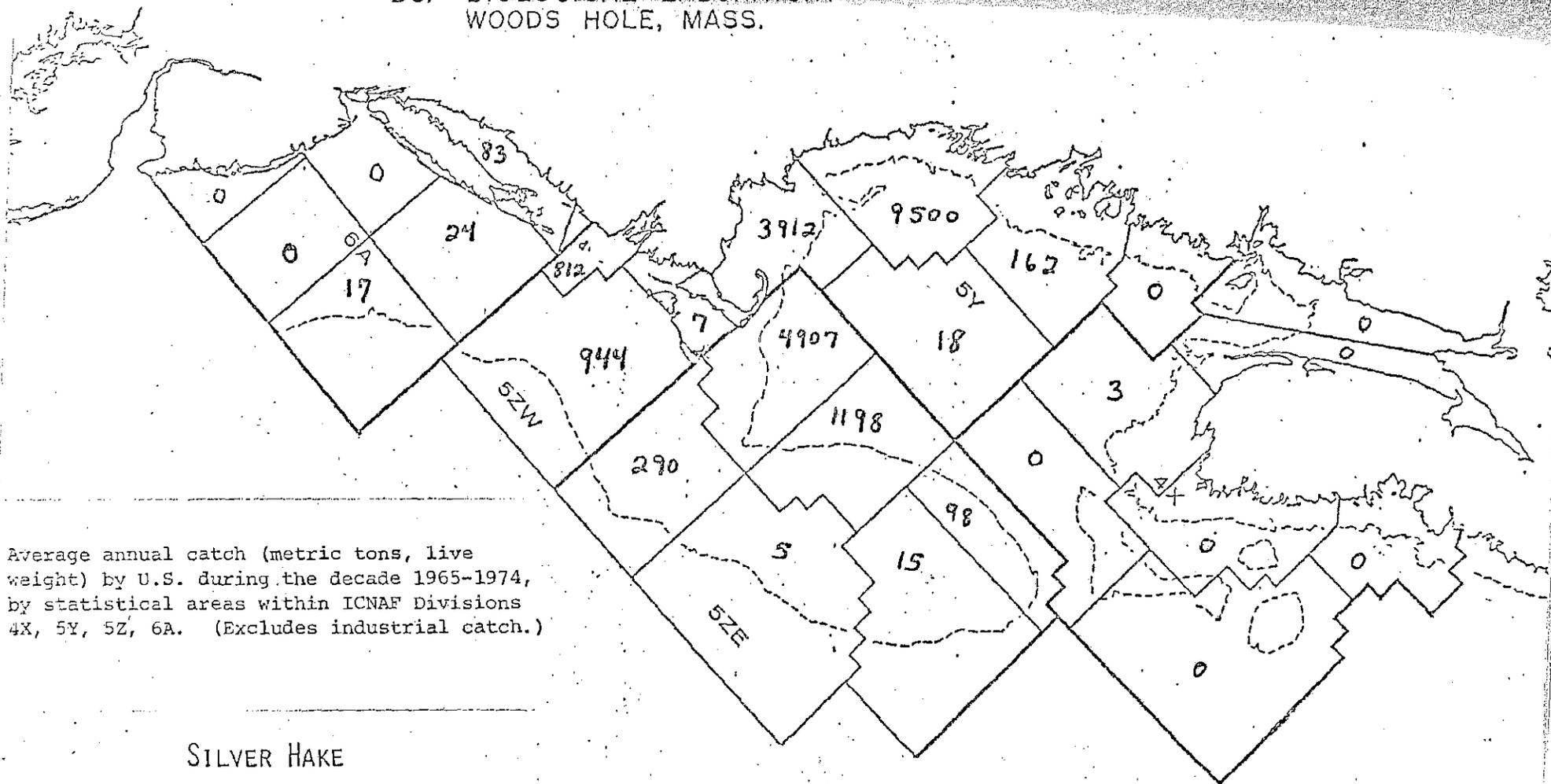
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6. (Including industrial catch.)

SILVER HAKE

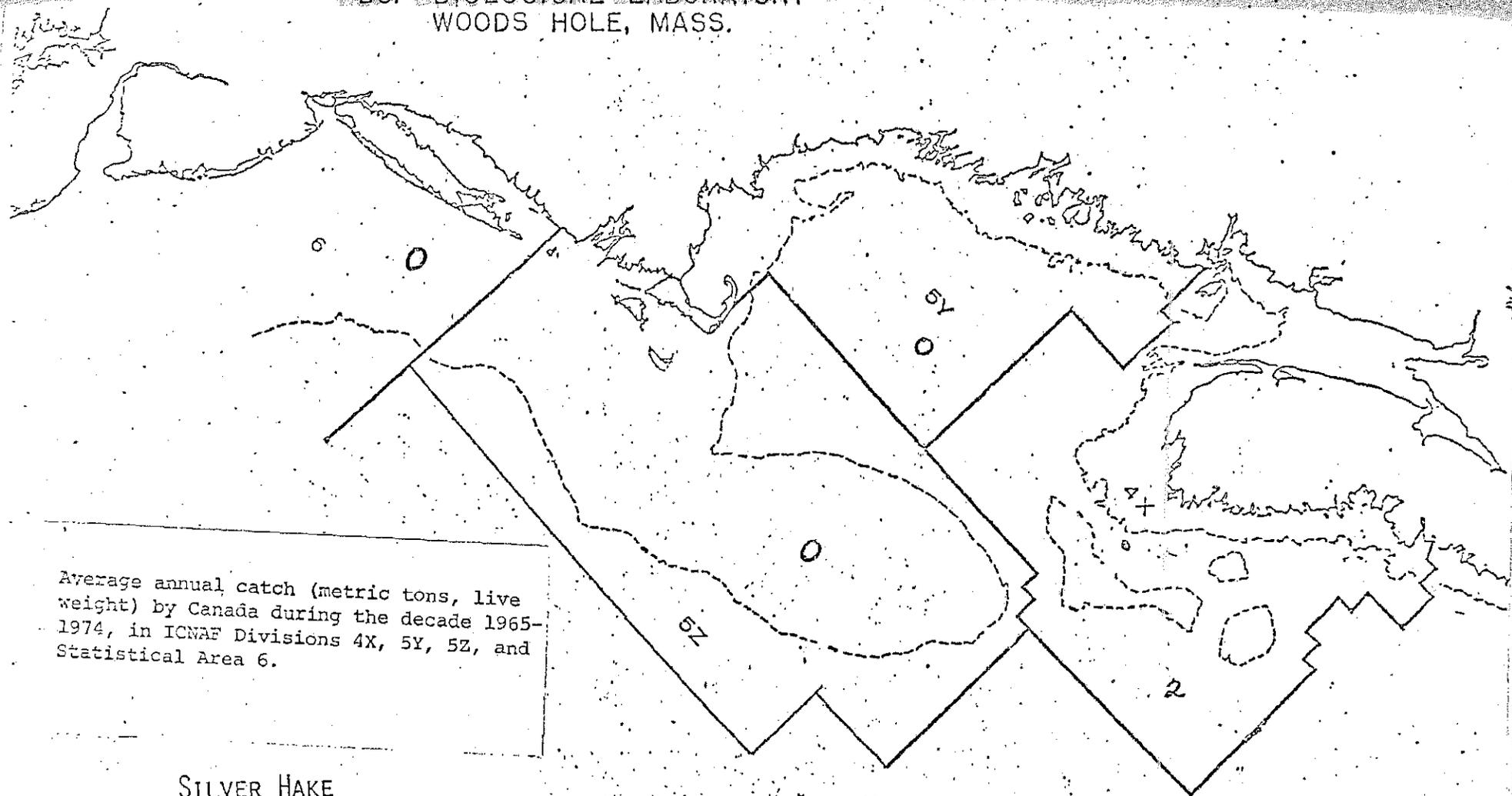
STATISTICAL AREAS
 BCF BIOLOGICAL LABORATORY
 WOODS HOLE, MASS.



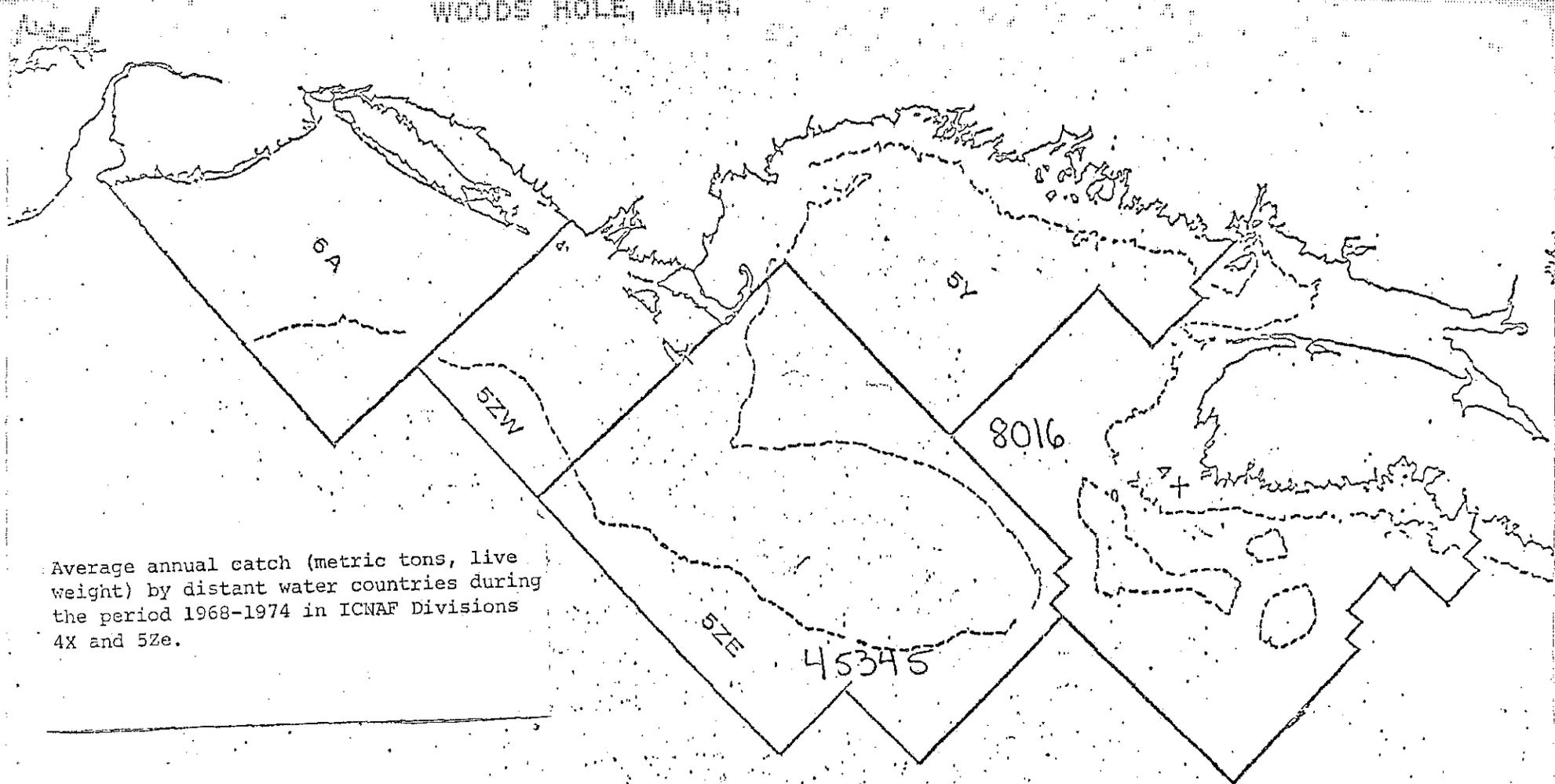
Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

SILVER LAKE

STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

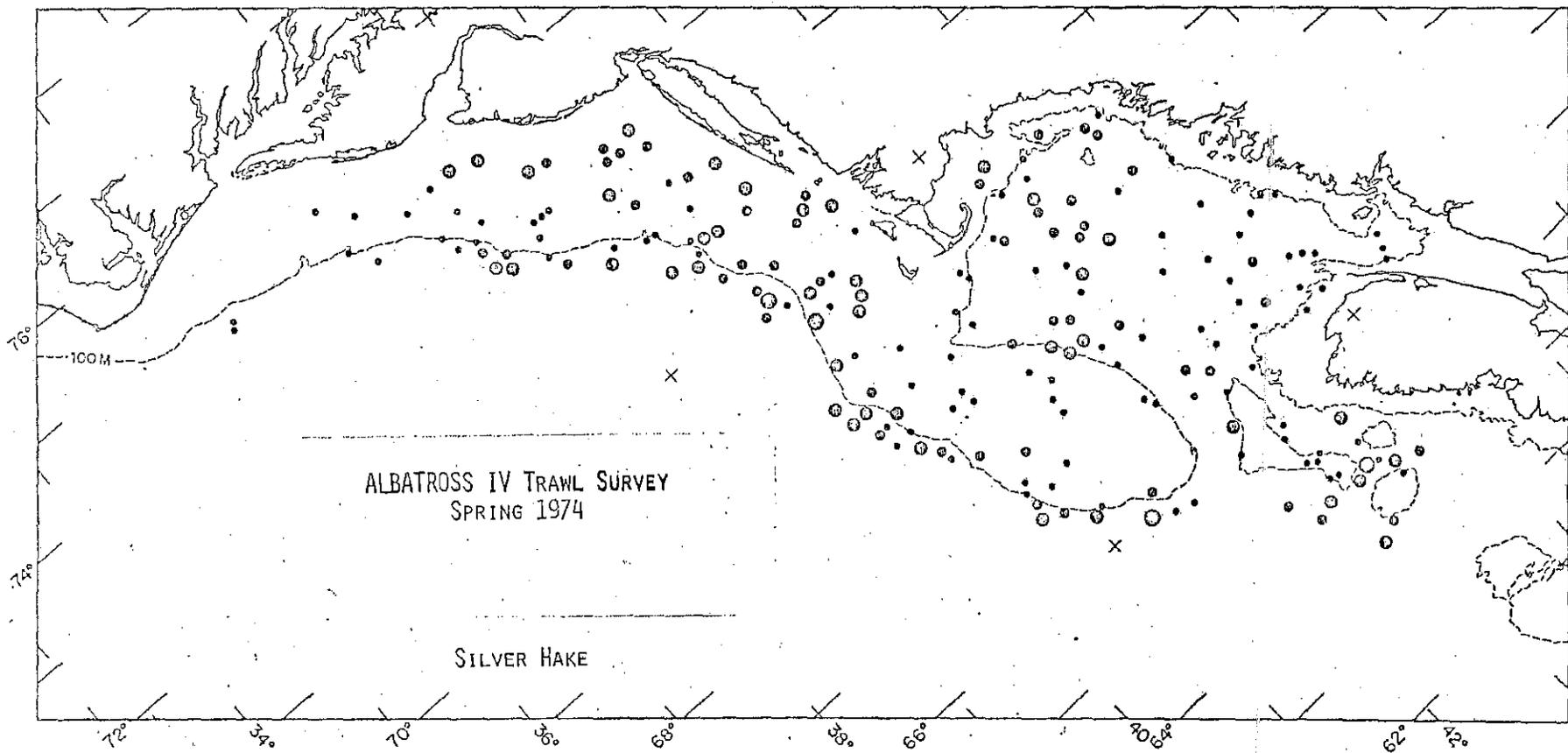


STATISTICAL AREAS
BOF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



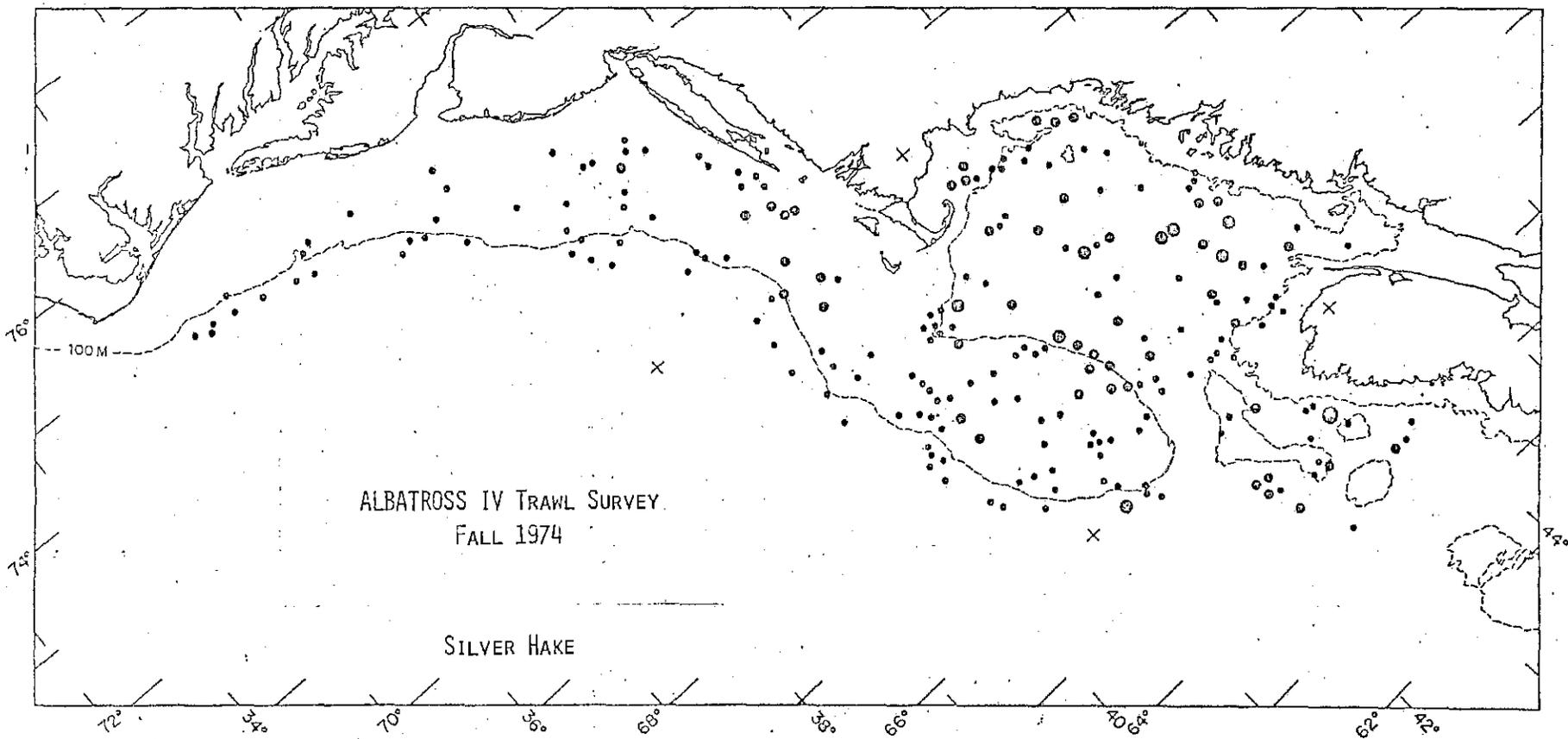
Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

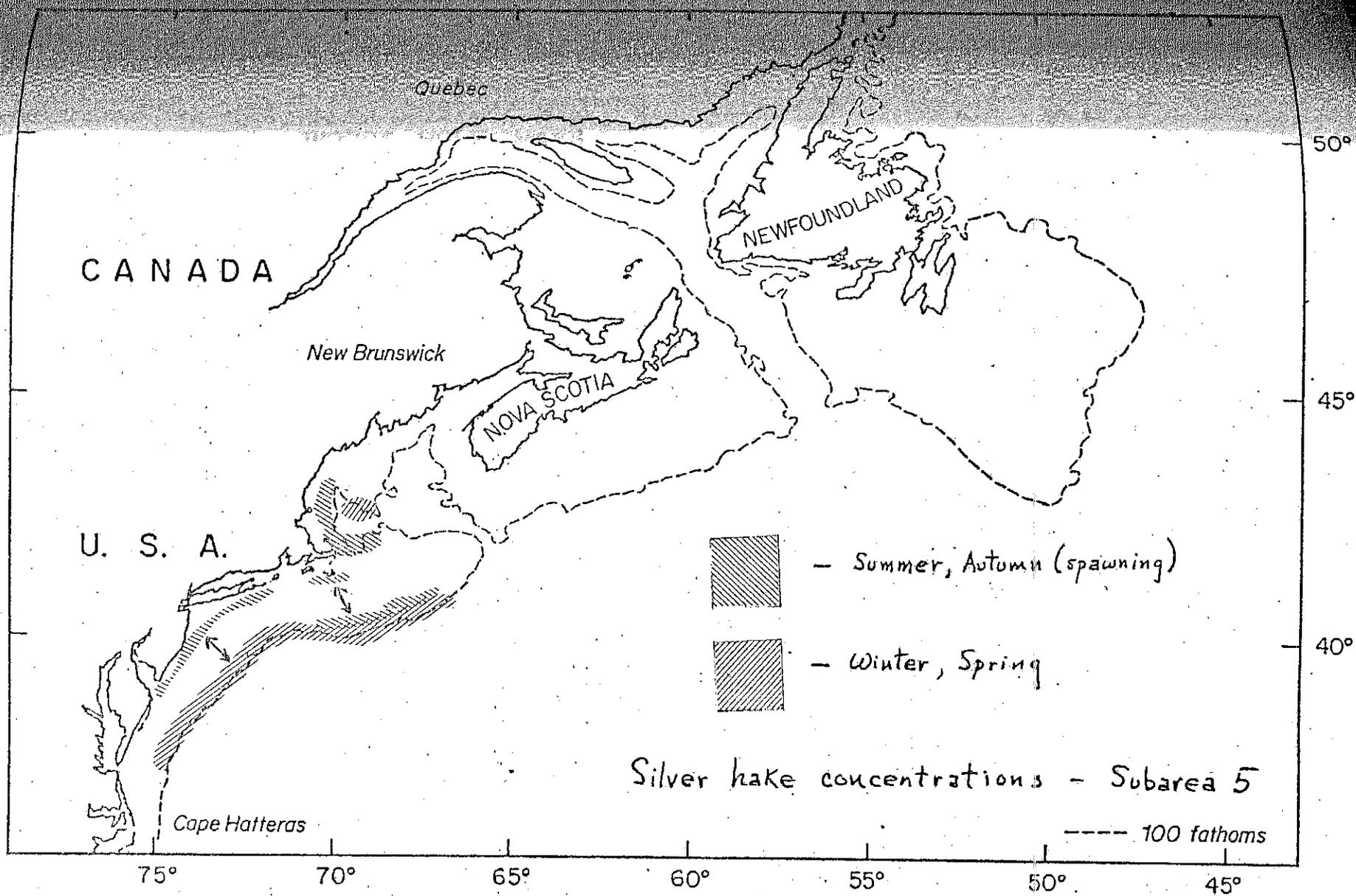
SILVER HAKE

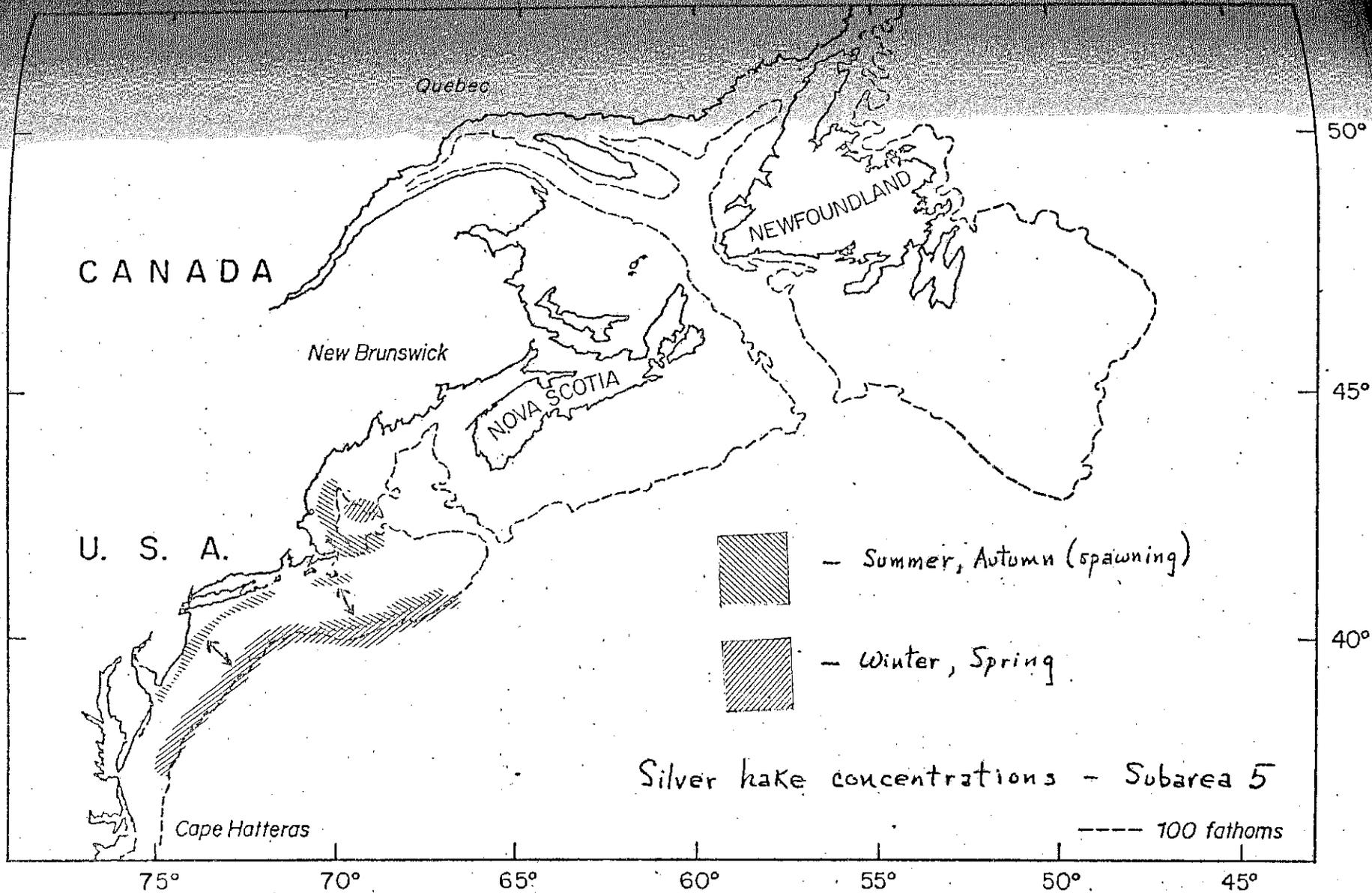


Albatross IV Cruise 7403 Species 072 Silver Lake
Spring 1974

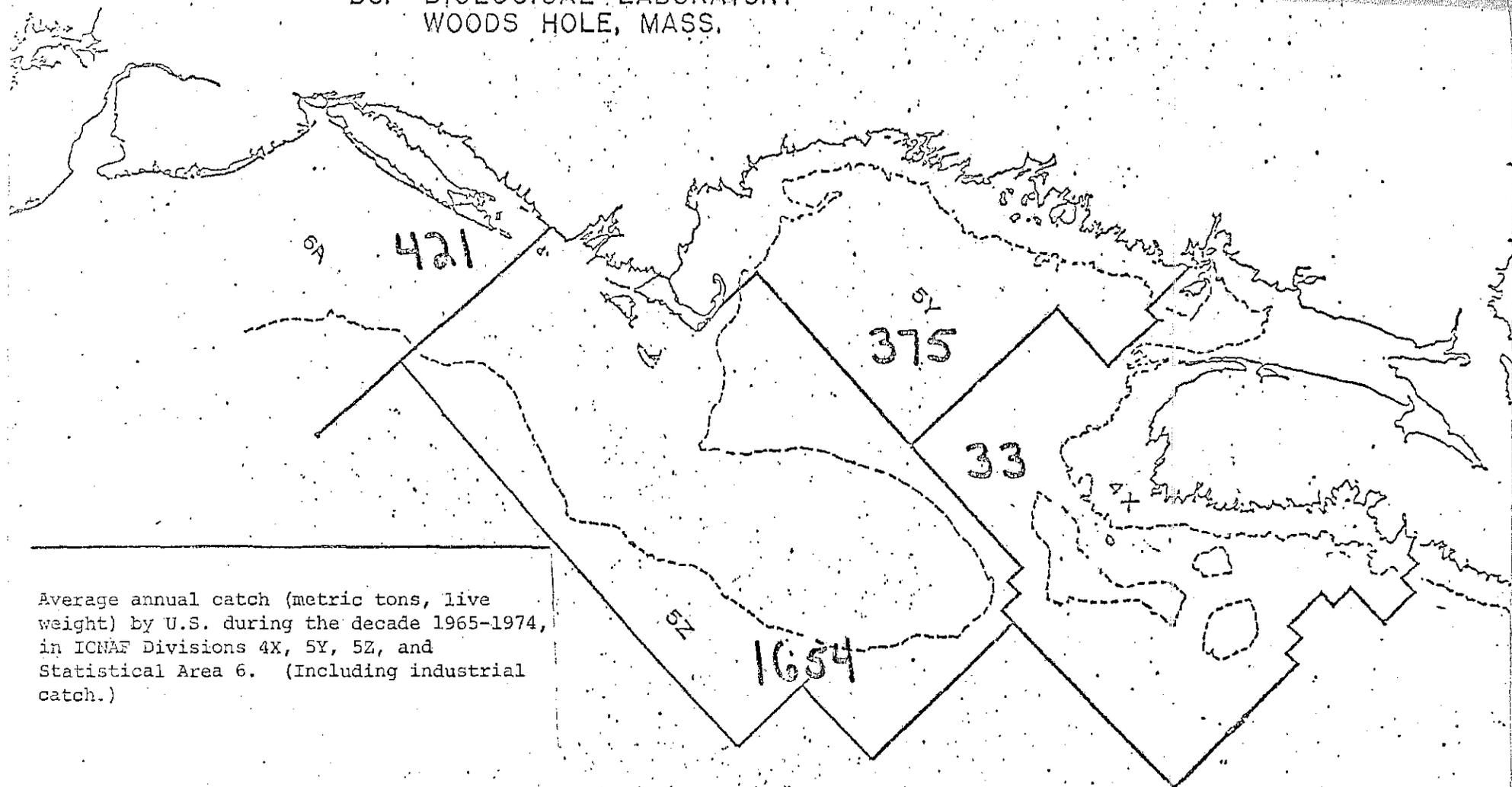
42°





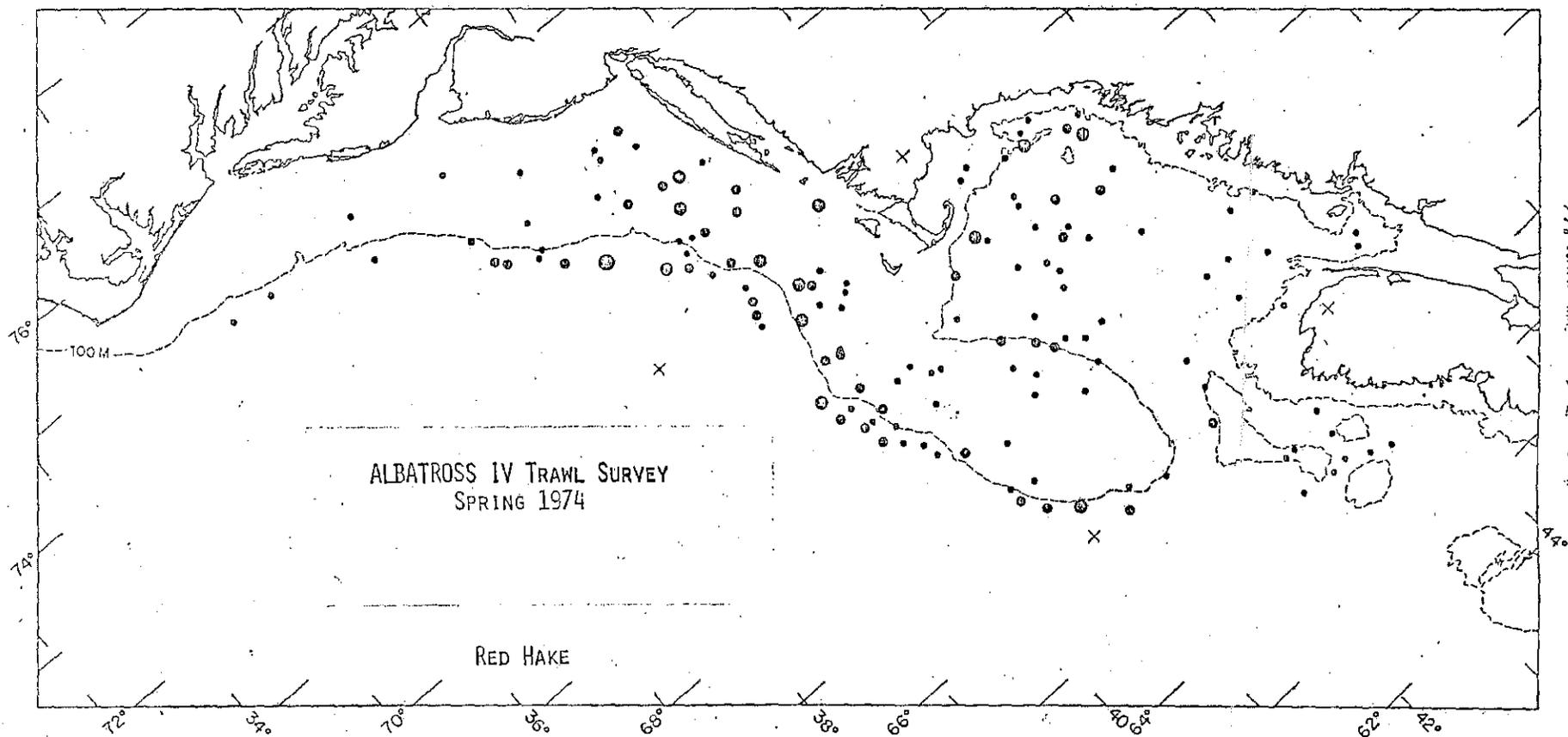


STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

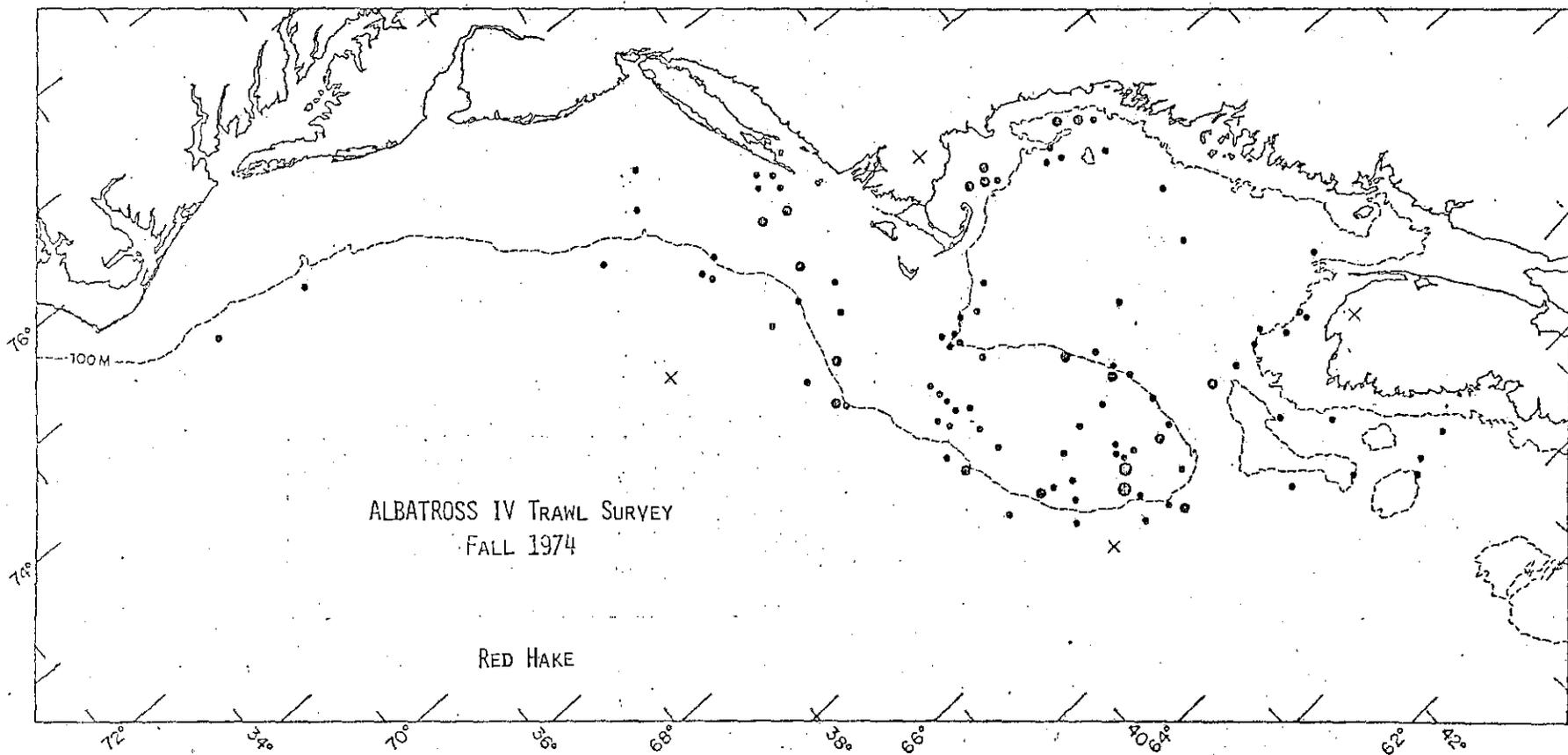


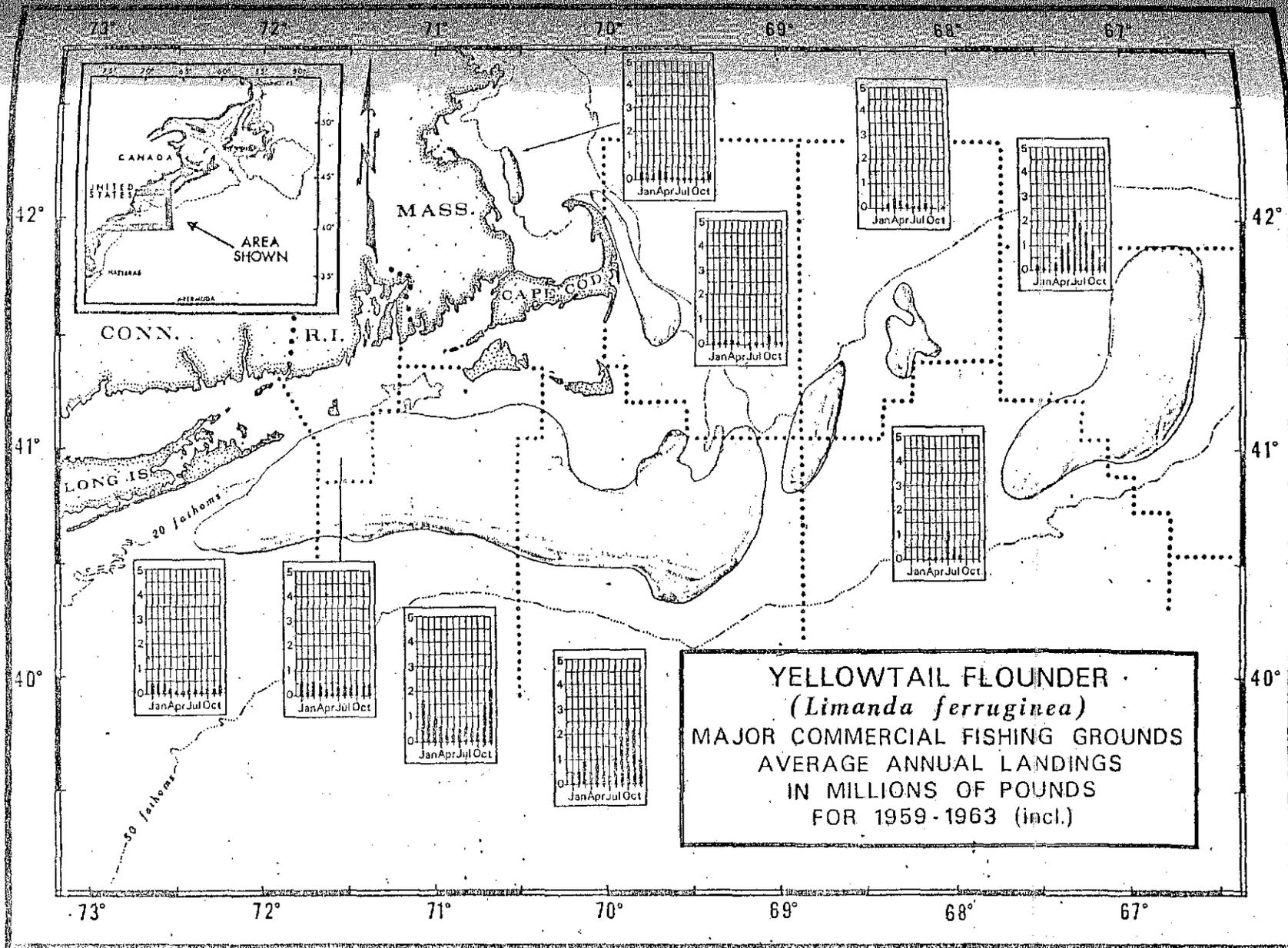
Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, in Ichnaef Divisions 4X, 5Y, 5Z, and Statistical Area 6. (Including industrial catch.)

RED HAKE

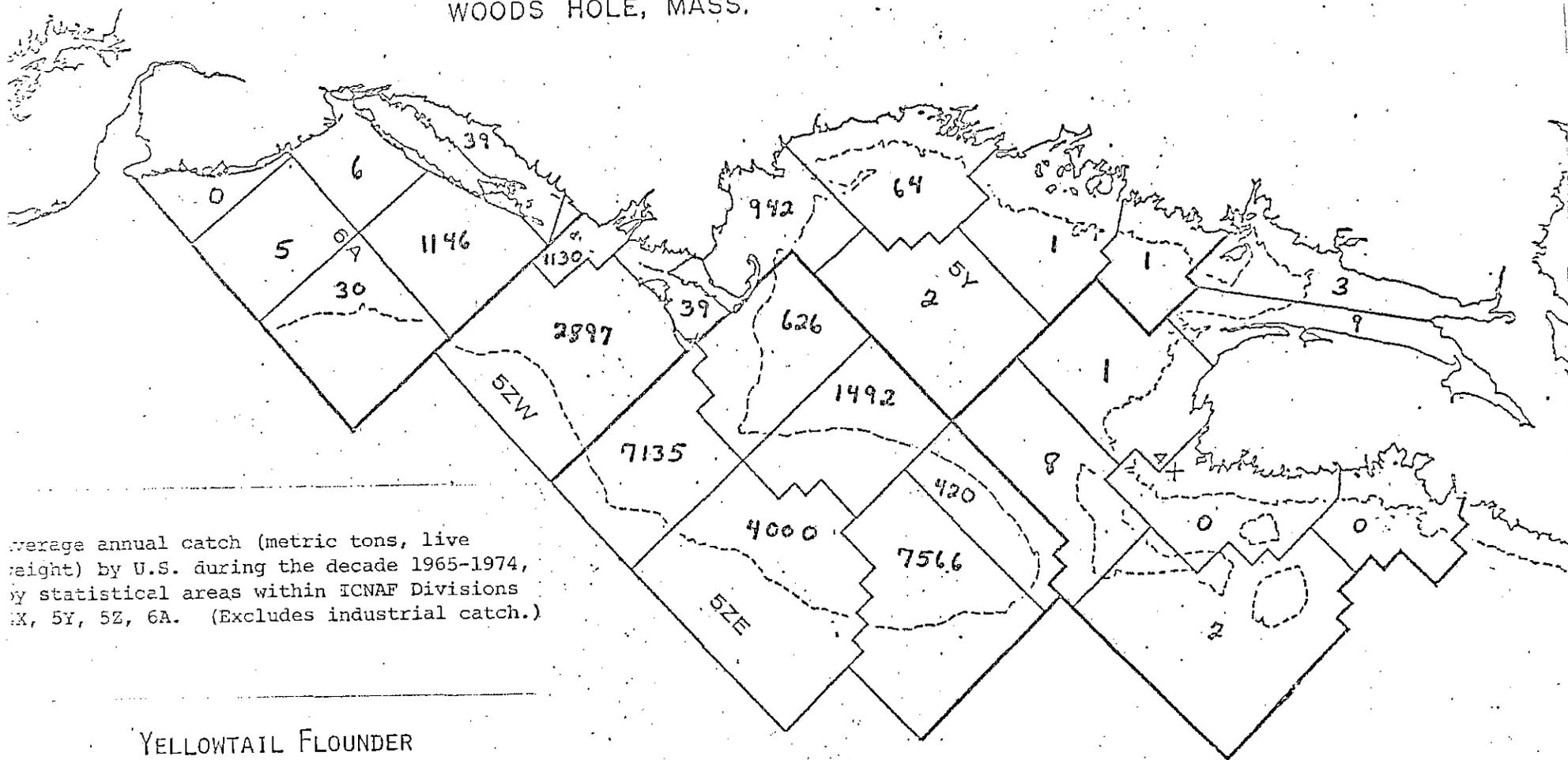


Albatross IV Cruise 7900 - Station 017
Red Hake Spring 1974



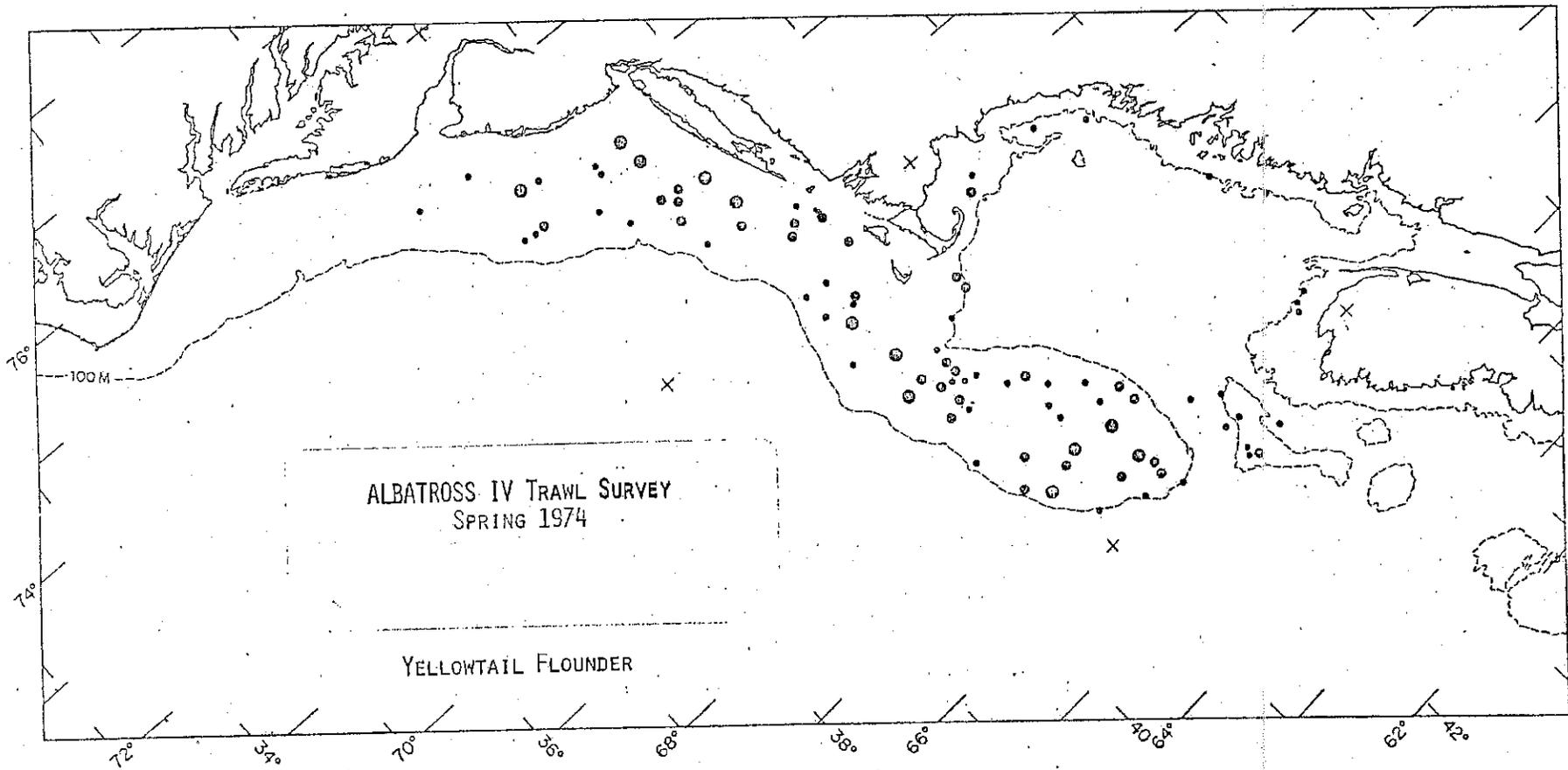


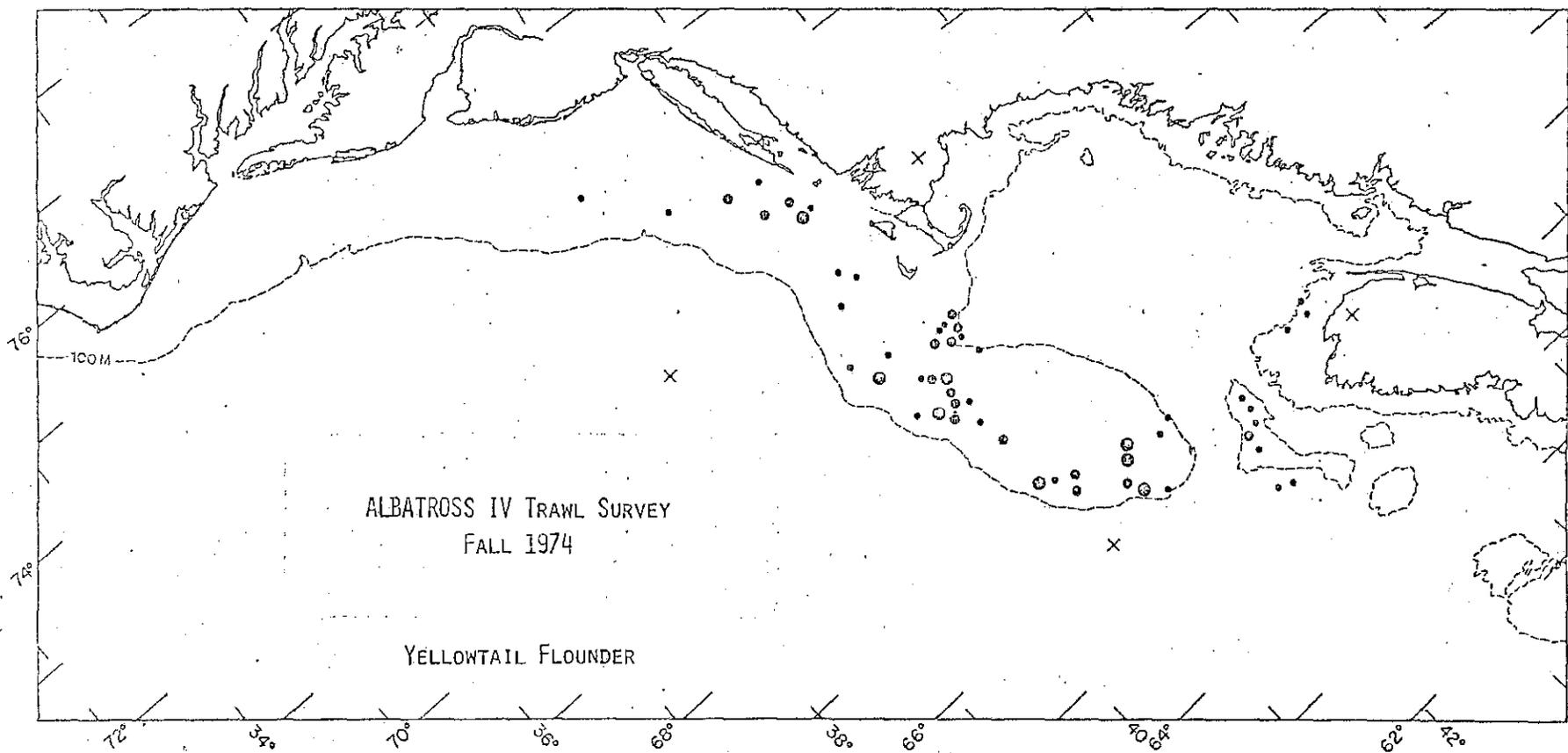
STATISTICAL AREAS
 BCF BIOLOGICAL LABORATORY
 WOODS HOLE, MASS.



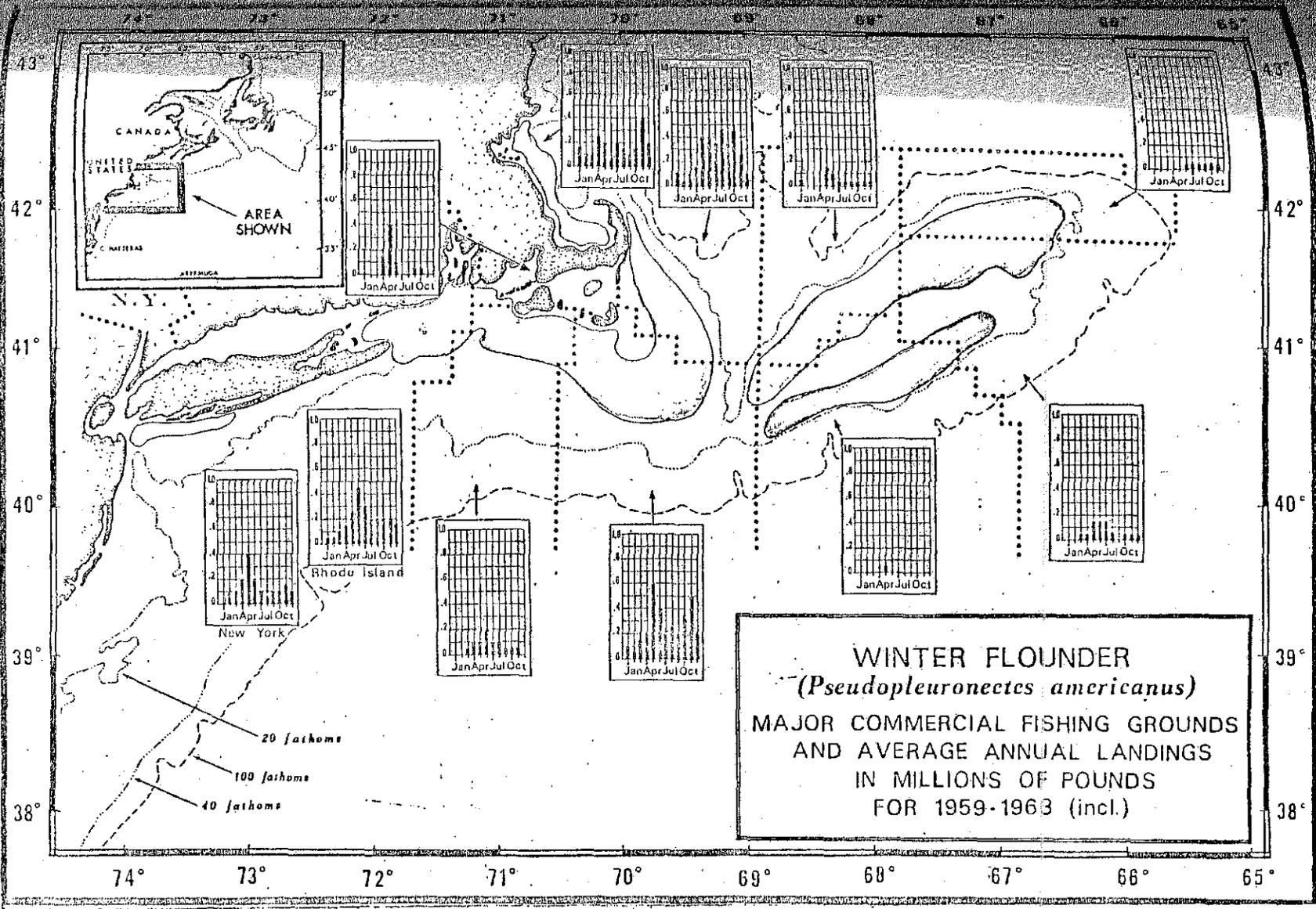
Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 5X, 5Y, 5Z, 6A. (Excludes industrial catch.)

YELLOWTAIL FLOUNDER

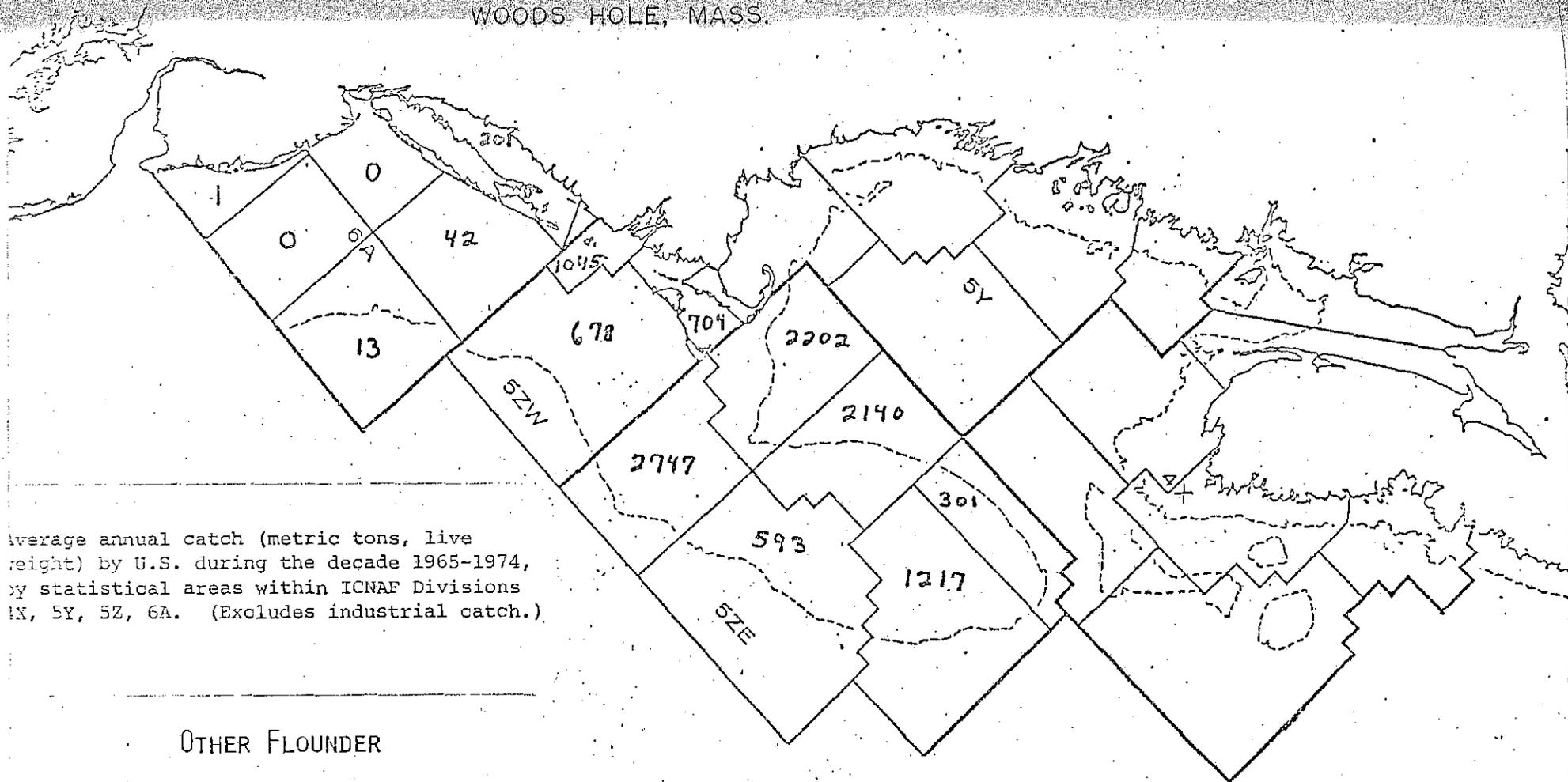




Yellowtail Flounder, Fall 1974, Survey 44

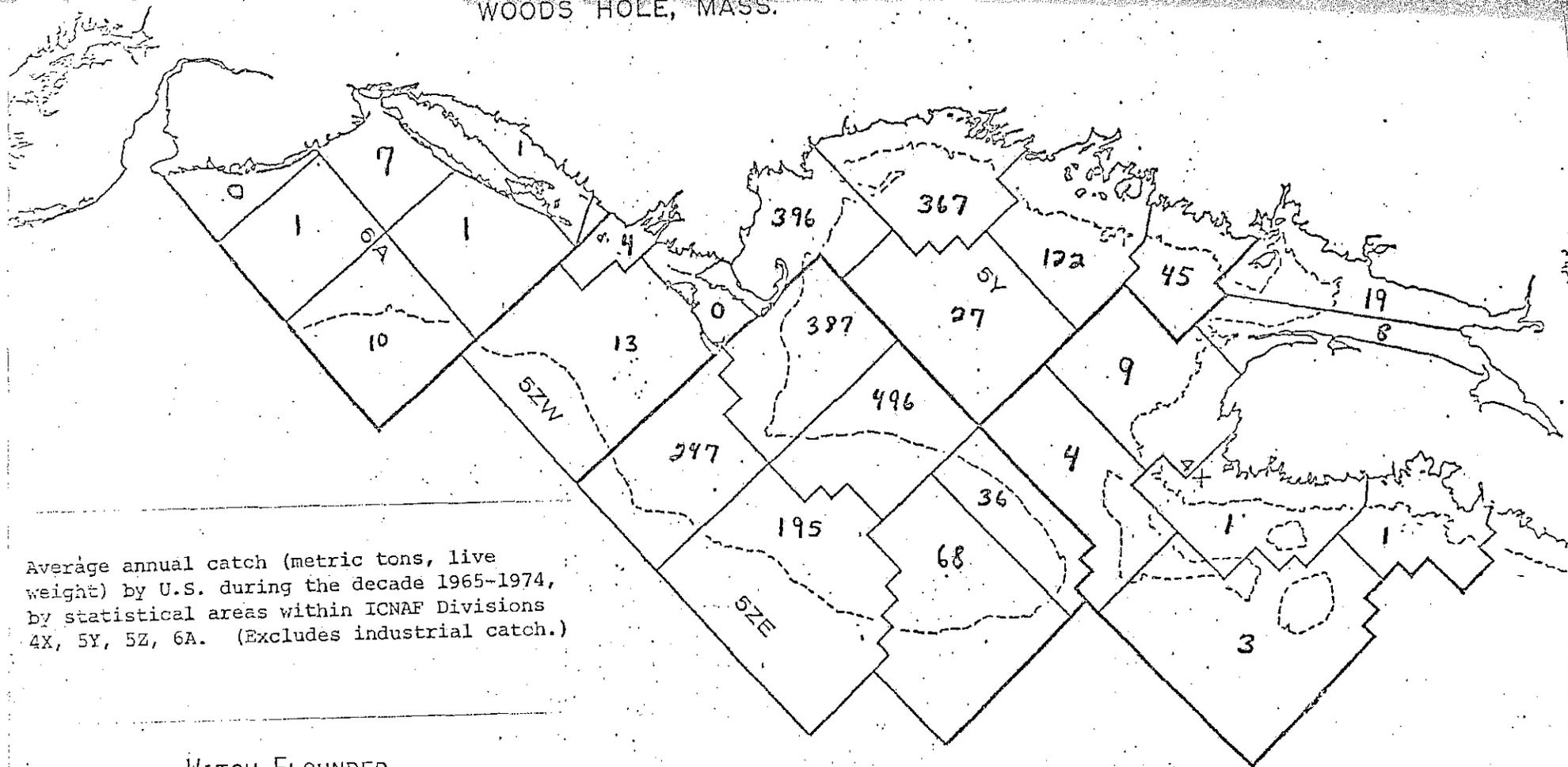


STATISTICAL AREAS
BCF: BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



OTHER FLOUNDER

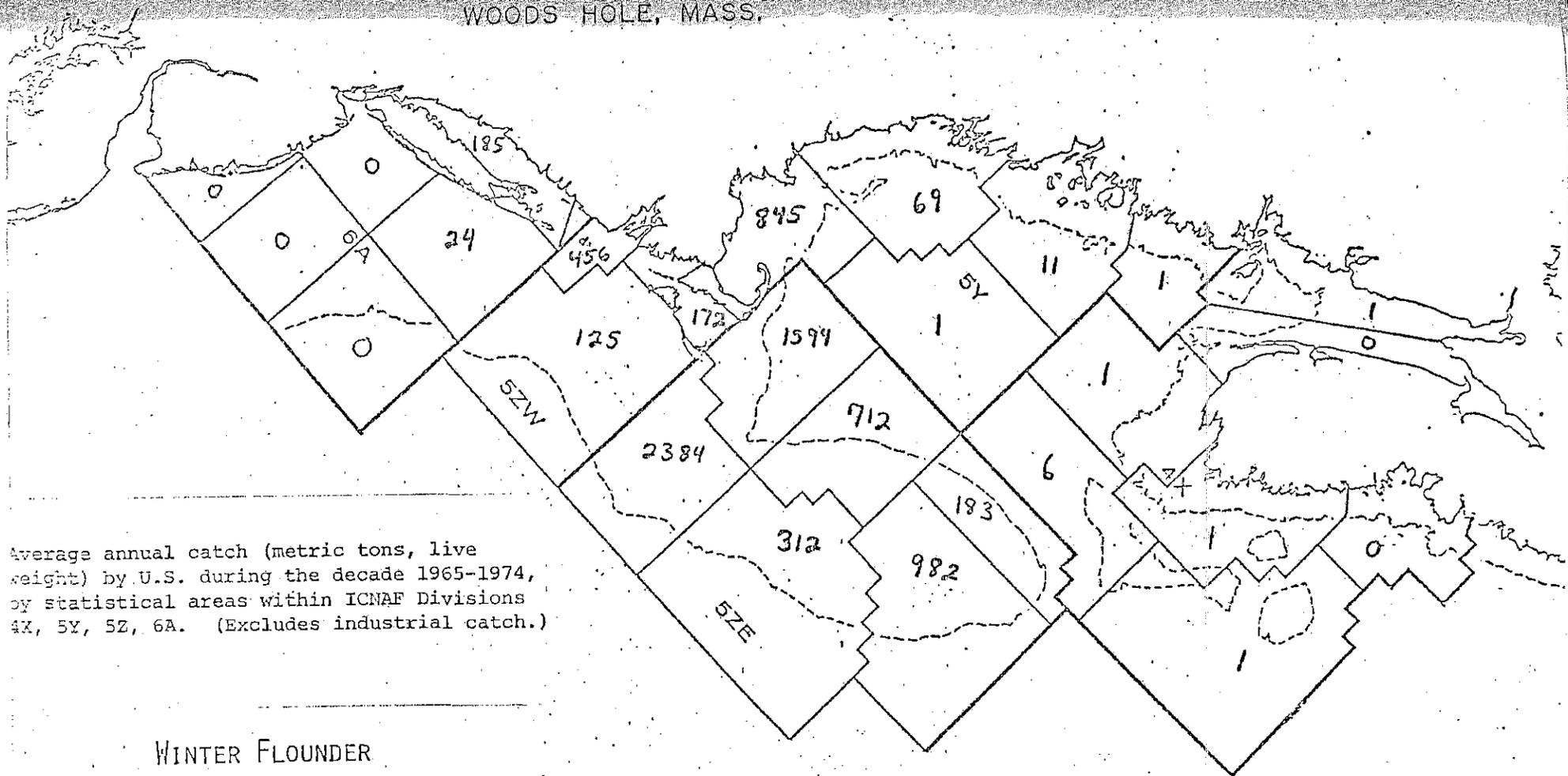
STATISTICAL AREAS
 BCF BIOLOGICAL LABORATORY
 WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

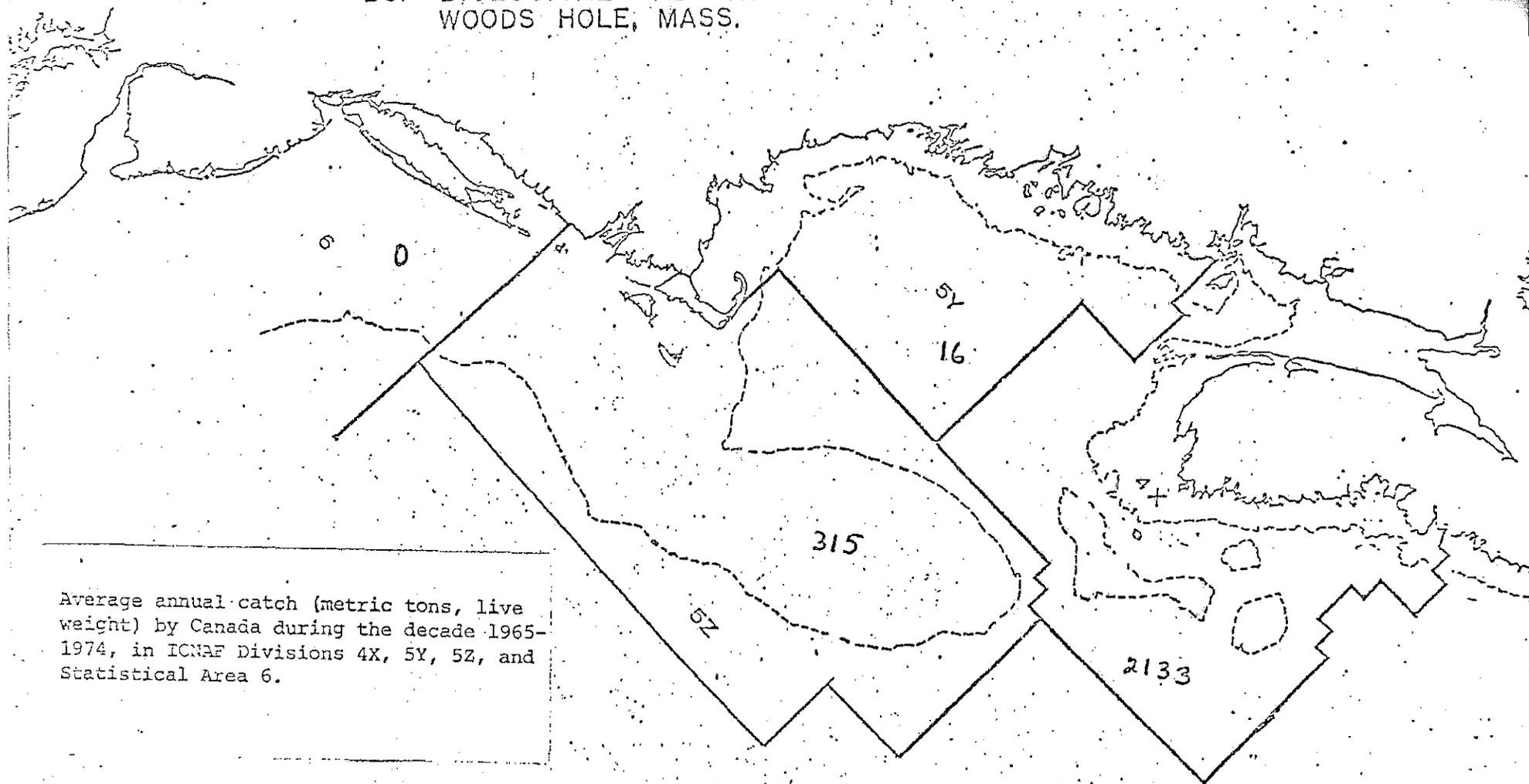
WITCH FLOUNDER

STATISTICAL AREAS
 BCF BIOLOGICAL LABORATORY
 WOODS HOLE, MASS.

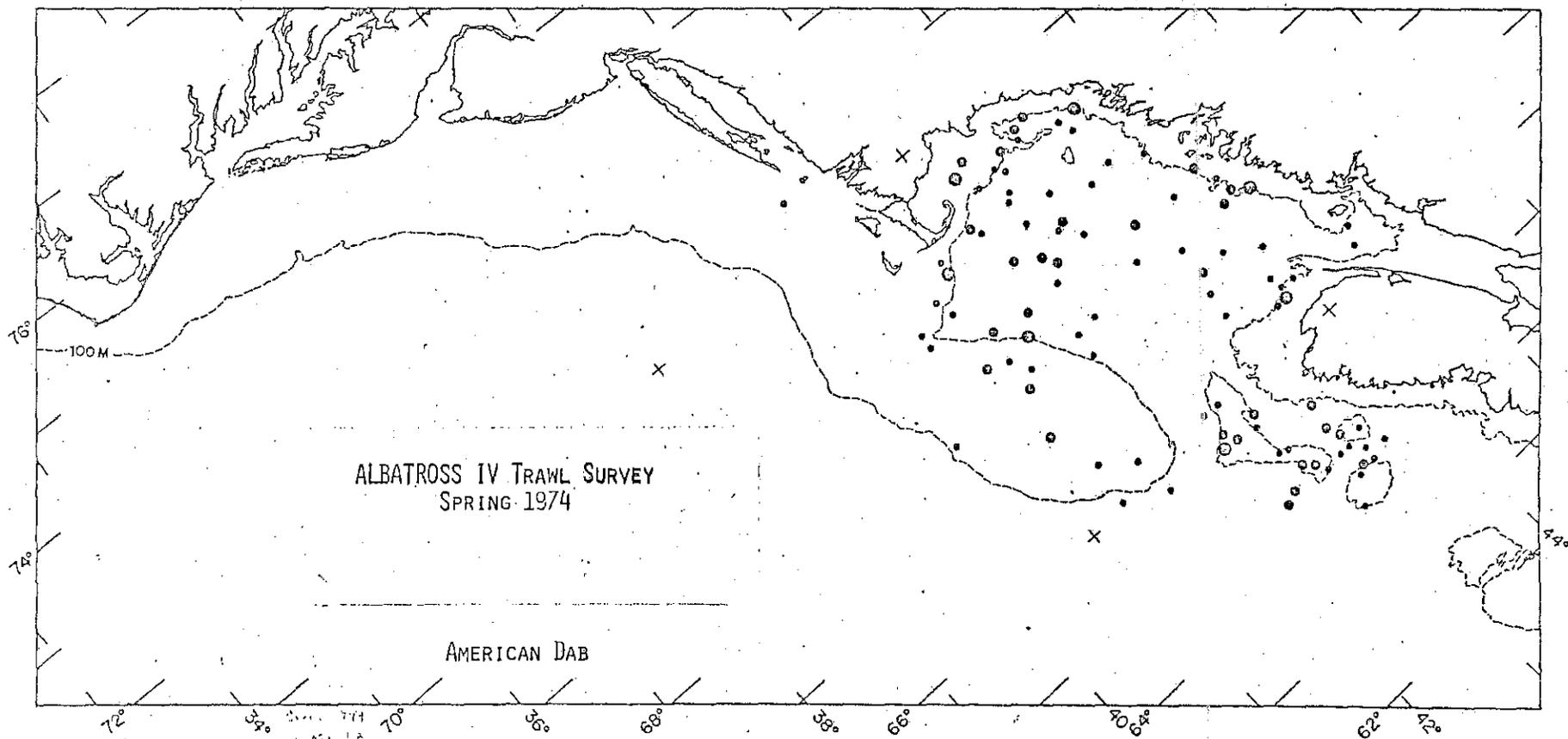


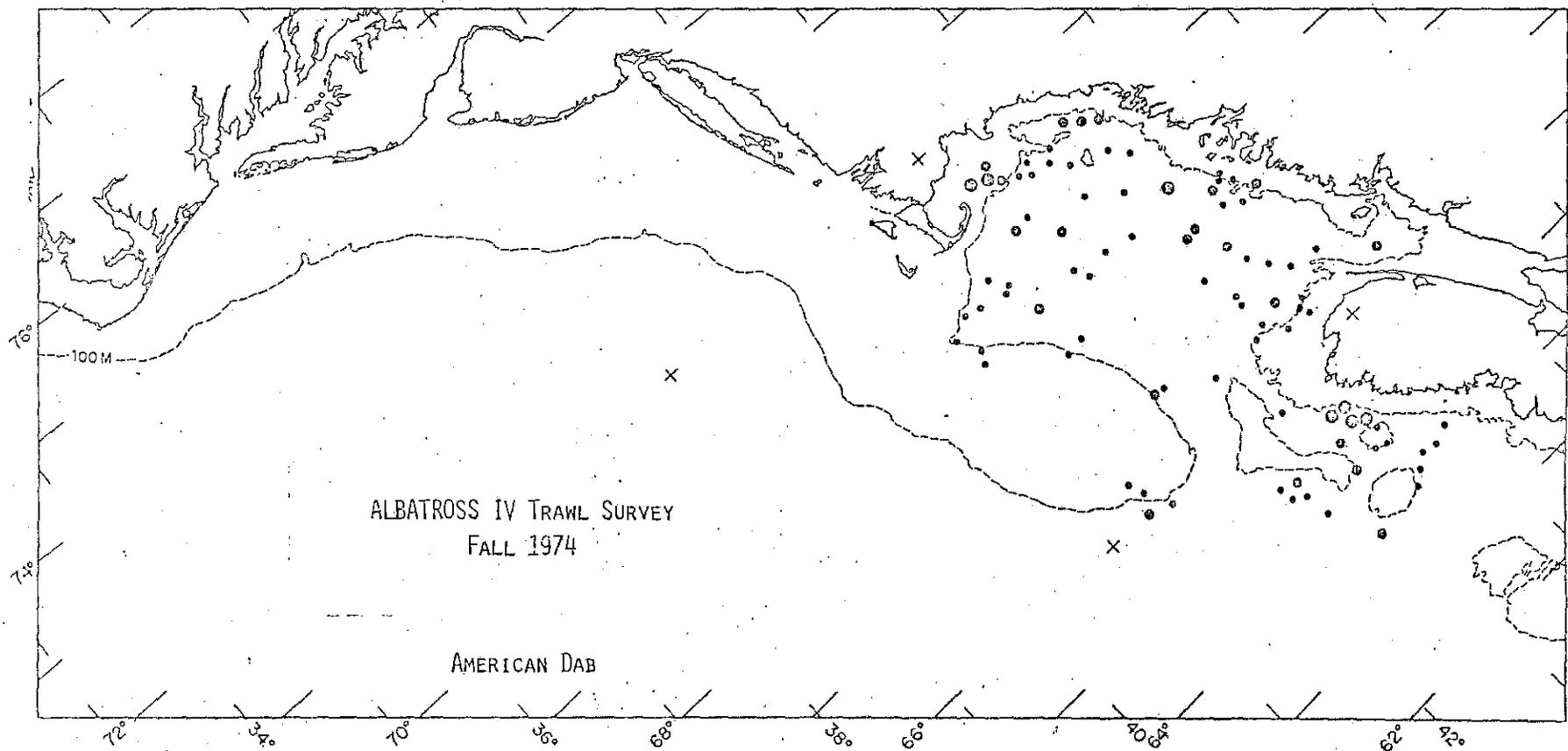
WINTER FLOUNDER

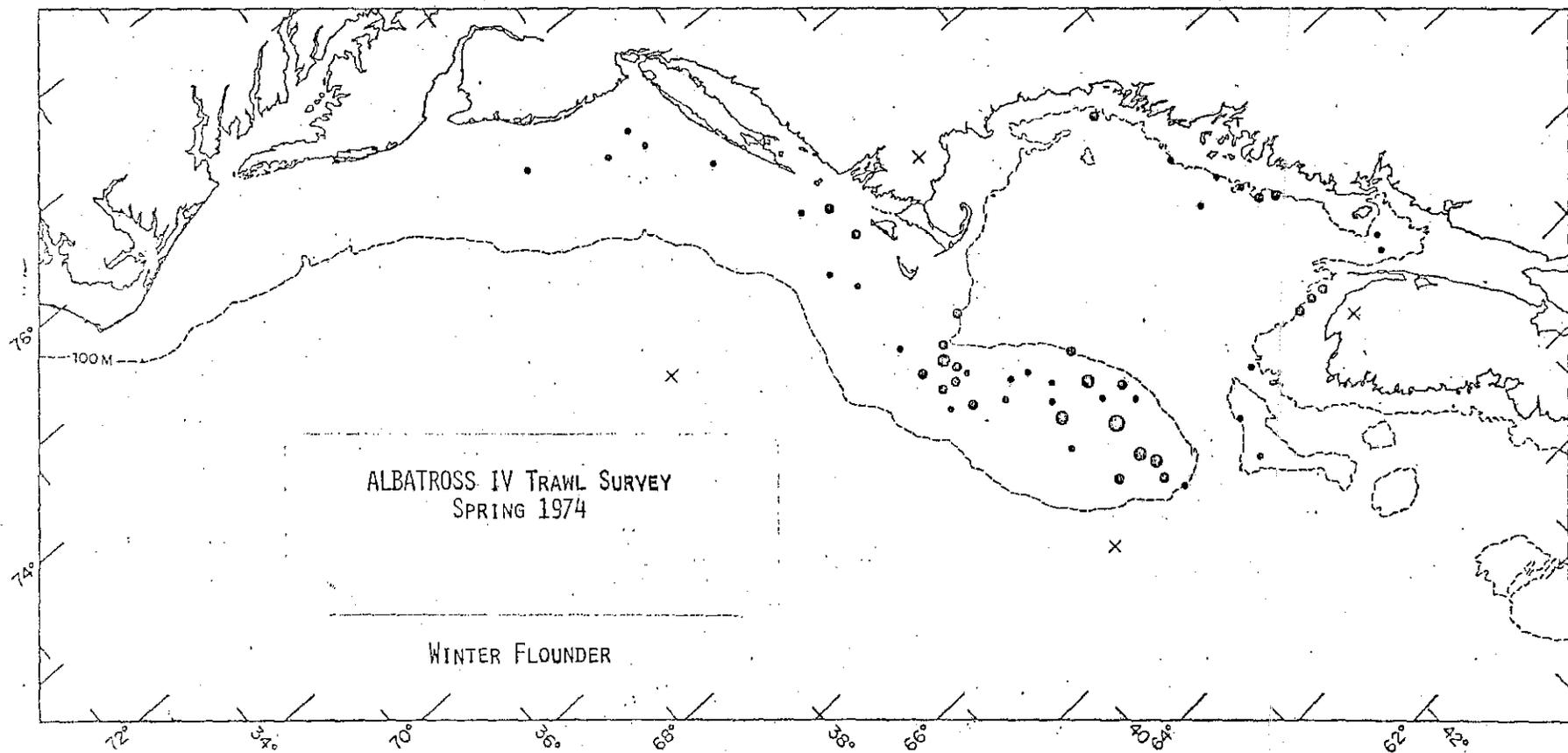
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

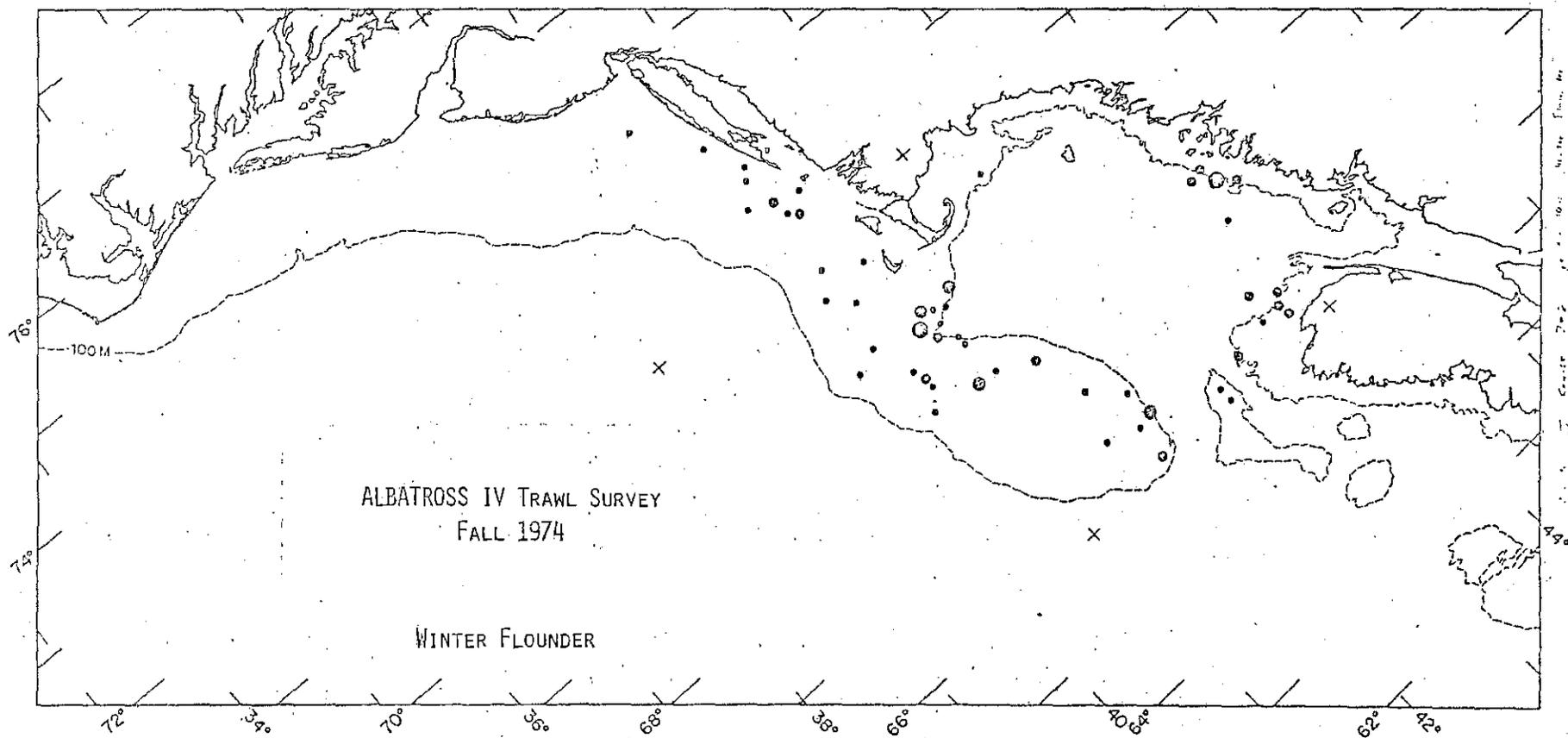


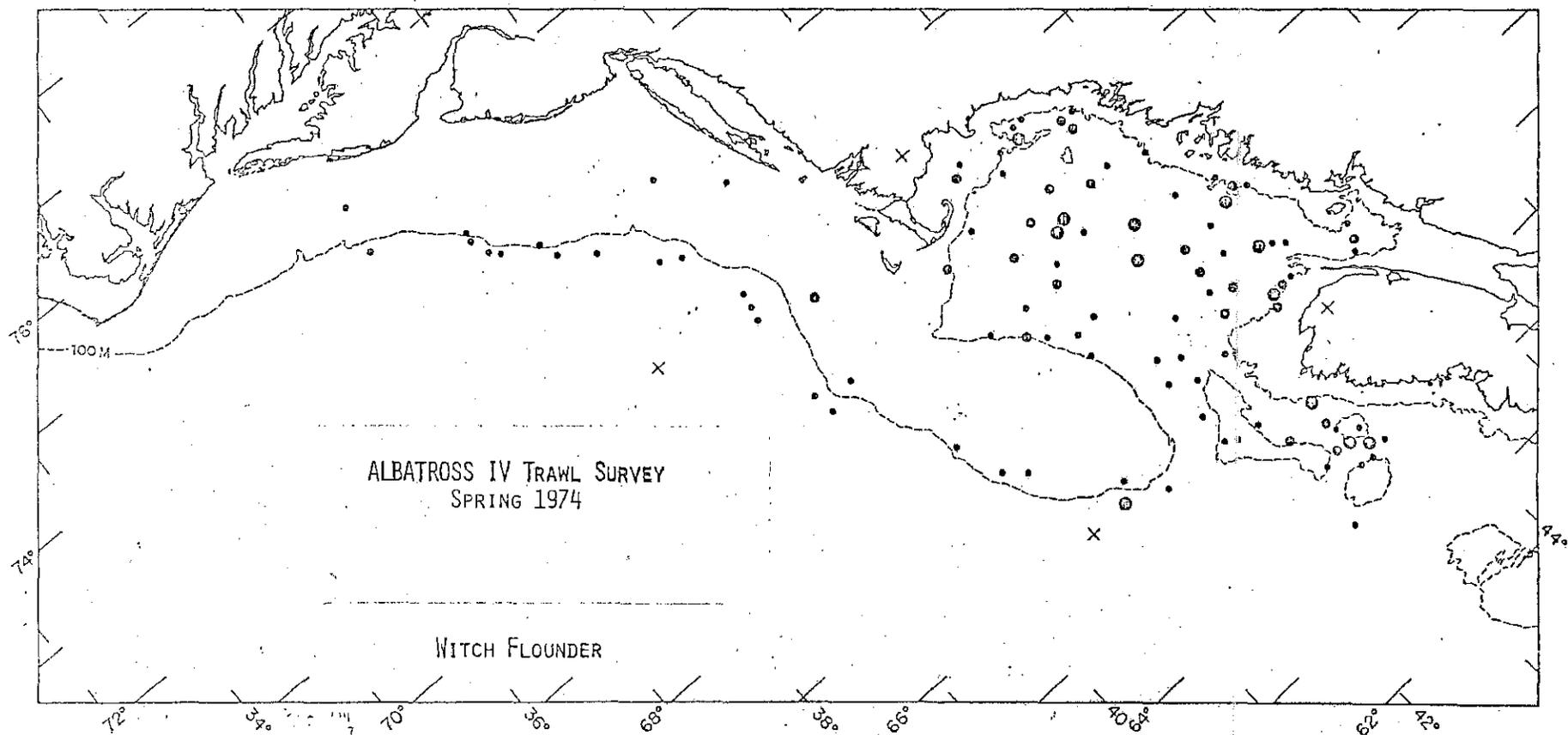
ALL FLOUNDERS

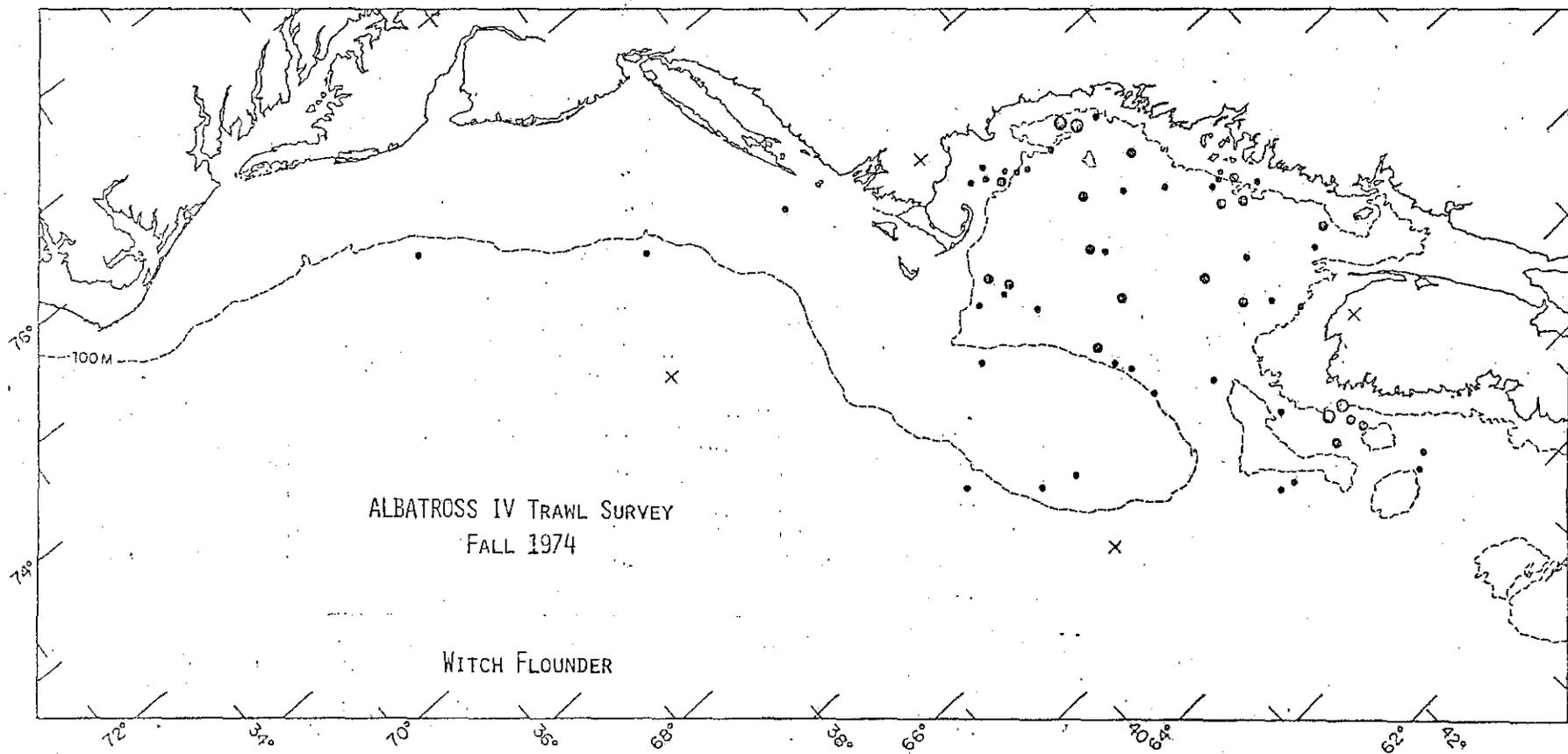




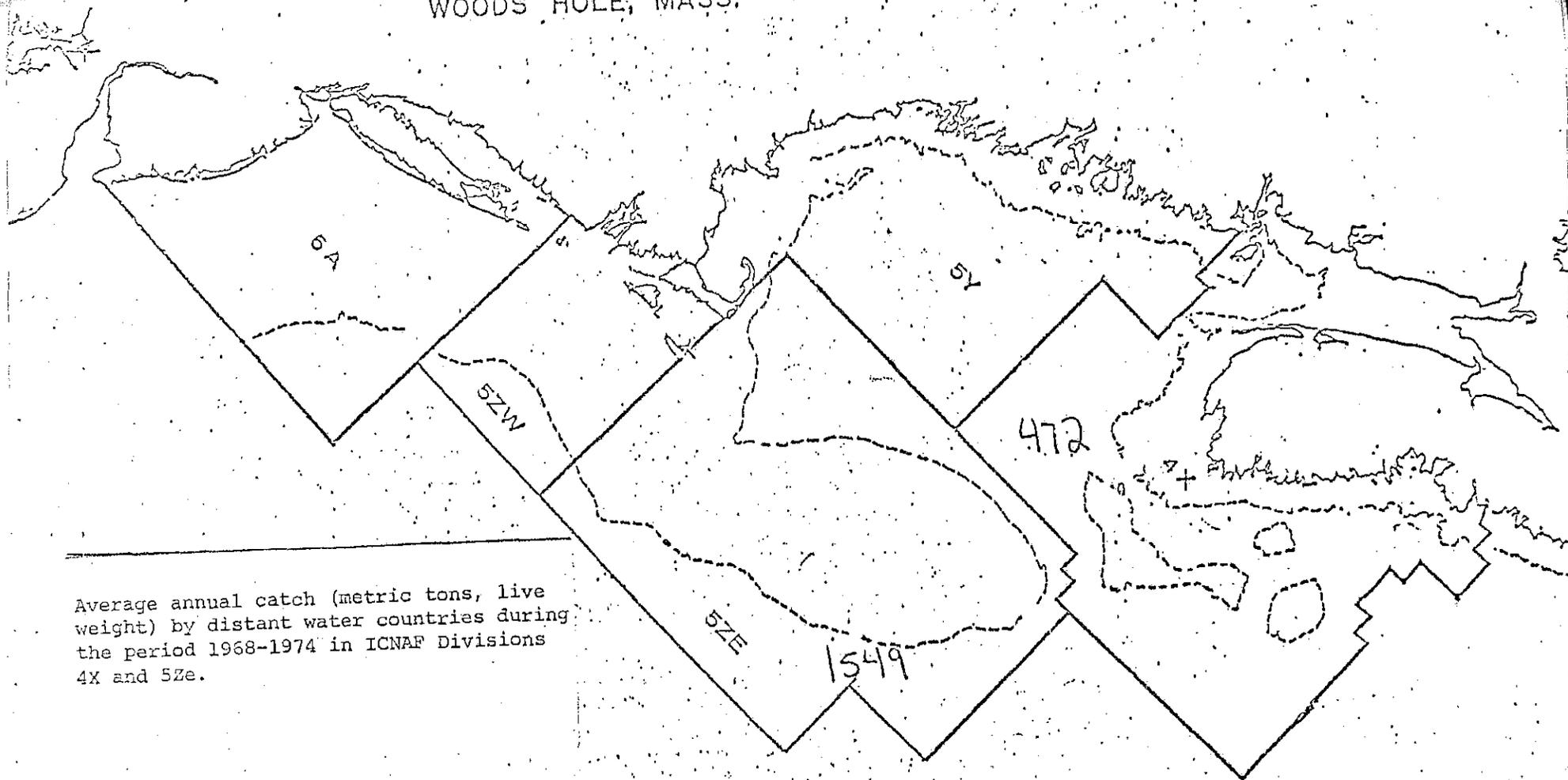






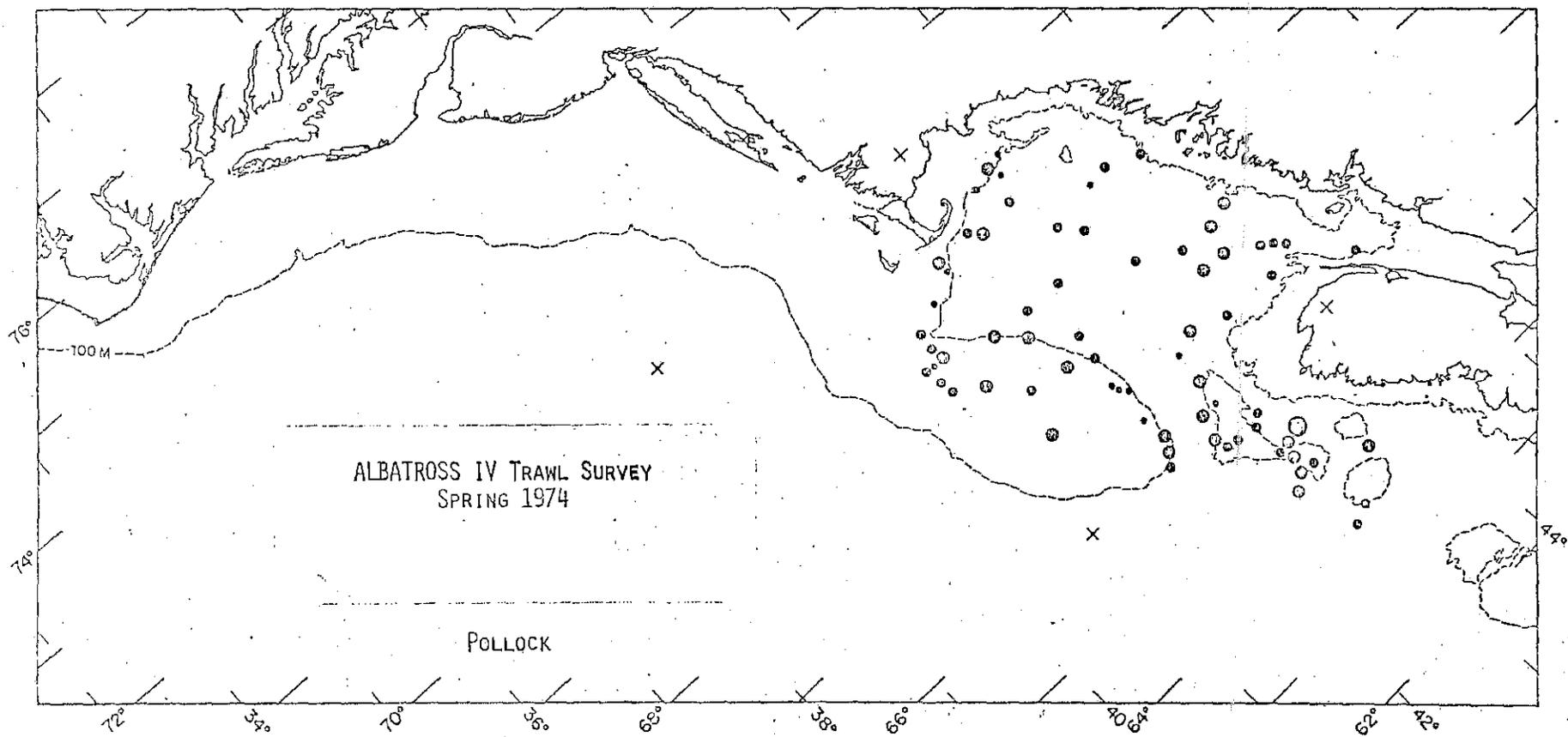


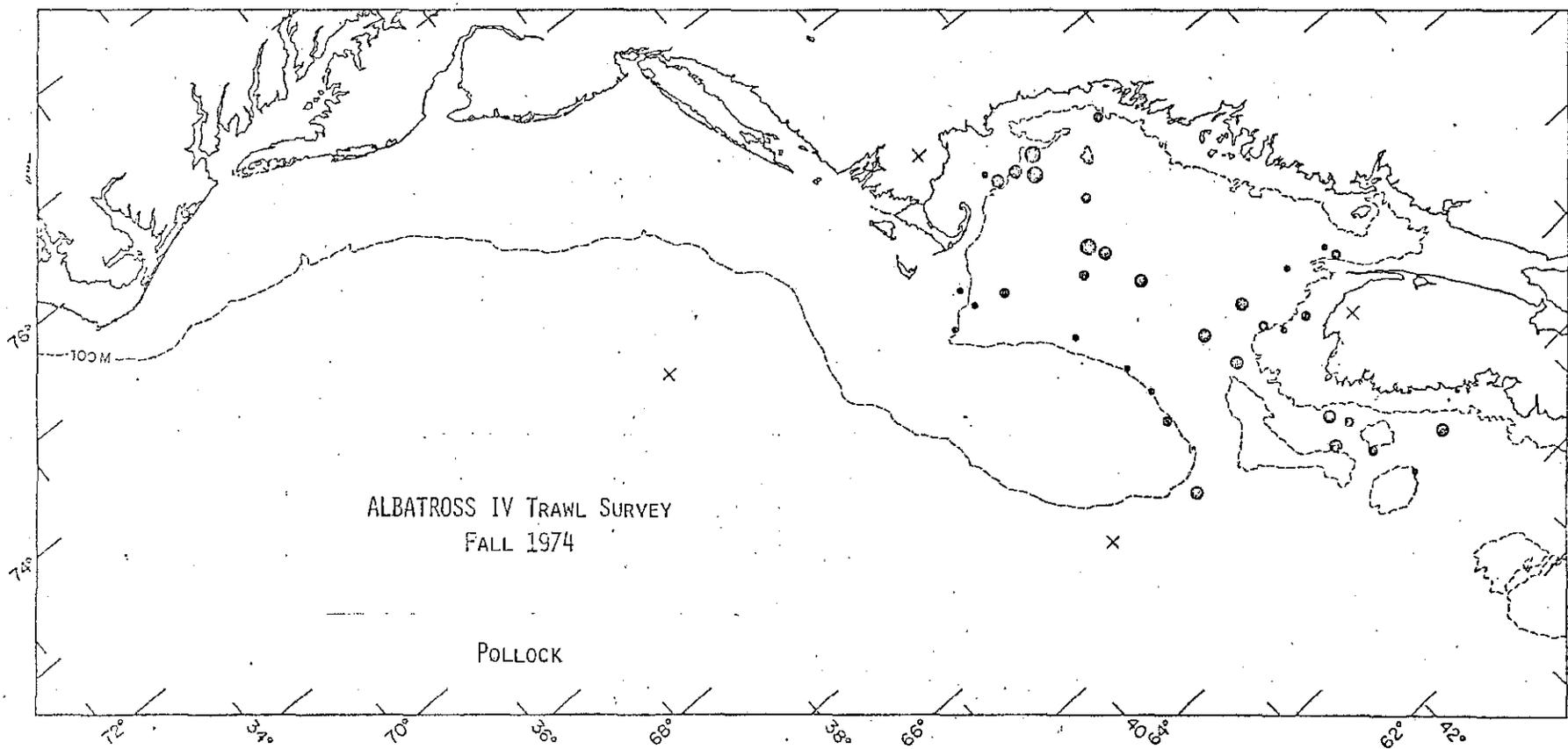
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

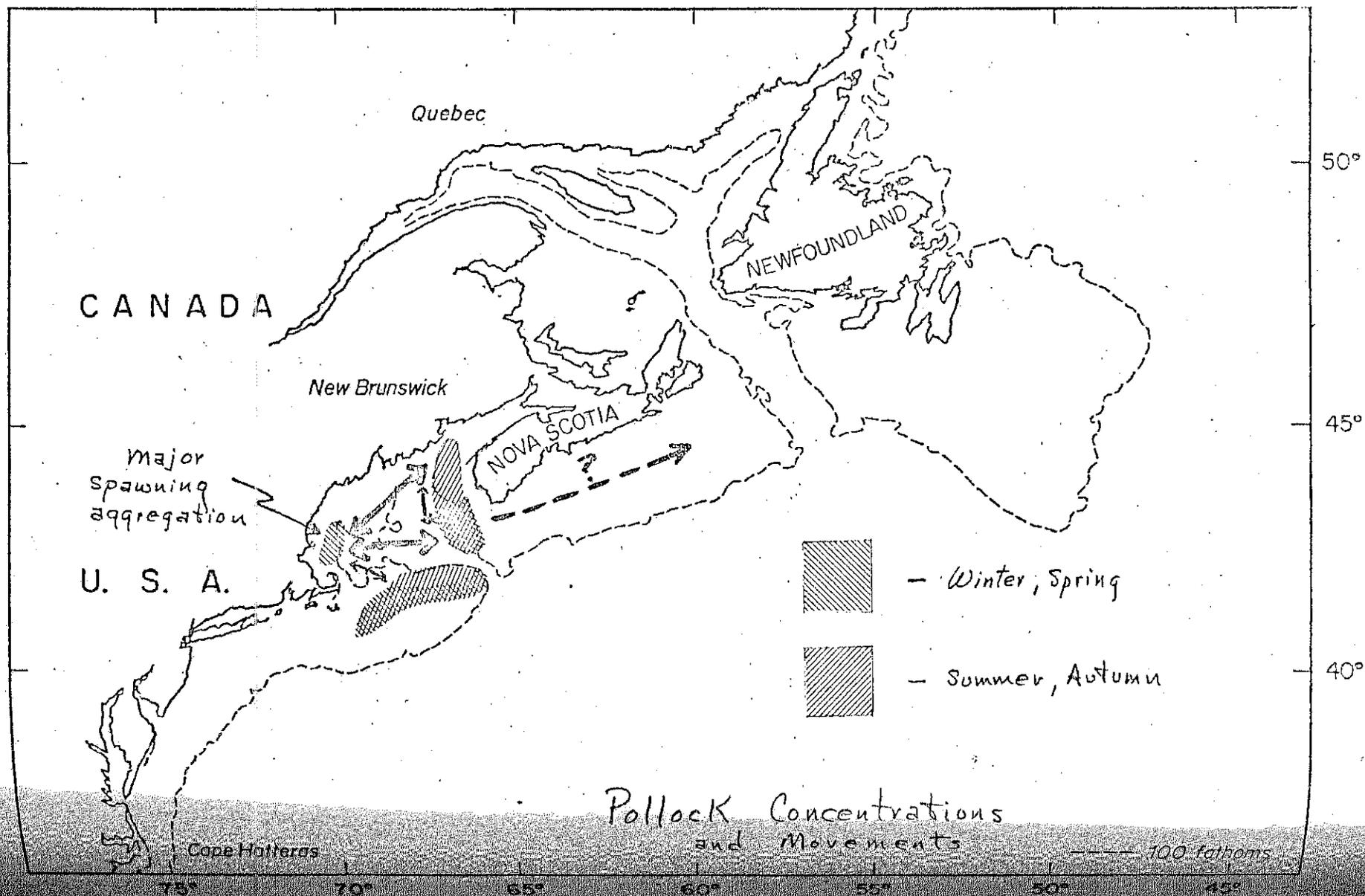
POLLOCK



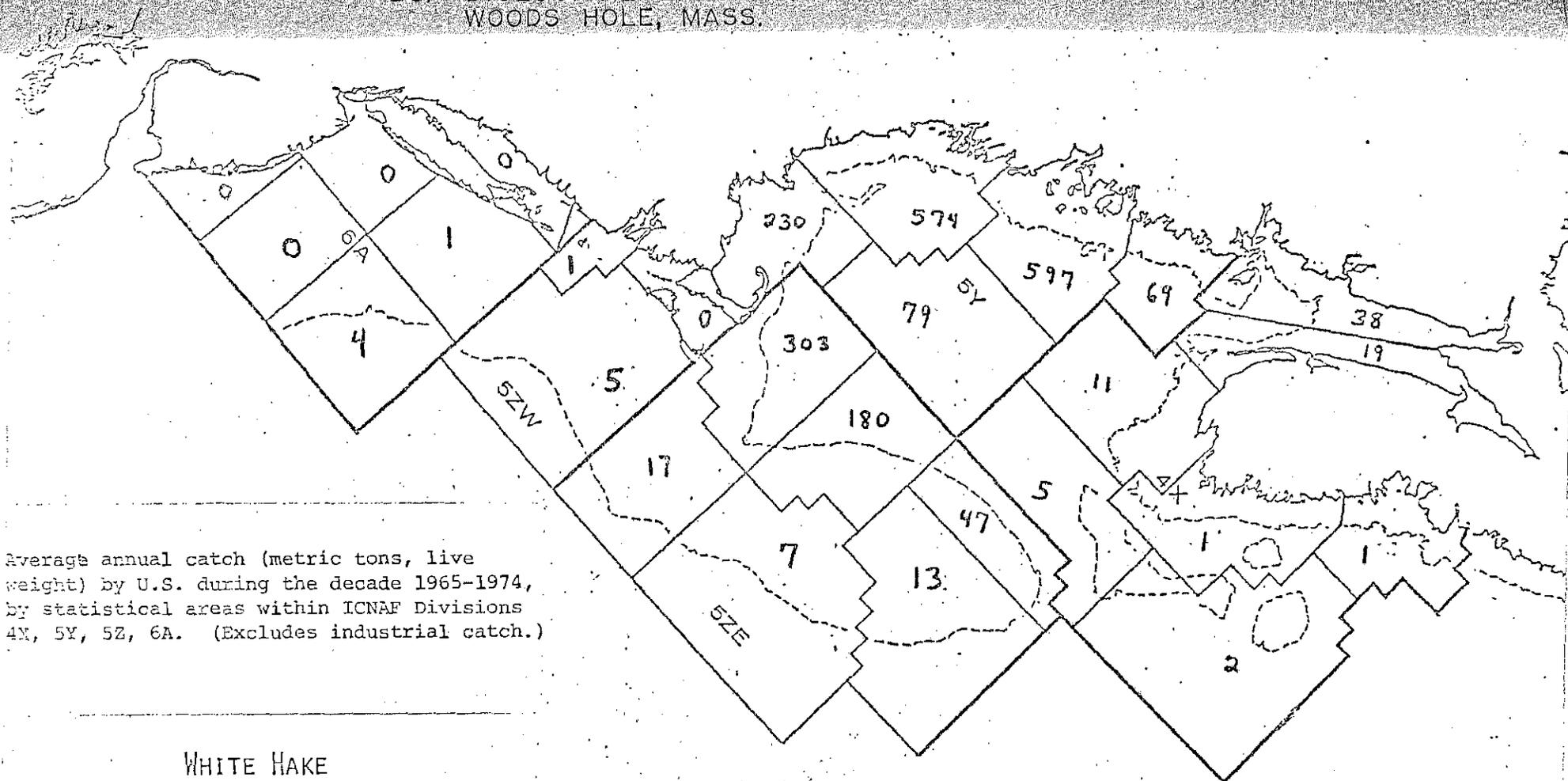


Map Series 11 Series 112

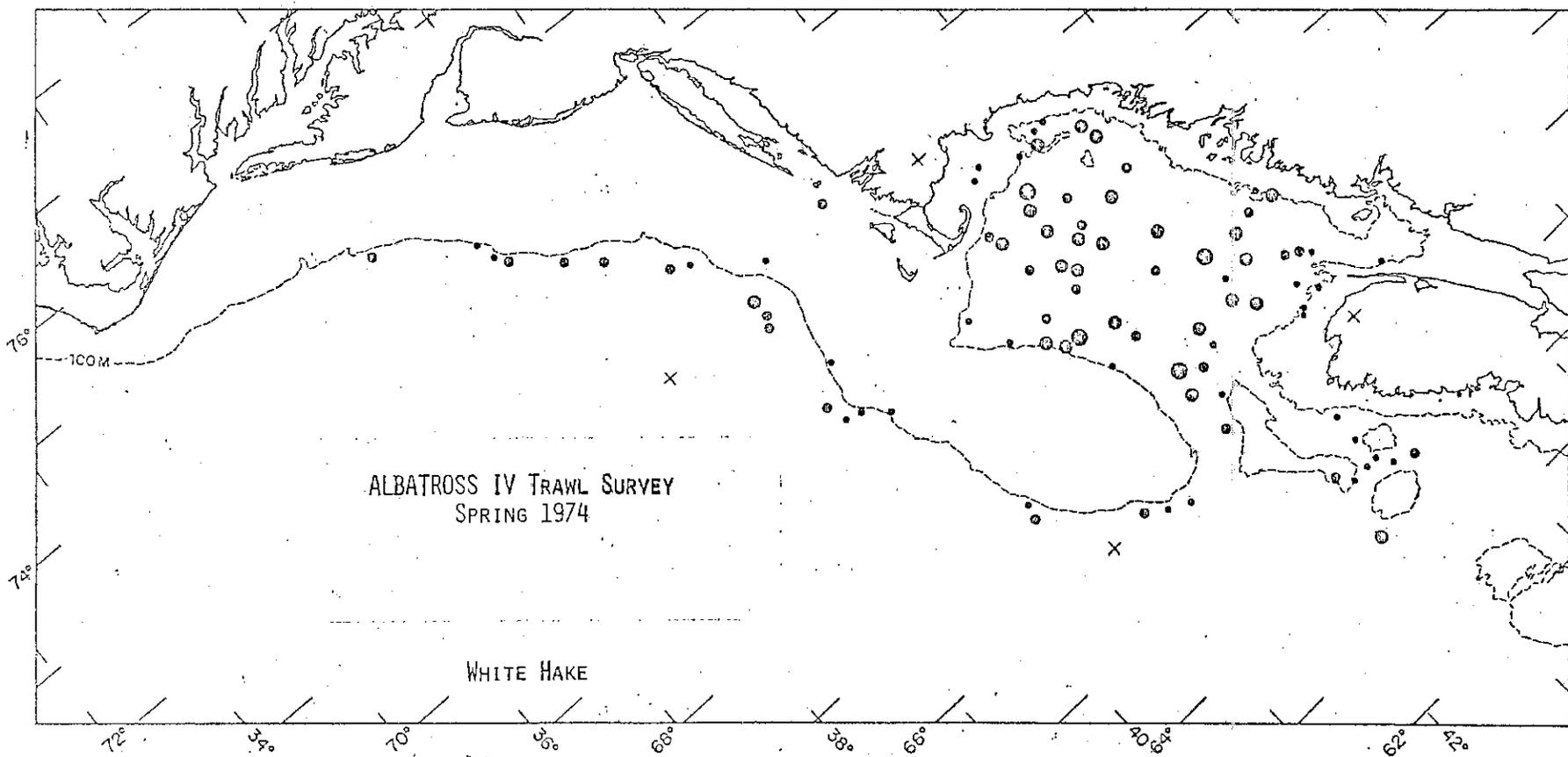
470

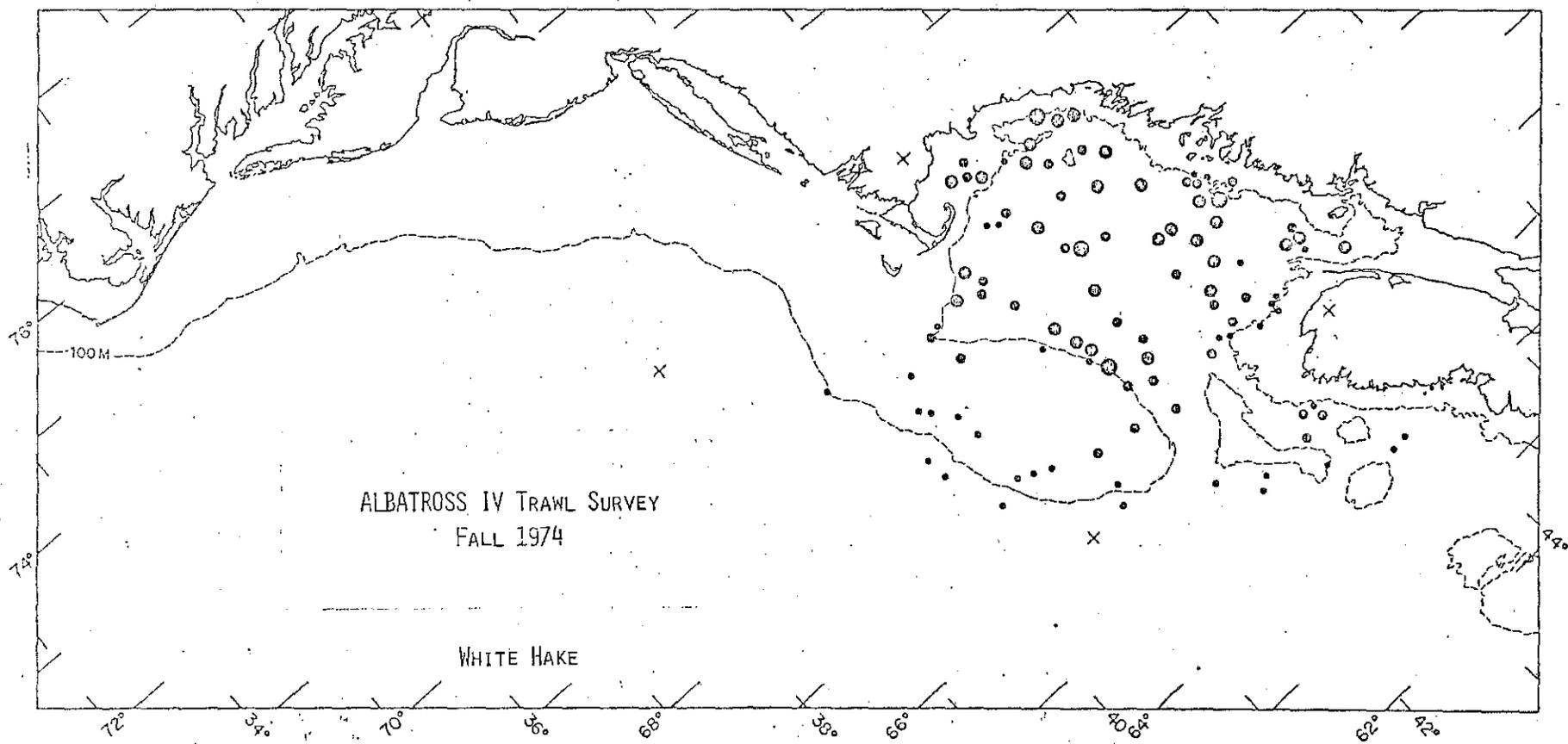


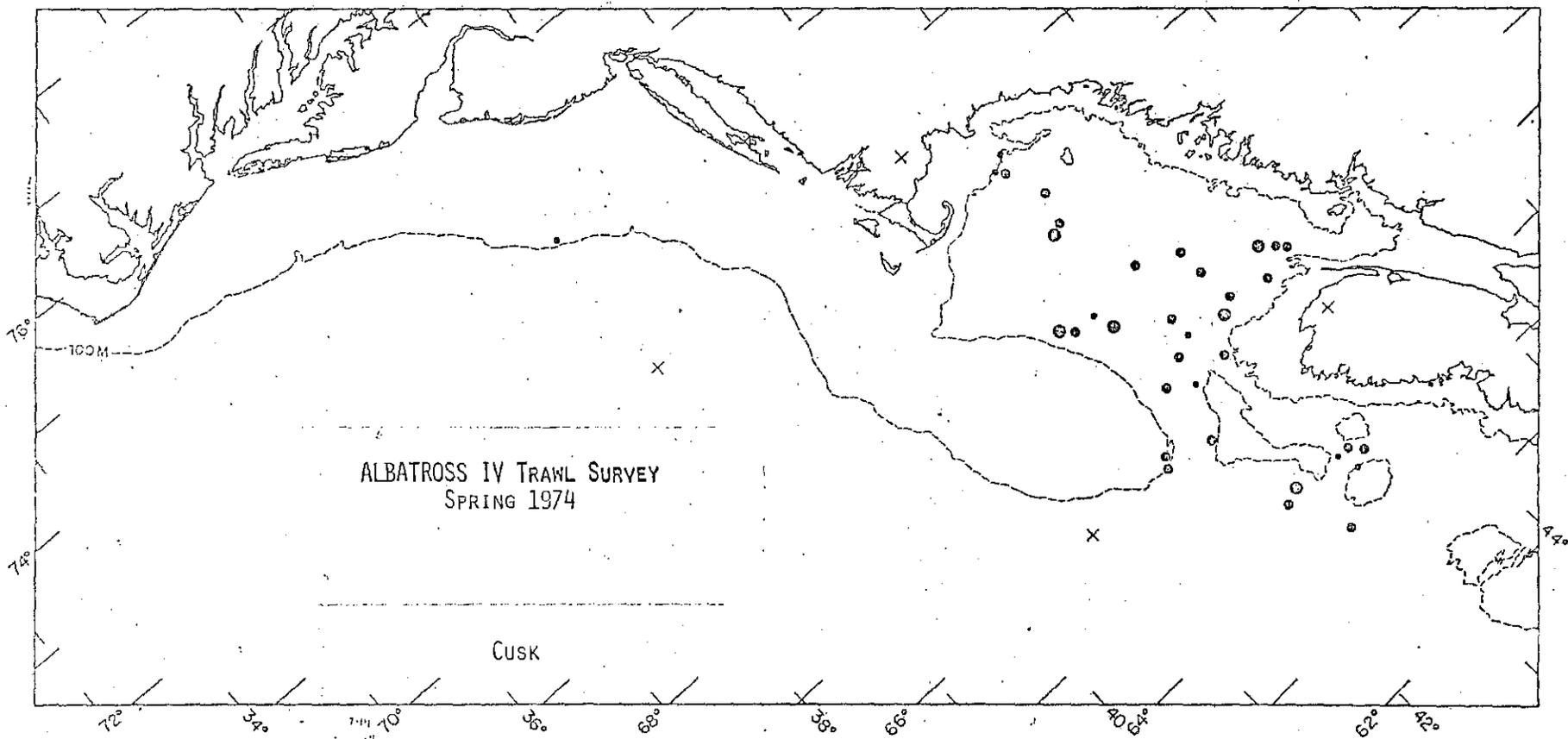
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

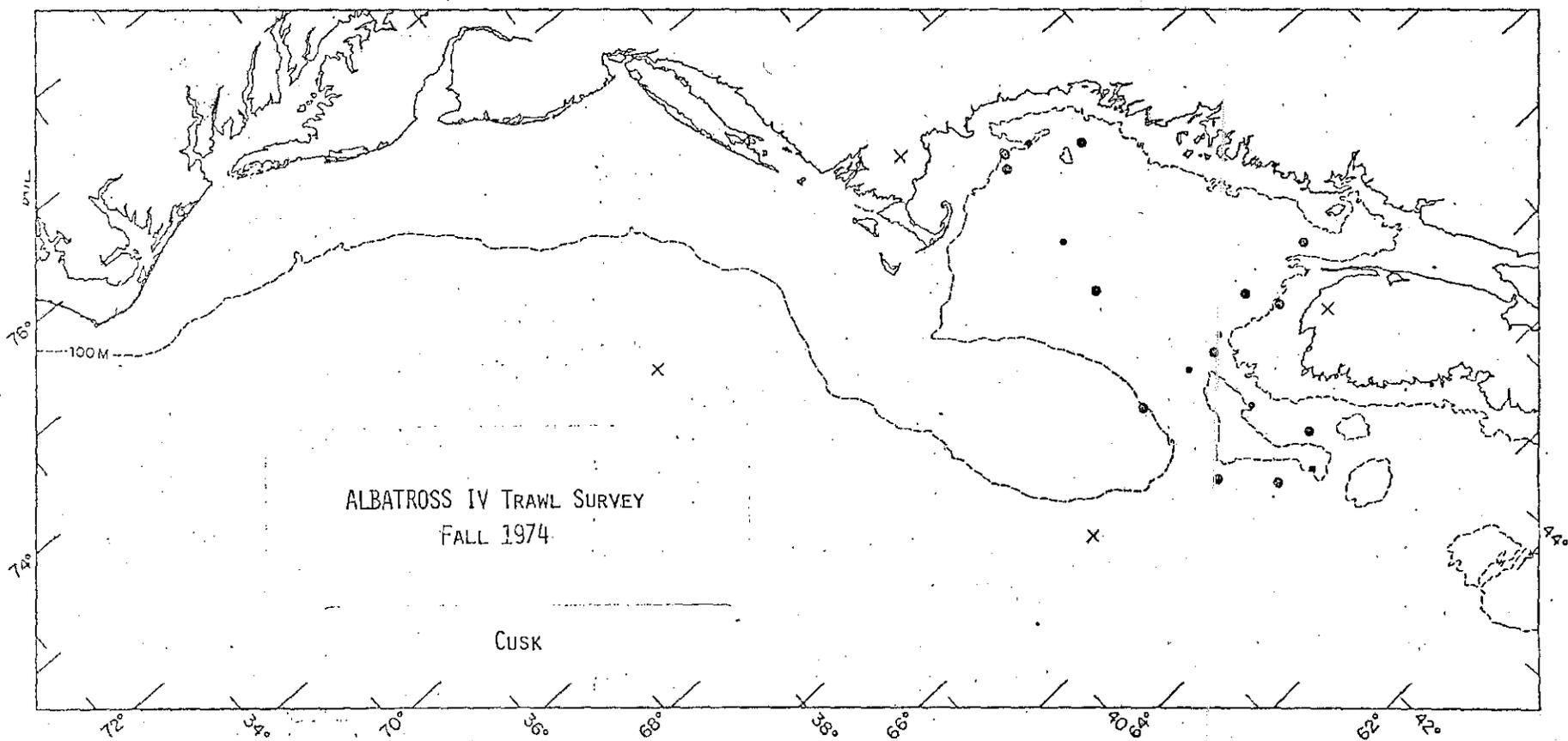


WHITE HAKE

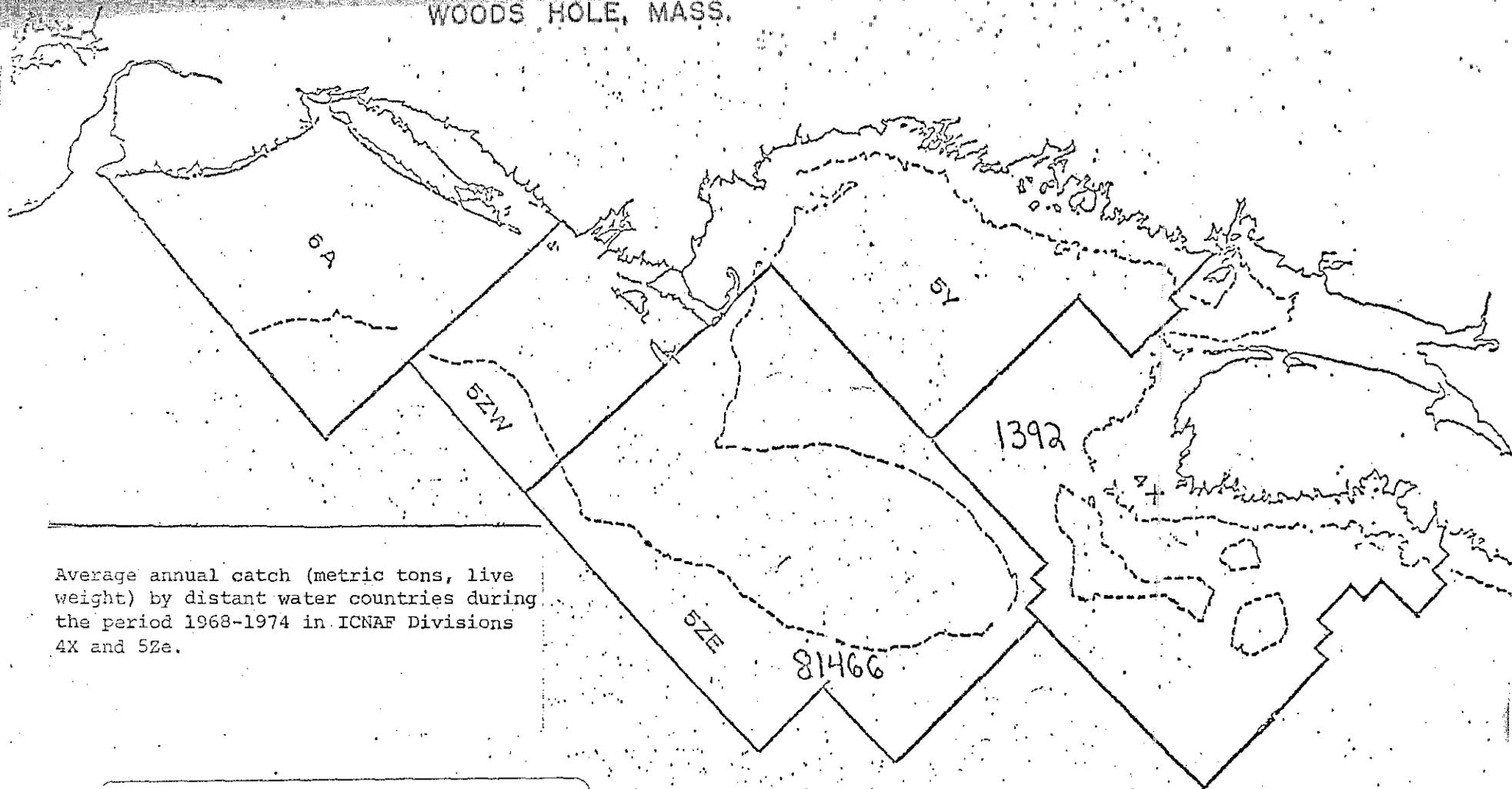






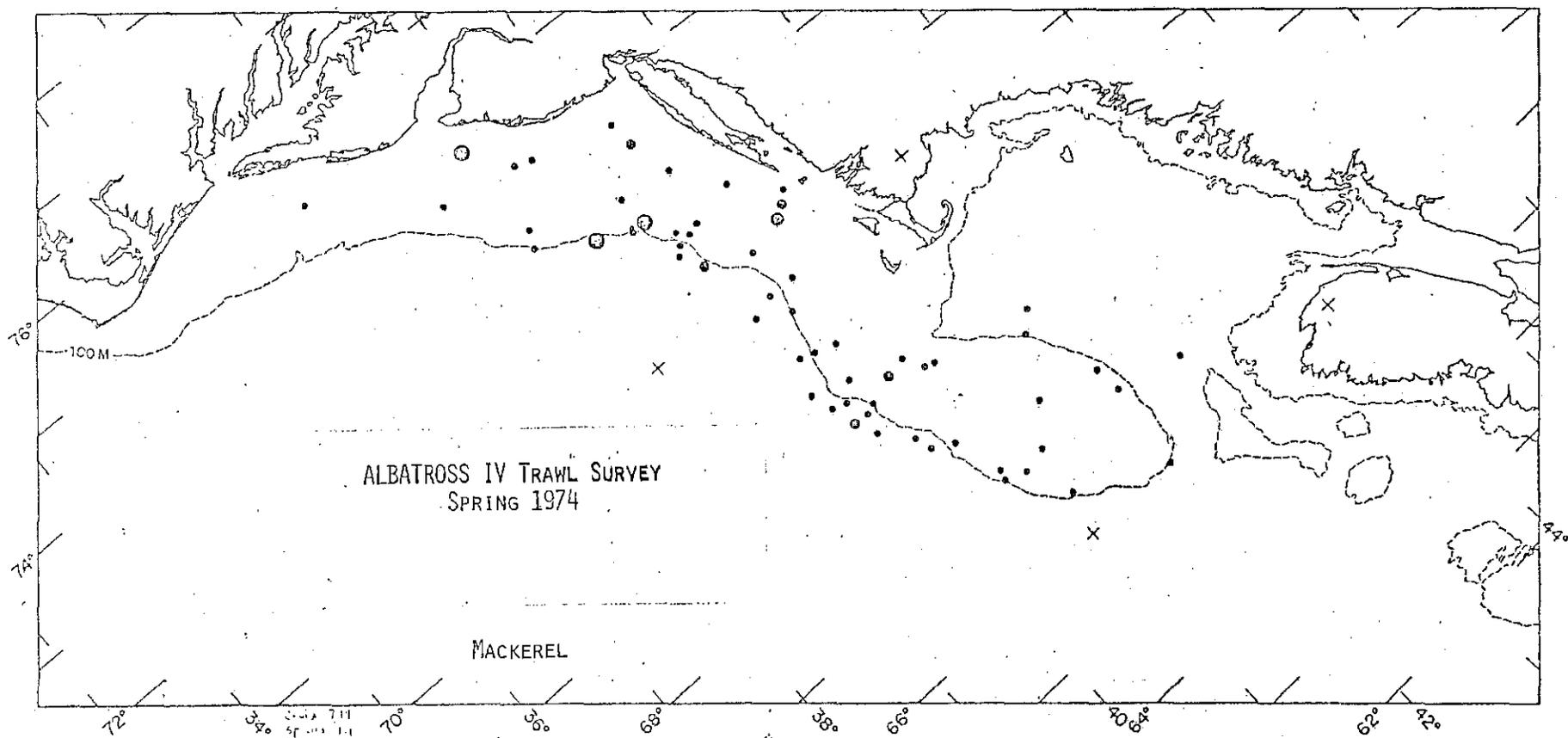


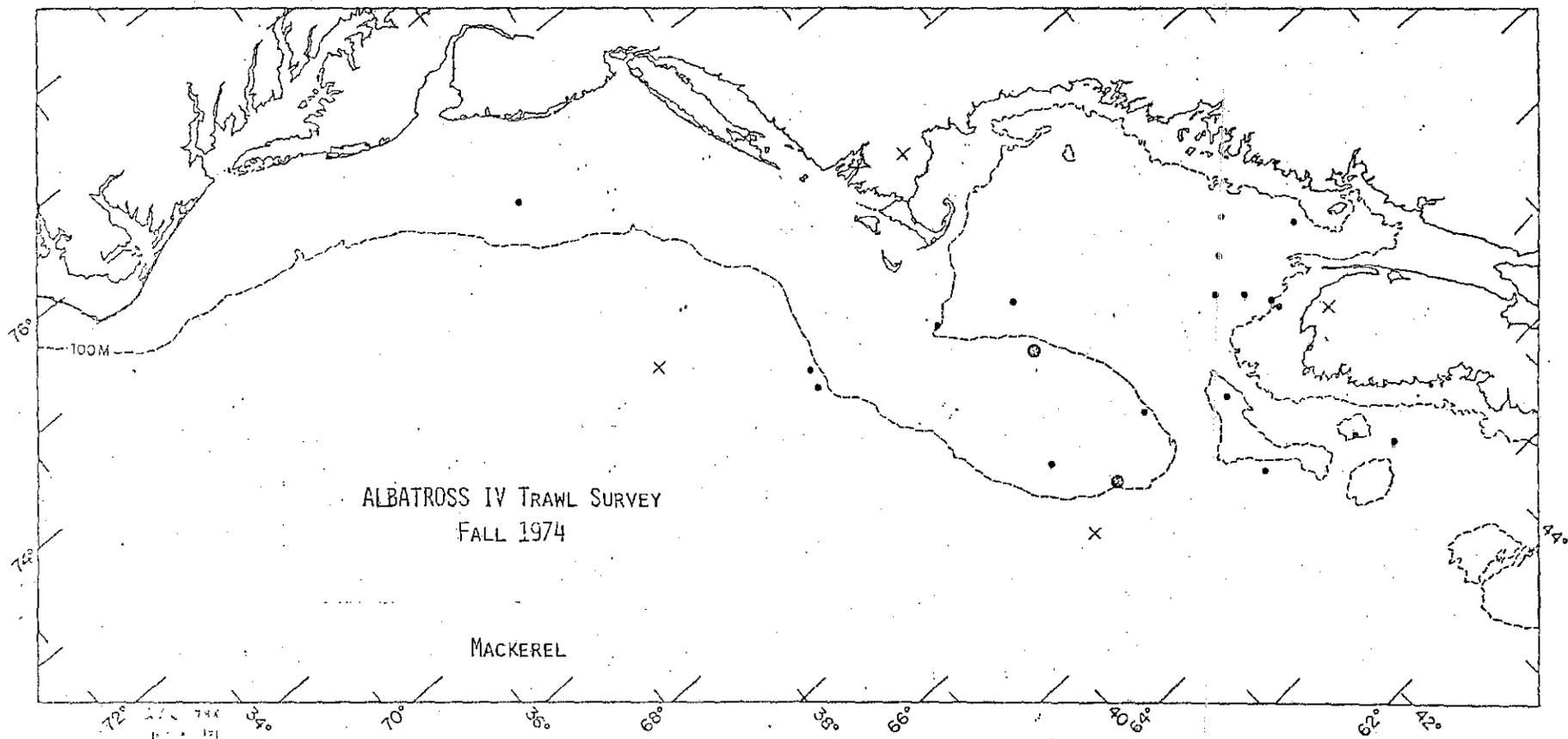
STATISTICAL AREA
BCP BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

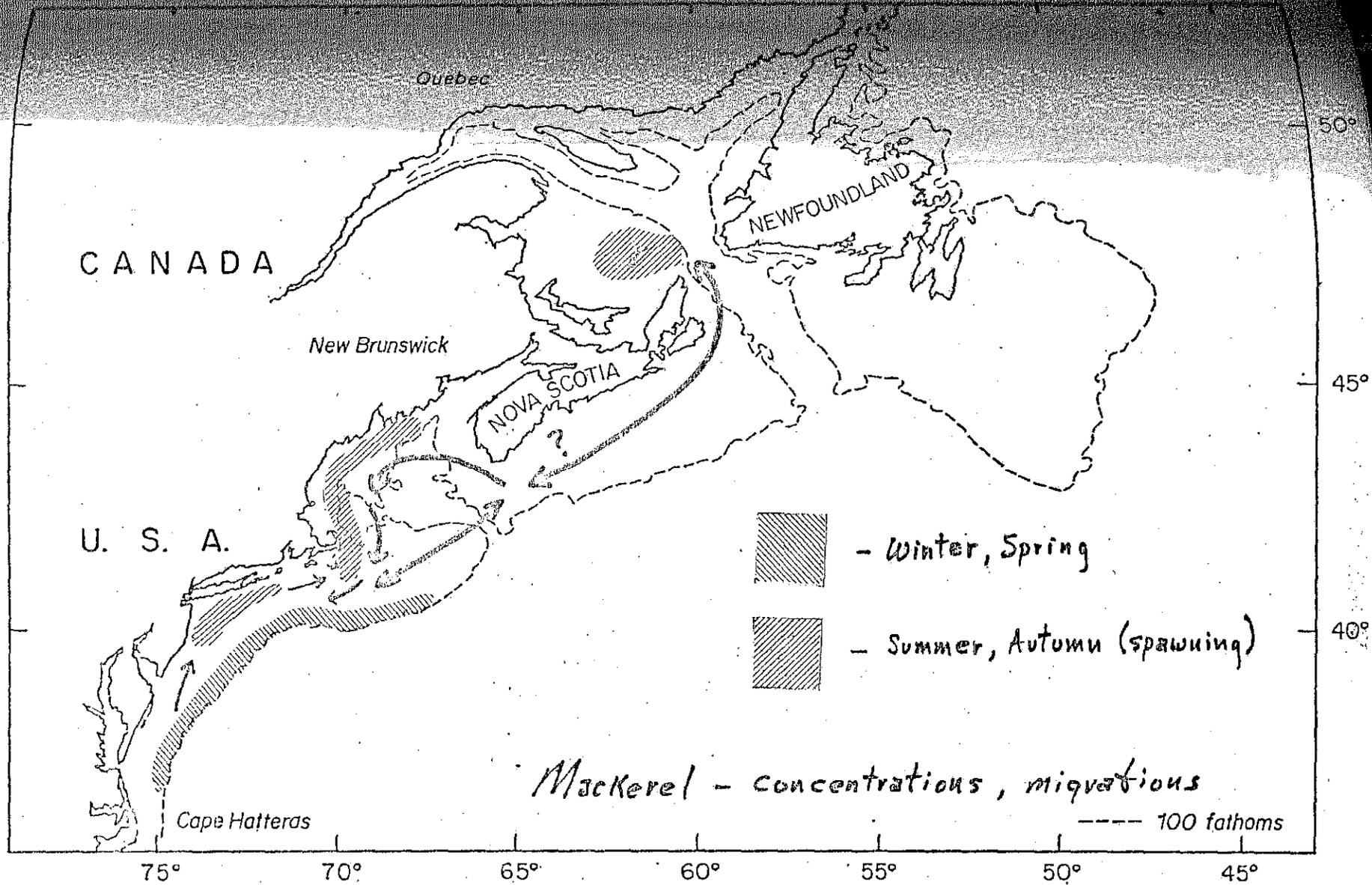


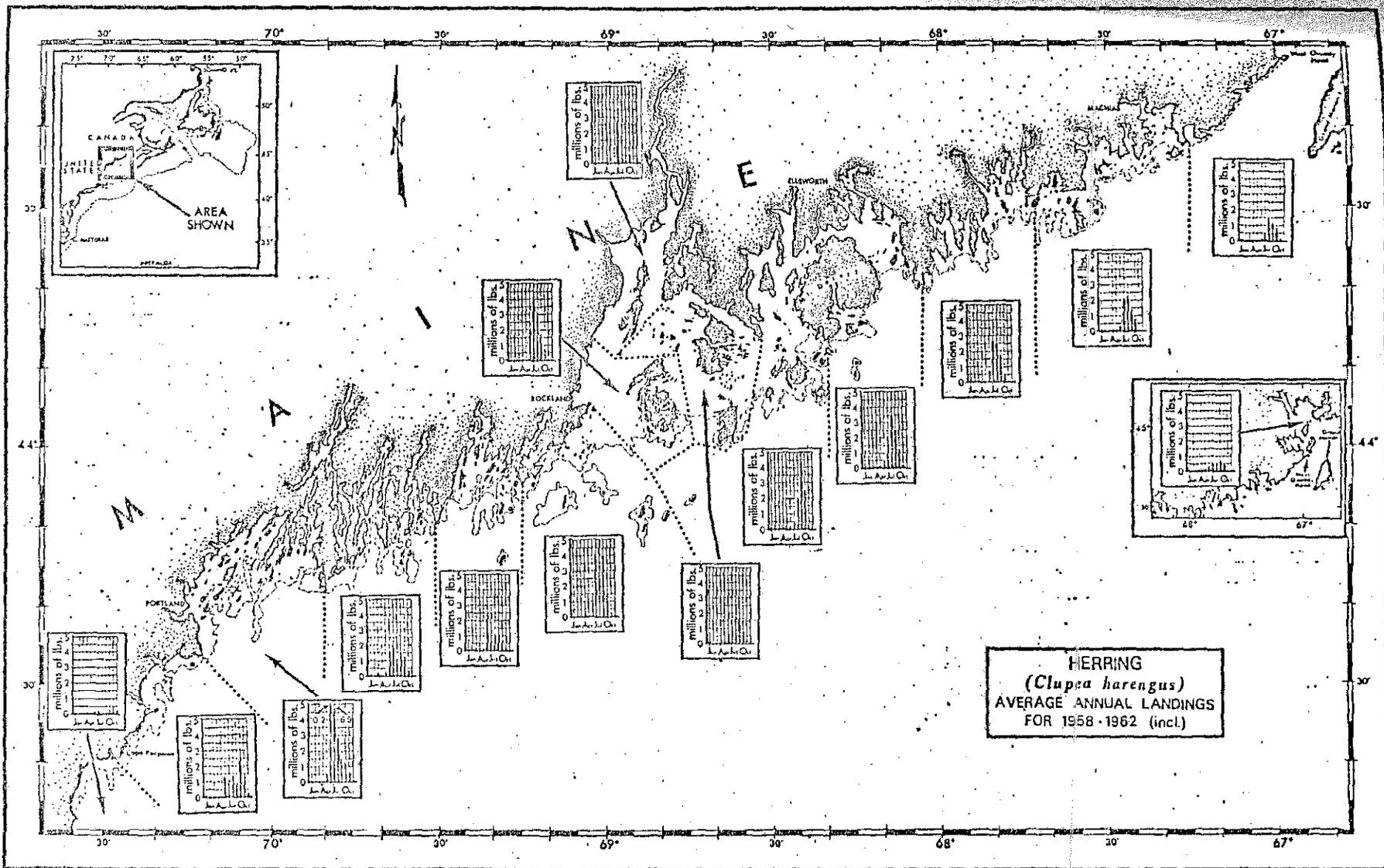
Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

MACKEREL

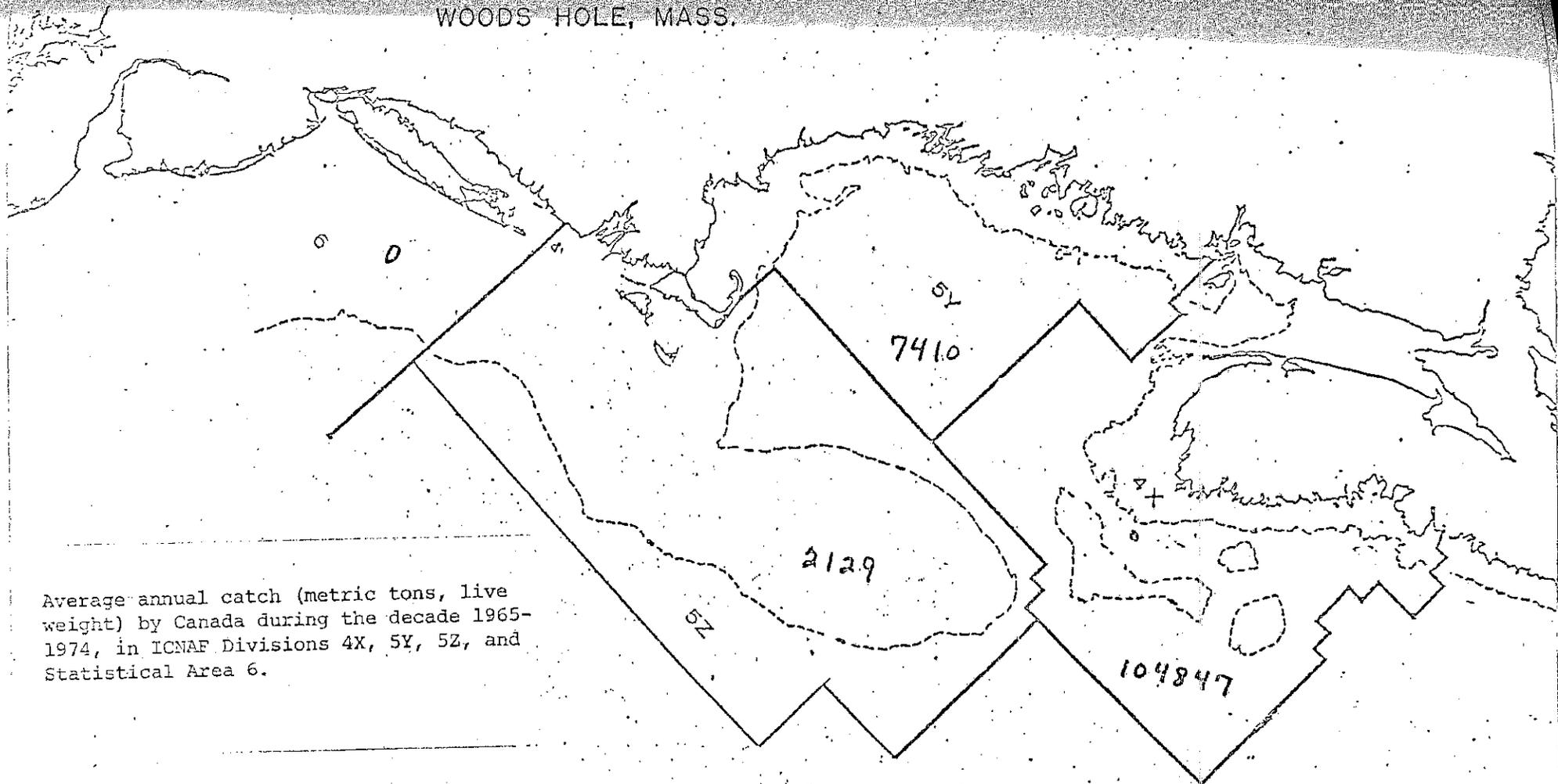








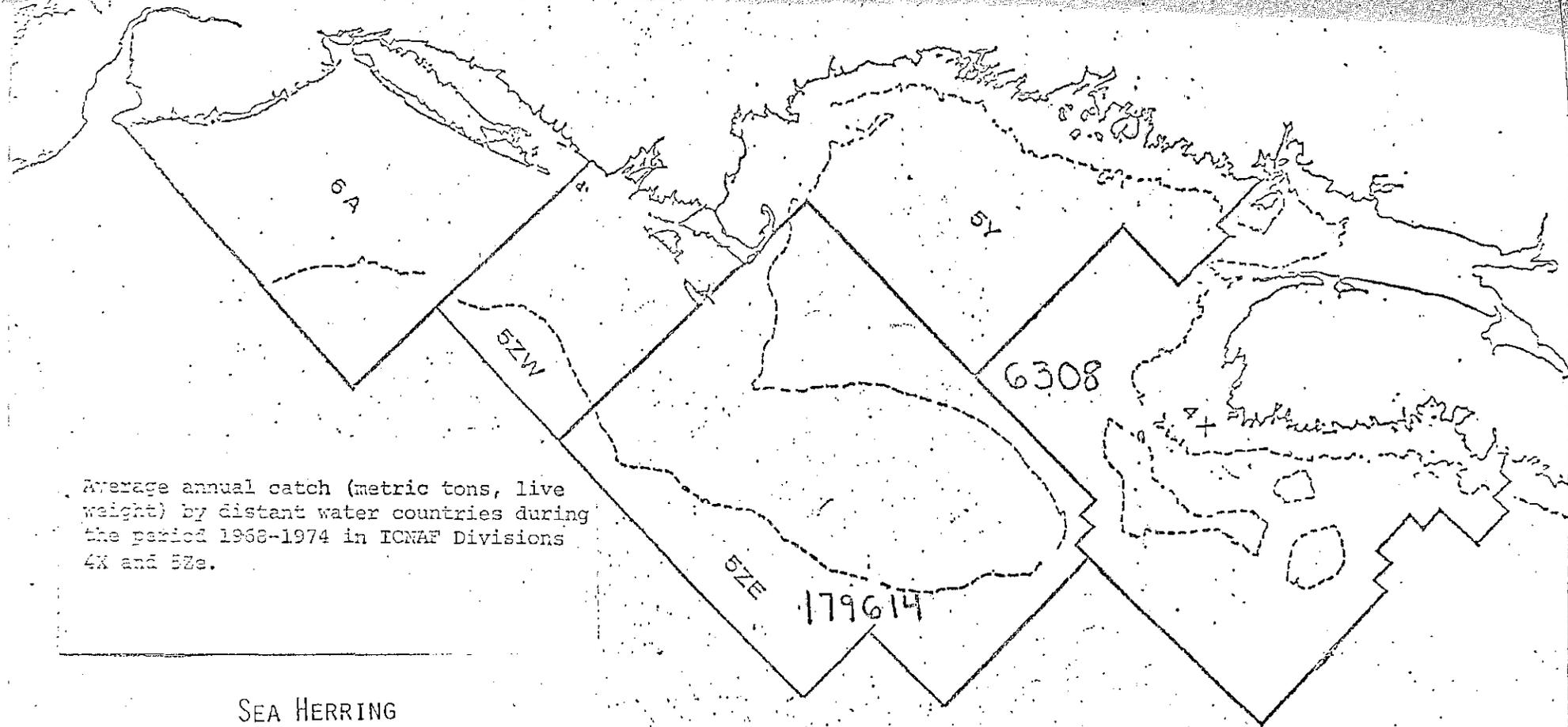
STATISTICAL AREAS
BOF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

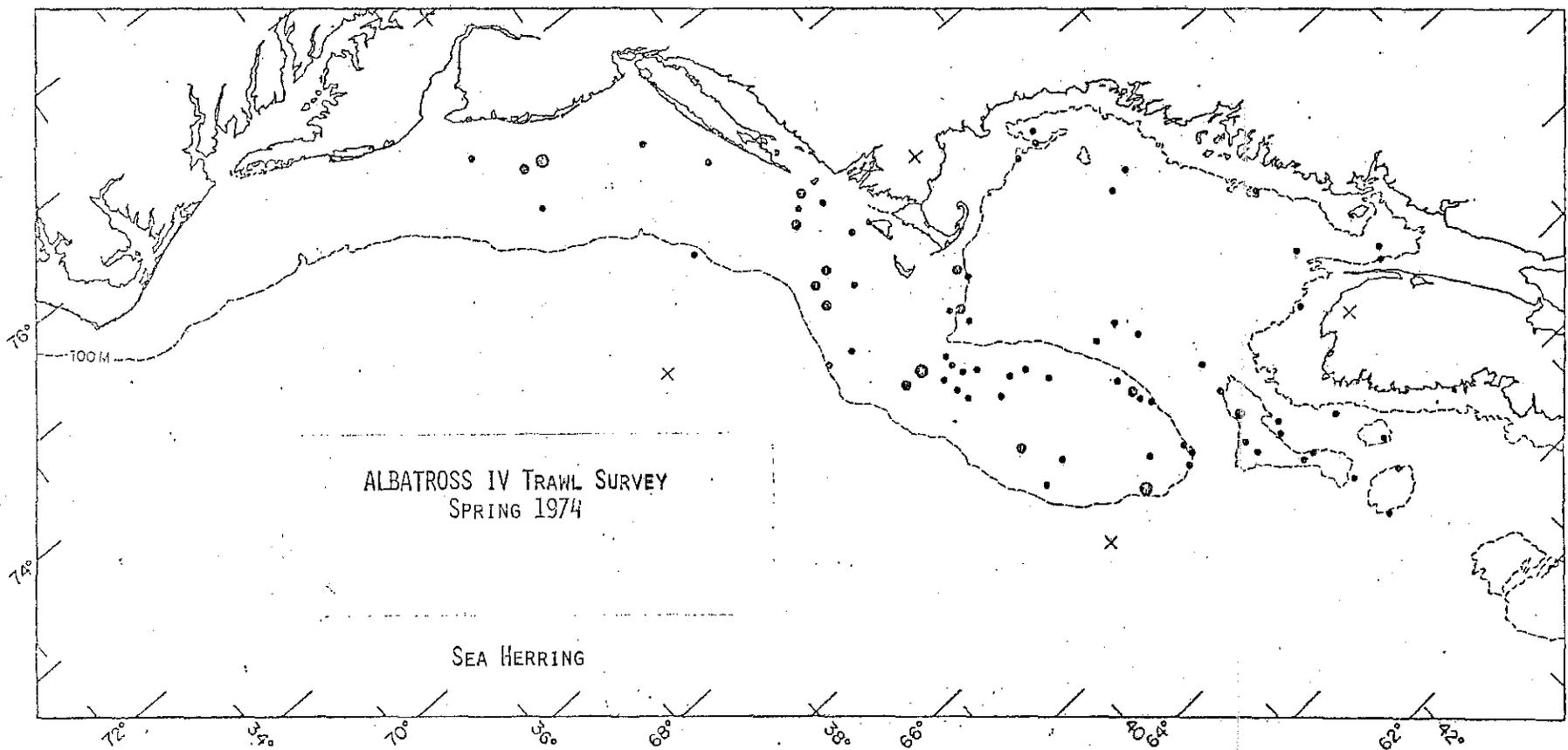


Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

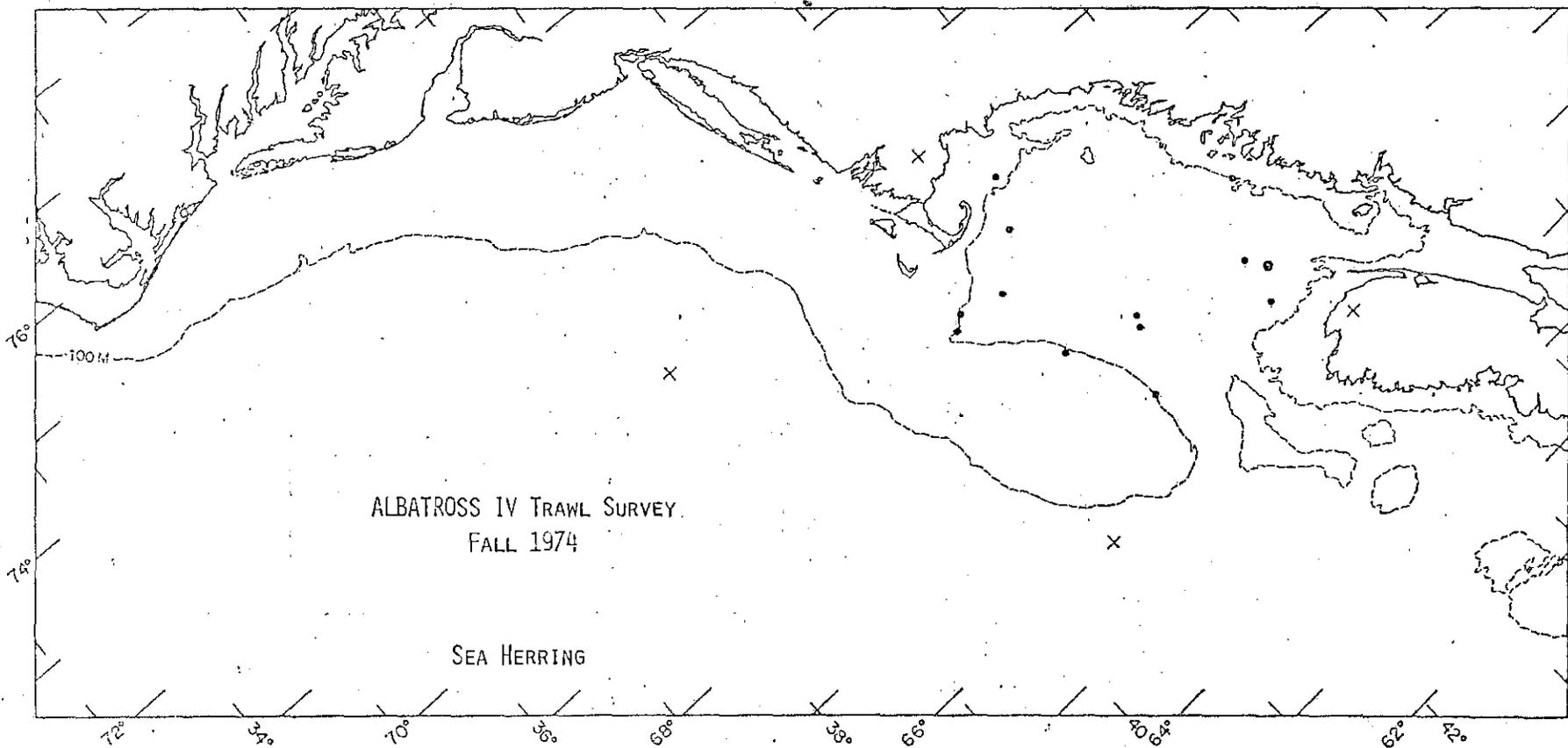
SEA HERRING

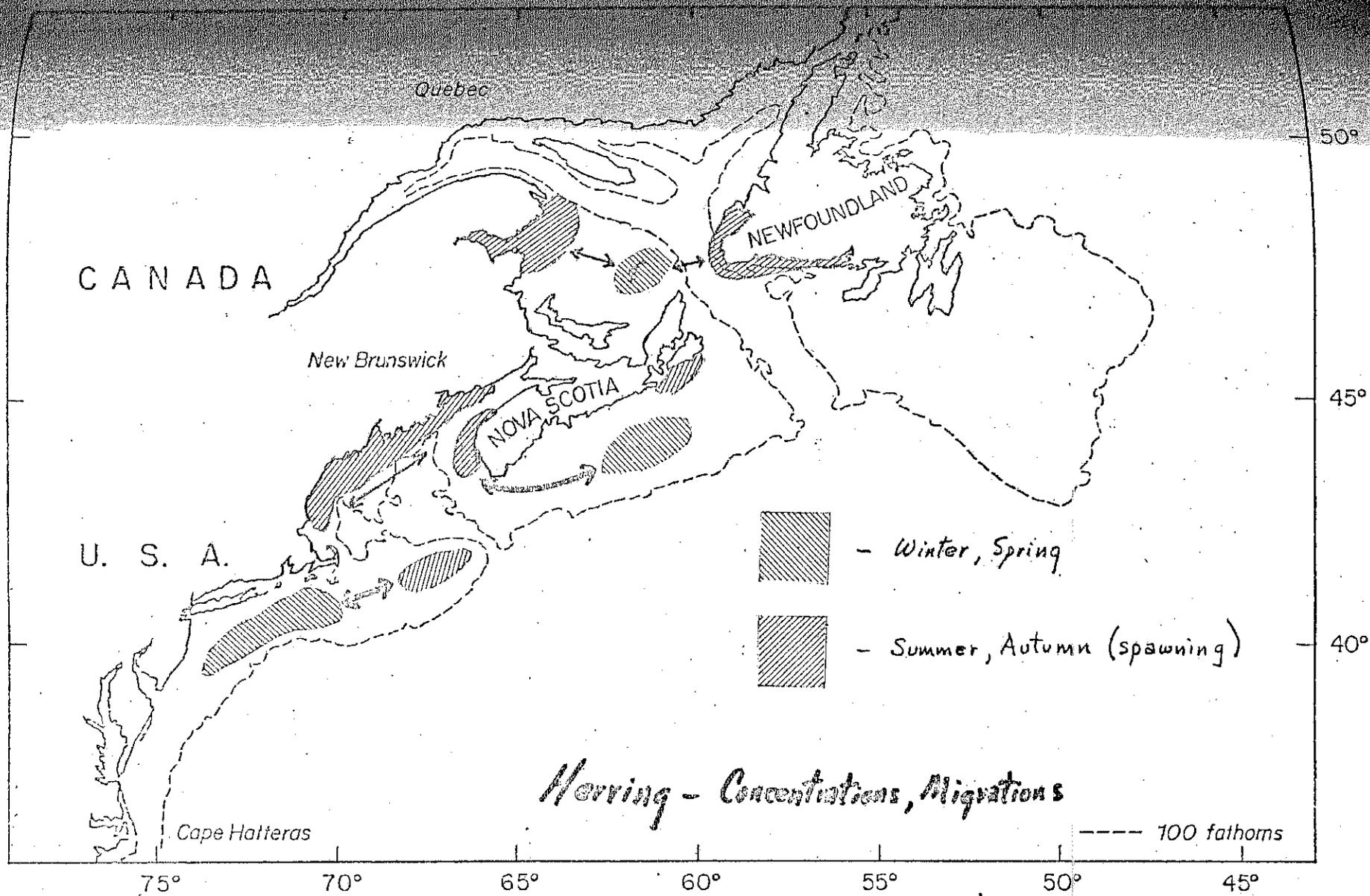
STATISTICAL AREAS
BOF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



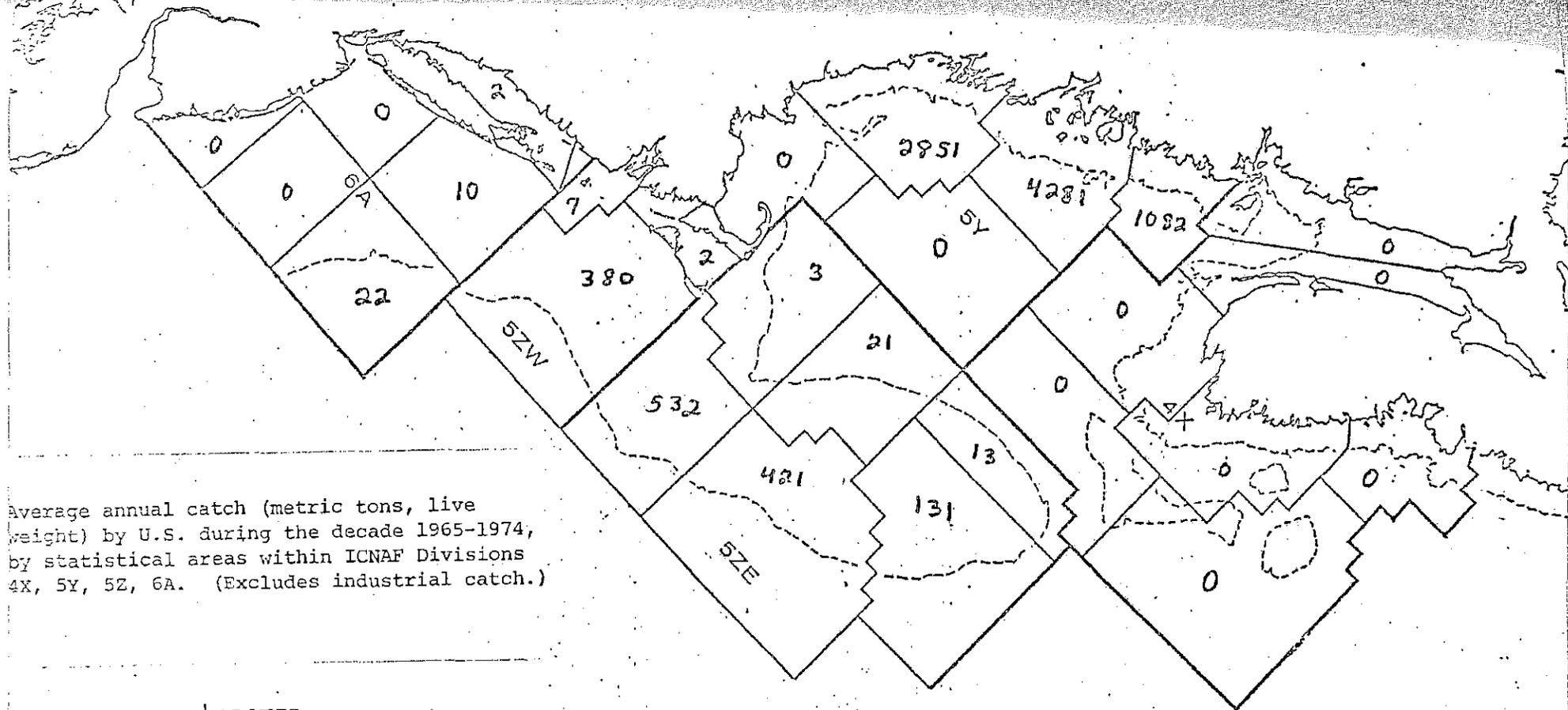


1000 Yds
E. Gravit. 1977
1:50,000



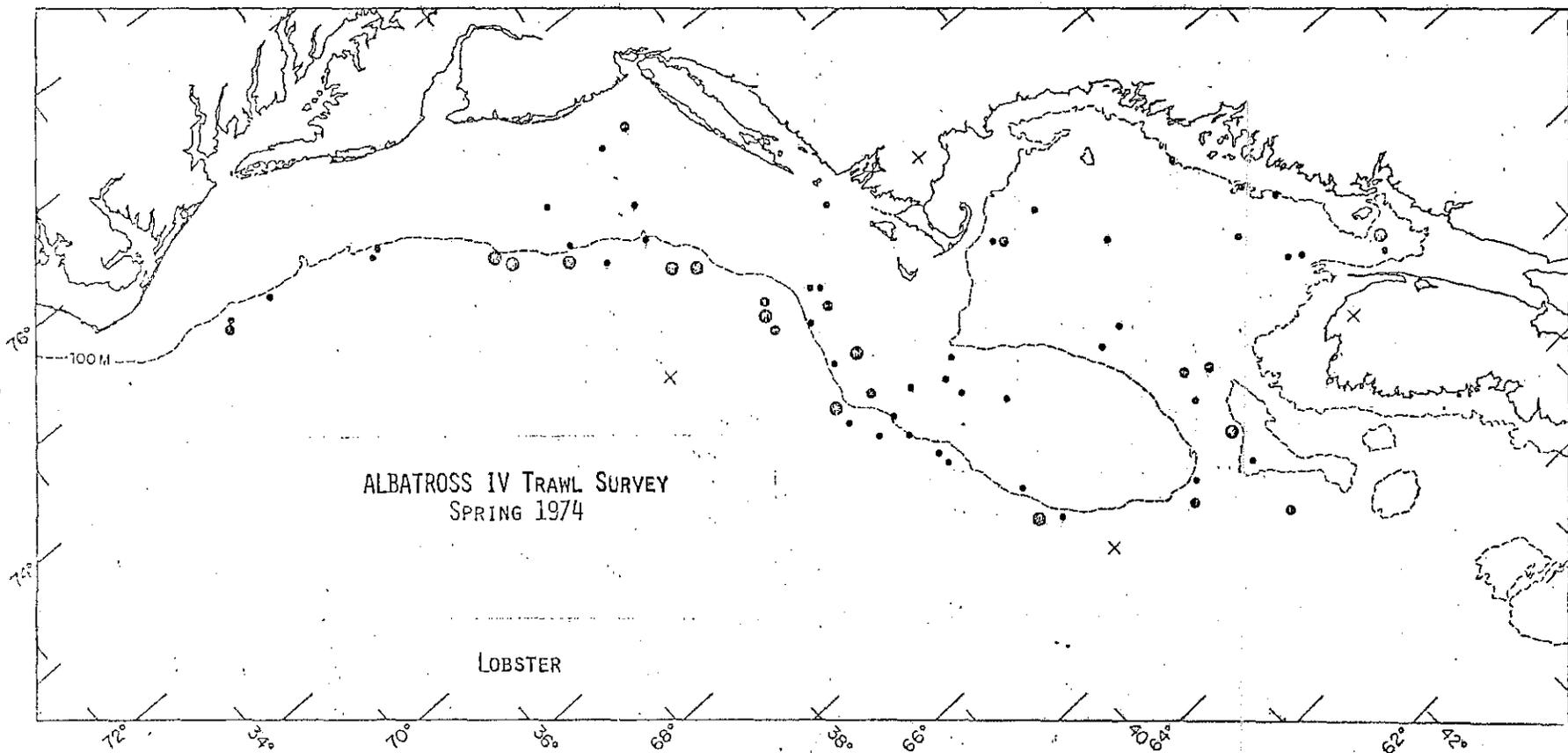


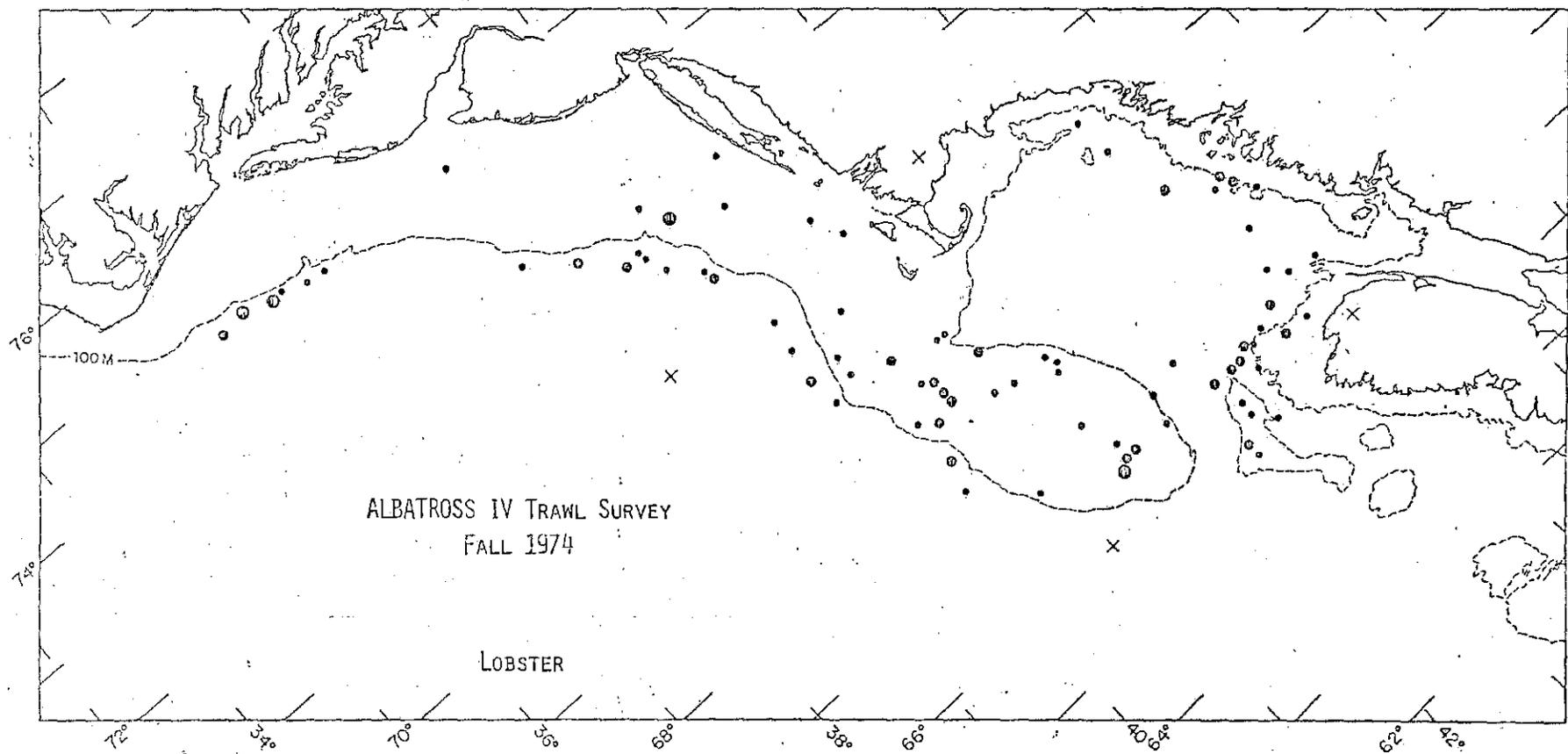
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

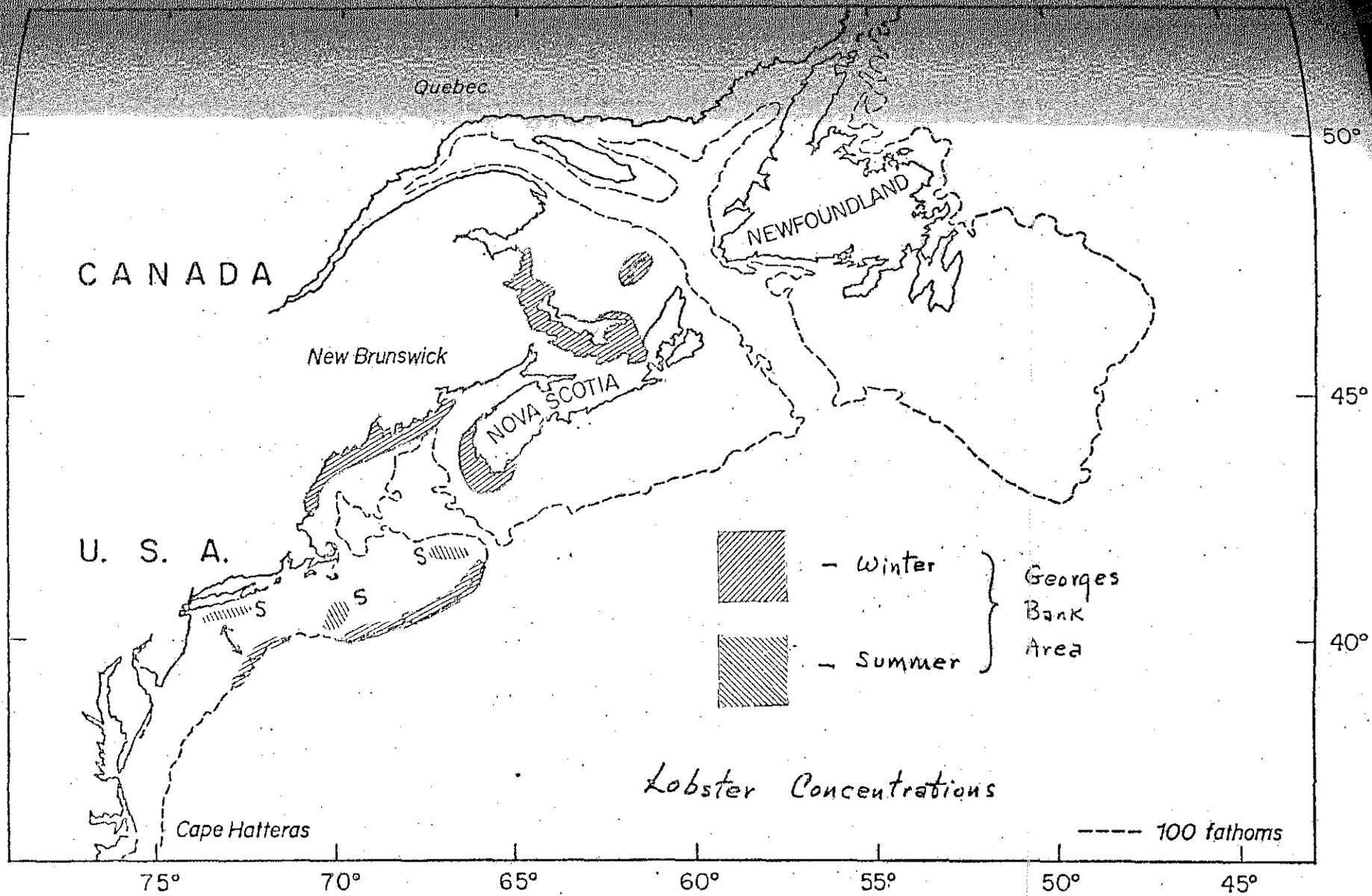
LOBSTER

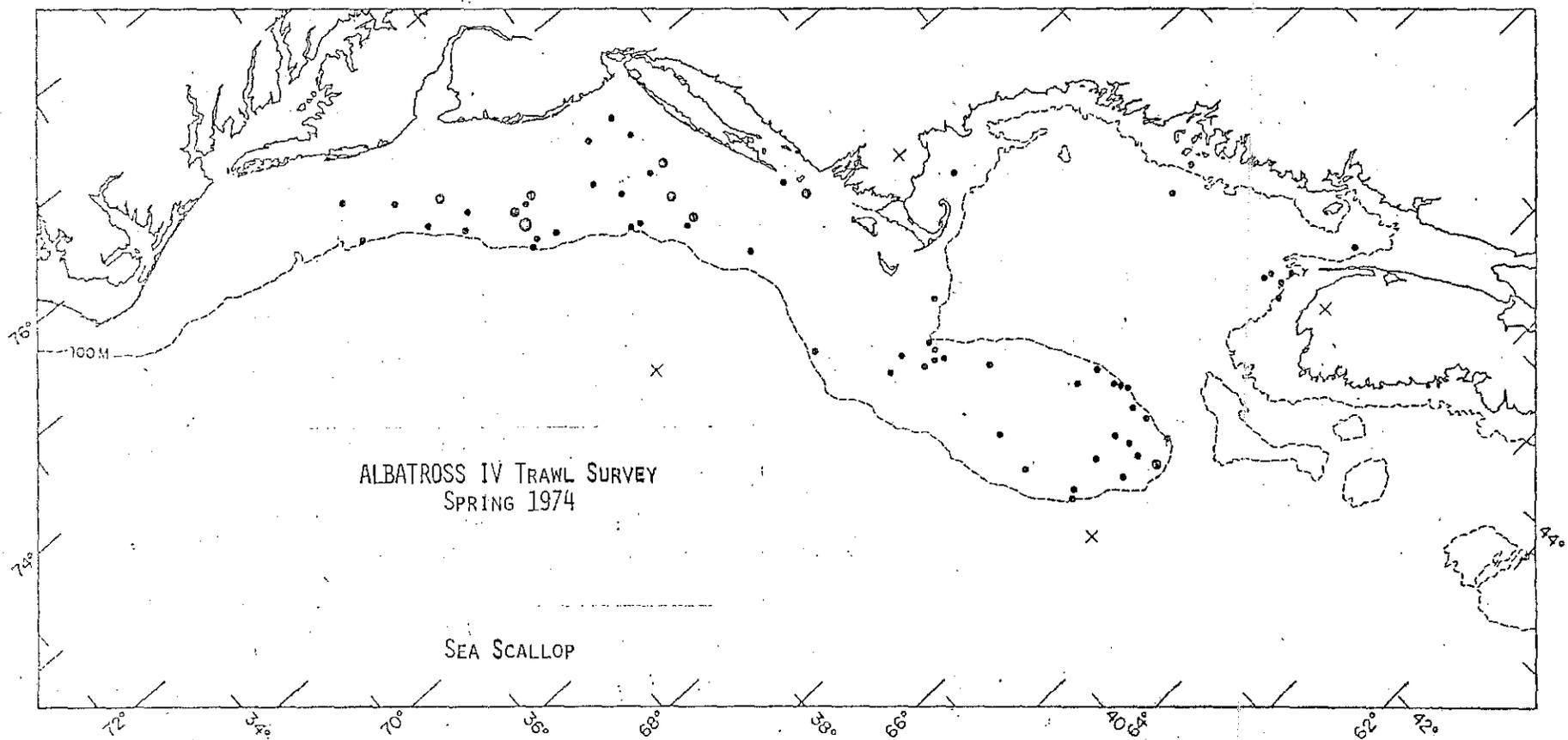


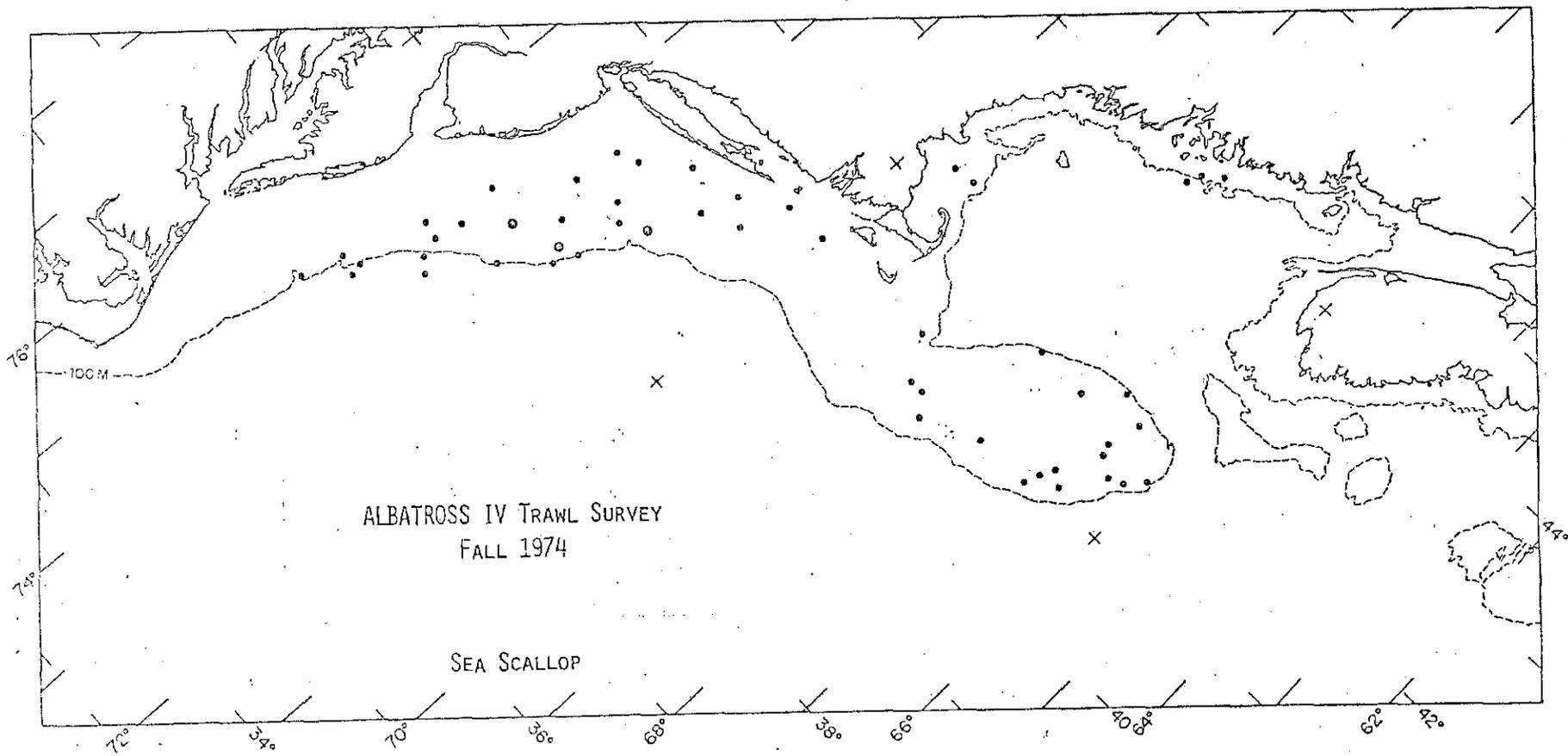


ALBATROSS IV Cruise 7407 August 301
Fall 1974

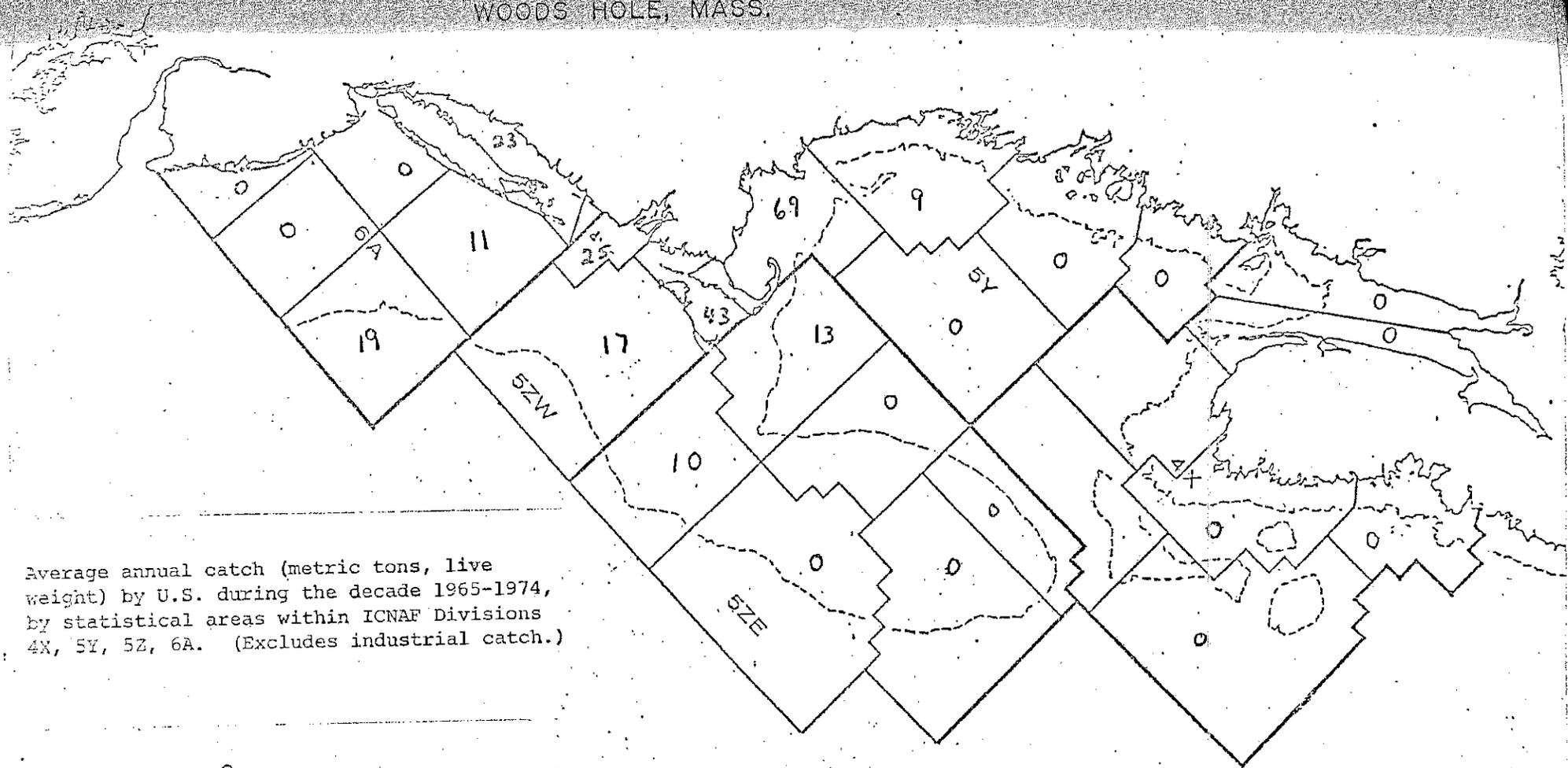
74°





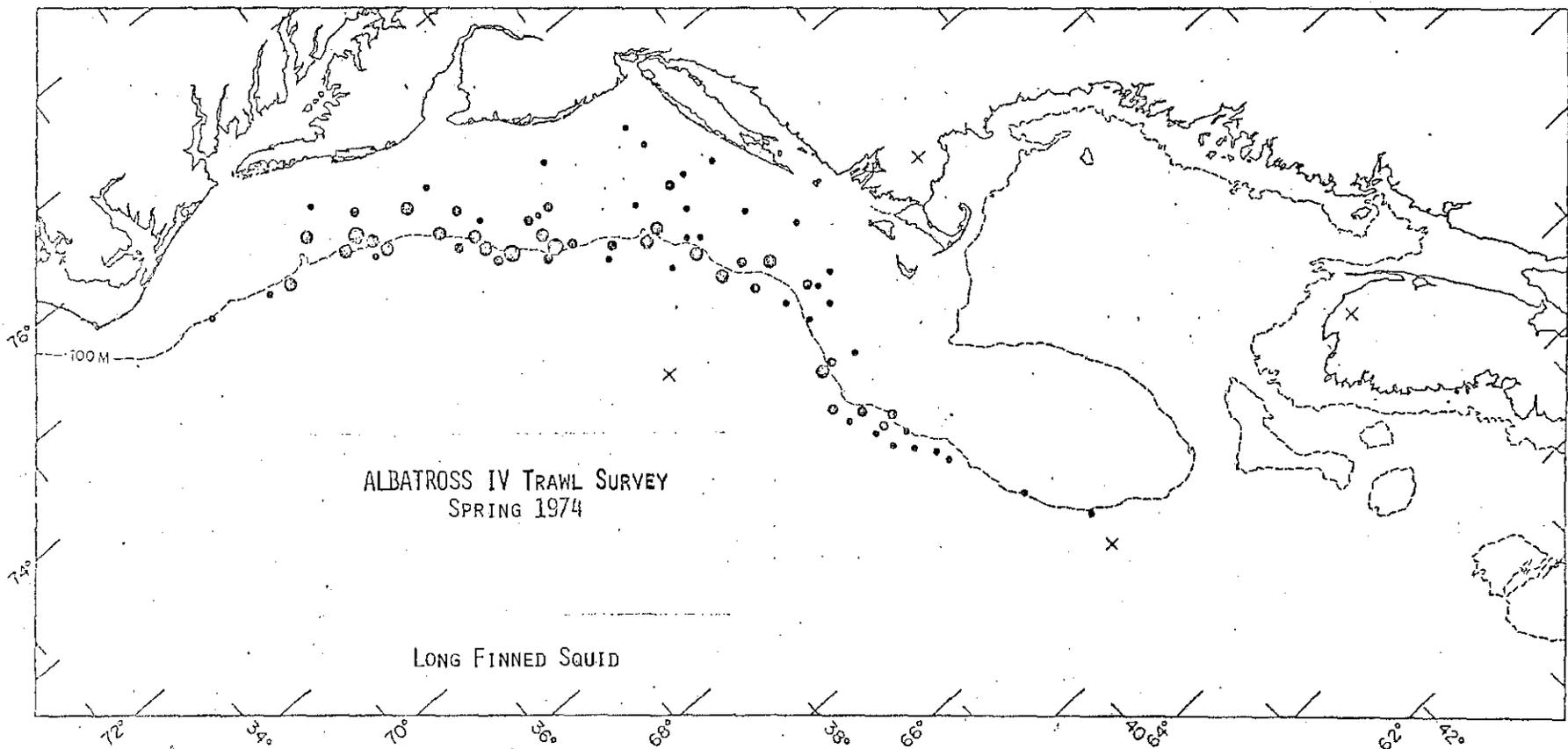


STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

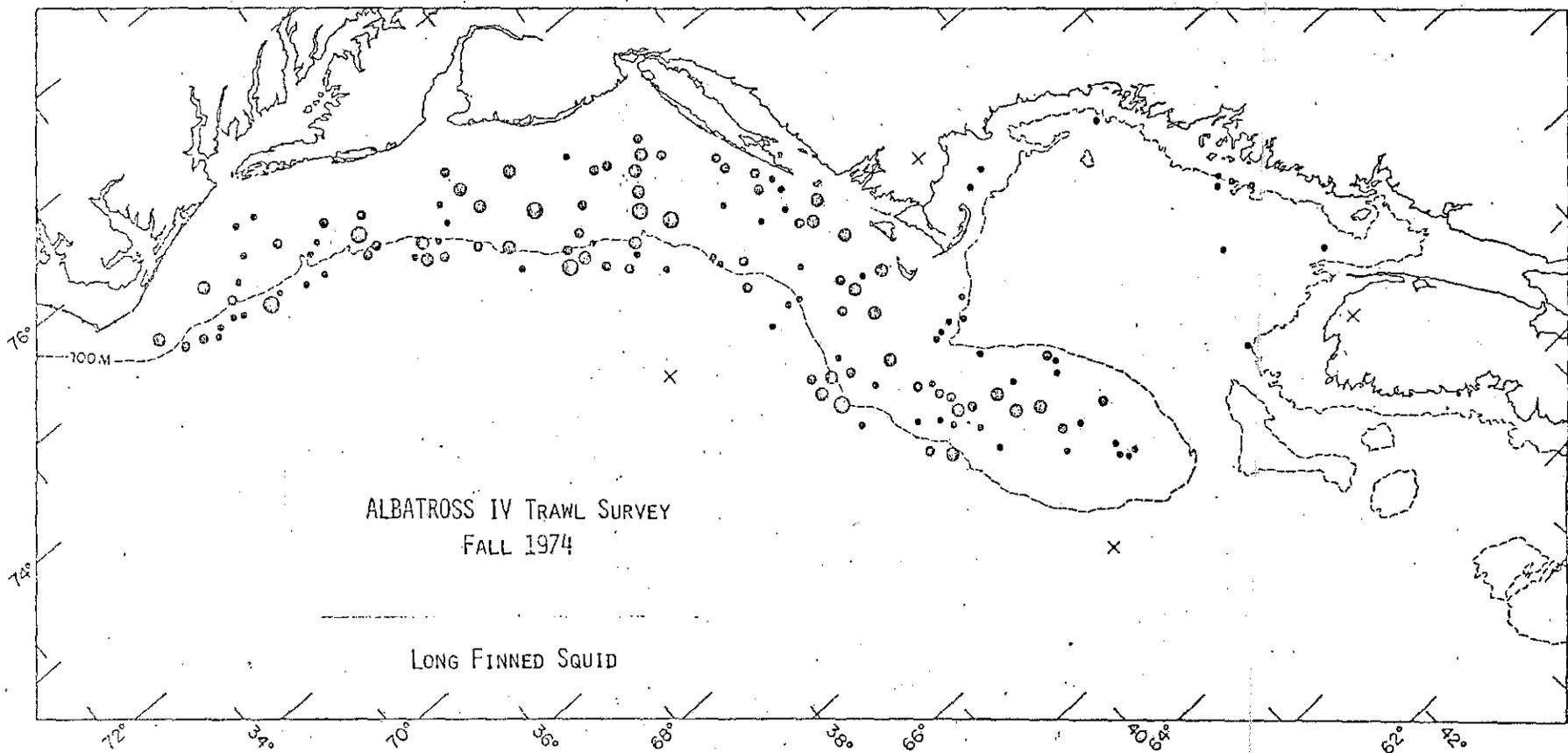


Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

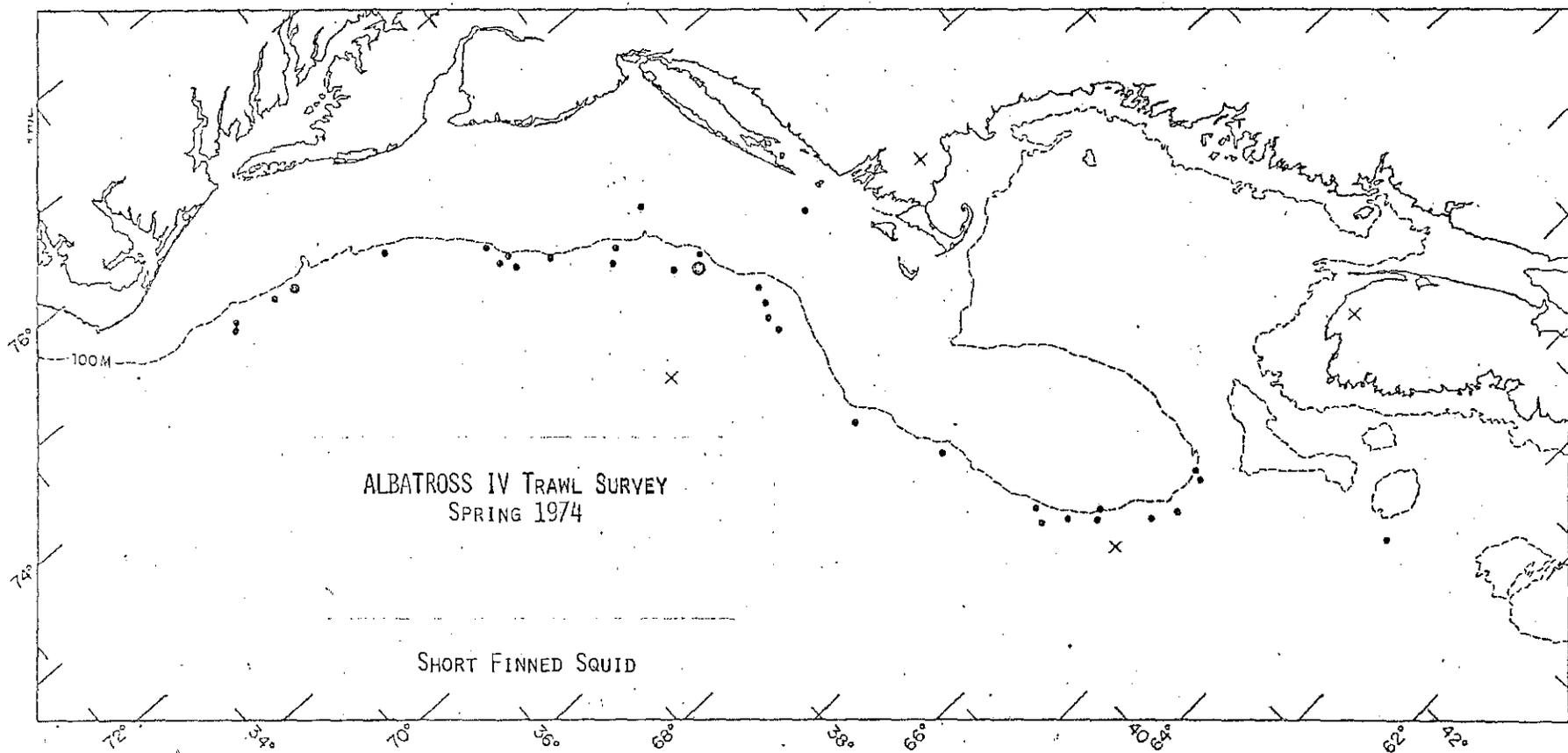
SQUID



ALBATROSS IV TRAWL SURVEY SPRING 1974
LONG FINNED SQUID



Albatross IV Cruise Trawl Survey Log
 1974



4 Stations SE of Gause July Species 502
"Thur" Spring 1974
790

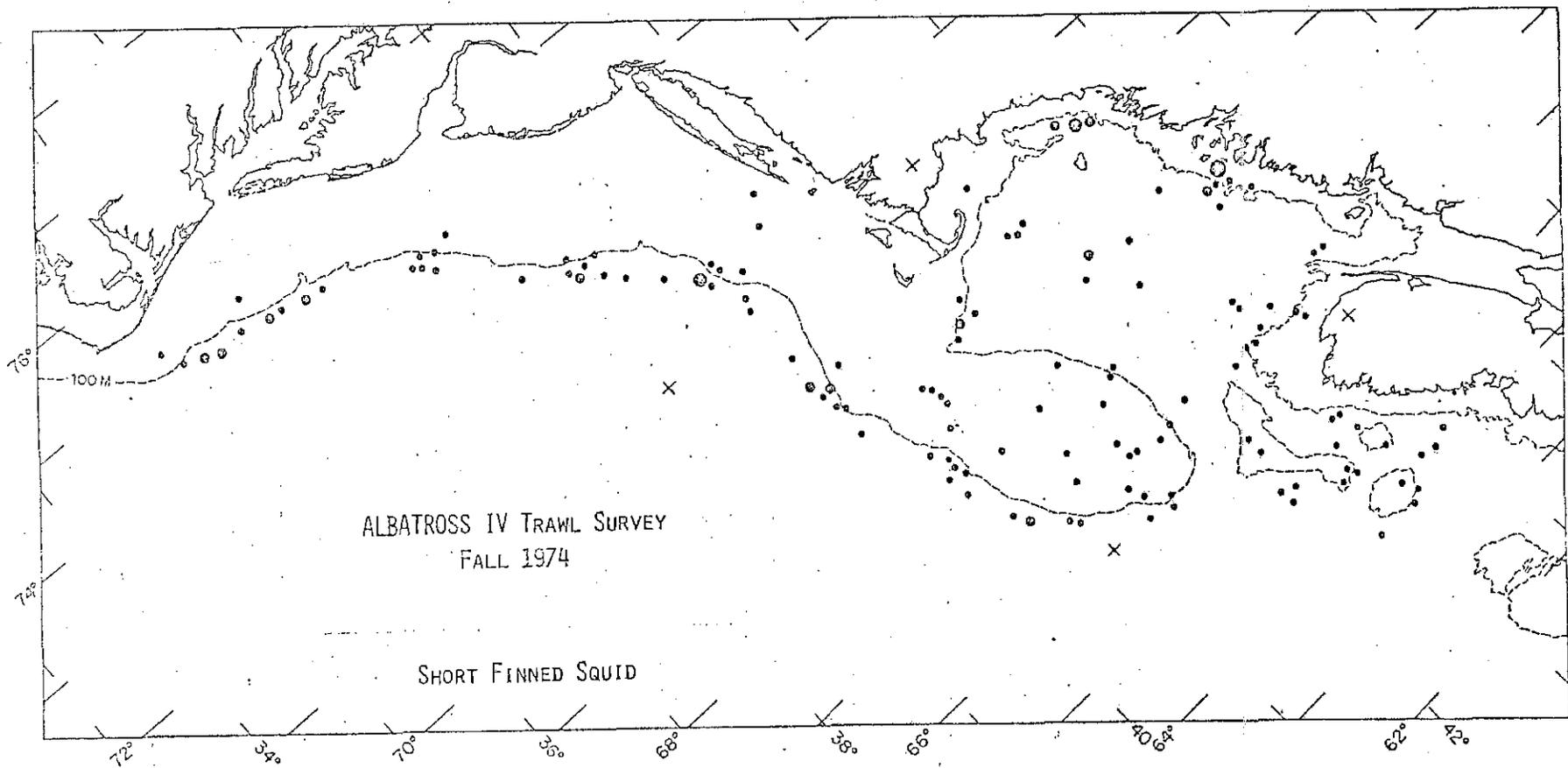
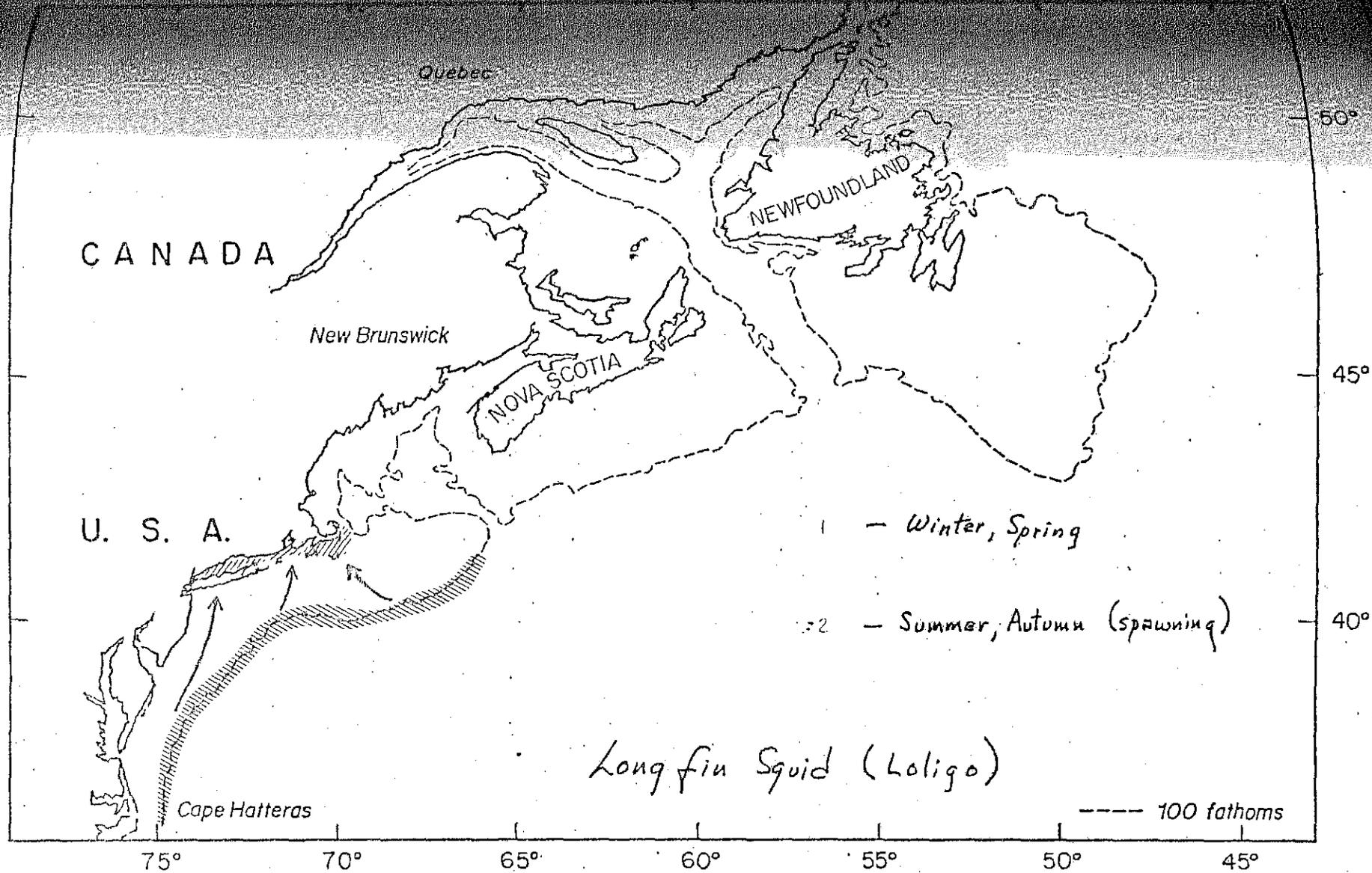
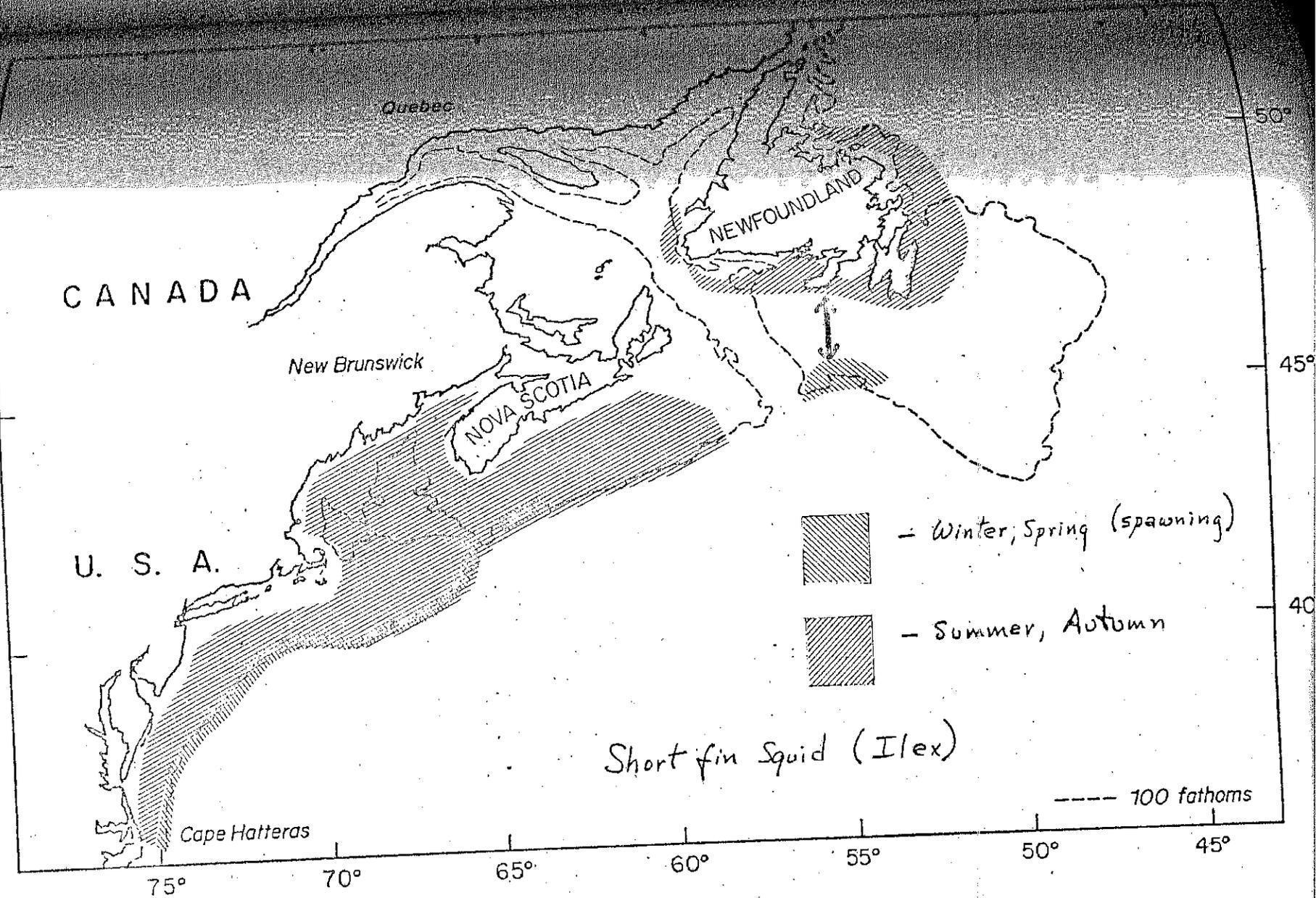


Figure 1. Short Finned Squid, Fall 1974





IV. Population distribution plots - miscellaneous species

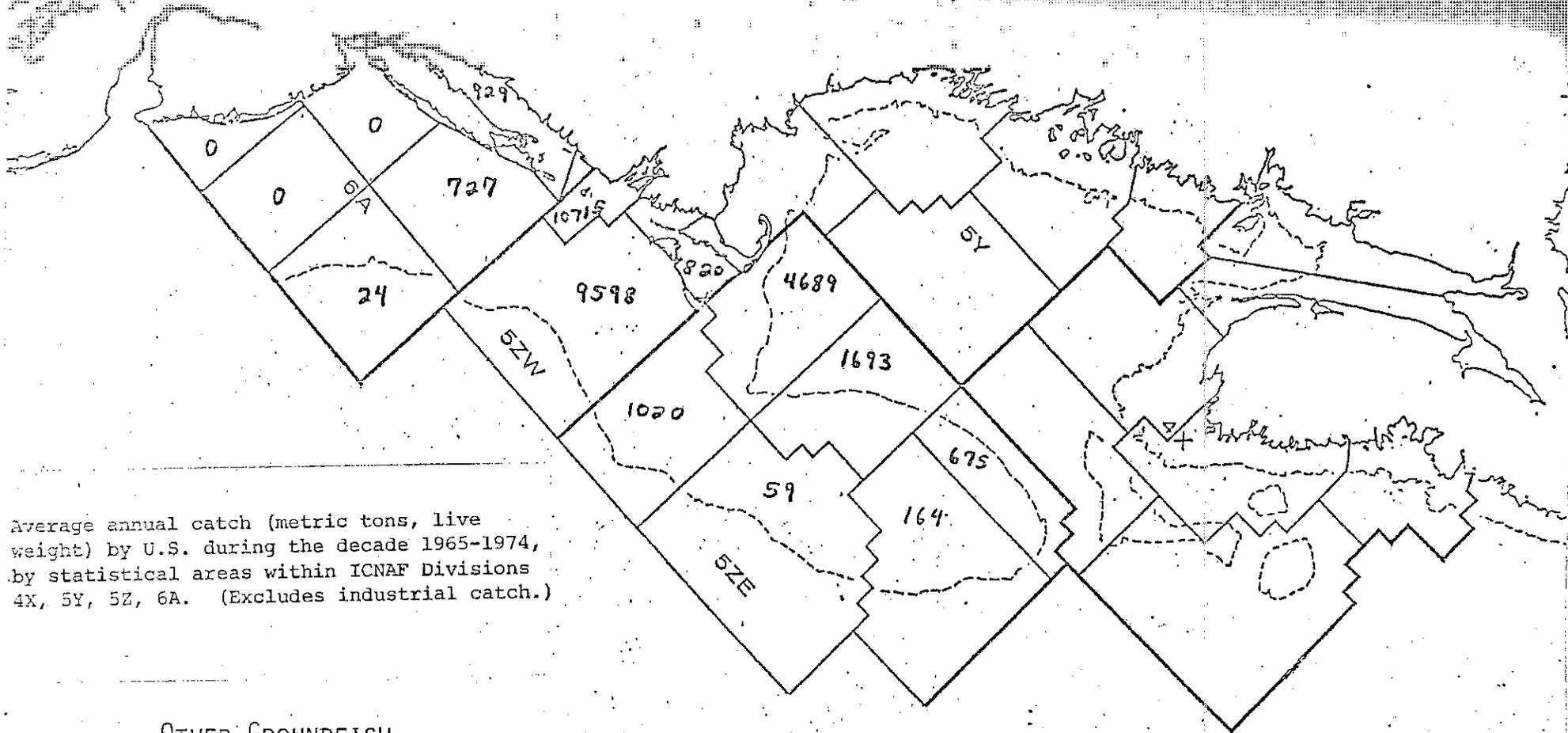
A number of groundfish species included in the ICNAF categories "other groundfish," "other pelagic," or "other finfish," individually represent small landings relative to major species. However, in aggregate these species represent a significant component of the finfish biomass, and their economic importance can increase dramatically in times of scarcity for traditional species, or if new markets are established. For example, New Bedford fishermen have recently been turning to sand dab (windowpane flounder) and summer flounder to fill the gap left by low yellowtail abundance.

The following figures illustrate spring and fall density distributions of populations of 13 species, based on the 1974 US research vessel surveys. Species included are as follows:

Gulfstream flounder	long-horned sculpin
windowpane flounder	big skate
four-spot flounder	little skate
butterfish	spiny dogfish
ocean (eel) pout	alewife
goosefish	argentine
sea raven	

Distribution plots for a number of these demersal species illustrate the fact that eastern Georges Bank represents a natural ecological limit to their distribution. Other species, such as alewife, argentine, and dogfish, occur in or adjacent to the disputed area, in varying abundance depending upon season.

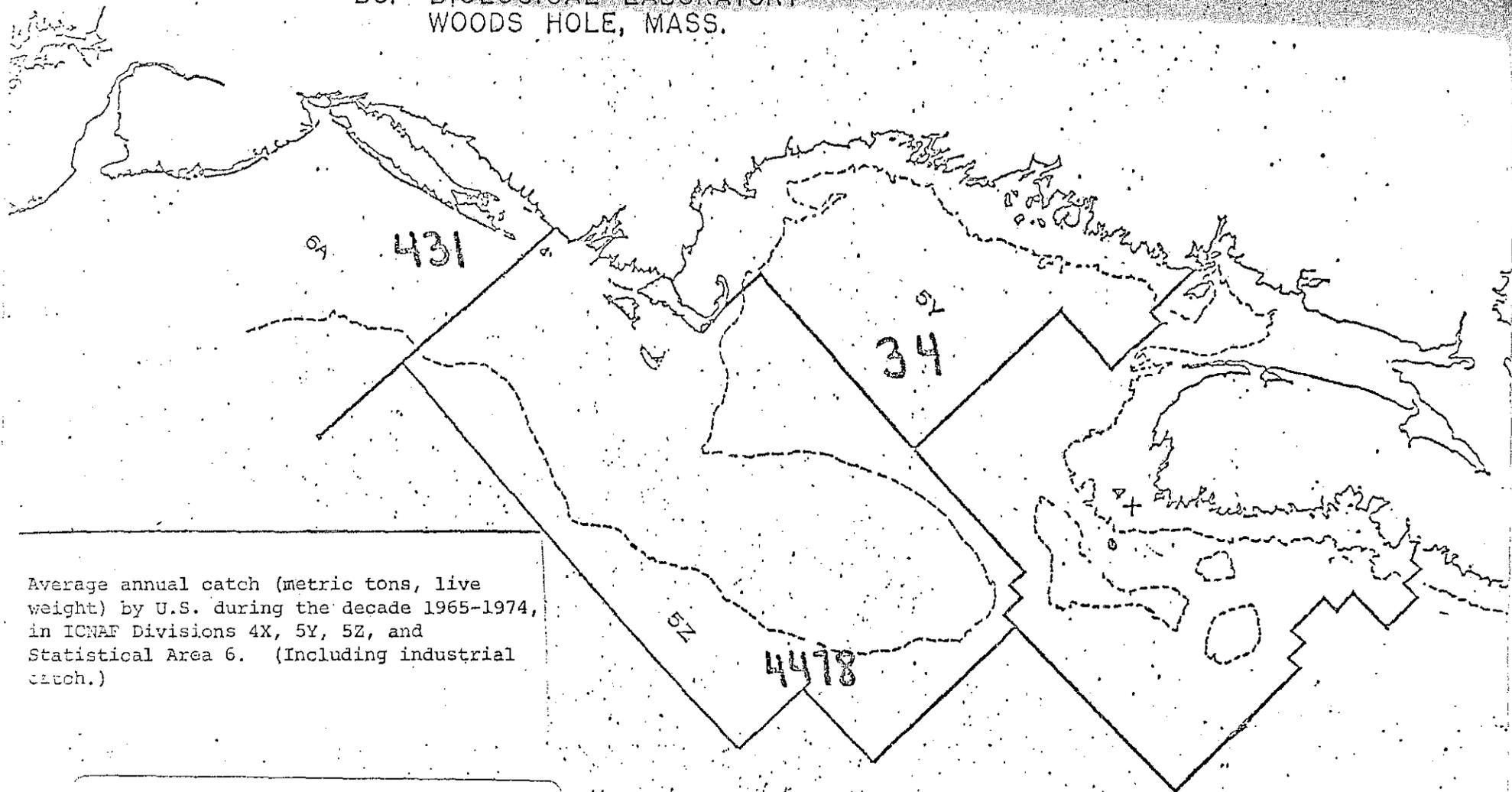
In addition, distribution of landings for other groundfish, other pelagics, and other species categories are illustrated for USA, Canada, and distant-water countries.



Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, by statistical areas within ICNAF Divisions 4X, 5Y, 5Z, 6A. (Excludes industrial catch.)

OTHER GROUND FISH

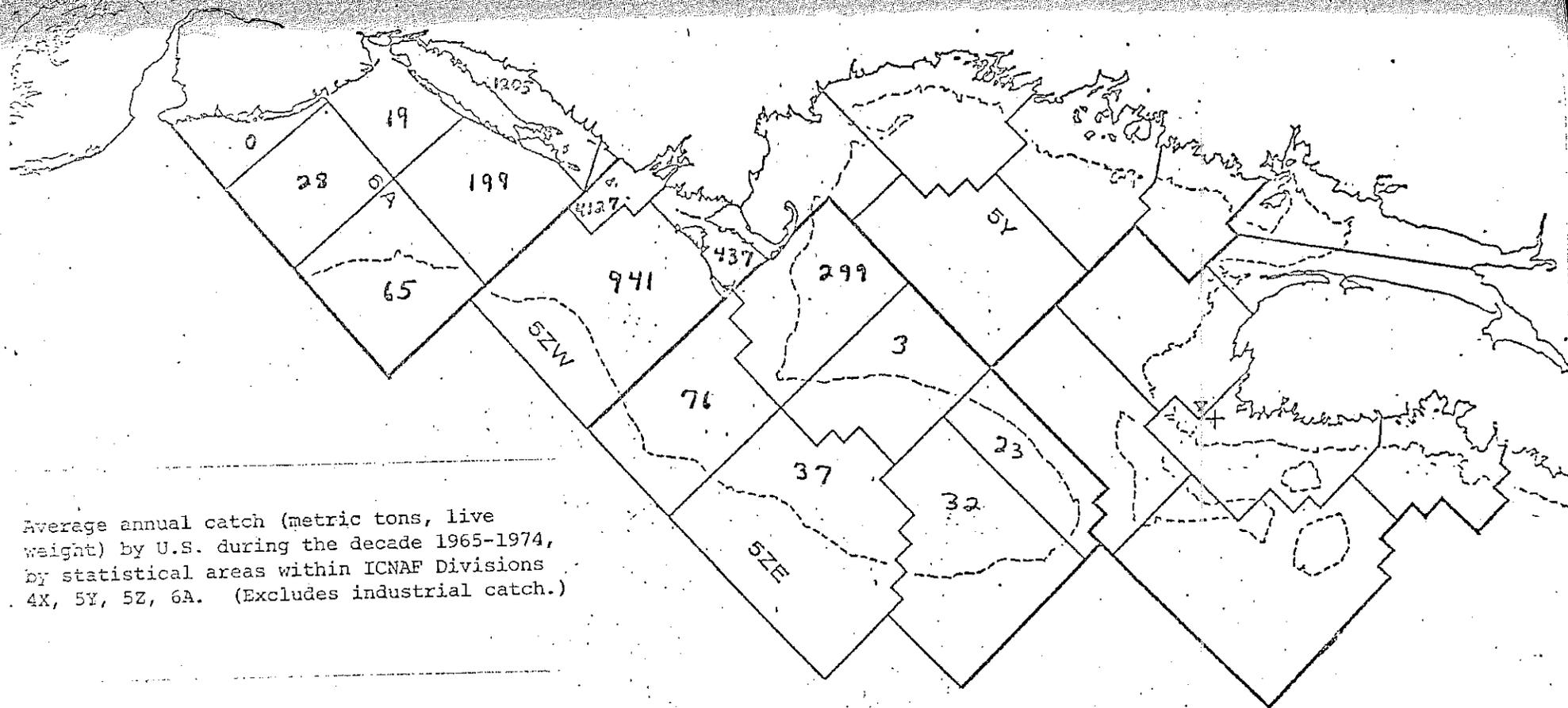
STATISTICAL AREAS
BCF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

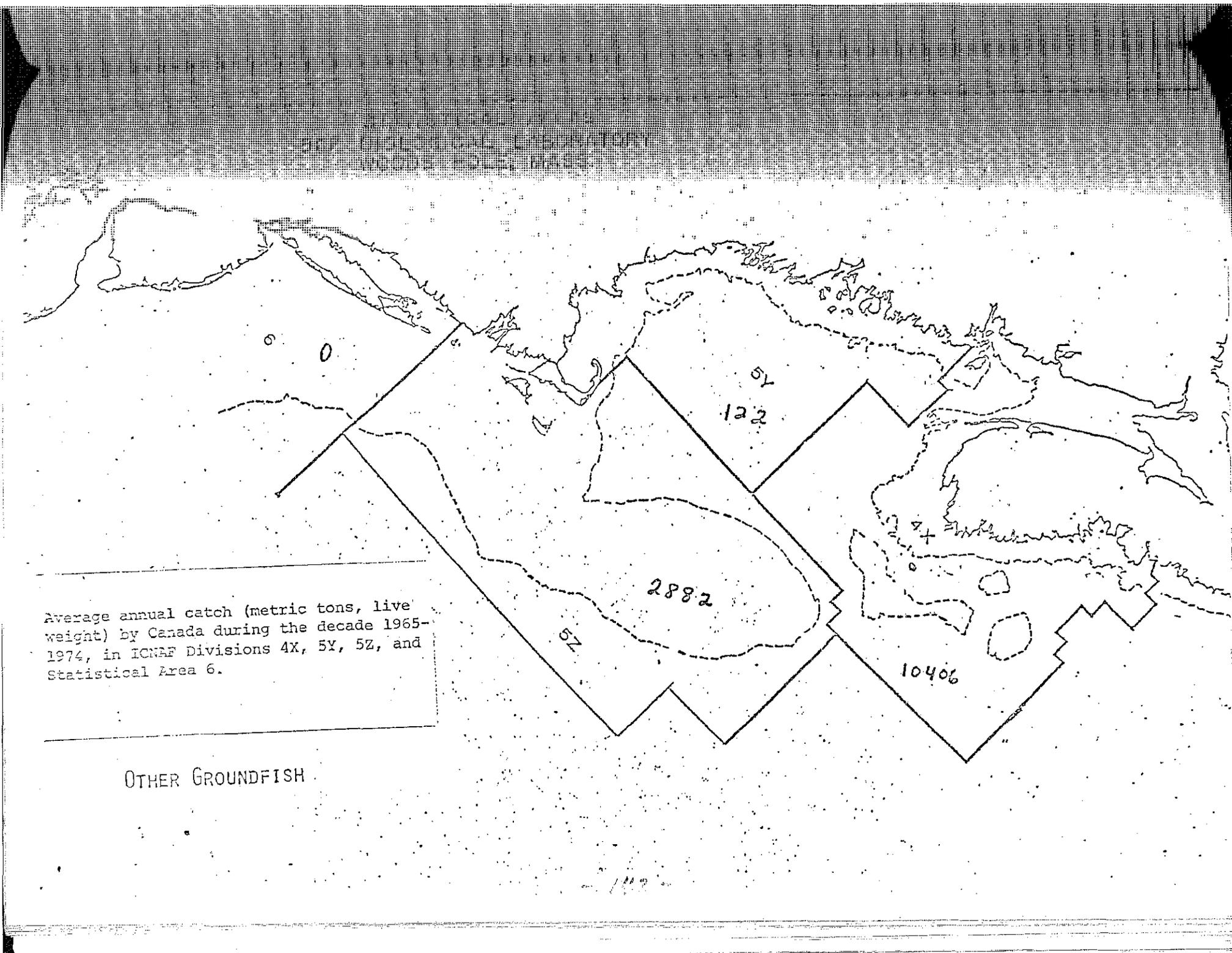


Average annual catch (metric tons, live weight) by U.S. during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6. (Including industrial catch.)

OCEAN POUT

STATISTICAL AREAS
BGF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

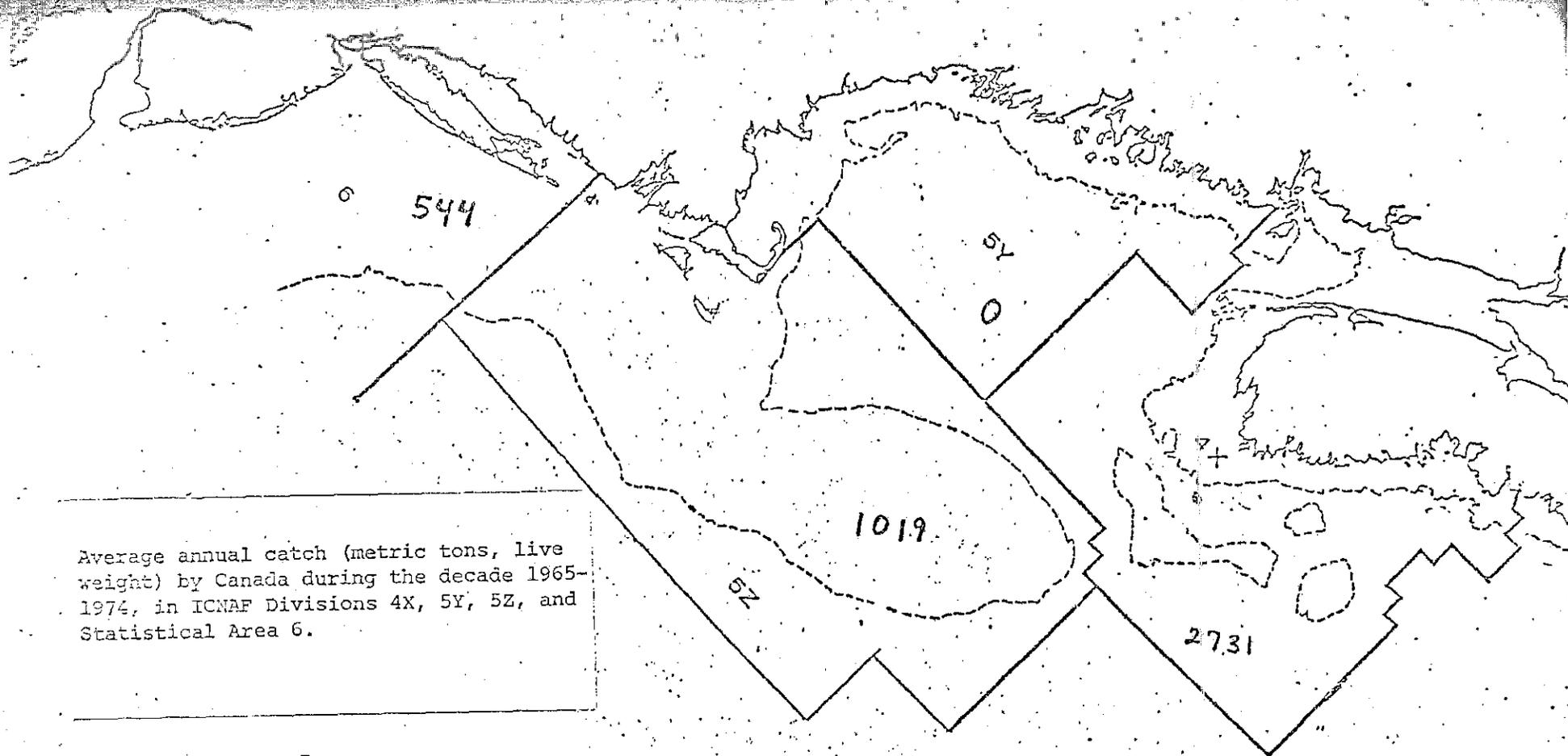




Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

OTHER GROUND FISH

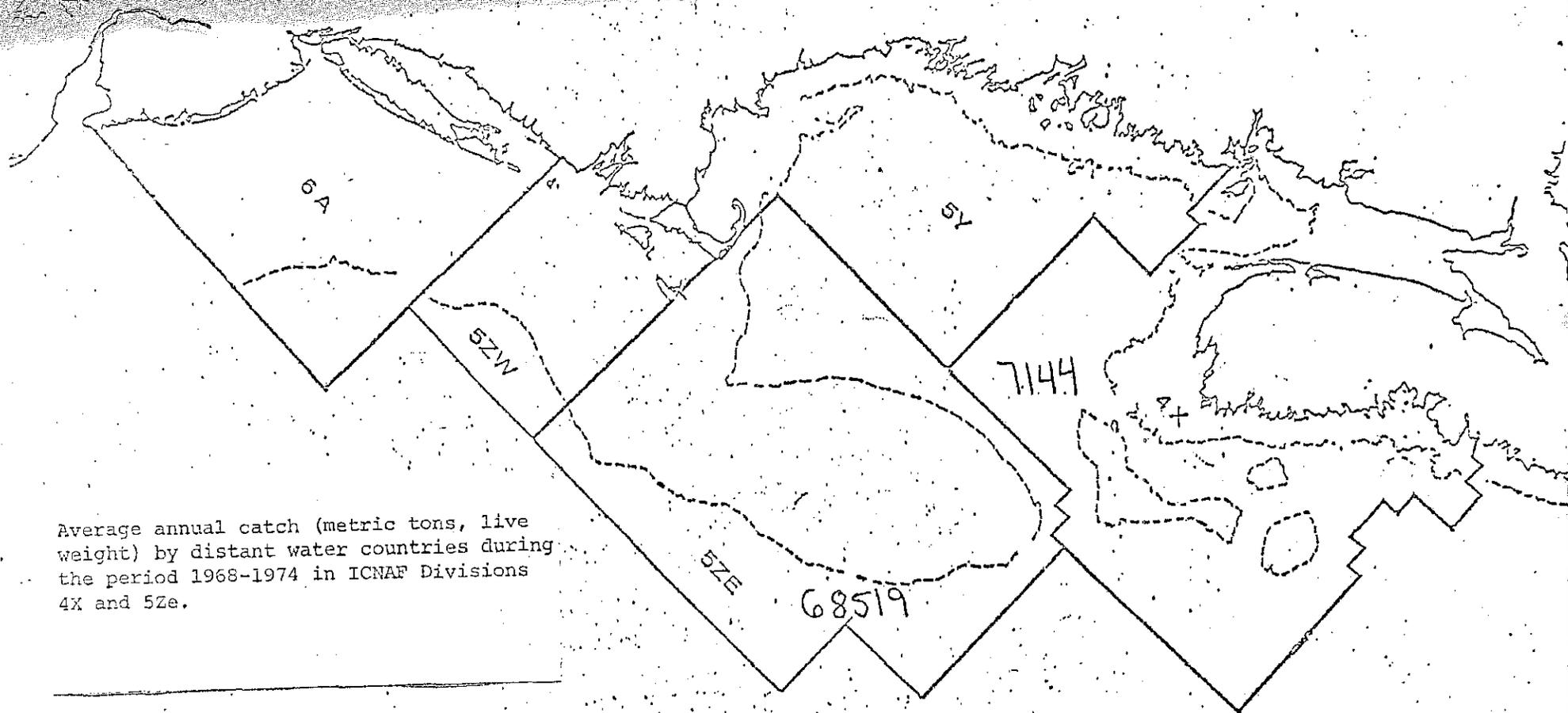
SCIENTIFIC DEPARTMENT OF THE CANADIAN GOVERNMENT
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by Canada during the decade 1965-1974, in ICNAF Divisions 4X, 5Y, 5Z, and Statistical Area 6.

OTHER PELAGICS

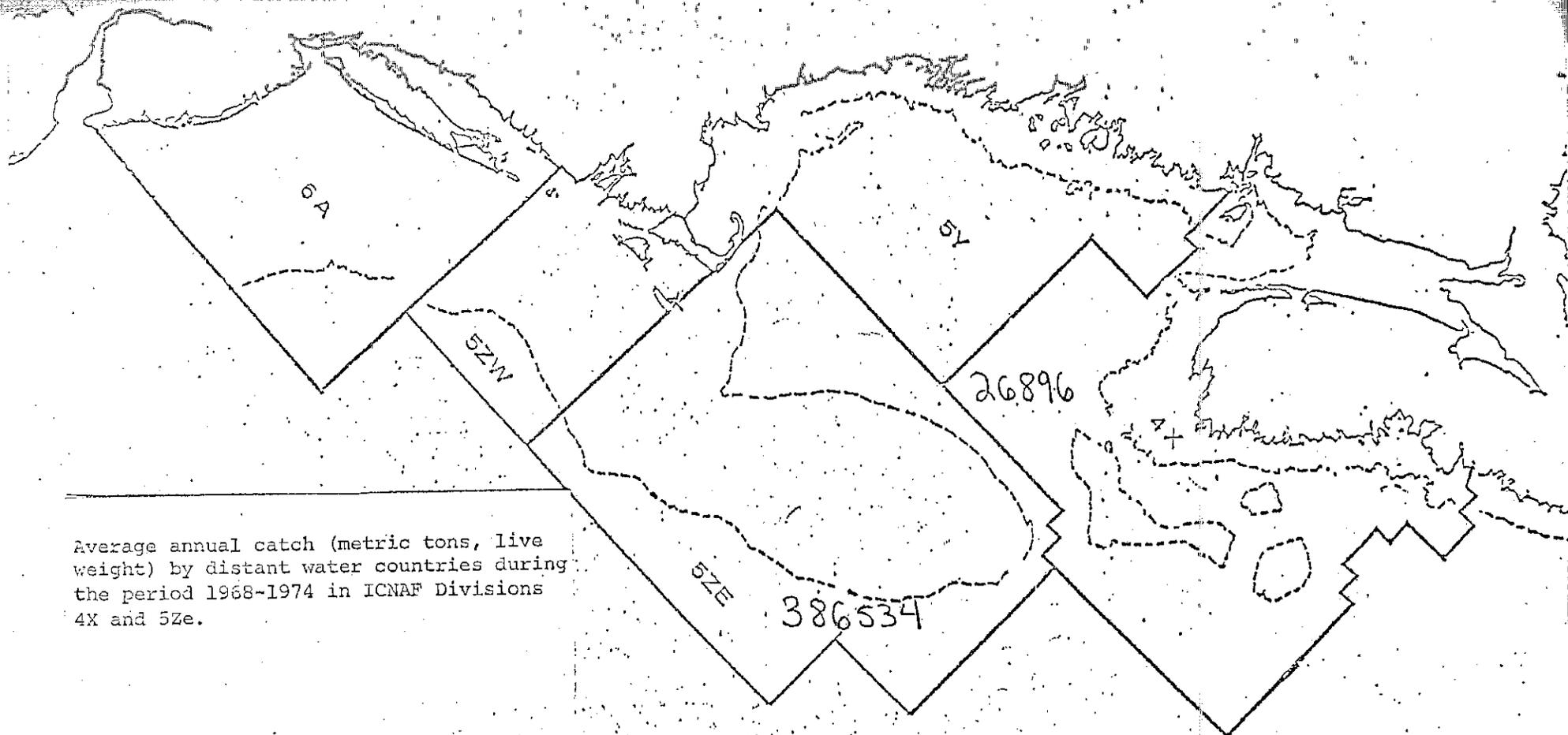
STATISTICAL AREAS
BOF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.



Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

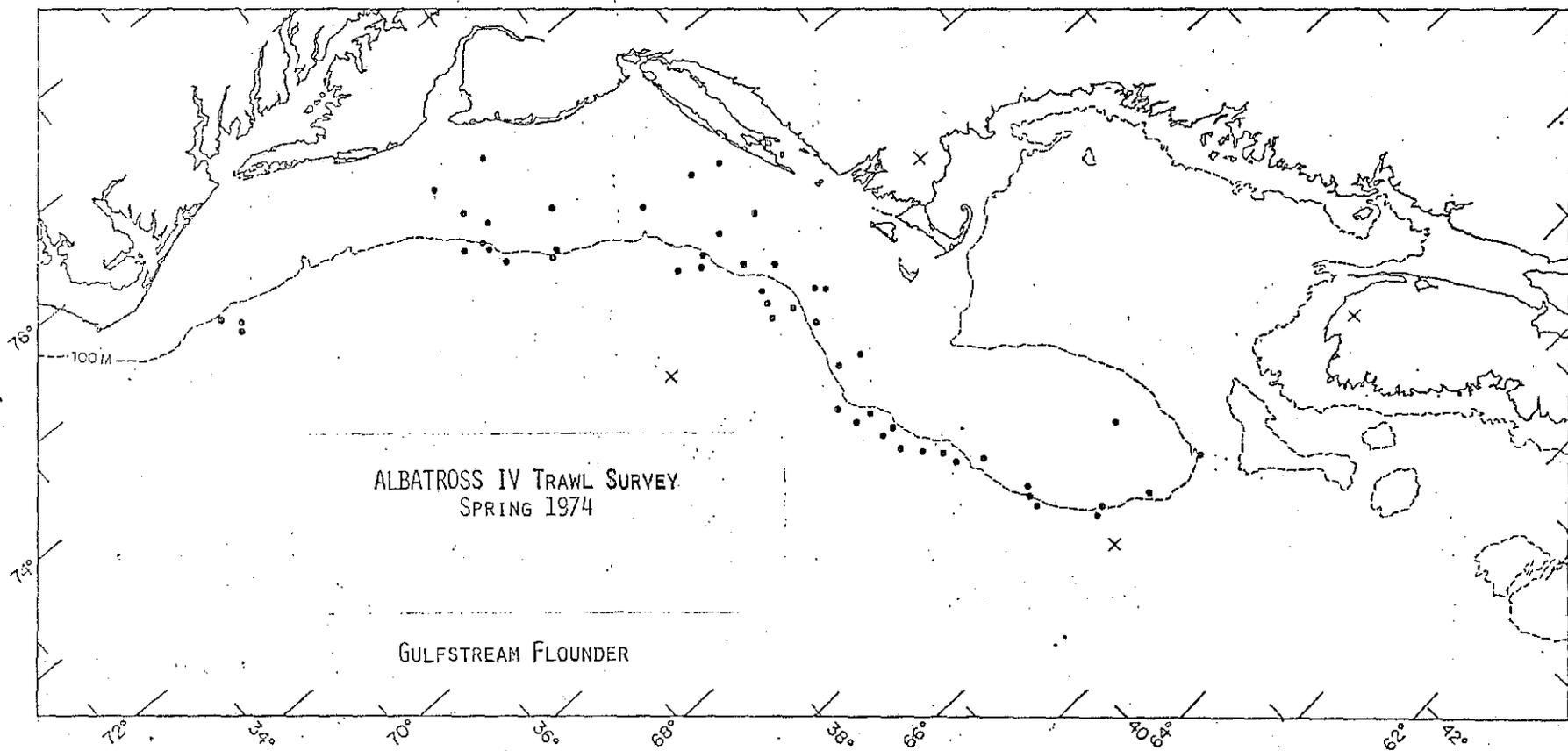
OTHER SPECIES

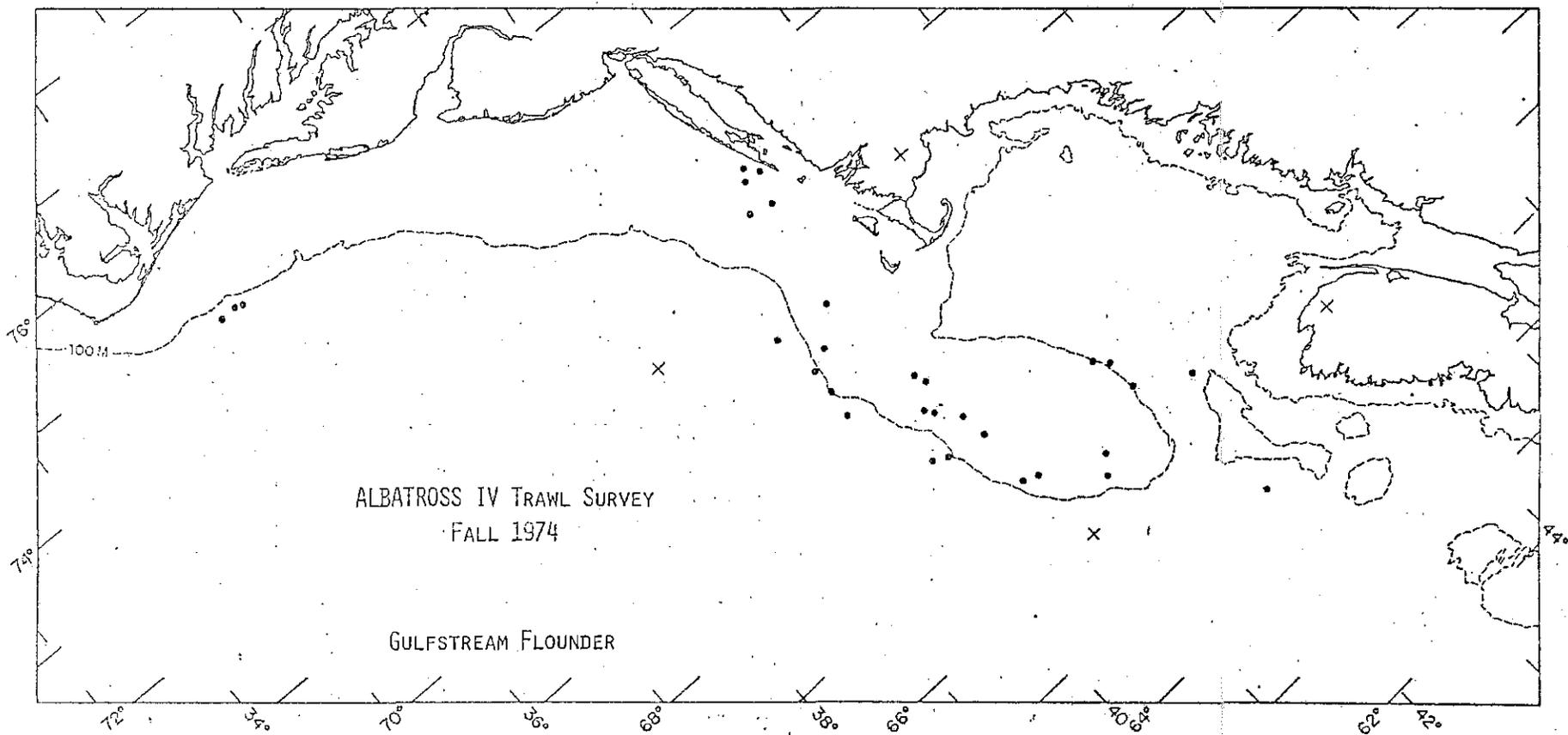
STATISTICAL SERIES
OF BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

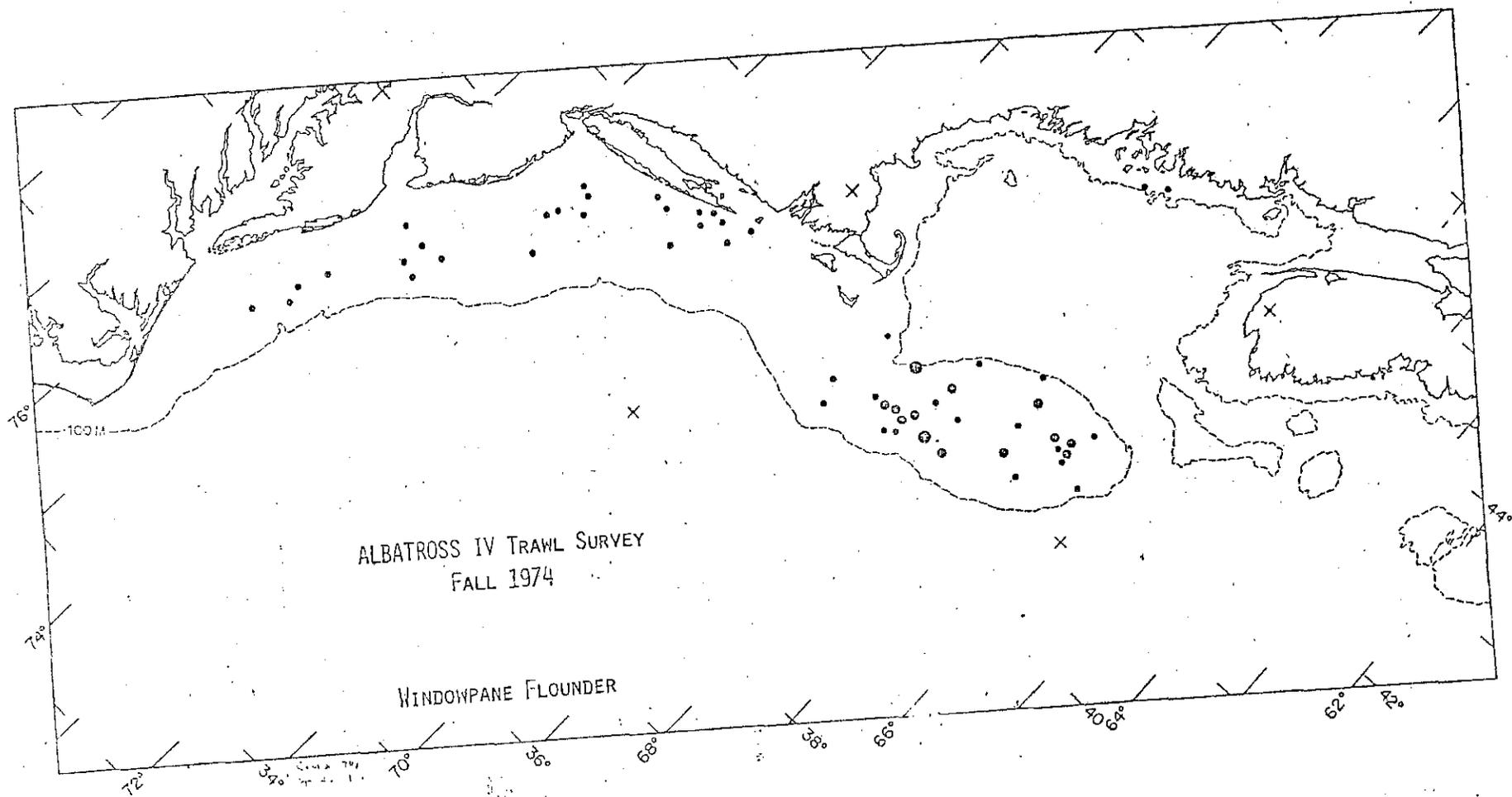


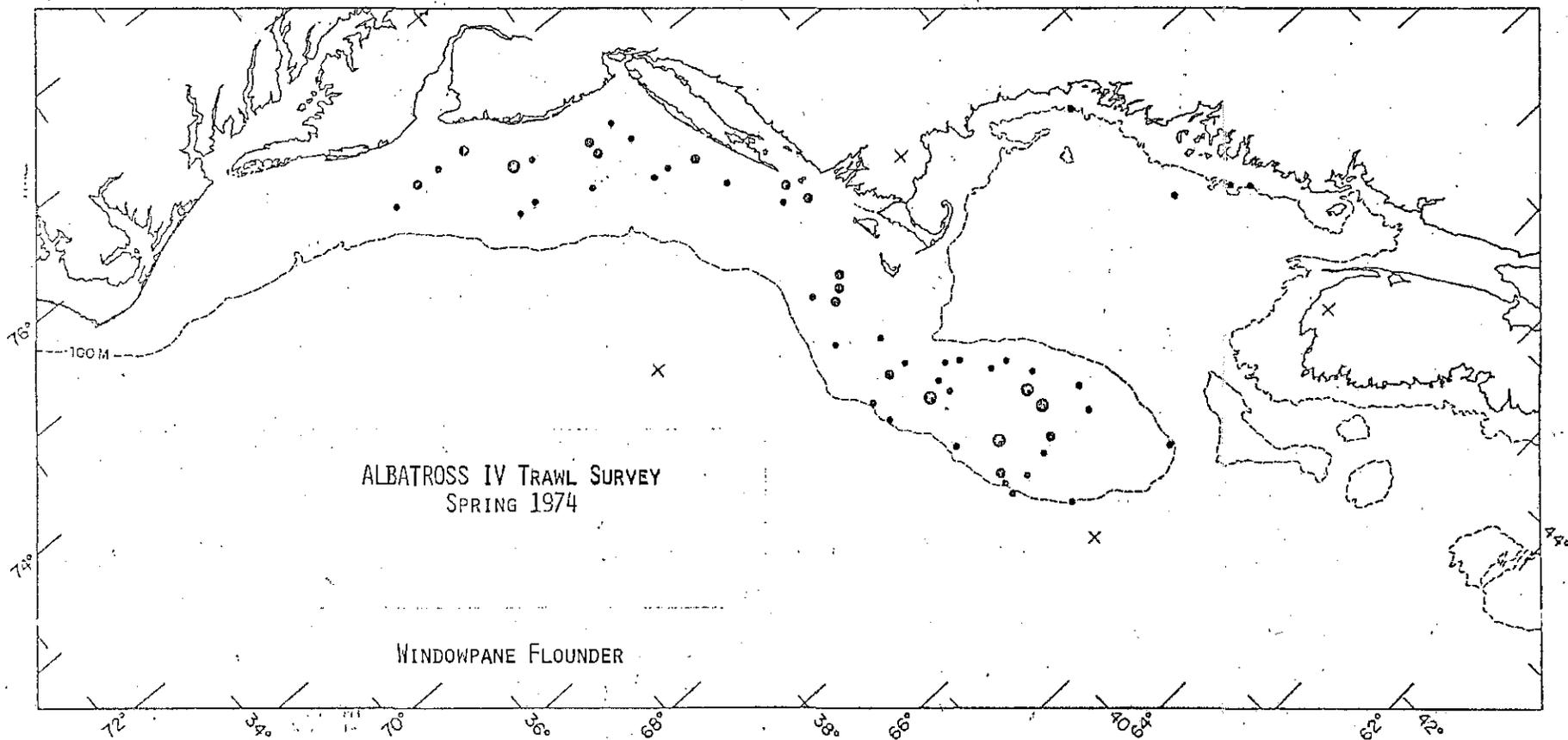
Average annual catch (metric tons, live weight) by distant water countries during the period 1968-1974 in ICNAF Divisions 4X and 5Ze.

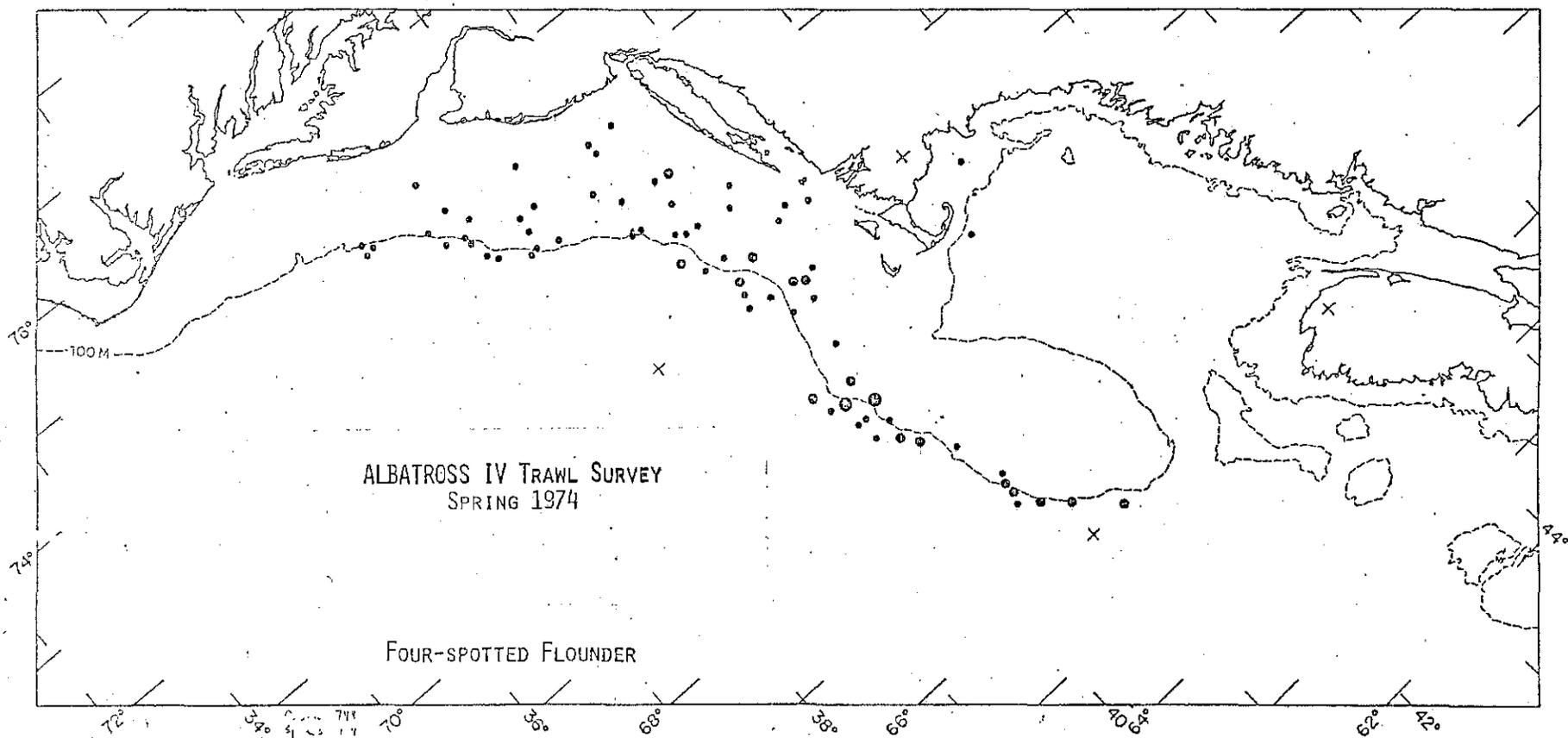
ALL SPECIES

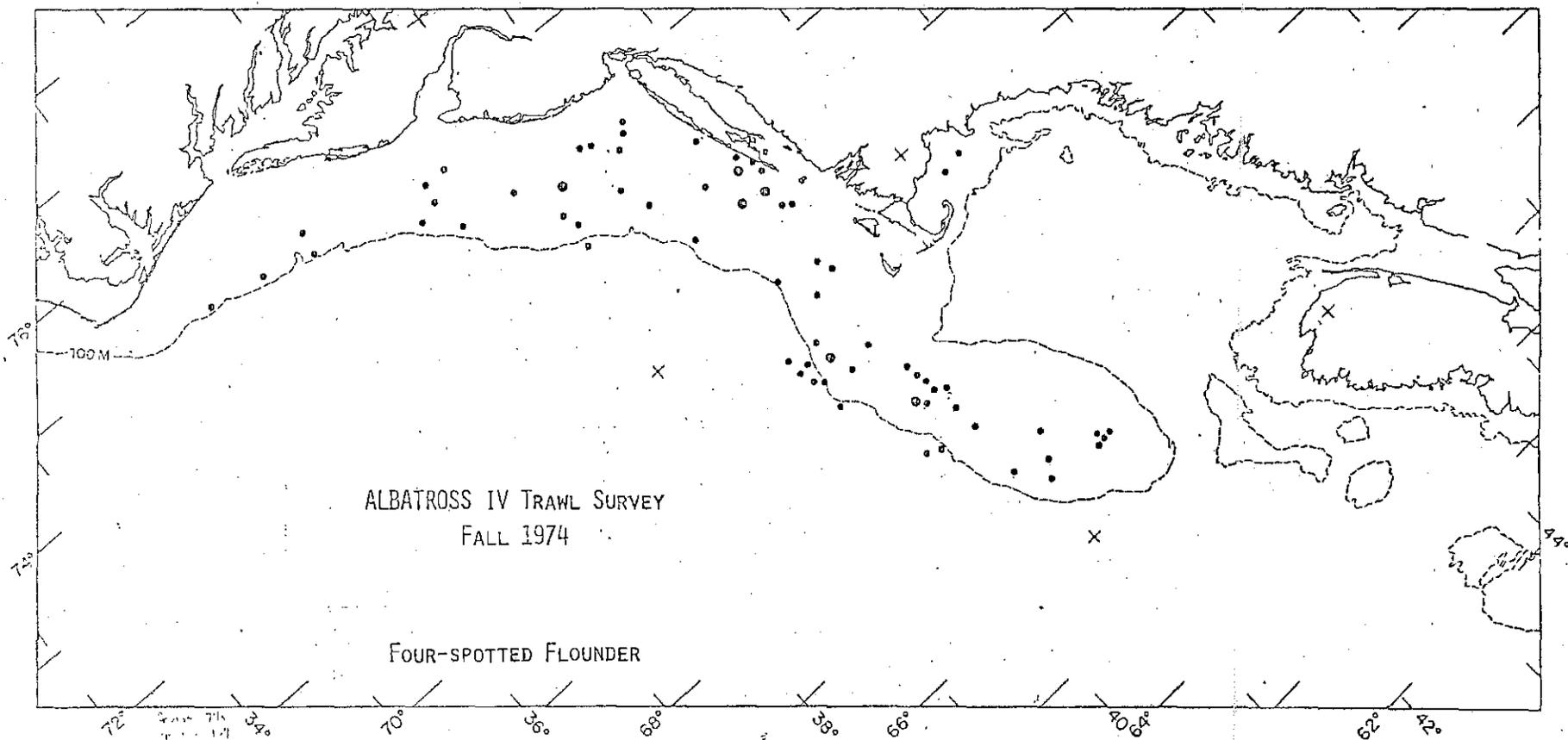


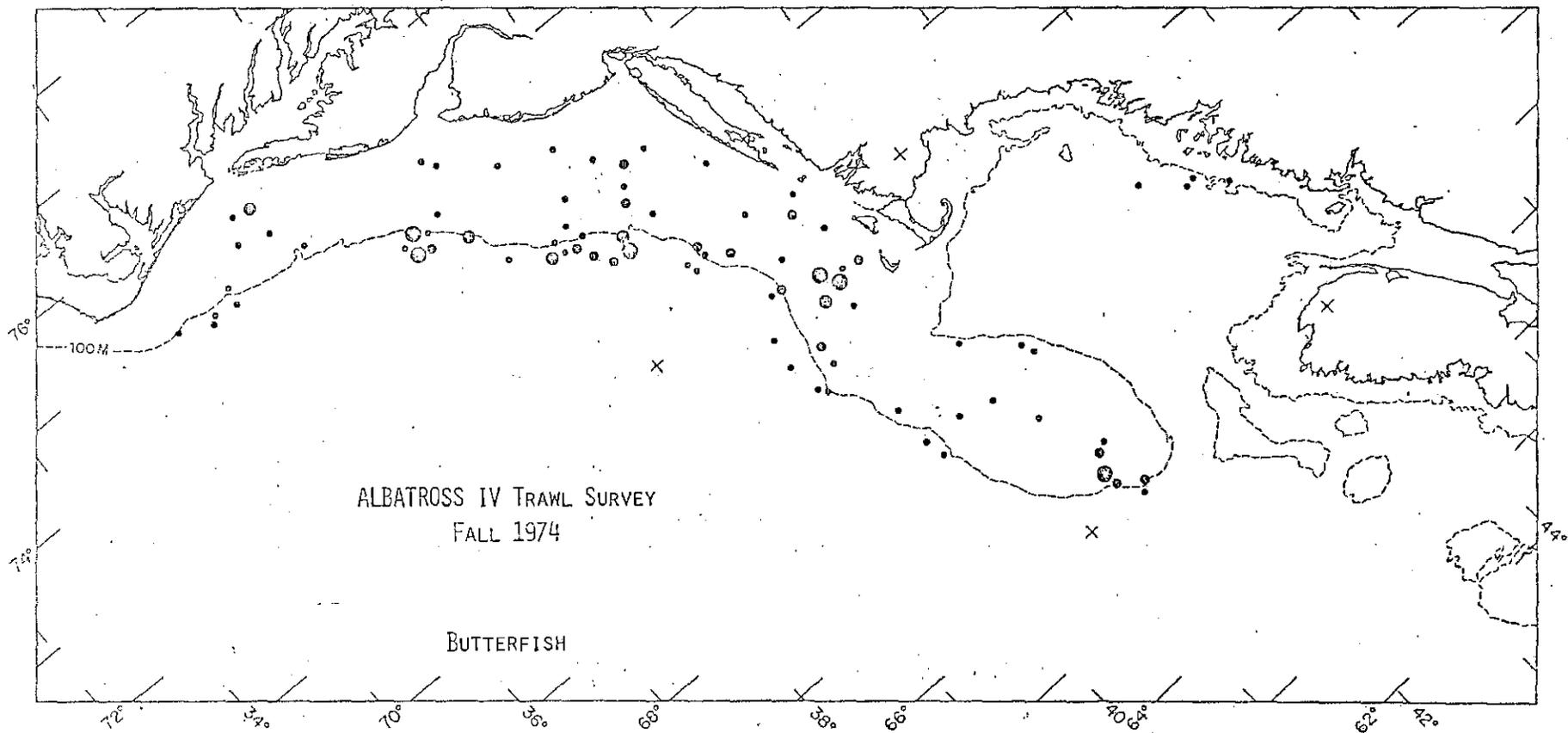




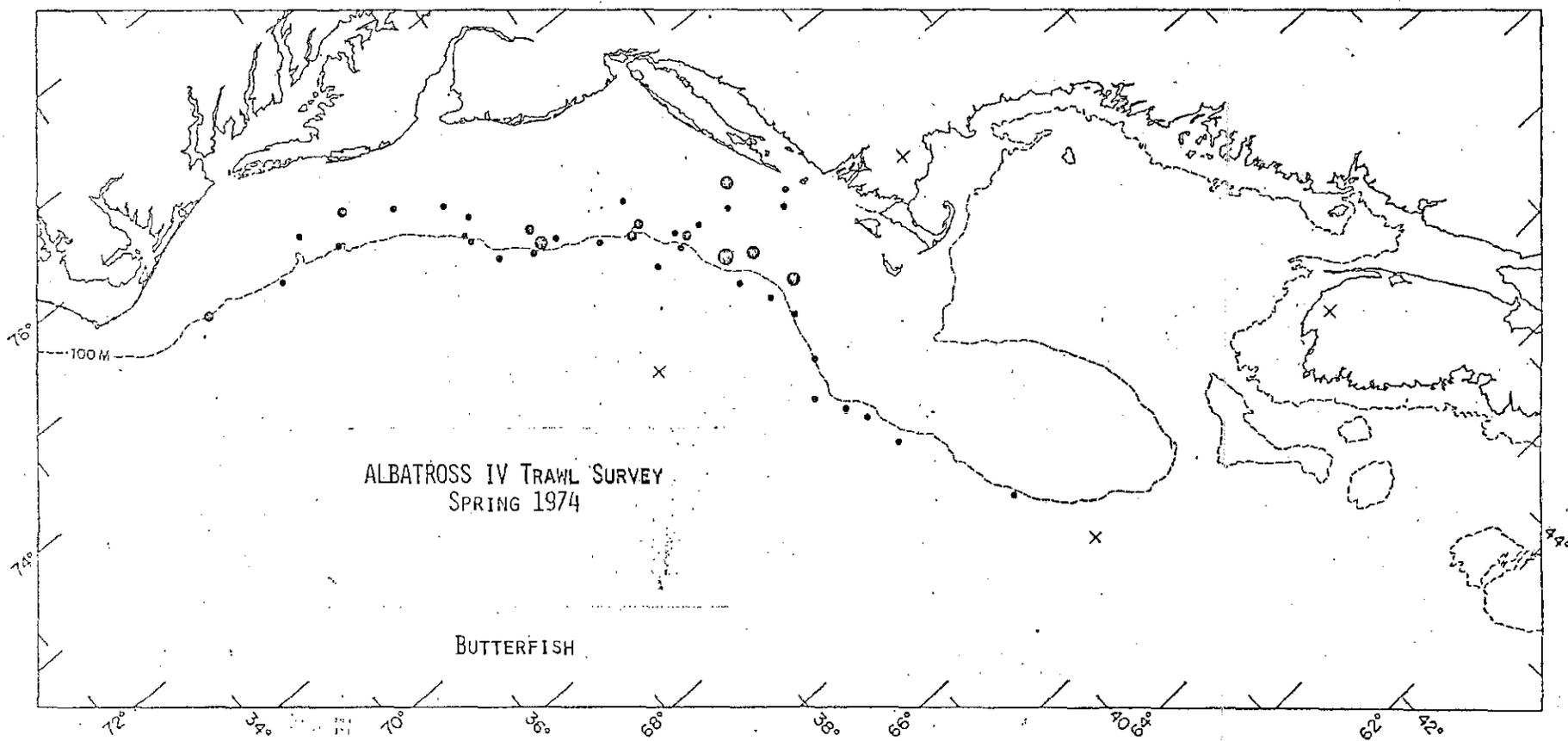


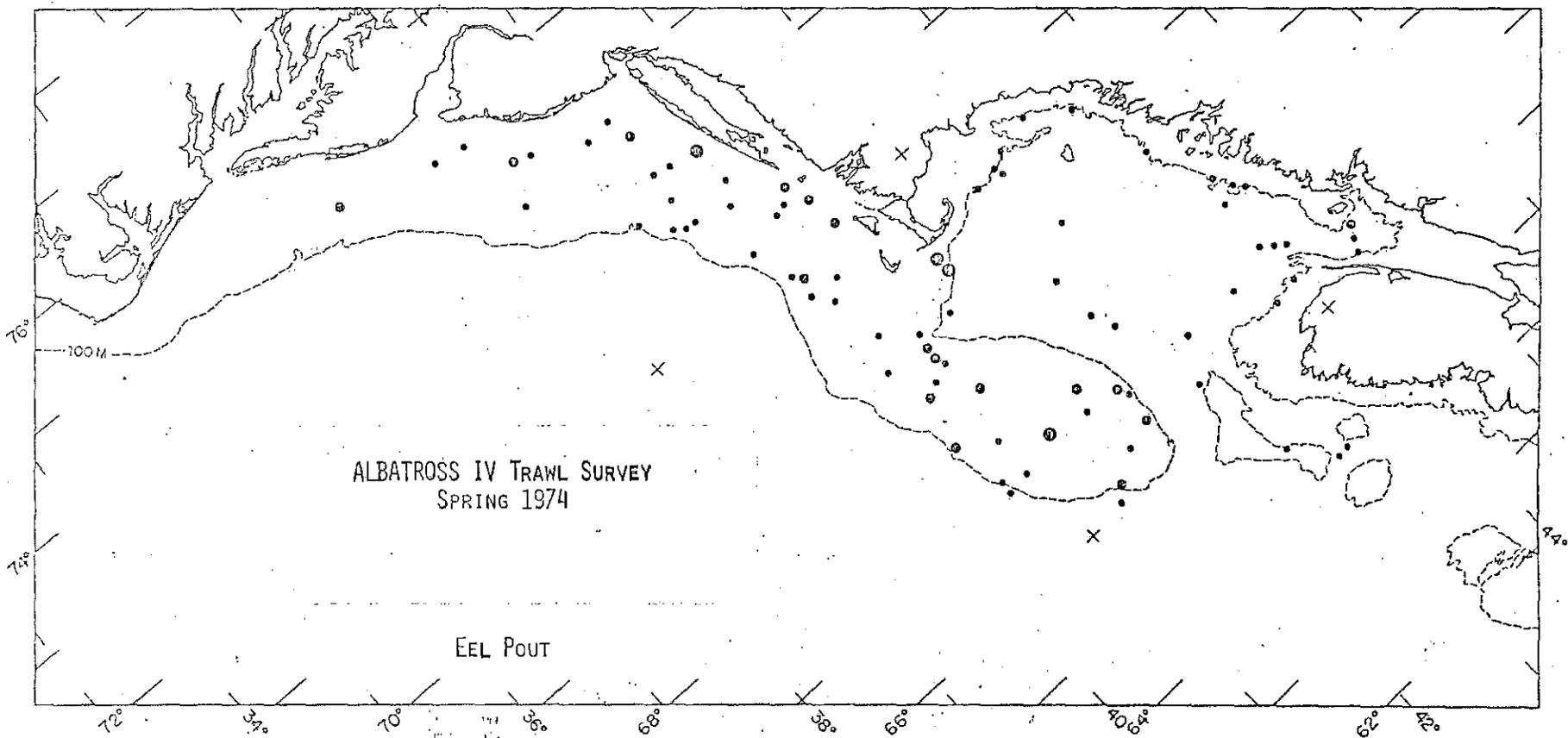


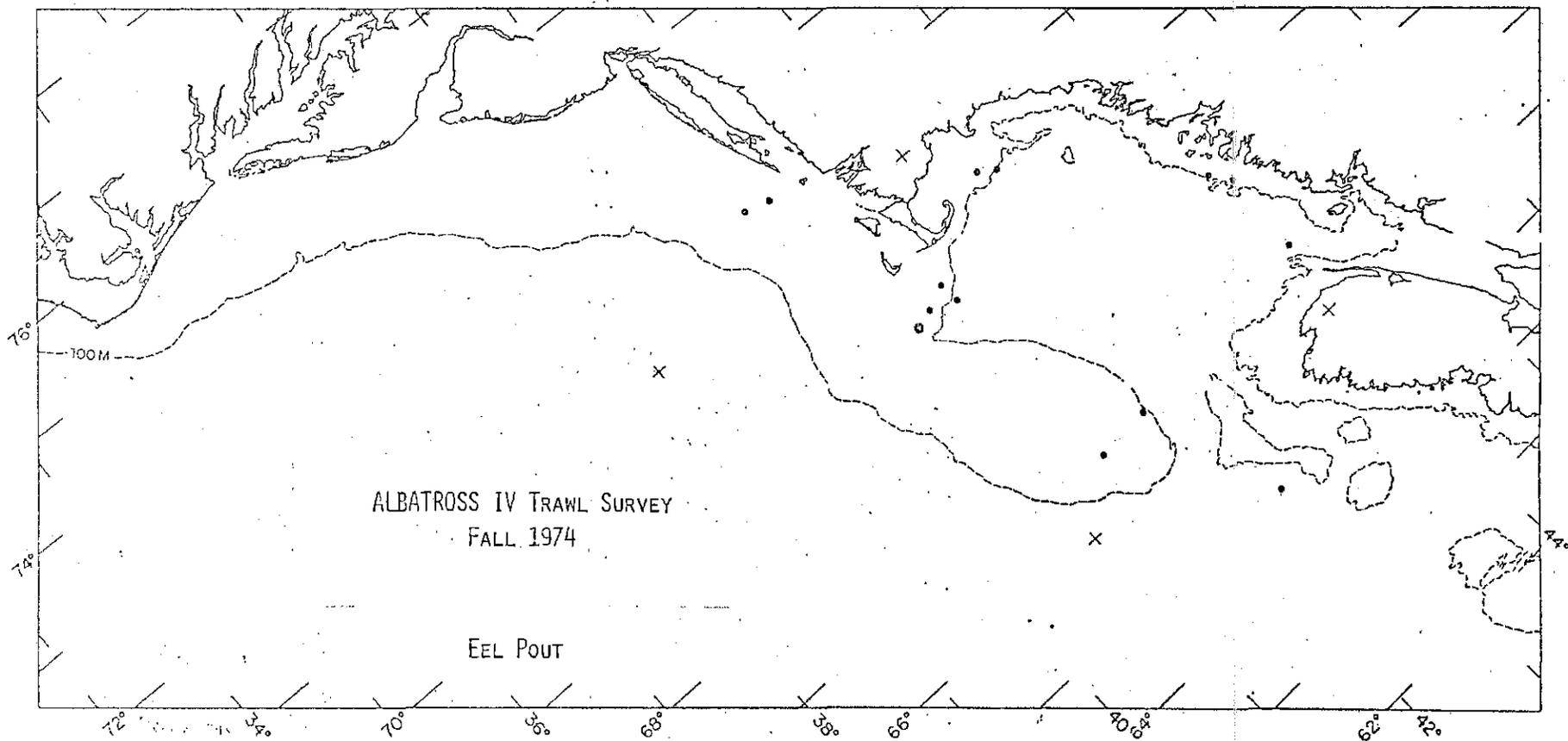


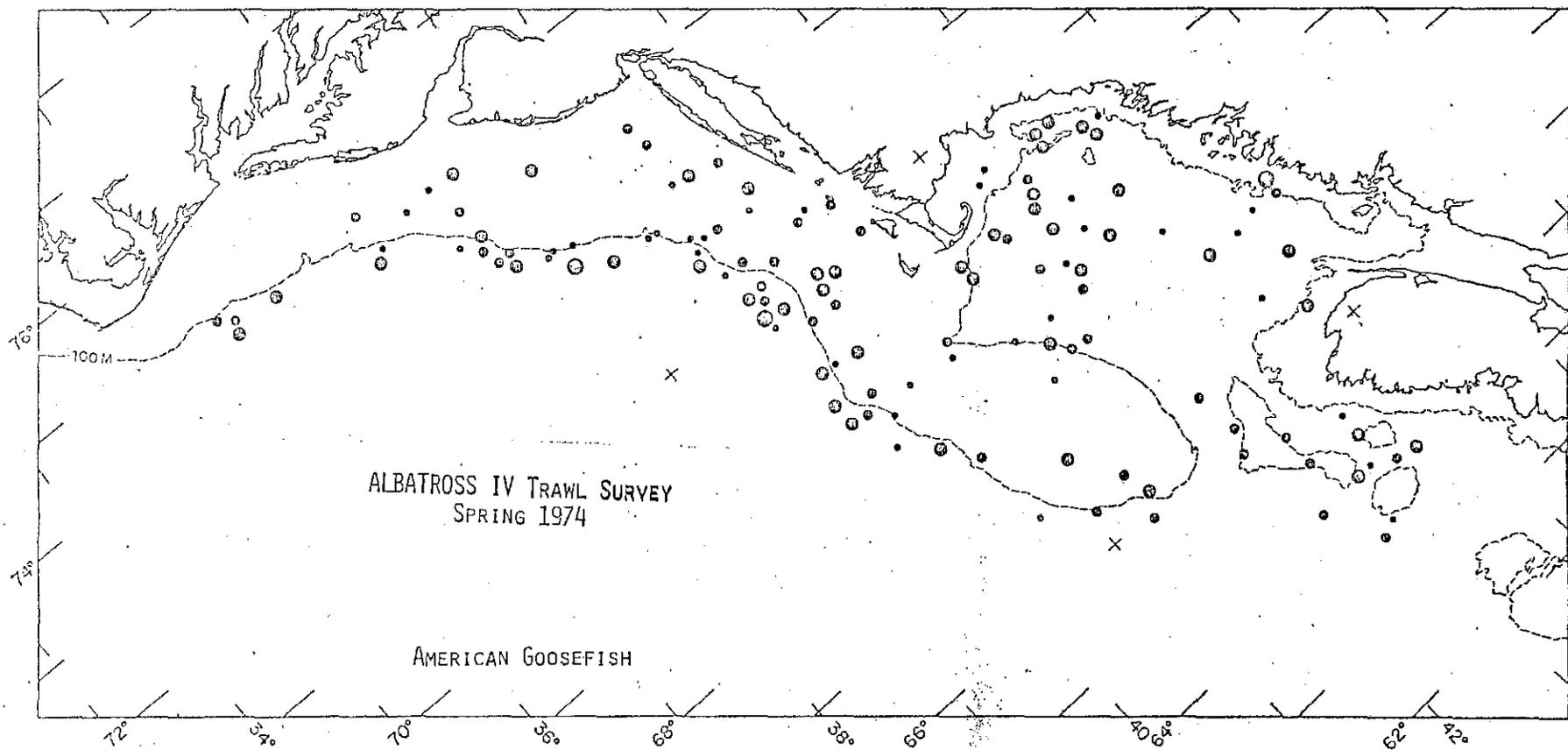


Albatross IV Trawl Survey

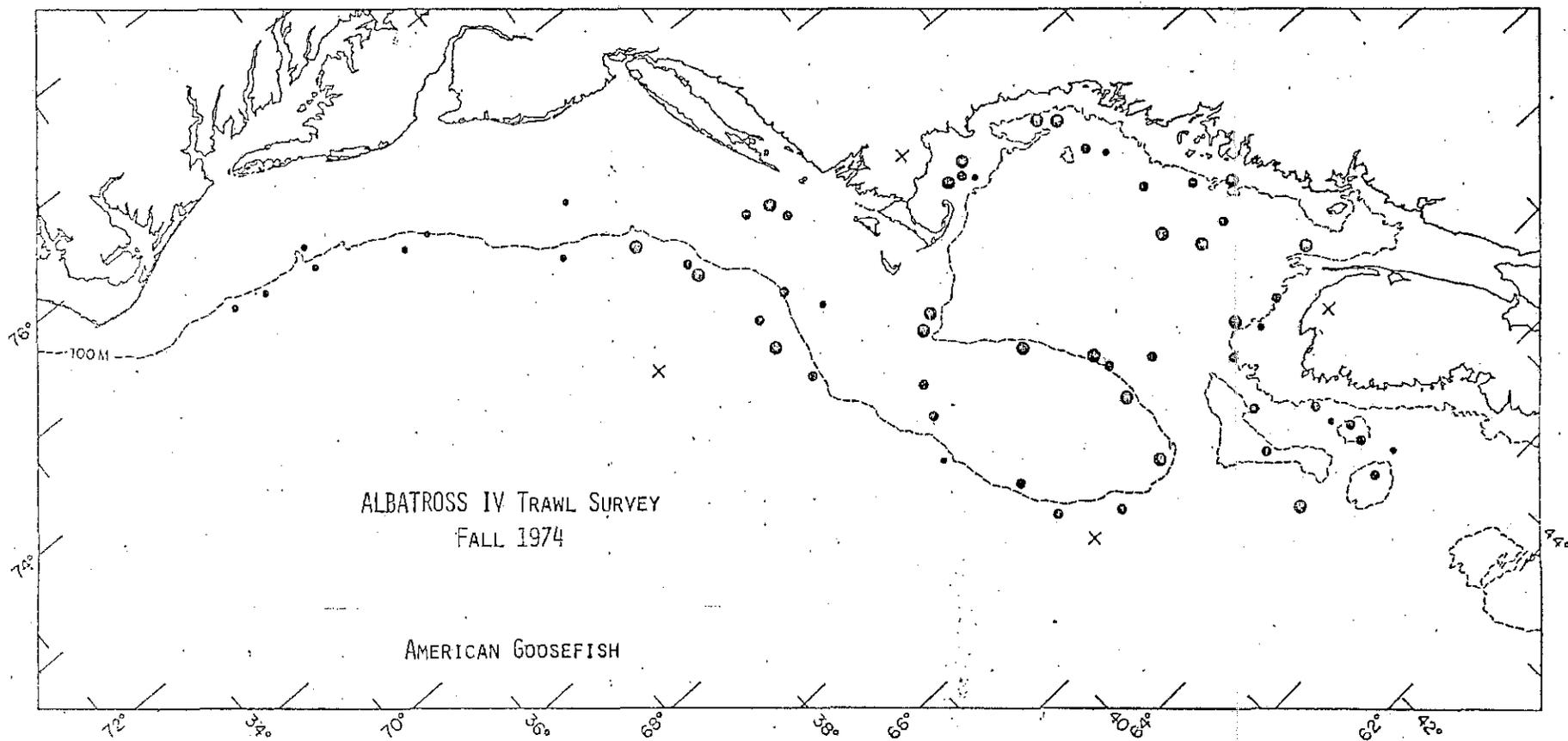


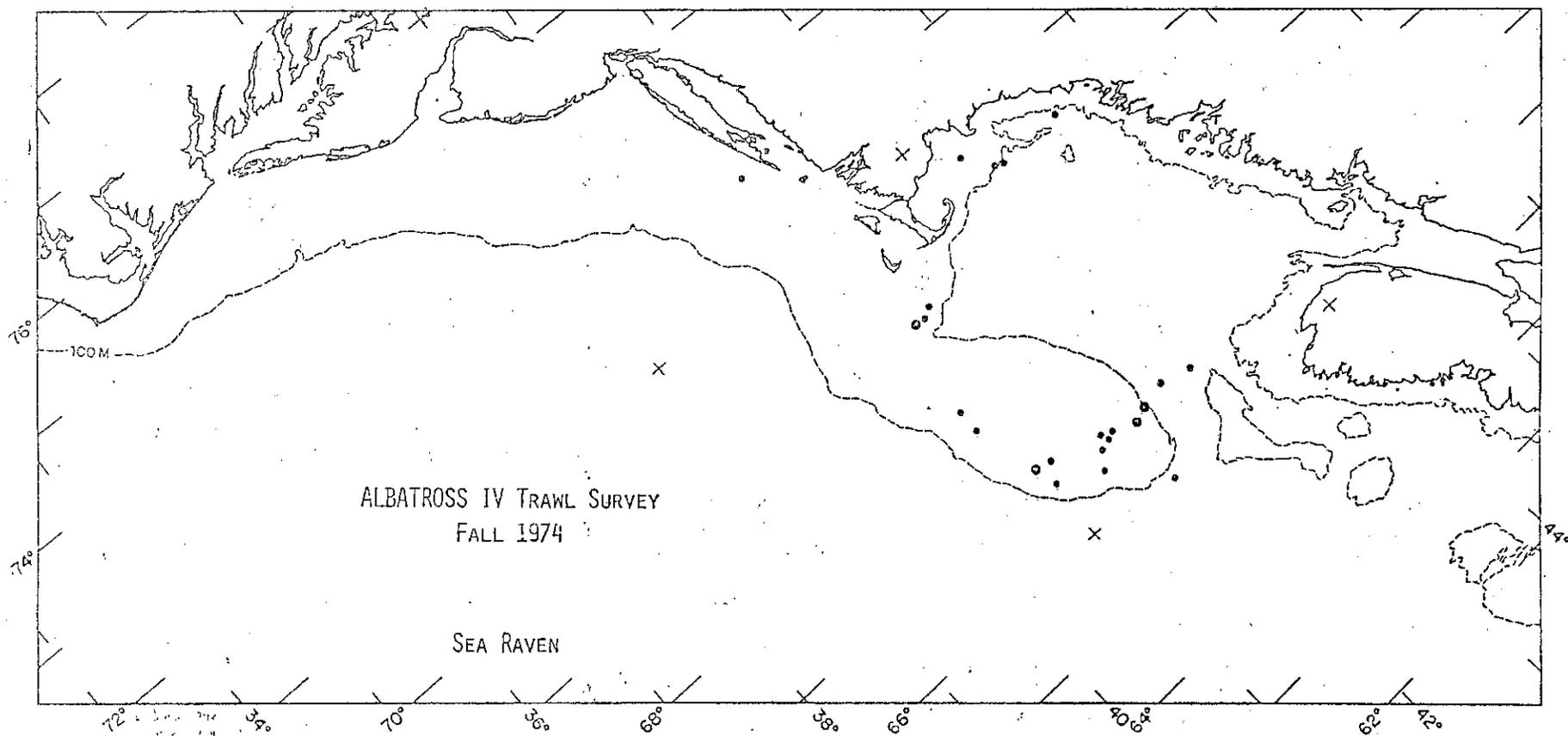


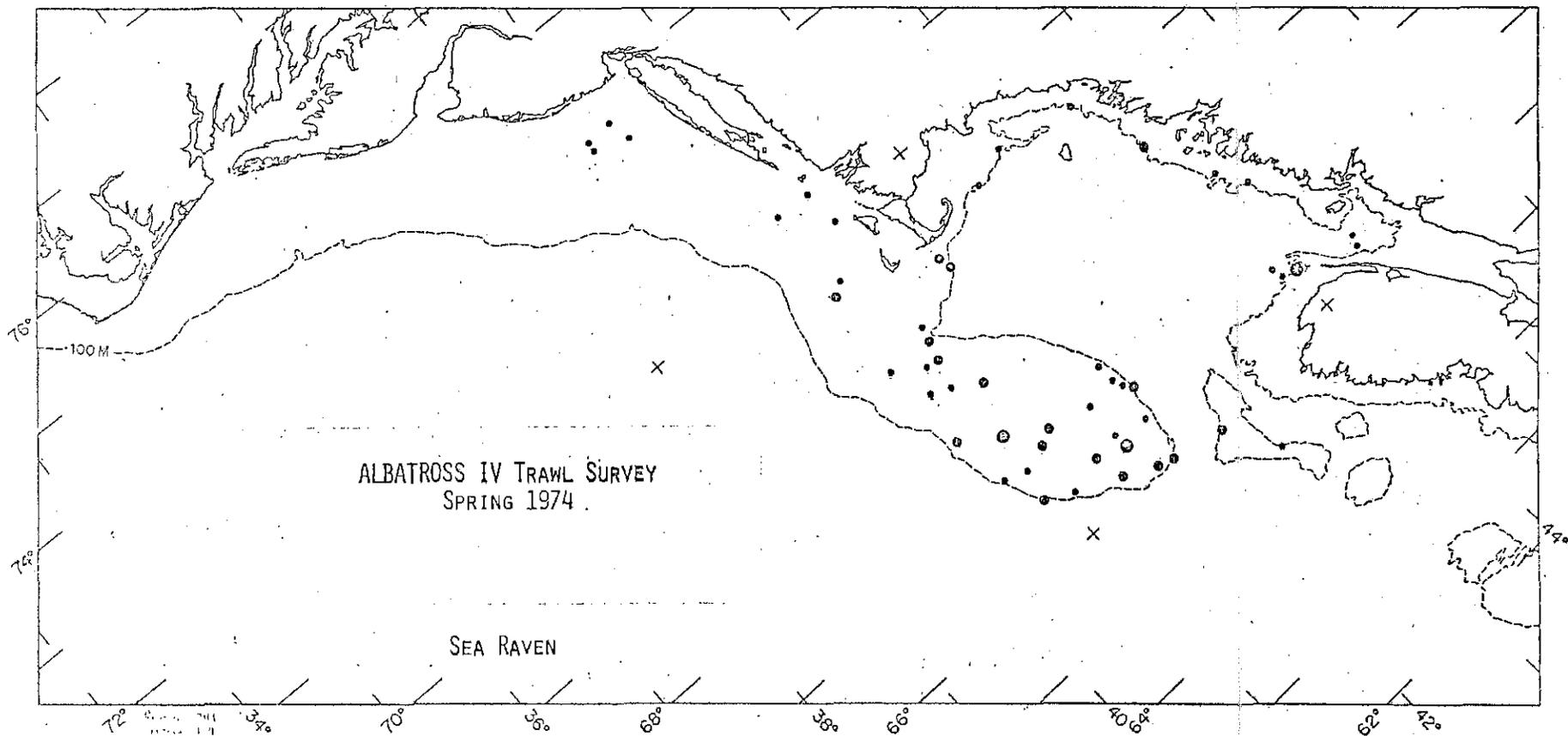


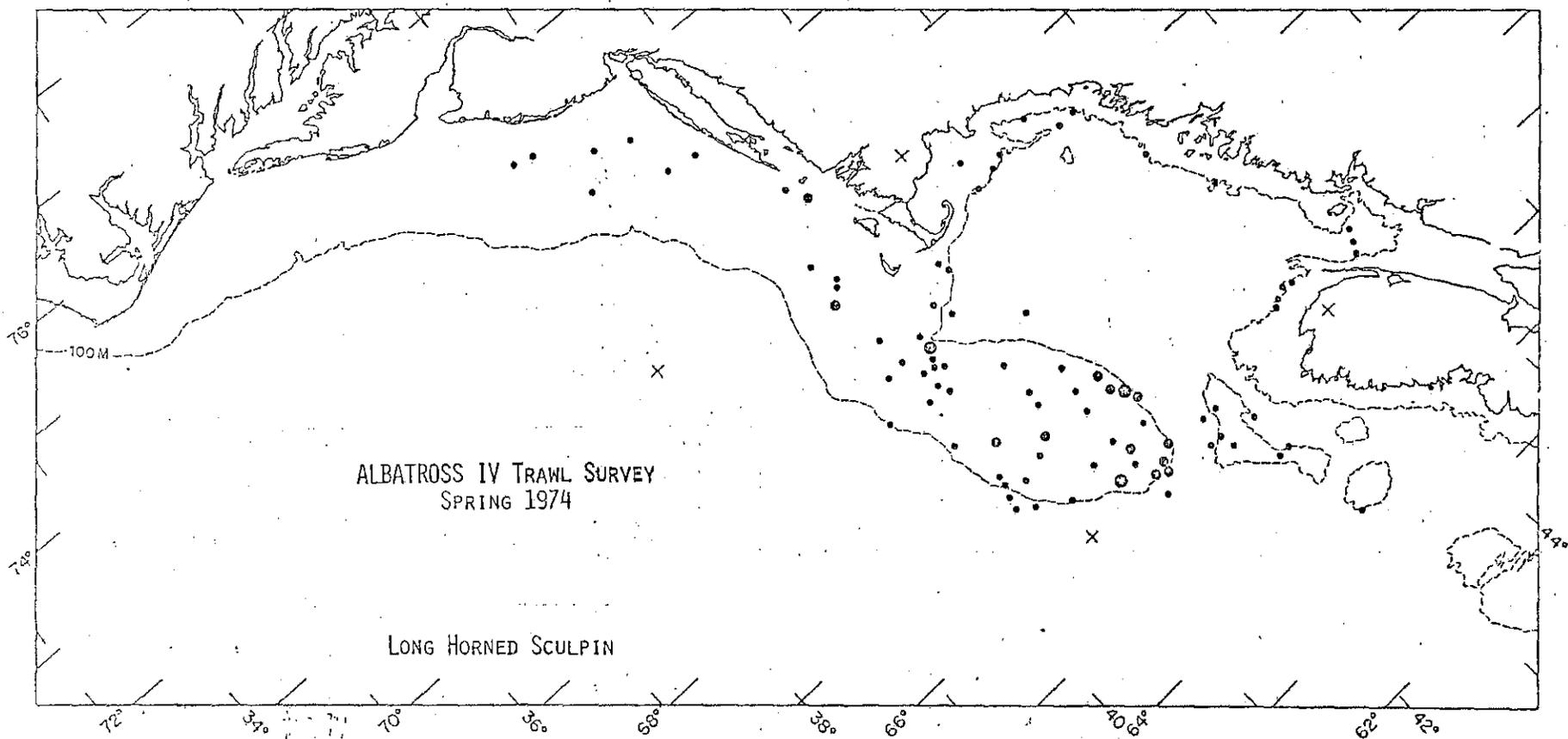


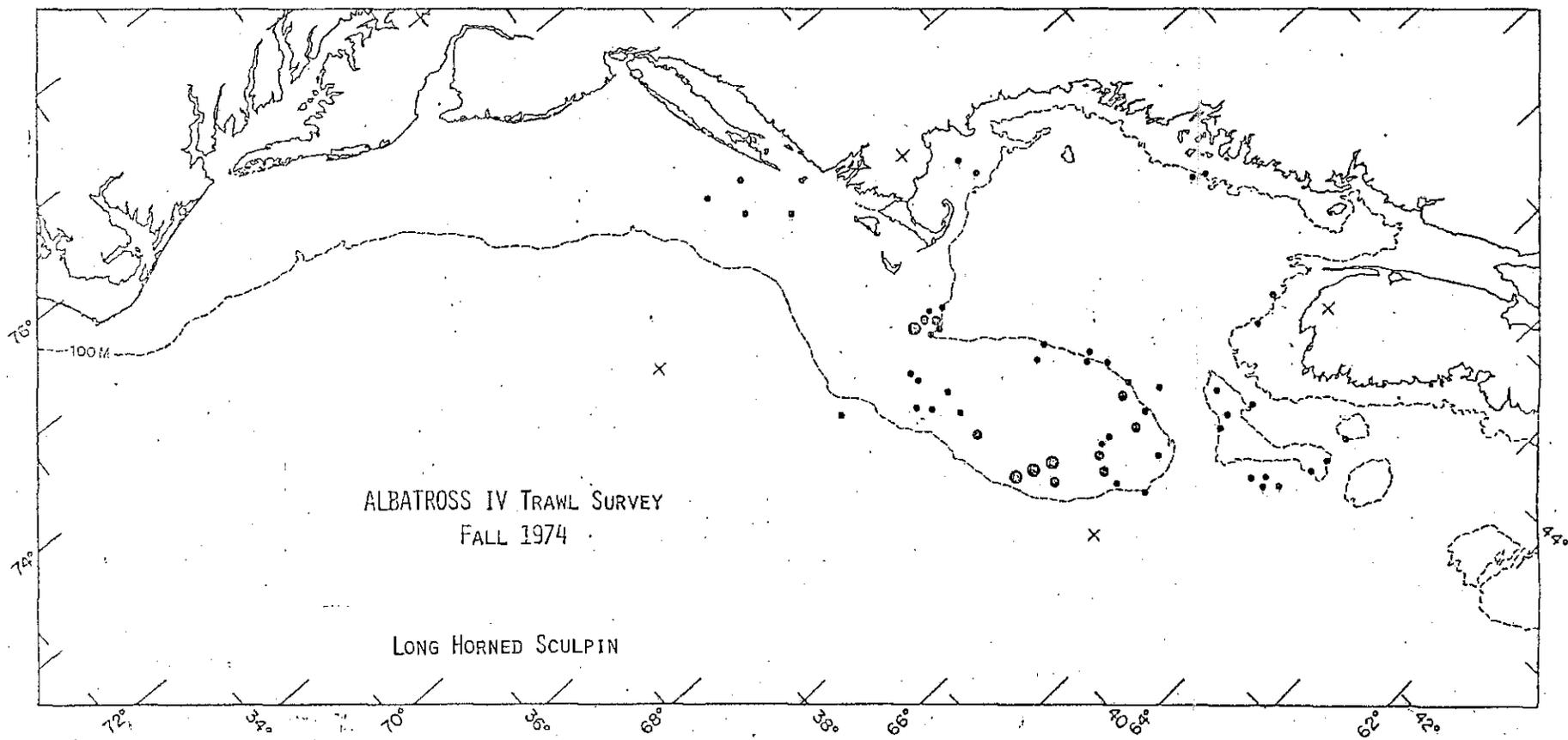
ALBATROSS IV Cruise Log Sheets 147
148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200

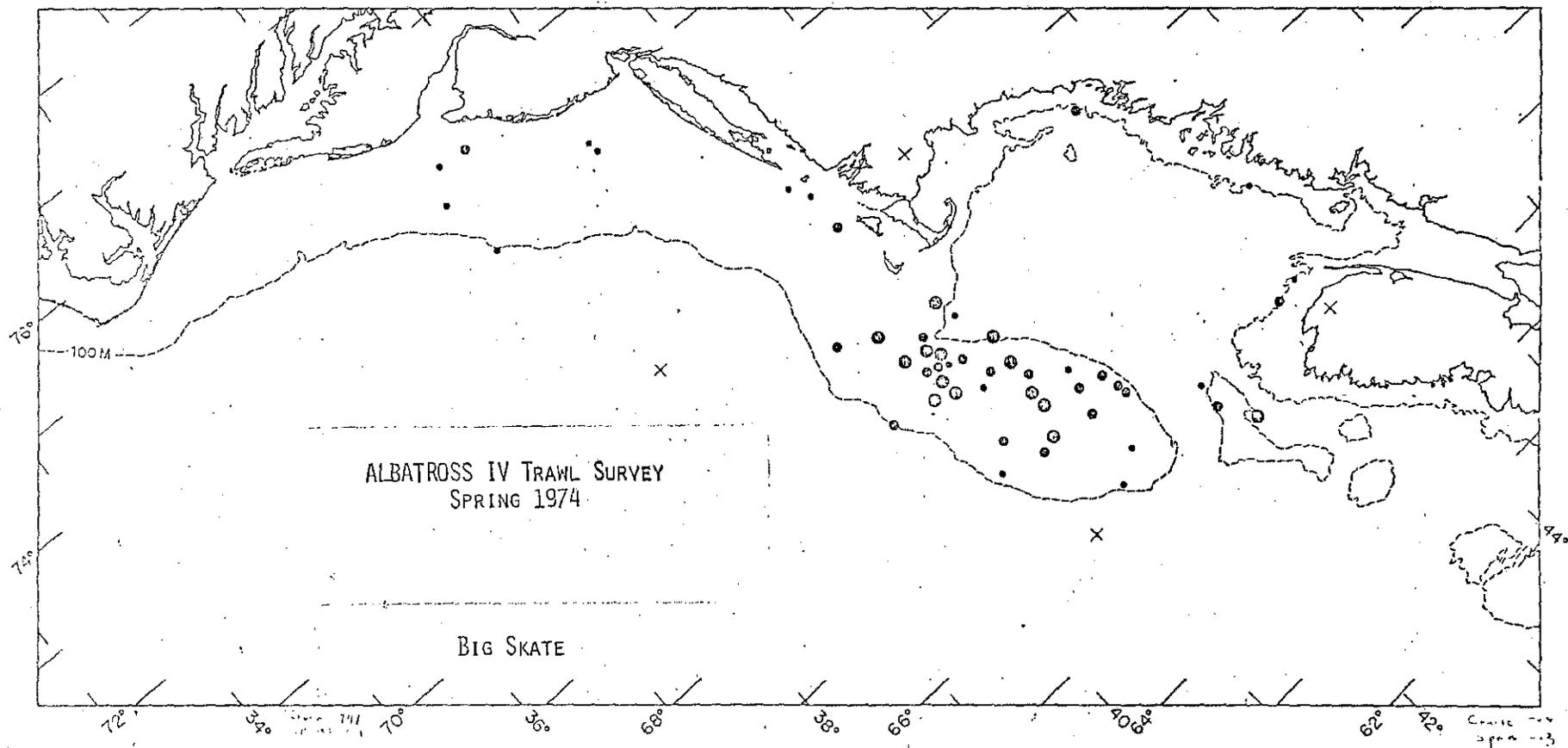


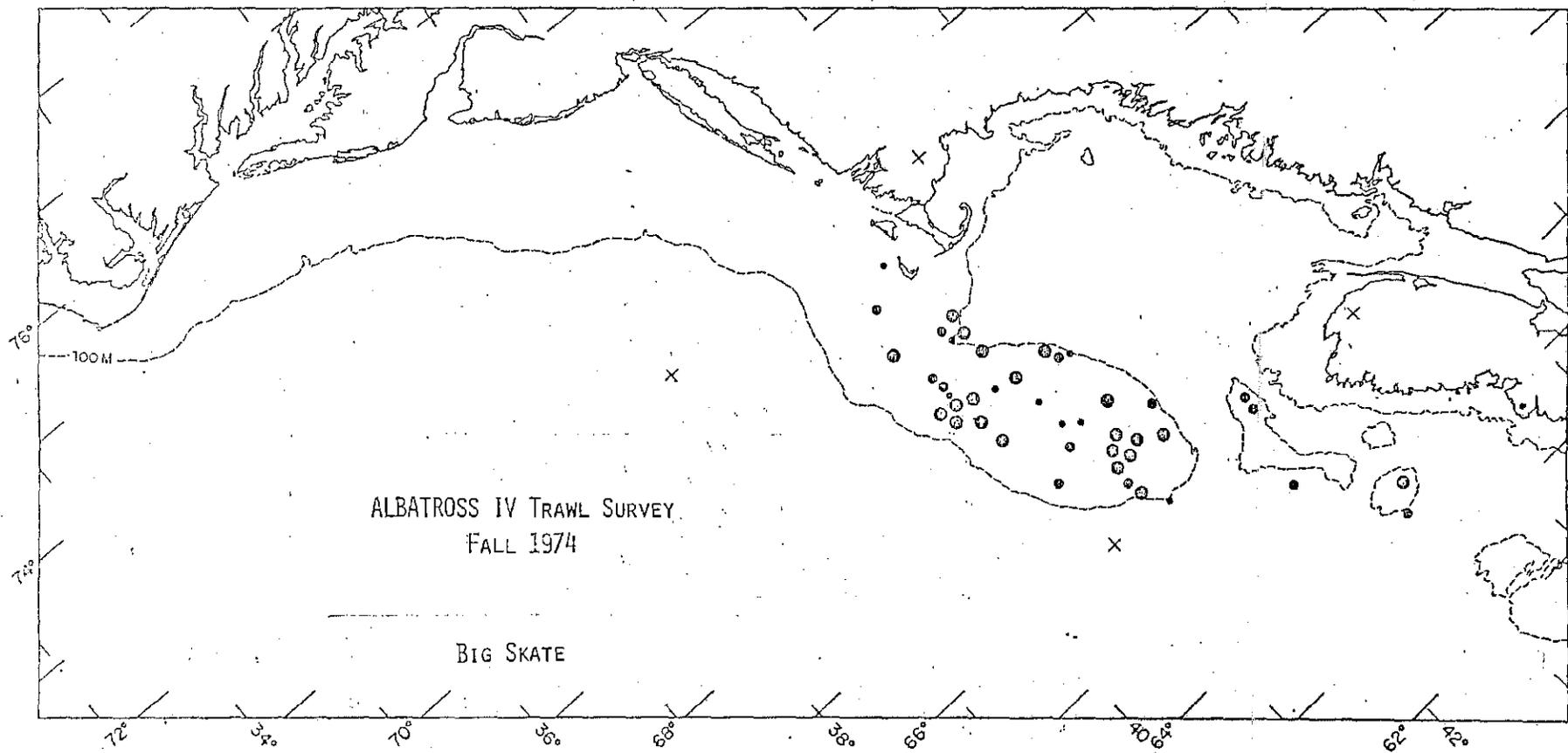




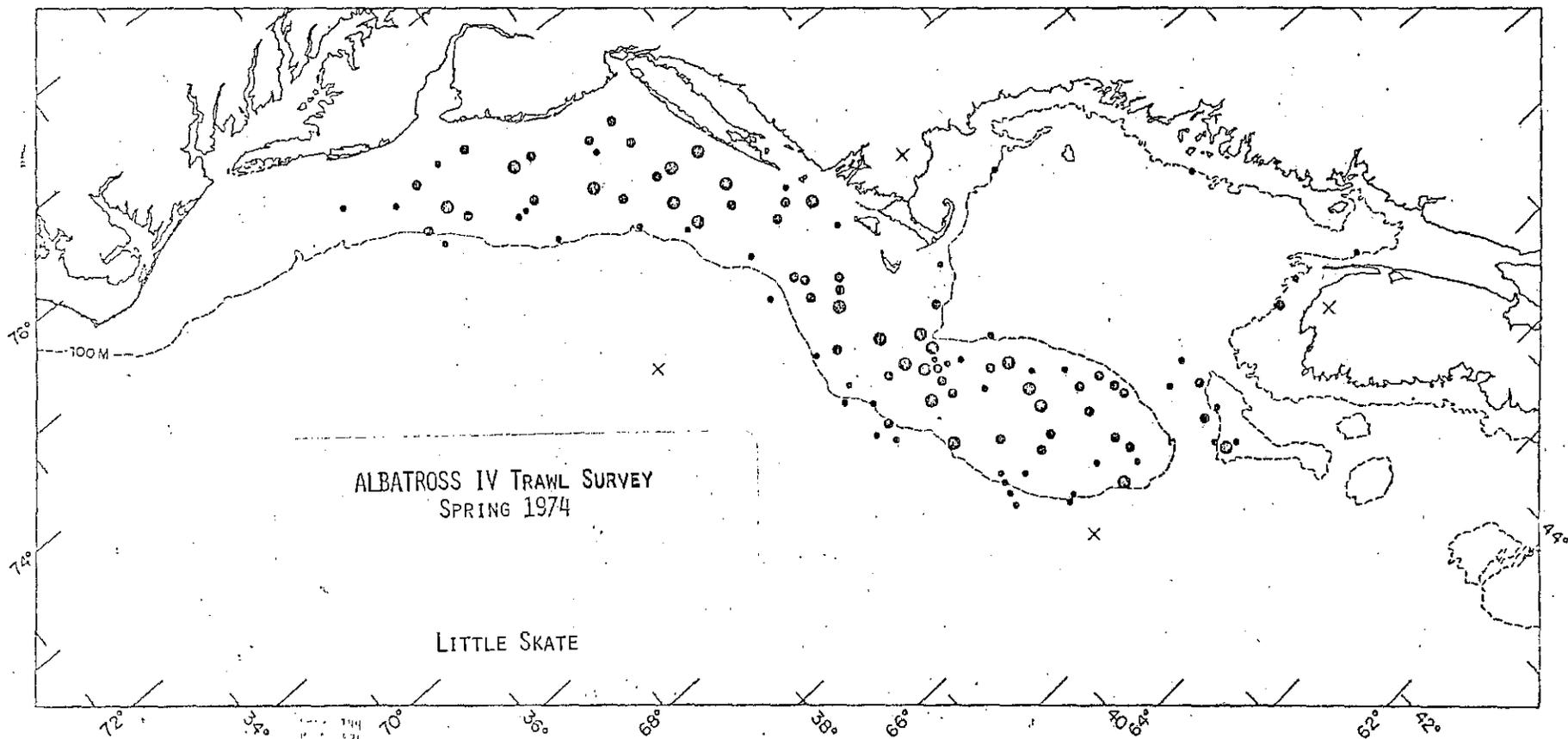


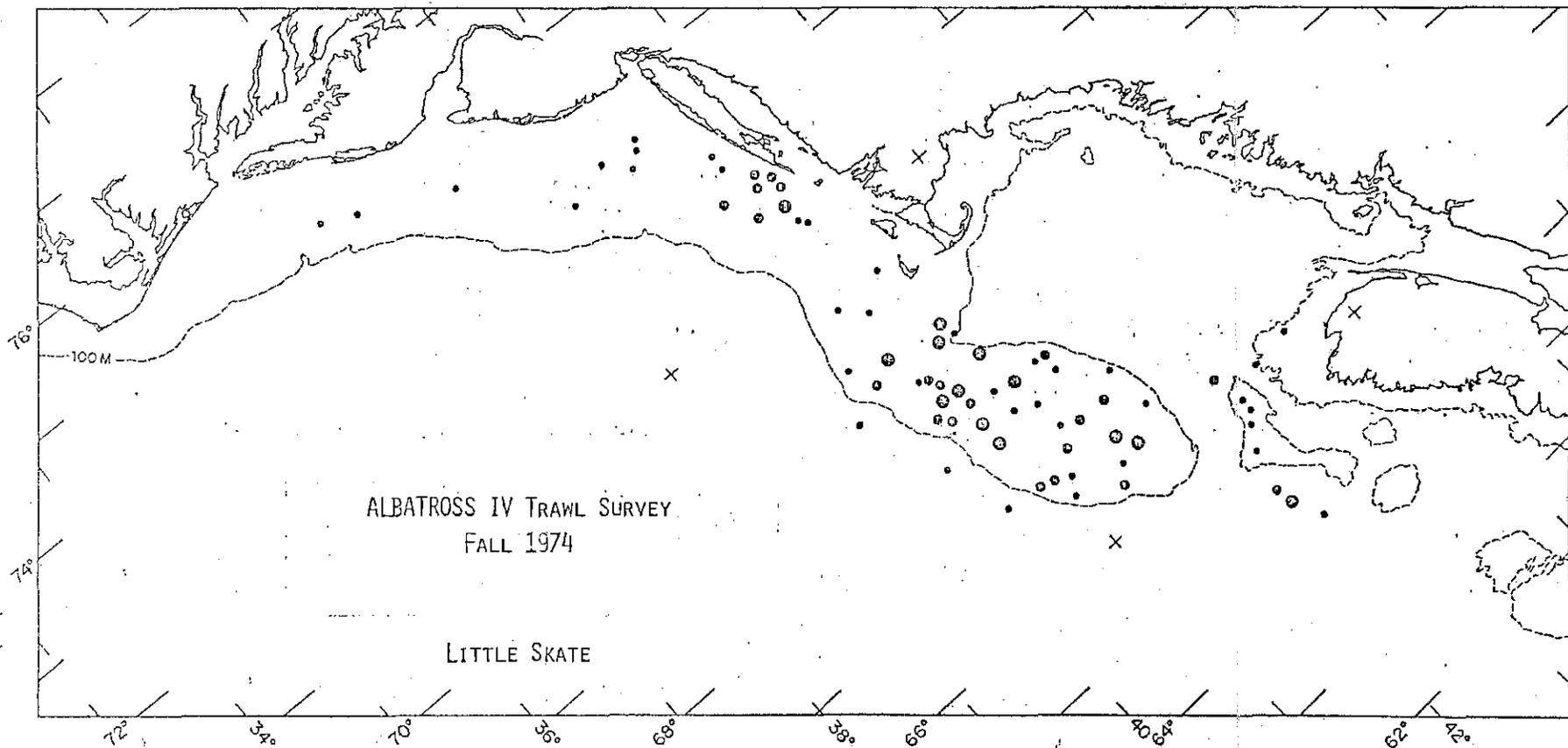






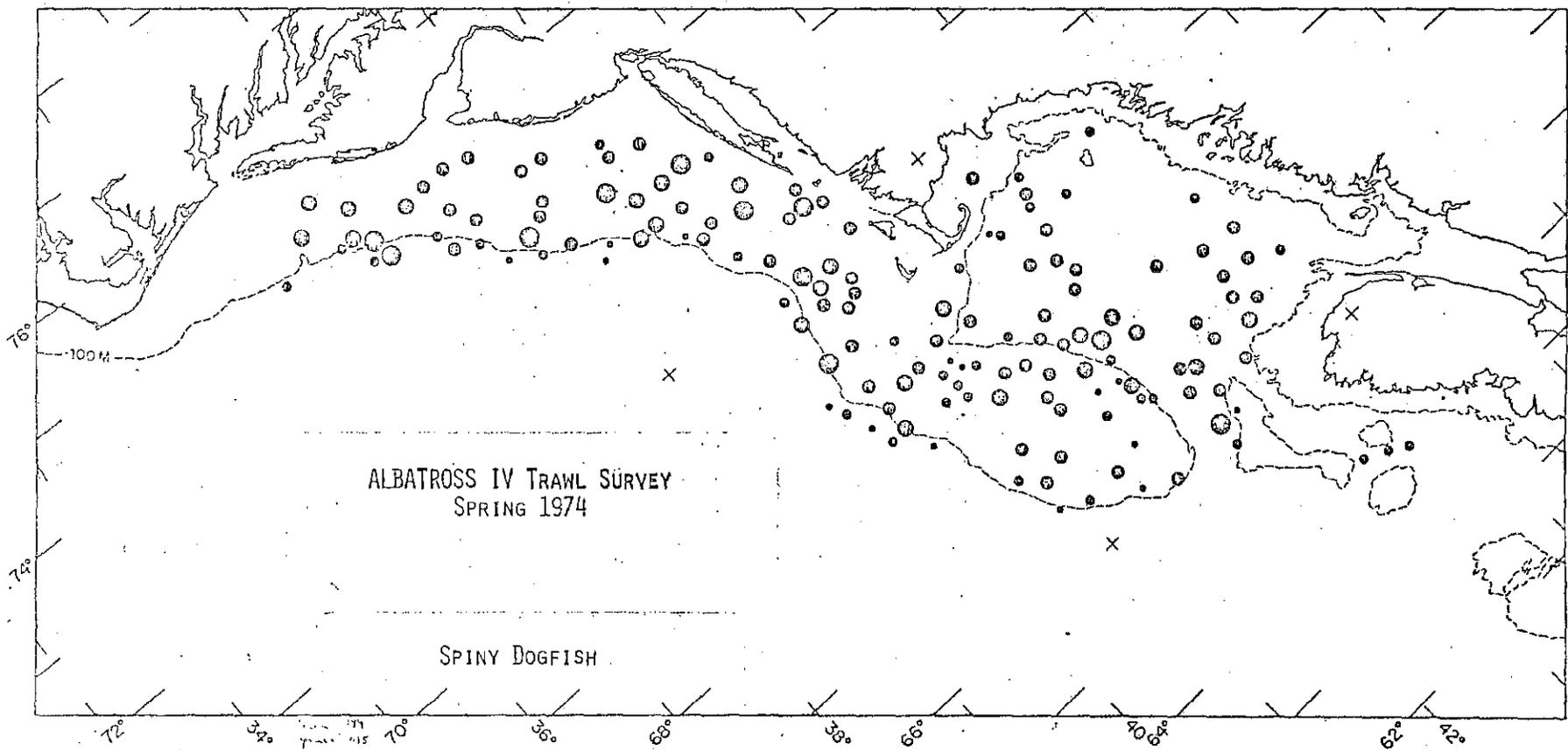
Locations of Skate Trawl Surveys 1974

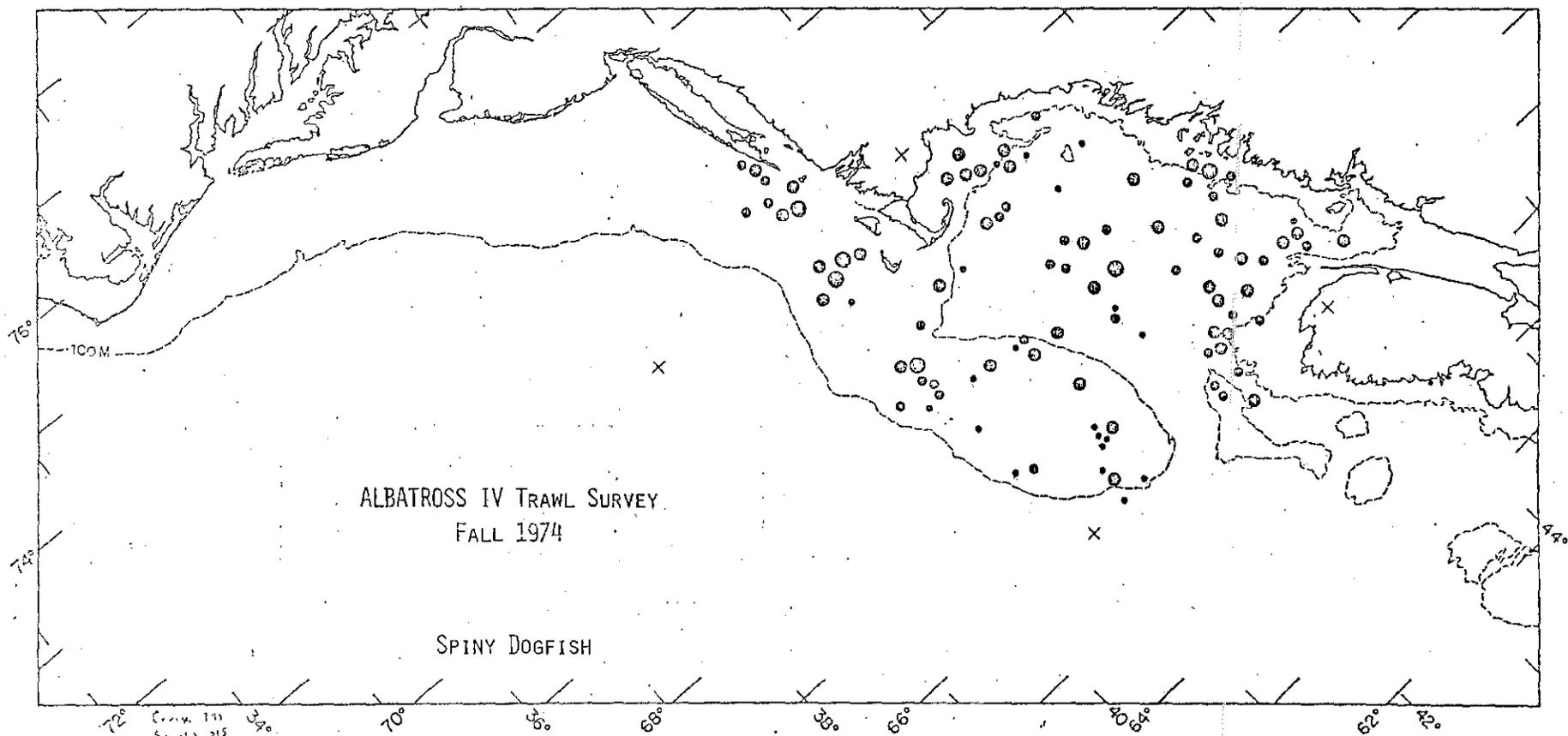


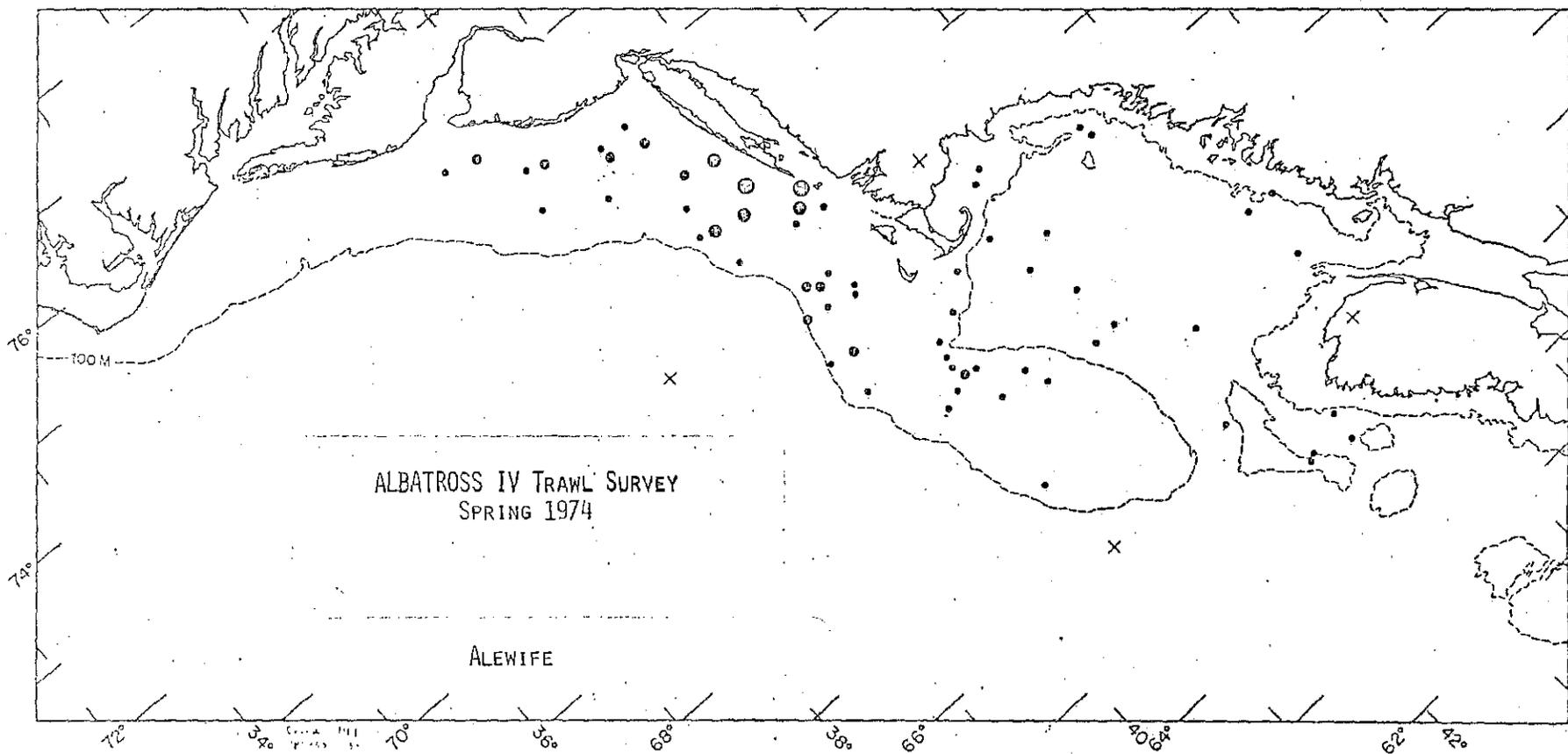


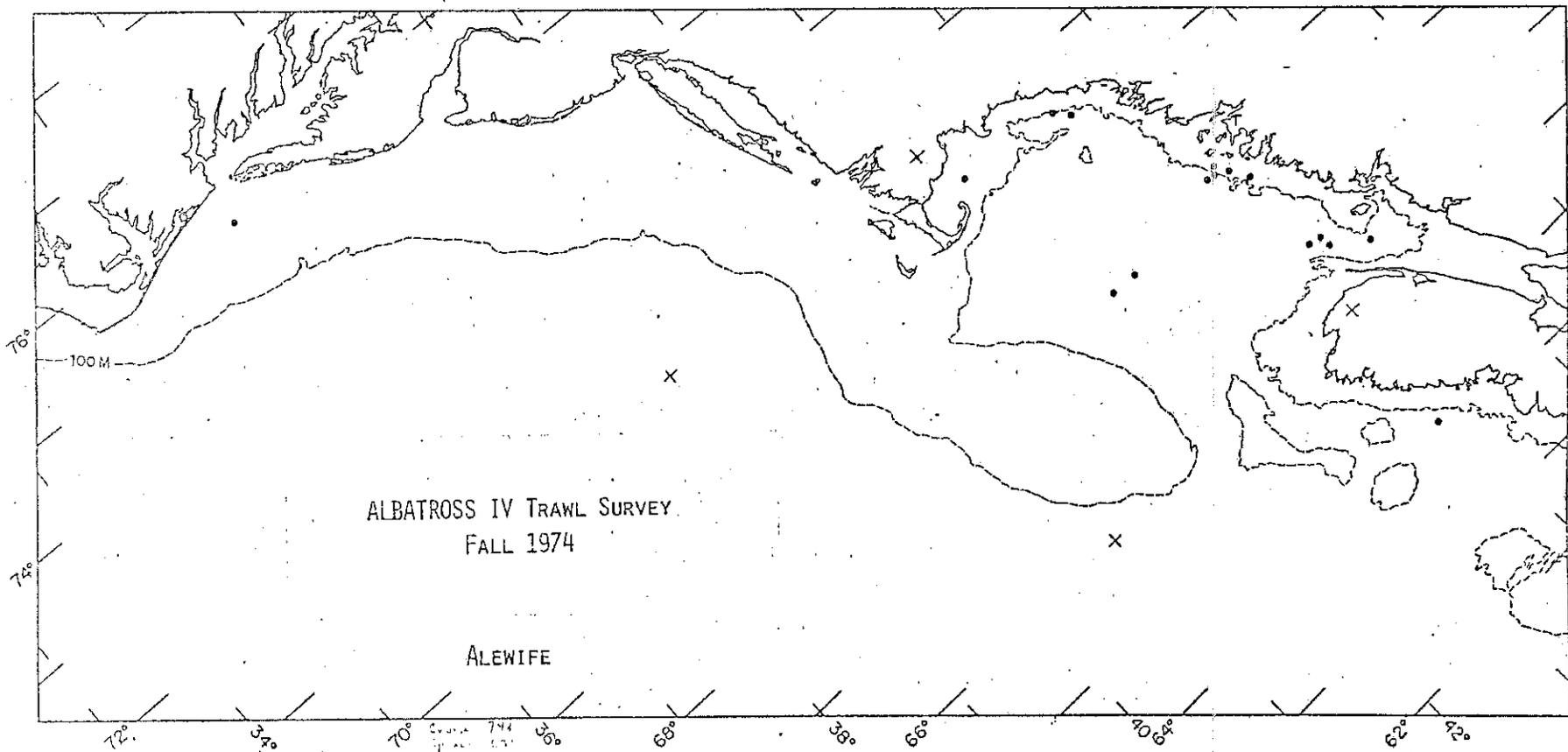
Albatross IV Cruise Log pp. 45-926
Little Skate Sp. 1177

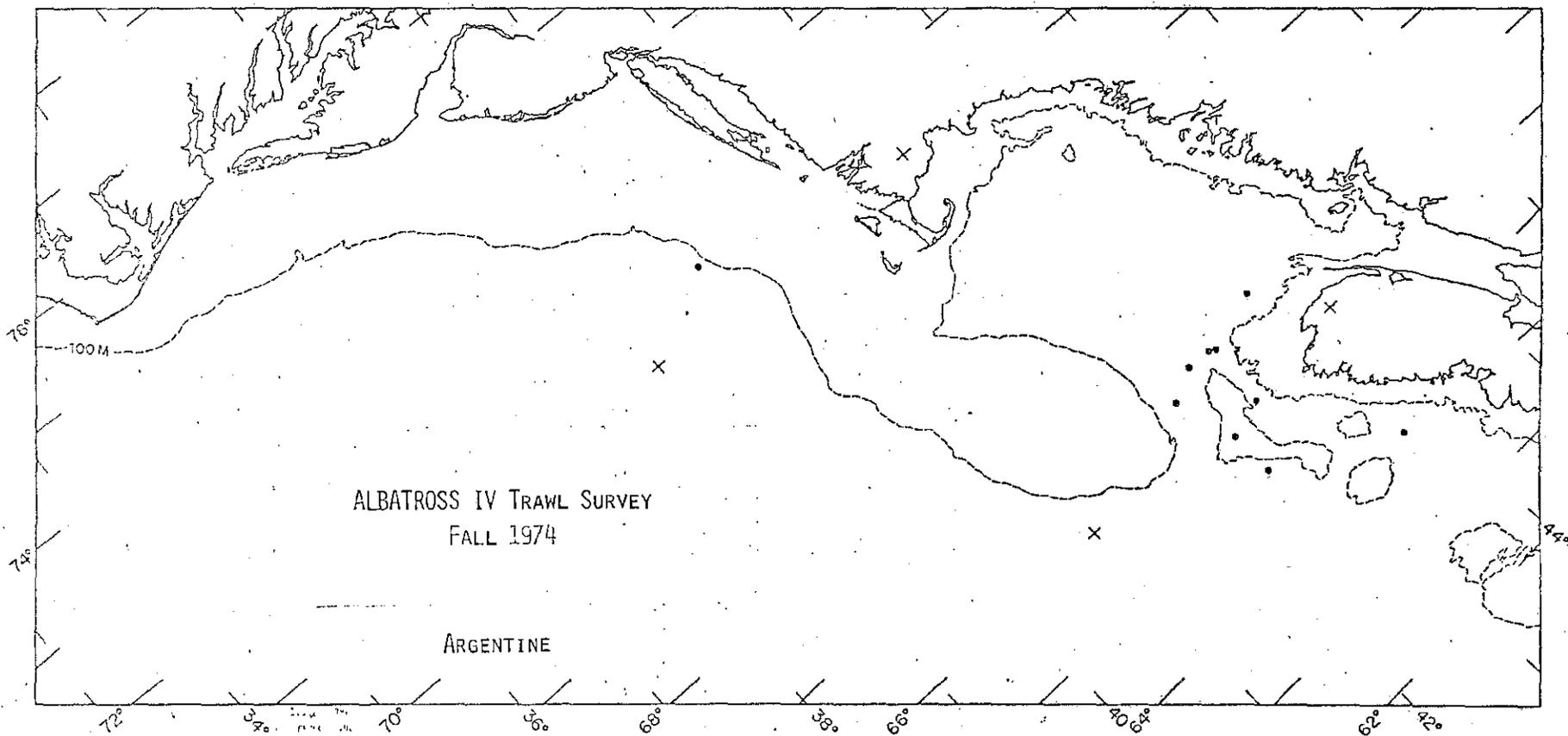
42°

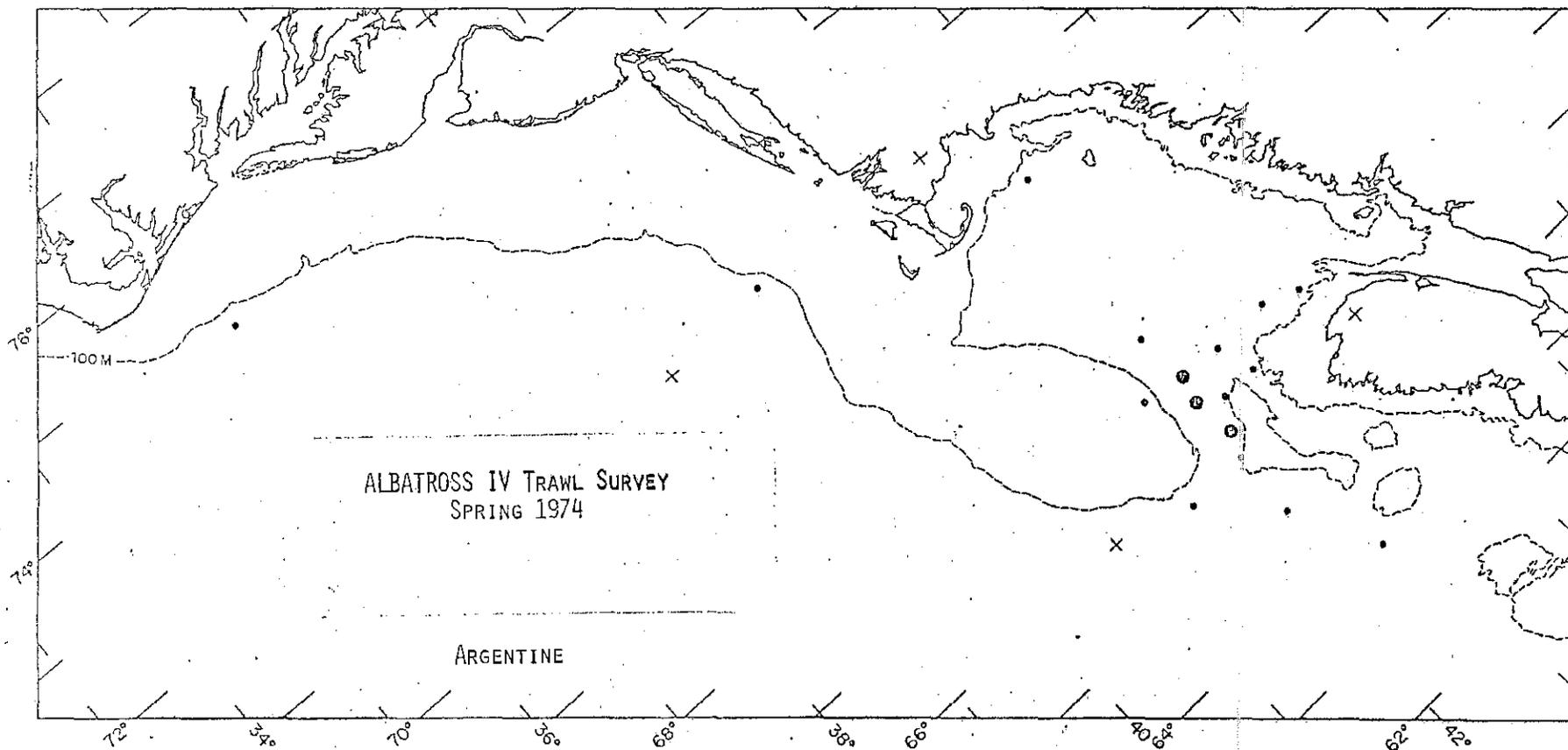












Albatross IV Cruise 764
Spring 1974