Section 4

THE FUTURE OF THE NEW ENGLAND FISHING INDUSTRY UNDER EXTENDED JURISDICTION

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INTRODUCTION

In March, 1976, President Ford signed the Fisheries Management and Conservation Act, giving the United States jurisdiction over the management of fishery resources within 200 miles of the nation's shore effective March, 1977. This legislation also makes provisions for the management of these resources. After many years of unsatisfactory management, resulting in the overfishing of important commercial species, it is hoped that this legislation will permit stocks to recover and provide the impetus needed to revive the New England fishing industry. In this section, the future of the New England fishing industry is considered in light of the potential impacts of this legislation.

Table 1 in Section 2 lists New England fishing vessels classified as over 5 net tons in major ports by length and by gear. These data may be summarized as follows:

	Length (feet)				
	38-49	50-69	70-99	>100	Total
Otter trawl (ground fish)	114	189	119	48	470
Otter trawl (shrimp and lobster)	13	28	6	--	47
Dredge (scallop and clam)	23	4	19	--	46
Other	100	59	12	--	171
TOTAL	250	280	156	48	734
Average crew size	2.5	4.5	7	12	4.8
Estimated total crew	625	1,260	1,092	576	3,553

Because data on vessels are generally available only for major ports and because onshore conflicts, if any, between the petroleum and fishing industries are likely to take place in these larger, well established ports, this discussion does not focus on minor ports in the region. Certain factors might cause some minor ports to become significant in the future. A case in point is the development, currently under consideration, of excess Navy property in Rhode Island. If the fishing operations being planned for this former Navy base are successful, many vessels may be attracted. Similar developments may be possible elsewhere in New England.

SPECIES GROUPS AFFECTED

Extended jurisdiction will give the United States control over large stocks of fish. For New England fishermen, the most important species affected are:

1. Groundfish (limited in this discussion to cod, haddock, flounder, ocean perch and pollock)

2. Herring

3. Sea scallops

4. Hake (red and silver)

5. Mackerel

6. Squid (shortfin and longfin)

7. Other finfish (whiting, butterfish, white hake, spiny dogfish, alewife and about 50 other species presently landed in relatively small quantities by U.S. fishermen).

These species represent a tremendous potential in terms of available fish stock. The groundfish and sea scallops are the two largest traditional domestic fisheries. In recent years, there has been an increasing interest in herring by the domestic fishing industry. The current and expected future markets for these three species groups are excellent. Consequently, the domestic fisheries for them may be expected to expand with a resulting increase in investment.

Although a potential exists for the other categories listed above, domestic fishing for these species may remain limited. Factors likely to contribute to constrained growth are:

1. Traditionally low domestic demand for these species.

2. Somewhat unstable market conditions, especially if large volumes are landed.

3. Technological problems (especially with squid).

4. The probability that foreign fleets will be permitted extensive exploitation of some of these species groups.

5. Subsidies provided to foreign harvesting and processing activities.

It is important to note, however, that these conclusions are highly speculative, in that too little time has passed since the passage of the 1976 act for industry and government response to become clear. The proper market conditions, combined with a favorable decision regarding allowable foreign catches, could result in a rapid increase in domestic investment in fishery for any species. At present, however, it appears that the most likely and imminent growth will be in fishing for groundfish, herring and scallops. The rate of expansion, of course, will be tied directly to the rate at which stocks recover from recent heavy fishing pressure.

ALTERNATIVE DEVELOPMENT STRATEGIES

Because the implications of an extended fishing limit are still unknown, it is not realistic to project a specific result for a 5-, 10- or 15-year period. One reason for this is that the effects of extended jurisdiction are related primarily to governmental policy rather than the market system. In particular, the final result will depend on the attitude of the United States toward foreign fishing within the 200-mile limit and subsidizing the domestic fishing industry, which in some cases is currently financially depressed. A related important factor is the degree to which the federal government is willing to protect the domestic industry from foreign subsidies. Rather than making specific 5-, 10- or 15-year projections, it is more useful to select alternative strategies available to the federal government and to attempt to project the implications of such strategies. Thus, in addition to the estimated current situation, which is summarized in the table above, three cases were established. These cases are patterned after those provided by the Economics and Marketing Division of the National Marine Fisheries Service (1975).

In examining these alternatives, we have focused on the groundfish fishery as the one likely to have greatest impact, in terms of number of vessels and employment, under any strategy. It is generally recognized that scallop landings in New England could double or triple under appropriate management and exclusion of foreign fishermen. However, since domestic landings were less than 10 million pounds in 1975, a doubling of domestic harvest would represent a fairly small addition of vessels and fishermen to the fleet. Most additions would probably be concentrated in New Bedford, the traditional center for this fishery.

Herring has a large potential as a major U.S. fishery if the federal government decides to exclude foreign fishing

for this species. Because of the schooling nature of herring, the catch per vessel is generally large and the catch per crewman is three to four times that of groundfish fishermen. Even a major increase in the domestic herring fishery would represent a relatively small number of fishermen and vessels. Therefore only groundfish are considered in the cases analyzed in detail below.

POTENTIAL INCREASES IN VESSELS AND CREWMAN

New England landings in the selected groundfish category during the past few years have generally been in the range of 250 million to 300 million pounds. Case 1 is based on the assumption that the federal government will develop an effective management and enforcement program and that there will be no increase in government support of the fishing industry. The implications of appropriate management are that foreign fishing will be reduced and that domestic catch rates would increase. The assumption in the 1975 NMFS report is that this would draw investment into the industry and that an estimated 500 million pounds of groundfish would be harvested by the New England fishing industry.

Case 2 includes the conditions for Case 1, with the additional assumption that the federal government will provide some financial assistance to the fishing industry. This would help overcome difficulties the industry might have in obtaining access to the capital market. It is important to note that both Case 1 and Case 2 assume that some foreign fishing in New England waters would continue and result in at least incidental catches of these species. It is assumed under Case 2 in the NMFS report that with additional government support the domestic fishery could take over part of the catch going to foreign vessels under Case 1. Case 2 provides for a domestic catch in New England of 700 million pounds of groundfish.

Case 3 assumes that sufficient support will be given to the fishing industry to enable it to take over all catches within the United States' jurisdiction, and that any landings beyond U.S. consumption requirements would be exported to Europe and other countries. Case 3 assumes that the U.S. domestic catch would be 750 million pounds.

The following assumptions were made to estimate the number of vessels implied by these three cases. (1) Appropriate management would allow for stock recovery and result in a 20 percent increase in the daily catch rate of existing vessels fishing for groundfish. (2) Existing unused capacity either in vessels that are currently tied

up or in vessels currently fishing less than the norm for that vessel size would allow for a 10 percent increase in capacity for existing domestic vessels. Therefore, due to increased utilization and increased catch rate, existing capacity would allow for increased landings of between 30 and 35 percent. (3) Vessels over 5 net tons will continue to account for approximately 90 percent of the groundfish landings. (4) New vessels that come into the groundfish fishery will be 70 feet or longer, but not more than 125 feet in length. Other vessels currently in the smaller range are likely to be replaced gradually, but it is assumed that the number of vessels in the 35-49 and 50-69-foot categories will remain approximately constant. Greater landings by all vessels due to the increase in catch rate would require larger crews. It is assumed that these additional crew requirements, along with the reactivation of some vessels that are currently tied up, would increase the labor requirements for vessels currently in the fleet by about 10 percent.

Based on these assumptions, Case 1 would result in 74 additions to the New England groundfish fleet and bring the total number of vessels from the existing 470 (Table 1) to an estimated 545. As shown in Table 2, this would increase estimated crew requirements to slightly over 3,400. This is based on the assumption that the new vessels would harvest 1.5 million pounds of groundfish each year and would require an average crew of 7 to 9, including a captain, a mate, an engineer and a cook.

Case 2 would result in 209 new vessels for a total fleet of 679. The estimated crew requirements would rise to over 4,600, approximately 2,100 more than the estimated current level.

Case 3 would result in 33 more vessels than Case 2, bringing the fleet total to 712, and would require approximately 4,900 crewmen.

It is assumed (Table 3) that additions to the domestic fleet would be distributed among the major ports in the same proportion as the current estimated fleets. The final distribution will depend on a number of factors, including the onshore impacts of Georges Bank oil drilling. An especially important determinant of the final distribution will be the policies of the individual ports. Several ports are currently considering what should be done to take advantage of a revived fishing industry due to extended jurisdiction.

TABLE 1

ESTIMATED NUMBER OF GROUNDFISH FISHING VESSELS
BY VESSEL SIZE AND PORT, 1976

STATE AND PORT	NUMBER OF VESSELS BY LENGTH, 1976 35-49'	50-69'	70-99'	100' + more	Total	Percent
CONNECTICUT						
Stonington	1	6	-	-	7	1.5%
RHODE ISLAND						
Point Judith	14	33	5	-	52	11.1%
Newport	11	12	5	1	29	6.2%
MASSACHUSETTS						
Cape Cod and South						
New Bedford	17	49	65	1	132	28.0%
Provincetown	16	28	5	1	50	10.6%
North of Cape Cod						
Boston	5	2	4	4	15	3.2%
Gloucester	3	35	32	24	94	19.9%
MAINE						
Portland	22	14	1	6	43	9.1%
Rockland	7	2	1	11	21	4.1%
Boothbay	13	5	1	-	19	4.0%
Eastport	5	3	-	-	8	1.7%
TOTAL	115	190	119	48	470	
%	24.4%	40.2%	25.2%	10.2%		100%

TABLE 2

ESTIMATED NUMBER OF GROUNDFISH VESSELS
AND CREW UNDER EXTENDED JURISDICTION

		Length Category (feet) 35-49	50-69	70	Total
Estimates of current totals					
	Vessels	114	189	167	470
	Crew	286	850	1361	2497
Estimates under extended jurisdiction					
Case 1:	Vessels	115	190	240	545
	Crew	315	935	2172	3422
Case 2:	Vessels	115	190	374	679
	Crew	315	955	3378	4620
Case 3:	Vessels	115	190	407	712
	Crew	315	935	3675	4925

TABLE 3

ESTIMATED NUMBER OF FISHING VESSELS BY
PORT WITH ENTENDED FISHERIES JURISDICTION

STATE AND PORT	EXTENDED JURISDICTION ALTERNATIVES: Case I Additions	Case I Total	Case II Additions	Case II Total	Case III Additions	Case III Total
CONNECTICUT						
Stonington	1	8	3	10	4	11
RHODE ISLAND						
Point Judith	8	60	23	75	27	79
Newport	5	34	13	42	15	44
MASSACHUSETTS						
Cape Cod and South						
New Bedford	21	153	59	191	68	200
Provincetown	8	58	22	72	25	75
North of Cape Cod						
Boston	2	17	7	22	8	23
Gloucester	15	109	41	135	47	141
MAINE						
Portland	8	51	20	63	23	66
Rockland	3	24	9	30	11	32
Boothbay	3	22	8	27	10	29
Eastport	1	9	4	12	4	12
TOTAL	75	545	209	679	242	712

It is recognized that there are various other estimates for the numbers of vessels in New England ports. One of these estimates made for the Office of Technology Assessment (1976) shows substantially higher vessel counts than those reported here. An analysis of the differences, however, shows that differences in vessel numbers are primarily related to vessels in the 45-foot or smaller category, and to vessels in fisheries other than groundfish. Thus, while the base numbers as expressed in Table 1 are lower than those contained in the O.T.A. publication, the projections for the groundfish fleet in Table 2 would not be affected by this difference.

POTENTIAL INCREASES IN FISH PROCESSING

Projections for the New England fish processing industry are somewhat more difficult to make than those associated with the harvesting sector because of the uncertainties of what may happen to U.S. imports if wide national fisheries resource zones are adopted worldwide. If the federal government does exclude foreign fishing vessels from within the United States' 200-mile resource zone, there may be a decrease in U.S. imports from some countries even though much of the fish that is presently caught off our shores does not return to the United States. If foreign vessels are excluded from the U.S. zone, it is likely that markets in Europe, Japan and elsewhere would begin to attract more of the fish harvested by foreign fleets. Imports from Canada will likely increase, however, because Canada's 200-mile fisheries jurisdiction will give Canadian fishermen access to more resources.

In 1974, there were 226 processing plants in New England. Employment in these processing plants was almost 8,000 and peak or seasonal employment was well over 9,000. Of these processing plants, 159 process fresh fish, 75 process frozen fish, 21 process canned fish and 7 cure fish. Table 4 shows that although the number of plants producing products, the value of frozen products is almost four times greater. One basic problem in attempting to project what is likely to happen to the number of plants and employment in the processing sector is that it is possible that if foreign vessels are excluded from U.S. waters, a rising domestic catch may be partly offset by declining imports (again with the exception of Canada). Under this situation, it is possible that employment increases would be primarily associated with the preparation of fresh fish for further processing into a frozen product. It is likely that if large quantities of fish are processed

TABLE 4

PROCESSING PLANTS IN NEW ENGLAND BY STATE (1974)

State	Number of plants	Employment Peak	Employment Average
Maine	92	4366	3292
New Hampshire	9	423	325
Massachusetts	107	4679	3892
Rhode Island	14	297	244
Connecticut	4	28	24
TOTAL	226	9793	7777

	Number of plants	Value (dollars)
Total Producing Fresh Products	159	61.5 million
Total Producing Frozen Products	75	210.5 million
Total Producing Canned Products	21	38.3 million
Total Producing Cured Products	7	1.9 million

domestically as frozen products there will be a move toward more capital investment in items such as filleting machines. Therefore, substantial increases in landings may result in only minimal increases in employment in processing plants. Fish processing plants producing frozen items such as fish sticks and portions and various specialty items now rely largely on imported products, but their capacity is such that a considerable increase in domestic landings could be handled.

Tables 5 and 6 present data on groundfish processing plants in New England. Groundfish processing is concentrated in Boston and New Bedford. It is important to note, however, that much of this product is now imported. Also, a majority of the firms in Massachusetts, New Hampshire and Maine process more than one groundfish species. Total employment in groundfish processing is estimated at slightly over 1,000 in Massachusetts and approximately 210 in New Hampshire. The 1975 NMFS publication points out that in the domestic fish processing industry in general there has been a gradual replacement of labor by capital. It is expected that, as indicated earlier, if large quantities of fish are landed domestically and prepared for freezing, fresh-fish processing lines would be more mechanized than at present. Thus, the labor requirements for such processing would be limited.

Because of the extreme uncertainties associated with the processing sectors, it is simply estimated that under Case 1 the average employment in groundfish processing would increase from present levels of approximately 1,000 to approximately 1,500. For the reasons given above, this increase is less than the relative increase in landings under Case 1.

In Case 2, which involves an increase of more than 130 percent in groundfish landings, it is estimated that labor requirements would increase by approximately 100 percent or to about 2,000 permanent employees. Case 3 would be likely to require about 800 more permanent employees. It is important to note, however, that seasonal employment would be higher since average employment is approximately 82 percent of peak employment in groundfish processing plants.

The techniques of herring processing are labor-intensive when compared to groundfish processing (see Table 7). Thus a substantial increase in herring landings, which would be possible should foreign vessels be excluded from the Georges Bank fishery, would result in a relatively great increase in employment in herring processing plants. Given some probable increase in labor productivity in

TABLE 5

PRINCIPAL CHARACTERISTICS OF GROUNDFISH PROCESSING IN NEW HAMPSHIRE AND MAINE (1965, 1970, 1974)

	Year		
	1965	1970	1974
Number of plants processing cod and haddock	9	9	6
Number of plants processing flounder	5	6	4
Number of plants processing ocean perch	5	4	5
Number of plants processing pollock	7	5	4
Total plants (exclusive of duplication)	13	13	8
Total output of groundfish**	4,974	6,579	7,509
Total output of all products (groundfish and other)**	6,591	24,896	30,351
Groundfish output as percent of total output	75%	26%	25%
Groundfish output per plant**	383	506	940
Total output per plant (Groundfish and other)**	507	1,915	3,831
Total employment in groundfish processing in peak seasons; workers*			263
Total employment in groundfish processing in average seasons; workers*			210
Average employment as percent of peak employment			79.8%
Employment involved in groundfish processing per plant in peak seasons; workers			33
Employment involved in groundfish processing per plant in average seasons; workers			26
Output of groundfish per man (peak employment)**			28
Output of groundfish per man (average employment)**			36

*Calculation made with the assumption that the ratio of groundfish processing employment to total employment equals the ratio of groundfish processing output to total output.

**These numbers are expressed as thousands of dollars.

TABLE 6

PRINCIPAL CHARACTERISTICS OF GROUNDFISH PROCESSING PLANTS IN MASSACHUSETTS AND RHODE ISLAND (1965, 1970, 1974)

	Year		
	1965	1970	1974
Number of plants processing cod and haddock	53	49	44
Number of plants processing flounder	42	47	42
Number of plants processing ocean perch	26	27	23
Number of plants processing pollock	30	30	29
Total plants (exclusive of duplication)	59	58	52
Total output of groundfish**	37,679	52,278	77,133
Total output of all products (groundfish and other)**	82,700	116,753	192,450
Groundfish output as percent of total output	45%	45%	39%
Groundfish output per plant**	639	901	1,483
Total output per plant (groundfish and other)**	1,402	2,013	3,701
Total employment in groundfish processing in peak seasons; workers*			1,338
Total employment in groundfish processing in average seasons; workers*			1,104
Average employment as percent of peak employment			83%
Employment involved in groundfish per plant in peak seasons; workers			26
Employment involved in groundfish per plant in average seasons; workers			21
Output of groundfish per man (peak employment)**			58
Output of groundfish per man (average employment)**			70

*Calculation made with the assumption that the ratio of groundfish processing employment to total employment equals the ratio of groundfish processing output to total output.

**These numbers are expressed as thousands of dollars.

Table 7

PRINCIPAL CHARACTERISTICS OF HERRING PROCESSING PLANTS IN NEW ENGLAND

	1965	1970	1974
Number of plants specializing herring processing	27	24	24
Total output*	12,256	13,428	25,841
Output per plant*	454	559	1,077
Peak employment in a year (workers)			2,457
Average employment over a year (workers)			1,727
Employment per plant in peak seasons (workers)			102
Employment per plant in average season (workers)			72
Average employment as percent of peak employment			70%
Output per man (peak employment)*			10
Output per man (average employment)*			15

* These numbers are expressed as thousands of dollars

herring processing plants, it is likely that a doubling in landings would result in an average employment in herring processing plants of 2,800, with possibly 4,000 employees at peak employment seasons. Most of the increased herring activity would probably be in Maine, with some additional activity in Gloucester and in Rhode Island.

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Section 5

NORTHEAST RECREATIONAL FISHERIES

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INTRODUCTION

Marine recreational fishing is big business. Unfortunately, comparatively little data has been gathered and there are no consistent statistics for recreational fisheries at the state level comparable to those available for commercial fisheries. The few studies that have been made have discussed sportfisheries in the "Northeast" region, which includes all six New England states, New York, New Jersey, Delaware, Maryland, Pennsylvania, West Virginia, Virginia, the District of Columbia and North Carolina to Cape Hatteras. Despite the paucity of information, however, it is clear that marine recreational fishing is of great economic importance and that sportfishermen have an important impact on the stocks of many fish species. National annual landings by saltwater anglers have been estimated to be as high as 1.6 billion pounds, which is some 80 percent as great as annual commercial landings of edible (as opposed to industrial) finfish (Stroud, 1969; Deuel, 1976).

In this section, marine recreational fishing is defined as the taking of finfish (and shellfish where specifically indicated) in marine waters for personal use, using methods which include surf casting, wading, fishing from boats, floats, docks, pilings, embankments, etc. and diving.

PARTICIPATION

Table 1 indicates where and how marine recreational fishermen caught fish in the Northeast region in 1965 and 1970. In 1970, 36.8 percent of the fish taken were caught in the open ocean with the remainder taken in sounds, bays and rivers. That same year, 59.9 percent of the fish caught were taken from private or rented boats and 22.2 percent from party or charter boats.

Participation in marine sportfishing in the Northeast region has grown dramatically since 1960 (Table 2). Sportfishing data (fish and shellfish) are available for each Northeast state during the one-year period mid-1973 to mid-1974. In that year there were 2.8 million marine recreational fishermen in New England. Participation increased in the Northeast region from

TABLE 1

PRINCIPAL AREAS AND METHODS OF MARINE RECREATIONAL FISHING; NORTHEASTERN REGION, 1965 and 1970

Principal Area of Fishing	Landings: Thousands of Pounds		Percent of Total	
	1965	1970	1965	1970
Ocean	110,522	104,852	41.7	36.8
Sounds, rivers, bays	154,264	180,371	58.3	63.2
	264,786	285,223	100.0	100.0
Principal Method of Fishing				
Private or rented boat	136,570	170,717	51.6	59.9
Party or charter boat	27,476	63,225	10.4	22.2
Bridge, pier, jetty	41,701	20,939	15.7	7.3
Beach or bank	59,039	30,342	22.3	10.6
TOTAL	264,786	285,223	100.0	100.0

Sources: Deuel and Clark, 1968; Deuel, 1973.

TABLE 2

PARTICIPATION IN MARINE RECREATIONAL FISHING
IN THE NORTHEAST REGION
1960-1974

State of Residence	Number of Participants (in thousands)			
	1960[1]	1965[1]	1970[1]	1973-4[2,3,4]
Connecticut				658
Delaware				146
District of Columbia				92
Maine				203
Maryland				904
Massachusetts				1,430
New Hampshire				148
New Jersey				1,620
New York				2,980
Pennsylvania				1,235
Rhode Island				285
Vermont				39
Virginia				980
West Virginia				136
Total New England				2,763
Total Northeast	2,504	2,905	3,433	10,856

[1]Includes North Carolina South to Cape Hatteras

[2]Includes shellfishing

[3]Includes children under 12

[4]One year period

Sources: Deuel and Clark, 1968; Deuel, 1973; Ridgely and Deuel, 1975.

2.5 million in 1960 to 10.8 million in the period mid-1973 to mid-1974. This increase in 1973 and 1974 may be attributable to the following factors (Ridgely and Deuel, 1975):

1. The earlier surveys did not include persons under 13 years of age. This age group, according to the Census Bureau, comprises 25 percent of the population.

2. The earlier surveys were limited to persons who fished at least three days or spent at least $7.50 a year on sportfishing, while the 1973-74 survey included everyone who fished at least once.

3. The earlier surveys did not include shellfishing, which was included in the 1973-74 survey.

Despite the differences in the survey techniques a steady increase in participation would be expected. Stroud (1969) found the national level of increase to be 6.1 percent. In comparison, the annual rate of U.S. population growth is estimated at 1.7 percent (S.F.I., 1975).

LANDINGS

At the outset, it should be emphasized that there are many difficulties involved in gathering catch statistics for sportfisheries. Existing techniques rely heavily on the angler's memory. Nonetheless, recent studies (Table 3) indicate that the weight of finfish landings by marine sportfishermen is nearly as great as that of commercial landings of marine foodfish. Table 3 lists the landings of species by sport and commercial fishermen in 1965 and 1970, the latest years for which comparative statistics are available. In 1970, in New England and New York, sportfishermen took 53.8 percent of the catch of marine species listed in Table 3. If total commercial landings, including industrial species, are compared to total marine recreational landings listed in Table 3, marine fishermen in New England and New York accounted for 36.4 percent of the total harvest for that region. The most important species harvested by marine sportfishermen in New England and New York in 1970 are as follows:

TABLE 3

LANDINGS OF PRINCIPAL MARINE FINFISH SPECIES BY RECREATIONAL AND COMMERCIAL FISHERMEN IN NEW ENGLAND AND NEW YORK, 1965 AND 1970

Species	SPORT				COMMERCIAL			
	thousands of pounds		% of total catch[1] by each species		thousands of pounds		% of total catch by each species	
	1965	1970	1965	1970	1965	1970	1965	1970
Bass, Black Sea	2,110	615	80.4	80.8	514	146	19.6	19.2
Bluefish	63,303	50,161	97.9	95.8	1,347	2,179	2.1	4.2
Catfish	---	---	--	--	7	24	100	100
Cod	28,978	35,688	44.7	40.2	35,831	53,029	55.3	59.8
Croaker	---	---	--	--	---	---	--	--
Drum	---	---	--	--	---	---	--	--
Eel	3,293	3,166	88.6	90.4	422	336	11.4	9.6
Flounder	40,966	36,295	25.4	24.6	120,450	111,241	74.6	75.4
Haddock	21,390	2,528	14.1	8.7	133,892	26,887	85.9	91.3
Hake	5,074	659	35.3	10.4	9,288	5,657	64.7	89.6
Kingfish	237	3,457	97.5	98.6	6	49	2.5	1.4
Mackerel, Atlantic	18,006	41,482	84.7	86.6	3,251	6,425	15.3	13.4
Perch, White	142	32	64.2	12.9	83	216	35.8	87.1
Perch, Yellow	7				---			
Pollock	9,348	5,584	44.4	38.8	11,709	8,790	55.6	61.2
Porgy (scup)	10,150	2,296	34.8	33.0	19,004	4,670	65.2	67.0
Puffer	12,941	7,899	100	100	---	---	--	--
Sea Robin	1,843	2,343	84.6	91.7	336	213	15.4	8.3
Shad	1,447	---	73.8	--	513	292	26.2	100
Sharks	2,187	5,263	82.9	97.2	450	150	17.1	2.8
Smelts	4,984	---	94.1	--	312	145	5.9	100
Spot	---	---	--	--	---	---	--	--
Striped Bass	47,999	45,844	97.4	94.3	1,271	2,780	2.6	5.7
Tautog	11,053	15,629	99.2	98.8	92	183	0.8	1.2
Tunas	1,004	3,711	26.5	51.4	2,781	3,503	73.5	48.6
Weakfish	452	1,645	85.4	83.8	77	318	14.6	16.2
Wahoo	---	---	--	--	---	---	--	--
Total of Species Listed Above	286,914	264,297	45.6	53.8	341,636	227,233	54.4	46.2
All Species	316,360	267,451	29.0	36.4	775,894	467,670	71.0	63.6

[1]The total catch is defined as landings by recreational and commercial fishermen combined.

Source: U.S.B.C.F. 1966; U.S.B.C.F. 1971; Deuel and Clark, 1968; Deuel, 1973.

Species	Percentage of Total Marine Sportfishermen Landings (by weight)
Bluefish	19.0
Striped Bass	17.4
Mackerel	15.7
Flounder	13.7
Cod	13.5
Others	20.7
TOTAL	100.0

The status of several species during the two study years is reflected consistently in both commercial and sport landings. For example, landings of all flounder showed little change between 1965 and 1970 in both the recreational and commercial fishery and the percent contribution to the total landings by each fishing group was almost identical in both years; similarly, a large drop in the haddock and scup fishery between 1965 and 1970 showed up equally in both the commercial and sport landings. Also, an increase in bluefish and striped bass landings in 1965 and 1970 are similarly reflected by both fishing groups. Though inevitably there is competition between recreational and commercial fishermen for certain marine species (e.g. flounder, scup, bluefish, Atlantic mackerel, cod, haddock, pollock and striped bass), direct competion cannot be inferred from comparative landing statistics for 1965 and 1970, since in no case is it apparent that increased landings of a species by one group resulted in a proportional decline in landings by the other. However, to properly draw conclusions about competition, long-term landing statistics by both recreational and commercial fishermen must be evaluated. Such statistics are not currently available for recreational fishery landings.

THE ECONOMIC IMPACT OF MARINE RECREATIONAL FISHING

Although statistics on the economic impact of marine recreational fishing are limited, some indications may be gleaned from a 1970 study (U.S. Bur. of Sport Fish. and Wildl., 1972). In that year, 9.4 million saltwater anglers in the United States spent $1.2 billion, and about half of these expenditures occurred

on the Atlantic coast. Though the study did not cite separate figures for expenditures by marine sport-fishermen in the Northeast region, an extrapolated annual total of $336 million may be derived by multiplying the total number of saltwater anglers in the Northeast by the average annual expenditure determined for anglers on the Atlantic Coast. A complete breakdown of expenditures by region and item is presented in Table 4.

As Deuel (1976) and McConnell and Norton (1976) point out, determining the proper value of the marine sport-fishery is a difficult proposition at best. Individual satisfaction and esthetic considerations do not easily lend themselves to monetary interpretation. However, Dr. T. McConnell of the University of Rhode Island, who has done considerable research in evaluation of the economic impact of marine recreational fishing, emphasizes that a simple tabulation of expenditures gravely underestimates that industry's value to a region; he stresses that the fisherman's satisfaction and enjoyment must also be considered. One approach to this is to assign a "primary" or net economic value based on an estimate of how much a sportfisherman would have to be compensated for deprivation of fishing privileges--in other words, how much it is worth to the fisherman not to fish. One current estimate places this figure at $13 per recreational day (Deuel, 1976), but this figure may be too high (McConnell, pers. com.). Expenditures, on the other hand, represent secondary economic benefits. Deuel (1976) estimated that, nationally, the primary economic value of marine recreational fishing was $1.5 billion in 1970. Adding this figure to total 1970 recreational fishing expenditures ($1.2 billion), he estimated that the gross value of the industry was $2.7 billion for that year. If we apply this same approach to marine recreational fishing in the Northeast region (Table 5), we can estimate an annual gross value of slightly under $1 billion. However, this approach may be misleading, as one authority, (McConnell, pers. com.) cautions that primary and secondary benefits measure different things and should probably not be added together. It must be remembered that recreational shellfishing values, generally considered substantial, are not included in these estimates. In addition, reduction of the quality

TABLE 4

EXPENDITURES BY MARINE RECREATIONAL FISHERMEN ON THE ATLANTIC COAST AND IN THE NORTHEAST REGION IN 1970

	Number of Spenders (thousands)		Spenders as a Percentage of all Marine Recreational fishermen		Total Spent (thousands of dollars)		Average Spent Per fishermen (dollars)	
	Atlantic Coast	North-east 1	Atlantic Coast	North-east 1	Atlantic Coast	North-east 1	Atlantic Coast	North-east 1
Total Expenses	4,340	2,973	86.6	86.6	636,380	436,060	127.02	127.02
Food and Lodging:								
Food	2,065	1,414	41.2	41.2	74,226	50,877	14.82	14.82
Lodging	426	292	8.5	8.5	17,972	12,324	3.59	3.59
Transportation:								
Automobile	2,984	2,046	59.6	59.6	54,295	37,214	10.84	10.84
Other	133	93	2.7	2.7	11,957	8,205	2.39	2.39
Auxiliary Equipment:								
Special Clothing	92	62	1.8	1.8	2,044	1,408	.41	.41
Tents	17	10	.3	.3	915	618	.18	.18
Boats	96	65	1.9	1.9	88,356	60,558	17.64	17.64
Motors	76	51	1.5	1.5	32,517	22,280	6.49	6.49
Other	573	391	11.4	11.4	41,094	28,151	8.20	8.20
Fishing Equipment:								
Freshwater rods	106	72	2.1	2.1	1,977	1,339	.39	.39
Freshwater reels	94	65	1.9	1.9	2,117	1,442	.42	.42
Saltwater rods	498	340	9.9	9.9	10,171	6,969	2.03	2.03
Saltwater reels	446	306	8.9	8.9	9,862	6,763	1.97	1.97
Lures	727	498	14.5	14.5	5,995	4,120	1.20	1.20
Lines	735	505	14.7	14.7	3,370	2,300	.67	.67
Other	1,283	879	25.6	25.6	13,479	9,235	2.69	2.69
Licenses and Privilege fees etc.:								
Licenses	224	154	4.5	4.5	1,243	858	.25	.25
Annual lease and fees	32	21	.6	.6	4,192	2,884	.84	.84
Daily fees	178	120	3.5	3.5	2,333	1,614	.47	.47
Special Government fees	4	3	.1	.1	25	---	0	0
Bait	2,972	2,036	59.3	59.3	83,888	57,468	16.74	16.74
Guide fees	16	10	.3	.3	928	652	.19	.19
Head and charter fees	828	566	16.5	16.5	44,039	30,176	8.79	8.79
Alcoholic beverages	962	659	19.2	19.2	43,152	29,558	8.61	8.61
Rental equipment	525	360	10.5	10.5	16,956	11,604	3.38	3.38
Other trip expenses	1,347	923	26.9	26.9	54,761	37,523	10.93	10.93
Magazines	471	323	9.4	9.4	3,423	2,334	10.68	10.68
General club dues	53	34	1.0	1.0	1,590	1,099	.32	.32
Special club dues	49	34	1.0	1.0	1,968	1,339	.39	.39
Boat launching fees	206	141	4.1	4.1	5,190	3,570	1.04	1.04
Other	208	144	4.2	4.2	2,245	1,614	.47	.47

[1]Extrapolated figures based on spending by Atlantic Coast Fishermen. The total number of marine recreational fishermen in the Northeast is assumed to be 3,433 (Deuel, 1973).

Source: U.S. Bureau of Sportfisheries and Wildlife, 1972.

TABLE 5

PROFILE OF THE MARINE RECREATIONAL INDUSTRY ON THE ATLANTIC COAST AND IN THE NORTHEAST REGION IN 1970

I	Total Fishermen:		
	A. Atlantic Coast[1]:		5,010,000
	B. Northeast[2]:		3,433,000
	C. Percent Northeast:		68.5%
II	Total Recreation days:		
	A. Atlantic Coast[1]:		61,032,000
	B. Northeast[3]:		41,807,000
III	Expenditures (Secondary economic benefits)		
	A. Atlantic Coast[1]:		$636,380,000
	B. Northeast[4]:		$436,060,000
IV	Economic Value:		
	A. Primary:	1. Atlantic Coast[5]	$793,416,000
		2. Northeast[6]	543,491,000
	B. Secondary[7]:	1. Atlantic Coast	636,380,000
		2. Northeast	436,060,000

[1]Source: U.S. Bureau Sportfish and Wildlife, 1972

[2]Source: Deuel, 1973

[3]Product of IIA and IC

[4]From Table 5

[5]Product of IIA x $13 (after Deuel, 1976)

[6]Product of IIB x $13 (after Deuel, 1976)

[7]i.e., expenditures (from Table 5)

of the fishing experience because of site-specific factors like increased congestion may strongly affect the economic benefits of the sportfishery (McConnell and Norton, 1976).

POTENTIAL INTERACTIONS BETWEEN MARINE RECREATIONAL FISHERMEN AND THE OFFSHORE OIL INDUSTRY

New England recreational fishermen will not be able to benefit from potential concentrations of gamefish around oil rigs as they do in the Gulf of Mexico simply because the rigs will be too far offshore. Marine recreational fishermen in New England could be adversely affected by the offshore oil industry. If a significant oil spill occurred in coastal waters recreational fishermen could suffer damage. If oil-related activities cause damage to fishery resources and the estuarine environments that support them recreational fishermen will stand to lose at least as heavily as commercial fishermen. One source states that 90 percent of the marine recreational fish catch and 63 percent of the commercial catch on the Atlantic coast is made up of species considered to be estuarine-dependent (S.F.I., 1973). The same source estimates that 535 pounds of fisheries products would be lost annually for every acre of estuary destroyed. Finally, marine recreational fishermen could suffer if activities of the magnitude of those generated by an offshore oil industry further restrict public access to the shoreline or otherwise limit the geographic distribution of sportfishing activities.

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Section 6

FOREIGN FISHERIES ON GEORGES BANK

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INTRODUCTION

To the domestic fisherman, foreign fishing on Georges Bank evokes images ot gigantic mother/processing ships supplied by fleets of fish hungry trawlers devouring one fishery after another. Unfortunately, during the 1960s and well into the '70s the vision was all too accurate. Not only was the International Commission for North Atlantic Fisheries (ICNAF) quota system largely ineffective before 1974, but U.S. enforcement was hampered by lack of personnel and authority.

The situation has changed perceptibly, however, since 1974. The tempo of foreign fishing activity on Georges Bank has slowed (Figure 1) in reaction to two developments. First, many stocks are exhausted to the point where they are no longer commercially valuable to foreign fishermen. Second, Marine Enforcement Agents of the Law Enforcement and Marine Mammal Protection Division of NOAA have recently developed a method for assessing the catch of a particular nation by species on a continuing basis, rather than after the fact. In the past, foreign nations have frequently surpassed their quotas by a large margin. In the spring of 1976, however, the division, utilizing its newly developed technique, forced the closure of the Soviet mackerel fishery at or about the ICNAF quota (Beers and Philbrook, 1976).

The Fishery Management and Conservation Act of 1976 will completely change the fisheries situation off New England. A discussion of the potential impacts of extended national jurisdiction over domestic fisheries is found in Section 4. Although the new legislation will limit foreign fishing on Georges Bank it is highly unlikely that it will be eliminated. The focus of this section will be on the species caught, techniques used and gear and boats employed by foreign fishermen on Georges Bank. A clear understanding of these topics will assist in understanding potential interaction of foreign fishermen with the petroleum industries on Georges Bank.

FOREIGN FISHING BY SPECIES

Foreign fishing vessels on Georges Bank currently harvest a limited number of species. The primary catch is mackerel, herring and squid. Smaller catches of red and silver hake, cod and other finfish are taken. Table 1 presents the principal species harvested by nation during the period 1974-1976. Some incidental or by-catch is taken by the nations and is unavoidable. The absence of groundfish should be noted. ICNAF agreements made in 1975

TABLE 1

MAJOR SPECIES TAKEN BY NATIONS IN THE NORTHWEST ATLANTIC; 1974-1976

Bulgaria	mackeral, cod, hakes
Canada	scallops
Cuba	mackeral, hakes
East Germany	mackeral, herring, squid
France	herring
Iceland	squid
Italy	squid
Japan	squid, herring, swordfish, butterfish
Poland	mackeral, herring
Rumania	mackeral, herring
South Korea	squid
Soviet Union	mackeral, herring, hakes
Spain	squid, cod
West Germany	herring

essentially prohibit foreign vessels from using bottom tending gear. The limited number of species harvested is due in part to the overfishing of such species as haddock and yellowtail, and the consequent quotas and restrictions established by ICNAF. While the odds are good that foreign fishing activity will decrease as domestic fishermen increase their efforts under extended U.S. jurisdiction, Table 1 should be a fair representation of foreign fishing activity by species in the near future. There is currently no large domestic market for most of these species.

Each current, important species has distinct features in terms of seasonality, gear employed, condition of the stock and fluctuations in the abundance of the stock not directly related to fishing. A summary sketch of the major species follows:

Mackerel

Mackerel are by far the most important species presently caught by foreign fishermen on Georges Bank. Approximately 90 percent of the harvest is taken by the Soviet bloc countries. Mackerel, a pelagic species, may be the last of the giant fisheries on Georges Bank.

Harvesting commences in January and continues until ICNAF quotas are filled. In 1976 that point was reached in March, much earlier than in past years. There is good reason to believe that in previous years the Soviets overfished their mackerel quota by 50 to 70 percent as the fishery continued into the late spring (Beers and Philbrook, 1976). Sizable mackerel catches are also taken in ICNAF area 6.

Mackerel are caught by Soviet bloc nations with midwater trawls, primarily from stern trawlers. The number of Soviet bloc fishing vessels engaged in the mackerel fishery increased steadily from the mid-1960s through 1973 but has diminished with reduced ICNAF quotas (Figure 2). The stock is reasonably healthy and will continue to yield large harvests if properly managed. Mackerel has been the most important of the Georges Bank foreign fisheries since 1972; previously, herring provided the largest fishery.

Herring

While mackerel is currently the largest foreign fishery by tonnage, over the last 12 years the cumulative tonnage of herring caught on Georges Bank is double that of any other species (Figure 3). The Soviet Union normally conducts a late spring herring fishery as a preview of the major fall fishery when several nations partake. In 1976, only 20 Soviet purse seiners worked Georges Bank for about 10 days, reporting poor results (Philbrook, 1976). This constrasts dramatically with the late '60s when 200 vessels or more descended on Georges Bank, and points to the present poor condition of herring stocks.

Herring, a pelagic species, are caught using mid-water trawls and purse seines. The speed and maneuverings of herring make purse seining the preferred method. The biggest fishery is in late summer. ICNAF quotas have recently severely restricted the allowable catch of herring. The 1976-77 tentative ICNAF quota is 20,600 metric tons for foreign fishermen, a fraction of the boom year catches of the late 1960s and early '70s when 200,000 tons a year were harvested. The herring stock is presently overfished but not exhausted.

Squid

Squid resources support a developing fishery, relatively new to Georges Bank. Two species are taken; winter (Loligo) and summer (Illex) squid. The preferred species is Loligo. Squid is a pelagic species that is harvested primarily with mid-water trawls and by jigging. Squid fishermen fish year-round and concentrate their efforts in the vicinity of the canyons on the 100-fathom curve. While there is only a limited domestic market for squid, it is prized by the southern Europeans and Japanese. At present squid are not overfished. Japanese squid fishermen frequently conduct a limited butterfish fishery in conjunction with their squid fishery.

Silver Hake (Whiting)

This was a target of the earliest Soviet bloc fishermen. The fishery peaked in 1965 and catches have been increasing since 1972 (Figure 5), indicating that the stock is not exhausted. The present stock, however, is only a fraction of what it was in the late 1950s to early '60s.

A demersal species, whiting are presently caught using near-bottom trawl gear, since foreign fishermen are prohibited from using bottom tending gear. Hake are usually processed as industrial fish.

Red Hake

Red hake, a cousin of silver hake, is another demersal species caught as an industrial fish. Catch history has been erratic (Figure 6). The stock is currently in poor condition, as shown by both catch statistics and tentative ICNAF quotas.

Cod

The foreign cod fishery, which extends geographically from ICNAF areas 1 through 5, is important on Georges Bank to Spanish and domestic fishermen (Figure 7). The Spanish take a sizable catch, usually with pair trawlers; their fishery is concentrated along the northern edge of Georges Bank and continues throughout the year. A badly overfished species, cod is just now showing the first signs of recovery after several years of severely restricted catches.

Haddock

While cod shows signs of a minor rivival, haddock remains the textbook example of overfishing (Figure 8). During 1965 and 1966, foreign fleets, especially vessels of the Soviet Union, wiped out the haddock fishery. It has been a major species of commercial importance domestically. No other species show such an abrupt rise and fall in catches. However, the cumulative affect of several years of more gradual depletion is probably equally devastating as the more recent mackerel and herring fisheries may illustrate.

Other

No other species of major importance are now caught by foreign fishermen on Georges Bank. While most foreign fishing is directed at specific species, by-catches of restricted species occur. The prohibition against the use of bottom tending trawl gear, restrictions on mest size and closed areas are intended to minimize foreign by-catches of domestically valuable groundfish species.

Since 1973 the American lobster has been protected from foreign fishermen. Previously, lobster was fair game for domestic and foreign fishermen alike, and large amounts were harvested by foreign vessels. It should be remembered that, as with some other species, the lack of reported foreign lobster catches in the ICNAF statistics does not necessarily mean that no catches were made.

OPERATIONS AND LOGISTICS

The tremendous distance foreign fleets come to fish on Georges Bank requires them to operate on a far more sophisticated scale than anything American fishermen are accustomed to. The Soviet Union is notable for the complexity and scope of its operations, which require supply/fish carriers, processing/mother ships and research vessels in addition to those actually fishing (Sealy, 1973). A Soviet fishing fleet resembles a naval task force, with specific goals and methods.

Similarly, the control exercised by foreign nations over their fishermen has no parallel in the domestic fishing industry. It ranges from broad national goals and licensing mechanisms to the day-to-day tactical control of Soviet trawler operations. Western European countries provide strategic direction through national fishery agencies which formulate goals within ICNAF quotas.

There are three distinct Soviet fleets: North Sea, Baltic Sea and Black Sea, each completely independent. They are divided into flotillas, distinguished mainly by home port, and varying in size and effectiveness. The composition of the Soviet mackerel fleet during the winter of 1976 points up the relative sizes of the fleets. There were six Black Sea vessels, 20 from the North Sea and 70 to 80 vessels from the Baltic. The latter are the best, as well as the largest, and consistently achieve the highest catch rates (Beers, 1976).

VESSELS

A most obvious difference between domestic and foreign fishing fleets is vessel size. Not only can the latter lay in more supplies at the start of a voyage, but they have large fish-holding capacity and, in many cases, processing capabilities, as well. Their endurance is measured in terms of weeks or months compared to 10 to 14 days for the larger American trawlers.

Operating flexibility is an almost equally important asset because of the seasonal nature of the various fisheries. Trawlers and processing ships can switch rapidly from one fishery to another by utilizing different harvesting techniques. Their gear is also likely to be newer and more effective.

This section delineates by type, purpose and capabilities the major classes of vessels involved in the foreign fishery on Georges Bank. The frequent references to Soviet bloc nations points up their overwhelming presence. Western Europe and Japan are represented primarily by trawlers in the 250- to 300-foot class. Table 2 indicates the number of vessels by nation operating in ICNAF areas 5 and 6 in early 1976.

While it is relatively simple to lay out the principal specifications and characteristics of the foreign vessels on Georges Bank it is only part of the picture. The boats are sailed and the gear is worked by fishermen with varying degrees of enthusiasm and seamanship. The Japanese work to the highest merchant marine standards. Excellent catch rates and high crew morale are the results. The Russians, for all the sophistication of their vessels and gear, frequently achieve only low productivity and have a nagging morale problem (Beers and Philbrook, 1976).

Trawlers

The majority of all foreign trawlers on Georges Bank are stern trawlers with some processing capability, measuring 225 to 275 feet in length, displacing 2,500 to 3,000 tons and manned by a crew of 90 to 110. A generalized description of their operating characteristics would include main propulsion of 2,500 to 3,000 horsepower, hold capacity of approximately 1,000 metric tons, partly refrigerated fish holds, semi-processing capabilities and a full complement of electronic aids to navigation and fish finding. Living quarters range from palatial to spartan. Recently, the crew size of these vessels has been substantially reduced and processing equipment has become more automated.

By contrast, an American trawler fishes on Georges Bank year-round, is commonly 70 to 110 feet in length, displaces 50 to 80 tons and has a crew of 6 to 10. Main propulsion comes from a 400 to 750 horsepower engine. Domestic fishing vessels have little processing capability.

TABLE 2

NUMBER OF INDIVIDUAL FOREIGN FISHING VESSELS ENGAGED IN FISHING OPERATIONS IN ICNAF SUBAREAS 5 and 6; JANUARY THROUGH APRIL 1976

Bulgaria	11
Cuba	12
East Germany	21
Iceland	1
Italy	7
Japan	15
Poland	27
Rumania	7
South Korea	2
Soviet Union	231
Spain	69

Source: Philbrook, 1976.

Approximately half of these trawlers are 15 years old and some were built 40 years ago. The electronic equipment is unsophisticated when compared with that on foreign vessels. Notwithstanding the general inferiority of equipment, American trawlermen have great knowledge of the grounds and are skilled at adapting to new methods and situations.

While the large size of foreign trawlers is explained by their distance from home, the wholesale swing to stern trawlers is a matter of performance. Stern trawlers achieve much higher catch ratios and are easier to operate. Foreign stern trawlers made their appearance on Georges Bank in the mid 1960s and have steadily increased in use. At present about 85 to 90 percent of the foreign fishing activity on Georges Bank is accomplished by stern trawlers (Philbrook, January, 1976). With this rise in stern trawler use has come a concurrent modernization of the foreign fishing fleets.

There remain some older foreign side trawlers fishing Georges Bank, but many have been retired. The Soviet Union has converted a large number of smaller side trawlers into purse seiners for use in the herring fishery. Incremental improvements of gear have been made to existing fishing boats over the years. The Soviet Union, however, does not favor piecemeal modernization but prefers to design, build and commission new series of trawlers incorporating the best features of past experience and ongoing research. The Atlantik and Super Atlantik classes, which have appeared on Georges Bank in the last three years, are prime examples.

Baseships/Processors

Possessing tremendous processing and storage capacity, Soviet bloc baseships transcend any vessels ever engaged in commercial fishing. Those involved in a distant water fishery such as the Northwest Atlantic vary in length from 520 to 680 feet, displace 22,000 to 43,400 tons and have a crew on the order of 550 to 600 (Sealy, 1976). The type, flexibility and capacity of their processing operations are specifically designed for different areas of the world and different species. The following description of one of the larger factory baseships illustrates the capabilities and flexibility of these vessels:

> The processing facilities aboard will consist of eight different production lines. The vessel's primary processing function will be to produce 220,000 cans of sardines, soury mackerel and other pelagic fish in 24 hours. The freezing line will be capable of processing 100 tons of fresh fish in 24 hours, the salting line 150 tons in barrels and 20 tons in cans during the same period. Production potential also includes 50 tons of salted fish in 50-liter barrels, 3 tons of roe, 4.5 tons of cod liver oil and 100 tons of fishmeal each day. (Office of Inter. Fisheries, 1976).

Several classes of baseships have their own fleet of small fishing boats which the mother ship transports from location to location. Other mother ships work closely with small and medium-length trawlers which are otherwise independent.

The newer baseships are highly mechanized, utilizing advanced technology for navigation, fish processing and handling. Computers are used extensively for handling the information requirements. Accommodations and facilities on the newer baseship have generally kept pace with advances in operational functions. Baseships are exclusively a Soviet bloc phenomena. The development of larger trawler classes with their own processing facilities has led to the development of another class of ships: fish carriers that specialize in the handling and transport of processed fish.

Fish Carriers

Fish carriers' primary function is to transport processed catch from the fishing grounds to the many ports from which the fleets are deployed. Usually, they are not as large as baseships. Some possess processing capabilities; others are strictly carriers. The newer classes carry the latest advances in fish handling and storage. Given the presence of large factory stern trawlers that process their own catch, fish carriers will continue as important components of Soviet bloc fishing activity. The Japanese also use fish transports but not to the degree that Soviet bloc countries do.

The Japanese are particularly adept in the transfer at sea of fish and supplies.

Size of Fleet

During the later 1960s, Soviet fleets of 100 to 250 vessels fished Georges Bank. Efforts of that magnitude will probably not be seen again because of depleted stocks and more efficient, larger trawls. However, 100 Soviet vessels were involved in the Georges Bank mackerel fishery during the winter of 1975-76 and concentrations of 50 or more were observed. By American standards Soviet operations are still gigantic.

Fishing by other nations may involve solitary vessels as well as small fleets. Spanish pair trawlers fishing for cod commonly operate in groups of some 20 vessels (Philbrook, February, 1976). Foreign squid fishermen, on the other hand, frequently work alone (or with a company fleet of 5 to 10 [Singara, 1973]). The primary influence on the number of fishing boats and the size of fleets working Georges Bank is the abundance of fish. As stocks have been depleted and ICNAF quotas tightened, there has been a measurable drop in the number of foreign fishing vessels in the Northwest Atlantic. Table 3 shows a definite downward trend in the number of foreign fishing vessels (1974-76) in the Northwest Atlantic. Data for years preceding 1974 are believed to be less accurate; however, the information clearly indicates the presence of larger fleets in earlier years.

A substantial fish find draws a crowd of trawlers. The harvesting method employed determines to a large extent the density of vessels in a particular area. Pair trawlers, because of decreased maneuverability, tend to observe larger separations than fishing boats engaged in single trawl operations. No precise data exist on the number of vessels per square mile but surveillance data indicate that concentrations of 50 to 100 vessels in an 80-square-mile area were not uncommon in 1974.

FISHING GEAR AND METHODS

Most foreign fishing on Georges Bank is directed toward individual species. The West Germans, for example, send a fleet in the late summer to catch herring. Methods and gear have evolved that are specific to particular species. However, most vessels are capable for switching from one gear type to another. Techniques are essentially the same as those employed by American fishermen, but on a larger and more sophisticated scale. An excellent description of the characteristics and operation of gear used by domestic fishermen is found in the WHOI report (1976).

TABLE 3

OVERFLIGHT SIGHTINGS OF FOREIGN FISHING VESSELS IN NORTHWEST ATLANTIC; JANUARY 1975-JUNE 1976

Month and Year	Number of vessels sighted
January 1975	234
February	334
March	266
April	255
May	183
June	204
July	137
August	142
September	133
October	146
November	112
December	125
January 1976	266
February	291
March	208
April	155
May	104
June	89

Trawl doors weighing upward of 4,000 pounds are common on foreign vessels, with some of the larger vessels using doors weighing 3 tons apiece. The dimensions of the trawl may be several times that found on a standard American dragger. Where the typical domestic otter trawl may have a 100 to 120 foot groundrope, that of a foreign fishing vessel may be 300 feet or more (Singara, 1973). Coupled with the tremendous horsepower of the larger foreign trawlers and the corollary increases in the strength of towing warps, the power exerted on a hang by a foreign trawl can result in forces several times that resulting from a snagged domestic trawl. It should be pointed out that while the forces resulting from a hang increase roughly in proportion to the size and strength of the gear, the actual sweep of the gear does not increase similarly.

In addition to size, the technological sophistication of foreign fishing gear further differentiates it from domestic fishing. Technical advances such as submersible fish pumps, fuel tanks convertible to fish storage compartments, improved fish handling, at-sea processing and transfer techniques are a response to the distant water reality of foreign fishing on Georges Bank. These advances are of interest but have little direct application to American fishing efforts. Other foreign developments to make fishing easier and more productive could be adopted by domestic fishermen; forward scanning fish scopes, net sounders for monitoring a trawl's configuration, hydrodynamically designed otter boards and stern trawling techniques are examples.

RESEARCH AND DEVELOPMENT

Research and development have had a fundamental impact on Soviet fishing and deserve mention. The Soviet Union has an unshakable commitment to the advancement of fishery technology which is bolstered by the very great demand for fish products in the Soviet Union. Each major fleet has an associated R & D institute and fisheries research vessel. The research effort has a practical orientation. The primary focus is "the discovery of new, little or unexploited stocks and the development of gear, vessels and machinery to catch and process them effectively" (Sealy, 1973). The results have been impressive.

A fish called the Roundnose Grenadier is a prime example. To develop the Grenadier as a commercial species required innovations in several areas. The species lives at a depth of 1,000 meters, and a wholly new trawling technique had to be developed. Secondly, the Grenadier required adjustments in processing methods to make it a marketable species. Consumer demand for the processed fish had to be stimulated. The Russians were successful on all counts. The relatively new krill fishery is another example of a species that is now commercially viable because of intensive development of harvesting, processing and marketing methods (Sealy, 1973).

Many advances have been made in general fishery technology: submersible fish pumps, fuel tanks convertible to fish storage compartments, transponders for monitoring the configuration of a trawl, large mesh midwater trawls and widespread use of the super-trawl class Atlantik, and the extensive sea trials of an experimental catamaran trawler, the Experiment, in the North Atlantic underscore the magnitude of the Soviet R & D effort (Sealy, 1973).

The technological superiority of foreign fishing boats and gear to domestic fishing boats is common knowledge. It is evident when comparing almost any foreign fishing boat on Georges Bank with an American dragger. This strength stems largely from the realization by European, Soviet bloc and Far East nations that there will be increased competition for dwindling fish resources in the future. Effective fish harvesting and processing methods are essential if a nation is to gather its share.

COORDINATION AND COOPERATION

The larger the fishing operation the more complicated coordination among foreign trawlers and with their support becomes. Soviet "flotilla" fishing furnished a good example. The flotilla commander directs the fishing activity at the same time that he assembles their supply and offloading requirements and arranges the necessary logistics. When a backlog develops "with trawlers not fishing, waiting days on end to transfer their bulging holds of mackerel to transport vessels" (Philbrook, March, 1976), the burden on a flotilla commander to expedite things is tremendous. The introduction of larger stern trawlers with processing and freezing capabilities has eased this type of problem. However, the mother/processing ship remains the hub of the supply network.

Cooperation among fishing boats of a foreign fleet is more evident than among American fishermen. Foreign fishermen, however, are not completely altruistic. Especially among foreign fleets outside the Soviet bloc there is much competition among vessels from the same country. Vessels belonging to the same company, however, do tend to share information. There is a much larger measure of cooperation, extending from fishing to logistics, among Soviet bloc fishing vessels. At the same time, the Soviets promote competition between boats and fleets. Special incentives in the from of honors and money are used to spur fishing production. While fleets commanders sail with specific orders relating to species quotas, operating areas and length of expeditions, the conduct on a day-to-day basis of fleet operations is entirely in their hands.

Working arrangements with U.S. and Canadian suppliers and service facilities are a second method of meeting the logistical problems of distant-water fishing. Foreign fishing companies frequently set up ports of call in harbors such as Gloucester, Boston and Halifax. After a period of 30 to 45 days fishing, a boat will lay over in a port for several days to resupply and allow the crew a break (Singara, 1973), but not to unload fish for processing and distribution in the United States. However, some foreign catches are unloaded in Canadian ports and much of this fish is then imported to American processing plants.

Japanese fishing vessels on Georges Bank use the Canary Islands as a base. They also transfer processed catch to freighters while at sea. While Western European fishing boats are seldom away from their home port for more than three months, Japanese vessels do not return to Japan for two years, although crew changes take place more frequently (Arnoldt, 1972).

Soviet bloc countries, especially the Soviet Union, differ substantially from Western European countries in the scope of their logistics efforts. Soviet bloc nations rely almost exclusively on their own supply lines and service capabilities, with the exception of trips into Halifax, Nova Scotia, or Havana, Cuba, for emergency repairs. Each Soviet flotilla operates a team of supply ships, tankers and fish carriers to provide for the fleet's needs.

All Soviet trawlers require periodic offloading of catch and replenishment of supplies. Even the modern freezer trawlers with their processing and freezing capabilities rely on this logistics pipeline, although with less frequency. Except for the largest trawlers, capable of final processing of their own catch, all Soviet trawlers rendezvous with a mother/processing ship to offload fresh or partially processed catches. In turn, the mother ship transfers processed fish to a fish carrier/supply ship which shuttles back and forth between the fishing grounds and the flotilla's homeport. The larger trawlers transfer their fully processed catch directly to the fish carriers.

This logistics network allows the Soviet fishing fleets to operate in any ocean. But the system is not immune to trouble. Supplies can be late, mother ships may not accommodate catches as fast as they are taken, the weather may preclude transfers at sea. To ease the latter problem, Soviet bloc countries have made agreements with the United States, through bilateral treaties, to set up inshore loading zones. By and large, given the vicissitudes of fishing and the marine environment, the Soviet system works well. Romania, Bulgaria, Poland and East Germany, all Soviet bloc countries, employ the same supply methods though on a smaller scale.

POTENTIAL FOREIGN FISHING INTERACTIONS WITH OFFSHORE PETROLEUM OPERATIONS

It is virtually certain that foreign fishermen will continue to be allowed to fish on Georges Bank in the foreseeable future, though the scale of their operations will be considerably smaller than that seen in the past decade. Two characteristics of foreign fishing activities should be of particular concern to the petroleum interest. The first is that the large size of foreign gear and vessels makes them capable of causing greater physical damage to petroleum installations than domestic vessels and gear. As long as bottom-tending gear is forbidden, and this regulation is strictly enforced, the potential for foreign gear to damage pipelines is slight. It should be remembered, however, that midwater and near-bottom trawls can be made to fish on the bottom and that by-catches of bottom-dwelling fish have sometimes been noted on vessels using these gear. If a large foreign trawler did snag a pipeline, the potential for damaging it would be great. Another cause for concern is the intensity

of foreign fishing effort on discrete concentrations of fish. It is easy to imagine the confusion generated by a large number of foreign trawlers operating in or near an active oil field.

Clearly, careful efforts should be made to inform foreign fishing vessels of the nature of oil-related activities and operating ground rules should be worked out well in advance. Methods for marking buoys, platfroms and the like must be communicated. If traffic lanes for oil-industry supply boats are set up, foreign fleets should be informed. It is essential that the locations of pipelines and the hazards of damaging them be fully impressed upon foreign fishermen. A break in at A. T. & T. communications cable to Europe occurred in the mid-Atlantic shelf when the anchors had penetrated deep into the bottom and the vessel had drifted several miles. Potential occurrence of such problems should be recognized and planned for.

Fig. 1. ICNAF Landings From Area 5Z: 1960 - 1974; Soviet, Soviet Block, U.S., Other and All Nations Combined

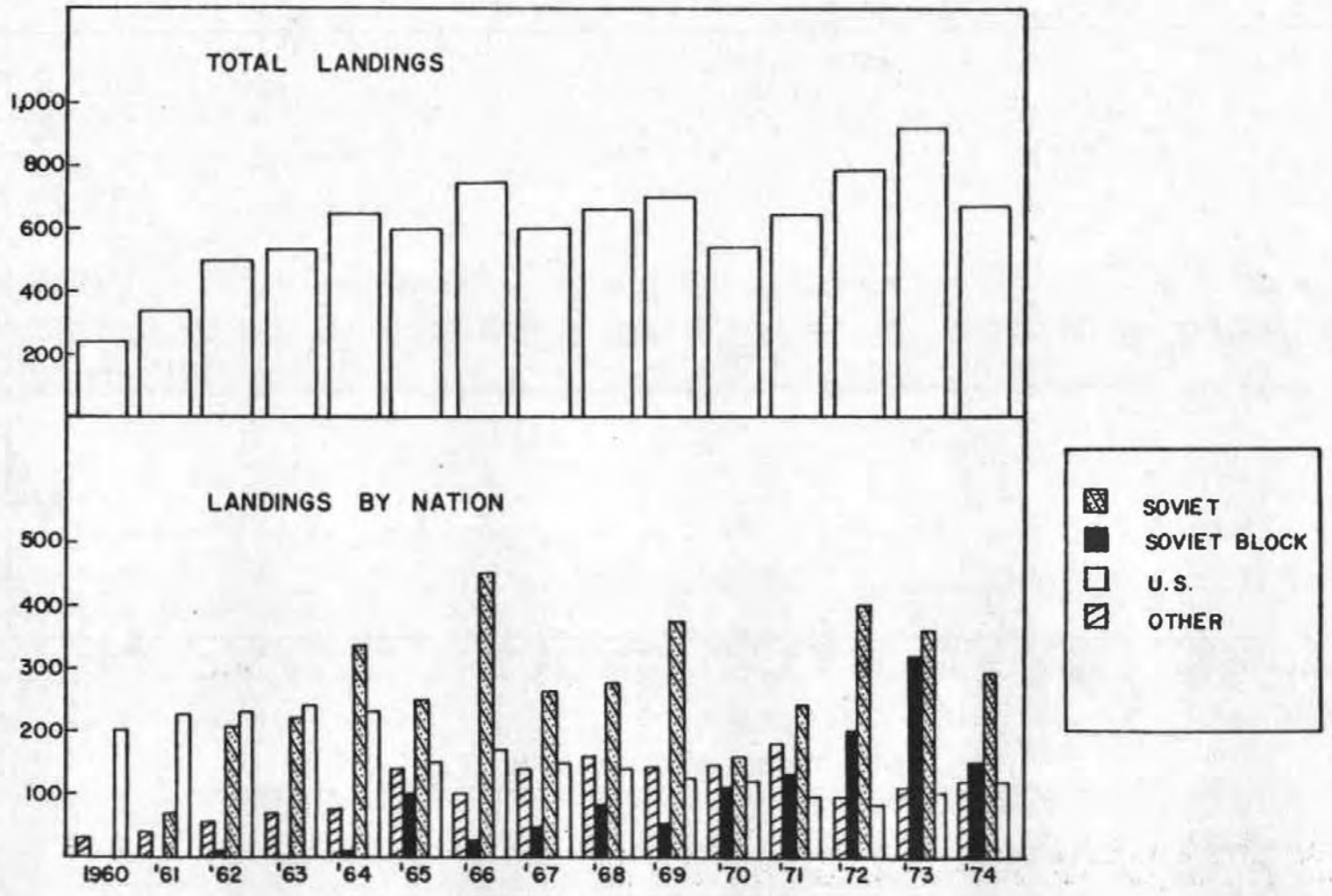


Fig. 2. Mackeral Landings, ICNAF Area 5Z (E & W)

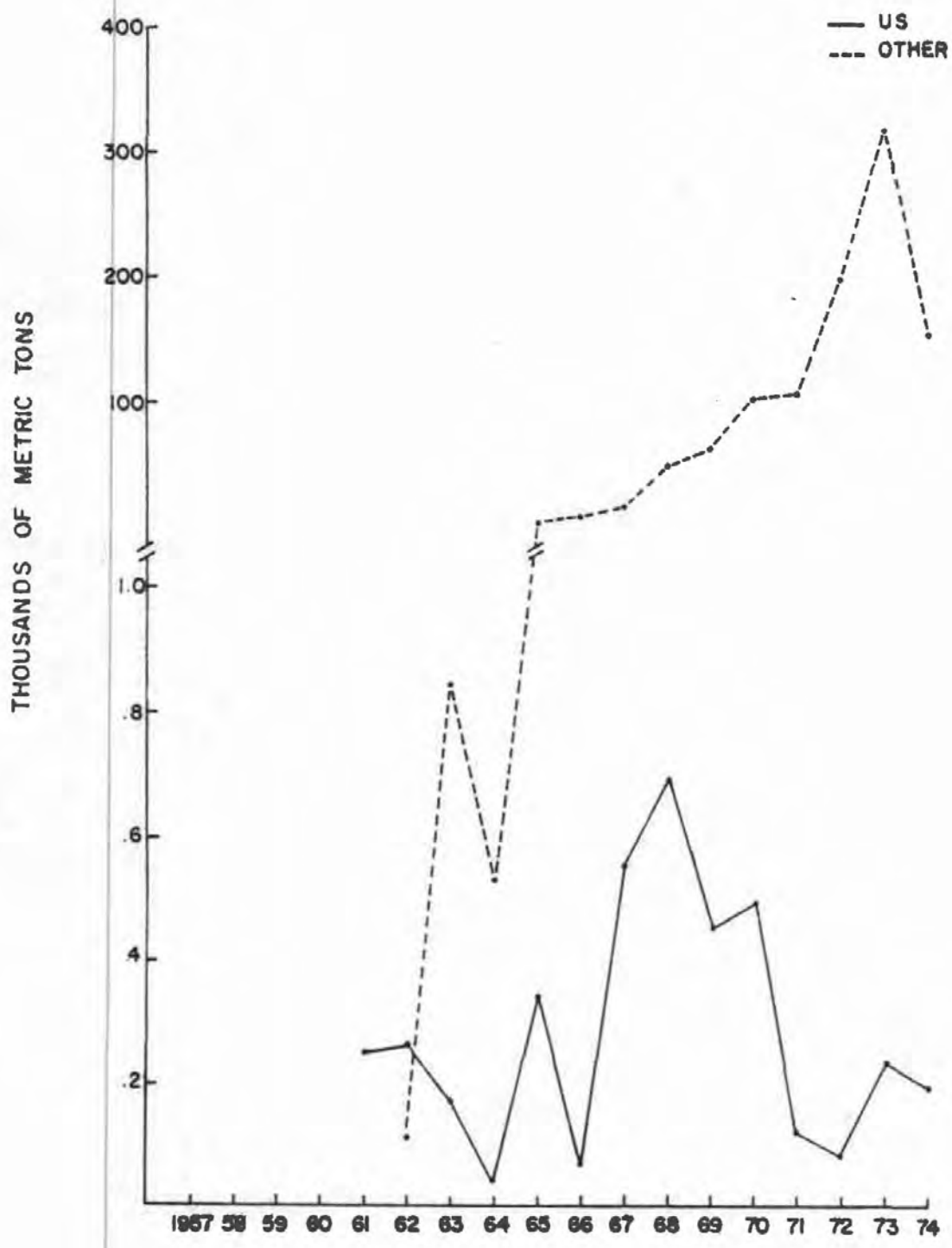


Fig. 3. Herring Landings, ICNAF Area 5Z (E & W)

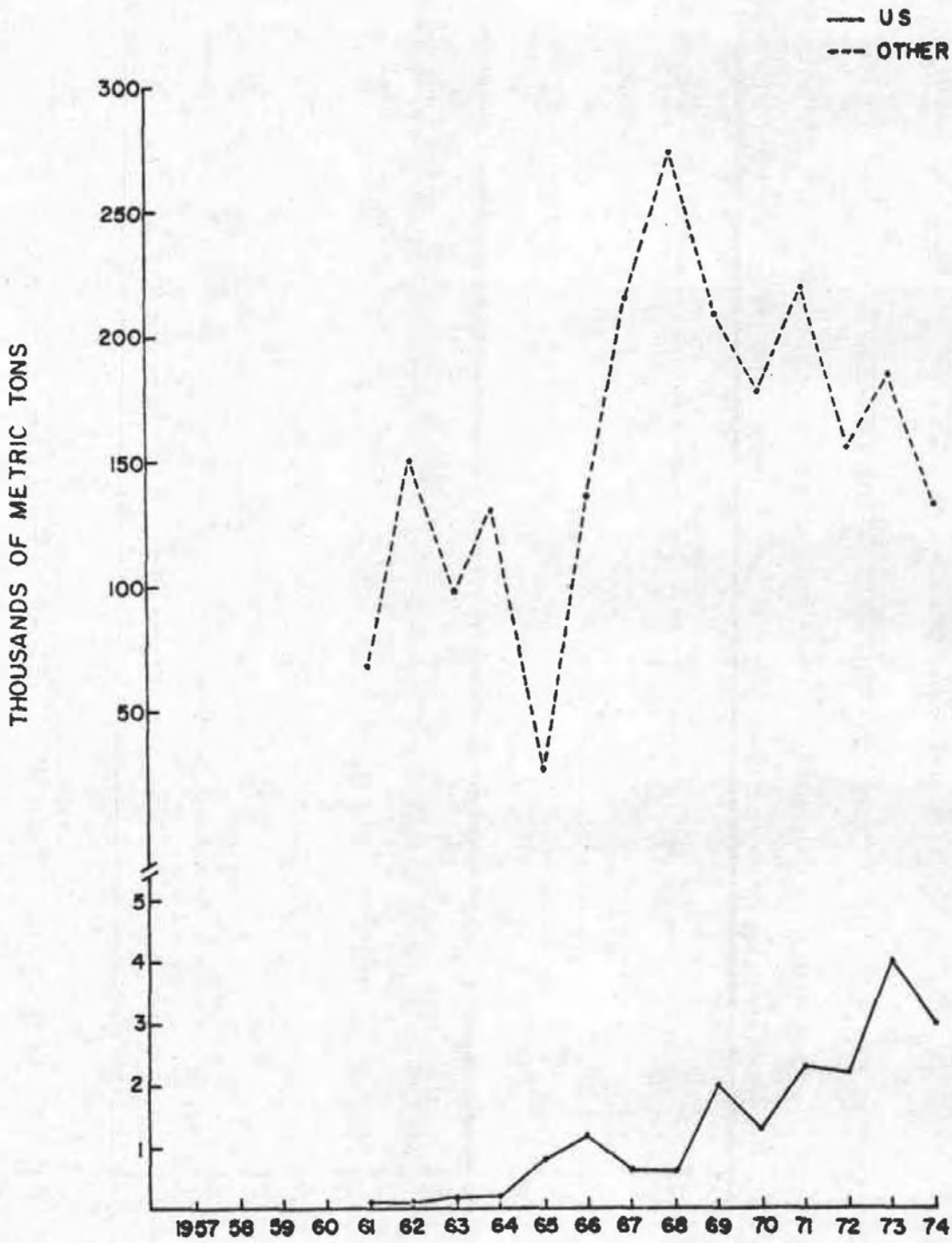


Fig. 4. Squid Landings, ICNAF Area 5Z (E & W)

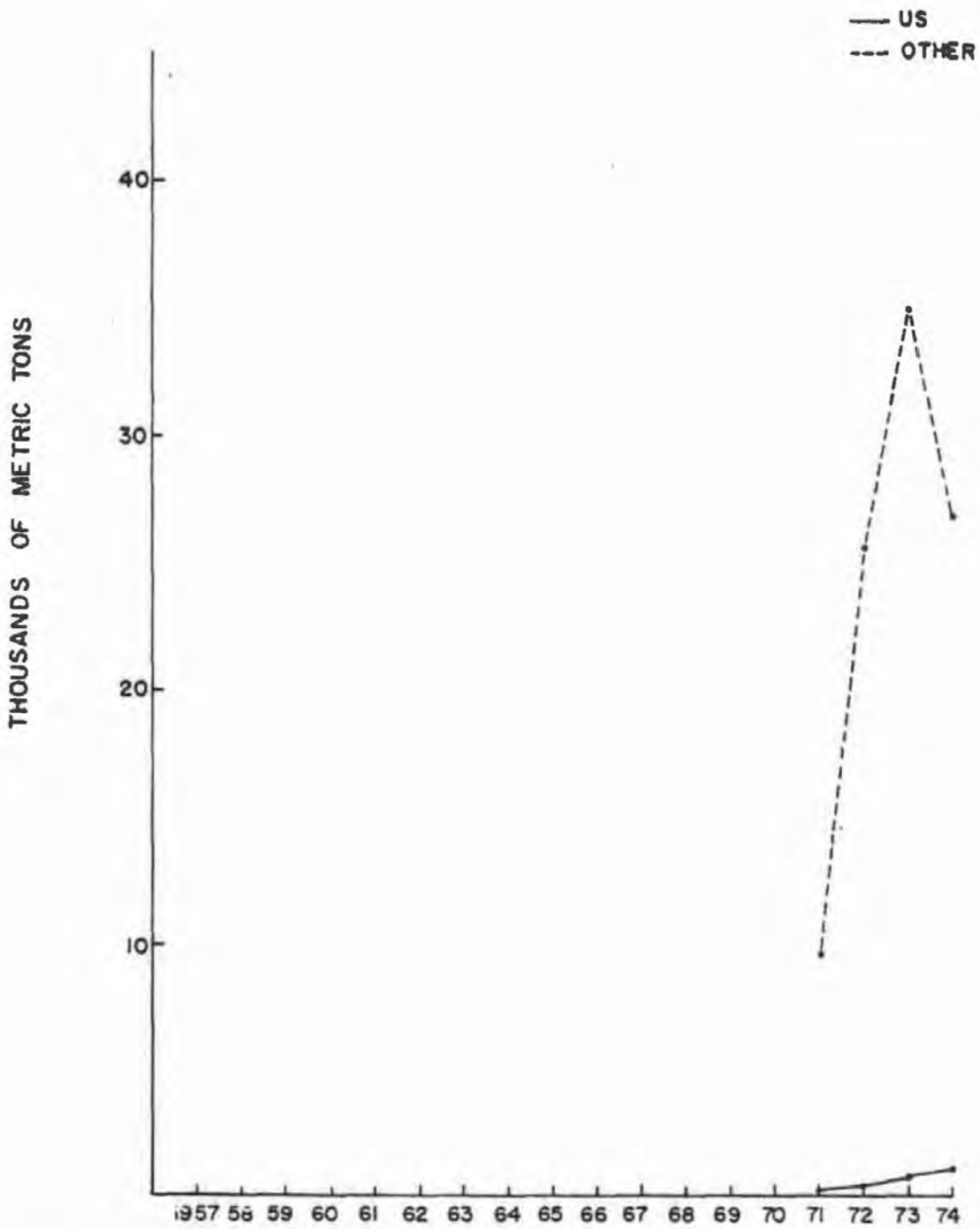


Fig. 5. Silver Hake Landings, ICNAF Area 5Z (E & W)

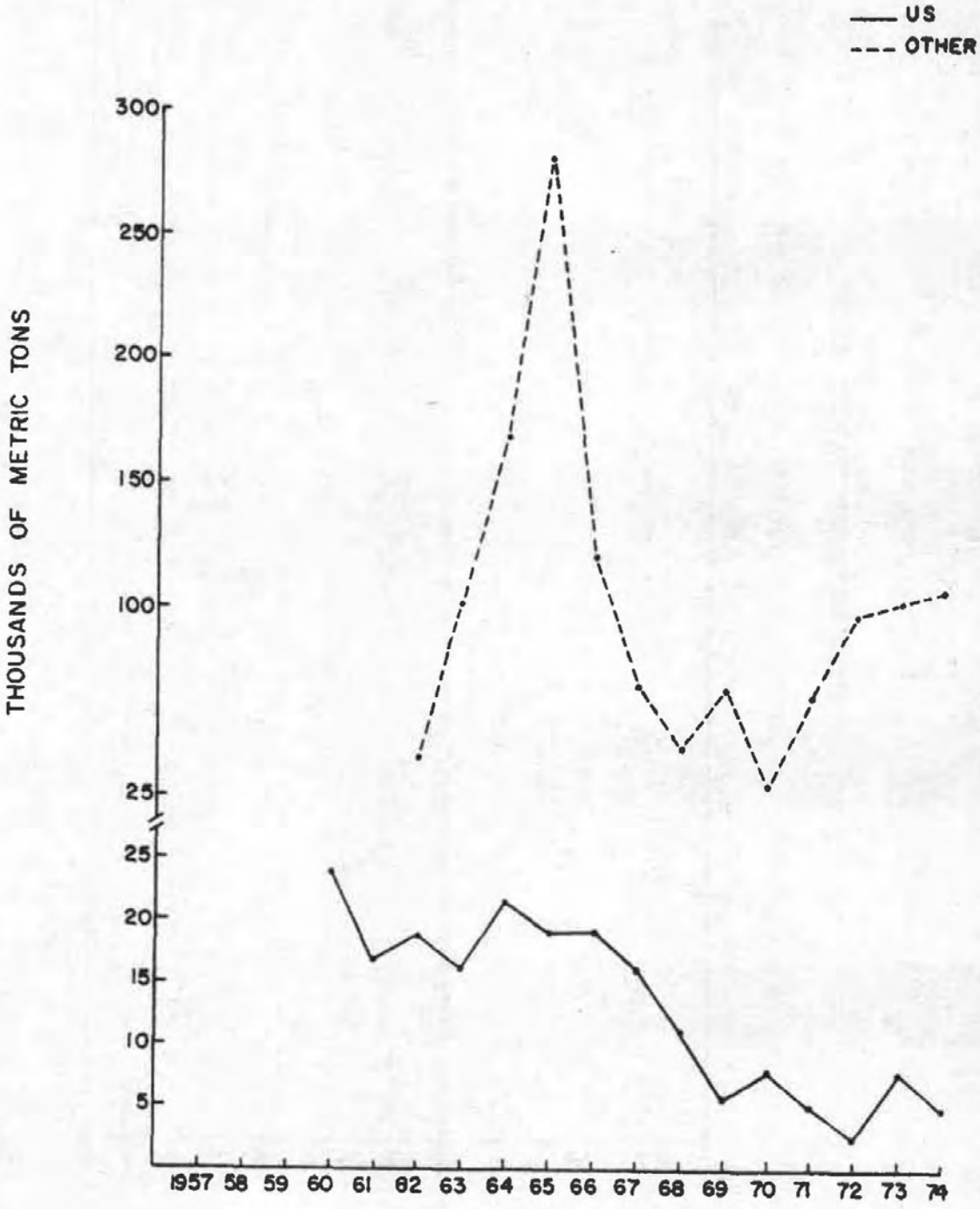


Fig. 6. Red Hake Landings, ICNAF Area 5Z (E & W)

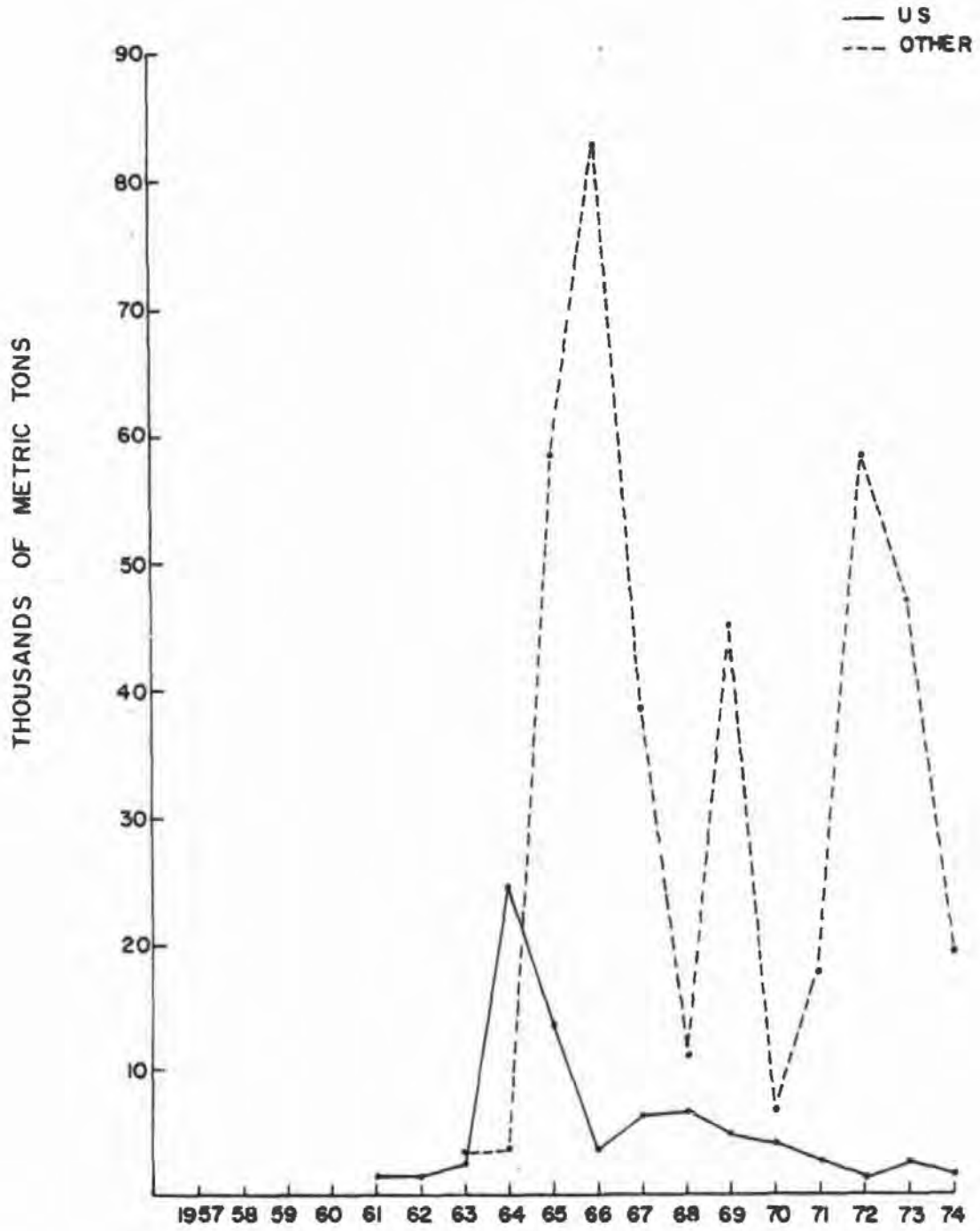


Fig. 7. Cod Landings, ICNAF Area 5Z (E & W)

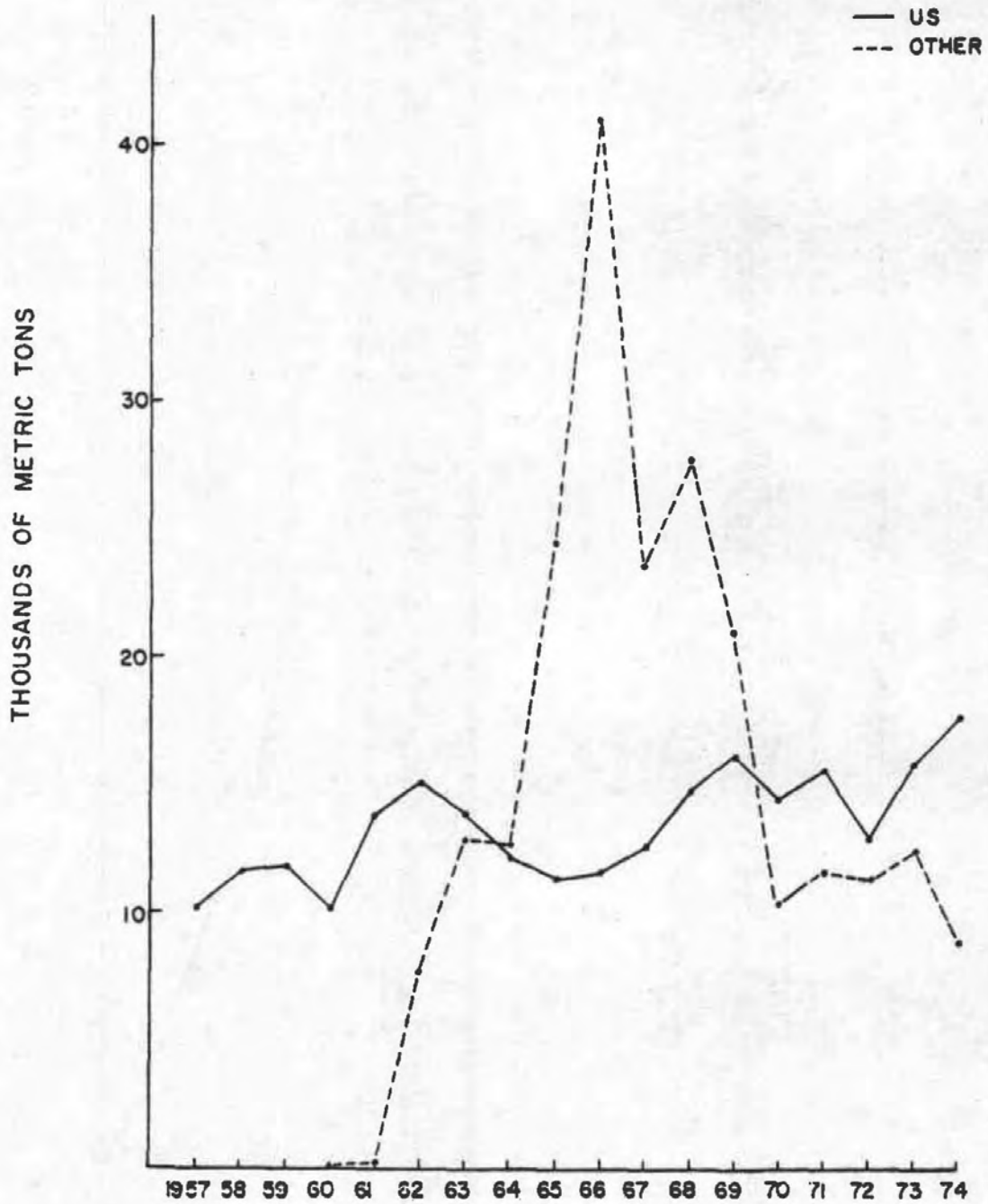
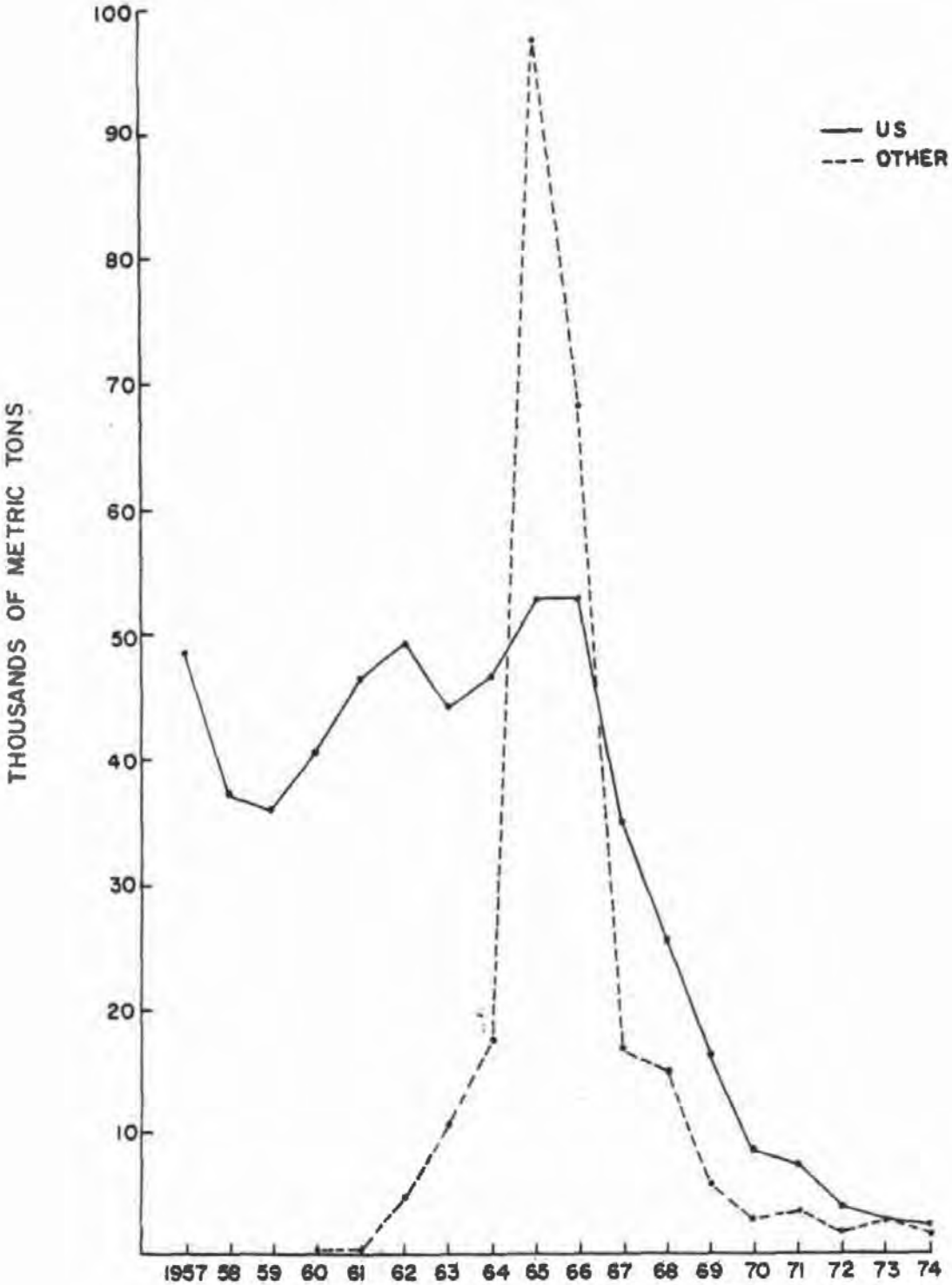


Fig. 8. Haddock Landings, ICNAF Area 52 (E & W)



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