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DEPARTMENT OF TRANSPORTATION

COAST GUARD

STUDY OF COAST GUARD ENFORCEMENT OF 200-MILE FISHERY CONSERVATION ZONE

(P.L. 94-265)

Ocean Operations Division
Office of Operations
U.S. Coast Guard Headquarters

MAY 1976

(Pd)
16200
6 June 1979

Subj: Information for the Spring Preview indicating a need for additional Coast Guard Cutters

4. (Cont.) are eight 378' HEC's assigned to Pacific Area. Each HEC is scheduled for two 60 day ALPAT's per year. Of these 60 days only 44 days are actually available for patrol in the active foreign fishery grounds, including the days required to transit from Kodiak. This results in a maximum of 704 vessel days on the active fishery grounds. Thus far these eight HEC's have not been available even for the above number of days due to the recent transfer of SHERMAN to Pacific Area as the eighth HEC and the Marine Sanitary Device installation, which removes each HEC from the ALPAT schedule for approximately one year. The deficiency in the number of vessel patrol days has been compensated for as much as possible by using CAMPBELL, CONFIDENCE, RESOLUTE, VENTUROUS, STORIS and occasional WLB's.

5. The presently required Gulf of Alaska domestic fishery patrols can be conducted with available assets of the Seventeenth District. Reference (a) established 316 vessel days per year to fulfill patrol standards. STORIS, CONFIDENCE and WLB's can meet this requirement if they are not required to conduct ALPAT's in the Bering Sea and Aleutians. However, it should be noted that the domestic fishery enforcement workload will increase with the establishment of each Fishery Management Plan and approval of each Joint Venture.

6. At the current level the West Coast fishery patrols can be conducted with available assets of the Eleventh, Twelfth and Thirteenth Districts. Reference (a) established 360 vessel days per year to fulfill patrol standards for the Hake/Mackeral foreign fisheries. There are also domestic salmon patrols which require 360 vessel days per year. These patrols cannot be effectively combined because the fleets are geographically separated. The foreign fishery patrols require three MEC's because the season is concentrated in six months. The domestic fishery patrols also require three MEC's because of the patrol days required, the dispersion of the fleets and concentration of the fishing seasons. CAMPBELL, RESOLUTE, VENTUROUS, YOCONA, CITRUS and COMANCHE can meet these requirements if they are not required to conduct ALPAT's in the Bering Sea and Aleutians. However, it should be noted that the domestic fishery enforcement workload will increase with the establishment of each Fishery Management Plan and approval of each Joint Venture.

7. The Western Pacific fishery patrols require three additional MEC's. Reference (a) established 211 vessel days per year to fulfill patrol standards. However, the Joint CG/NMFS Fisheries Enforcement Study, preliminary draft input, recommended 428 patrol days per year. This includes 144 days for enforcement of all FMP's in the Northwest Hawaiian Chain except Seamount Ground Fishery. 96 days are required in Guam and the Northern Marianas. 48 days are required in Samoa. The remaining days are required for the Main Hawaiian Islands and the Seamount Ground Fishery.

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8. Alaska and WESTPAC Drug interdiction patrols require two additional MEC's. The Pacific Area drug interdiction effort has been increased in recent months and significantly greater effort is contemplated. Fishery patrols and drug interdiction patrols cannot be effectively combined. The smuggler would only need to avoid the fishing grounds to increase greatly his chances of avoiding detection by the CG patrol vessel. The Fourteenth CG District does not require any additional assets for drug interdiction. The Seventeenth CG District requires two MEC's in Southeast Alaska for ELT and these cutters will also augment the SAR resources.

9. The Washington-Oregon-California (WOC) drug interdiction patrols require nine additional MEC's. This would enable two MEC's to be on continuous patrol along the California coast and two MEC's to be on continuous patrol along the Washington and Oregon coasts. A minimum of one MEC on continuous patrol in southern California and one MEC on continuous patrol along the Washington and Oregon coasts is needed. If sufficient MEC's were available to have 2 MEC's on continuous patrol in both of the above locations, effective barriers could be established when intelligence indicated the necessity. They would also increase the intelligence available to direct WPB's on coastal patrols. By utilizing HEC's of opportunity enroute to and from San Diego, the barriers could be extended. HEC's dedicated to drug interdiction can be used to collect intelligence and enforce laws on U.S. vessels off the coasts of Mexico, Central and South America. This effort could utilize from one HEC (for random patrols) to six (to provide 2 HEC's on continuous patrol). The HEC's and MEC's could also be used to establish artificial "choke points" to make up for the absence of natural ones on the West Coast.

10. The attached table summarizes the vessel requirements for Pacific Area.

11. The additional vessels needed as indicated above can be effectively used in fishery enforcement and drug interdiction. All mission areas must be considered in determining the utilization of vessels available. If or when the drug interdiction mission is terminated the resources could be effectively utilized to enforce FMP's, and patrol OCS projects, enforce shipping lane compliance, etc.

J. S. GRACEY

Encl: (1) PACAREA Additional Vessel Requirements Table

Pacific Area

Additional Vessel Requirements

	MEC	HEC
Bering Sea and Aleutian Fishery Patrols	0	3
Gulf of Alaska Fishery Patrols	0	0
West Coast Fishery Patrols	0	0
Western Pacific Fishery Patrols	3*	0
Alaskan Drug Interdiction Patrols	2	0
Western Pacific Drug Interdiction Patrols	0	0
West Coast Drug Interdiction Patrols	9**	6
Total	14	9

* Vessel requirements are based on 160 days per year of dedicated cutter time and do not include incidental enforcement by transiting buoy tenders. Geographic area is a significant factor.

** This is based on 4 vessels on continuous patrol off the Washington, Oregon and California coasts (1460 vessel days per year) and 160 patrol days per vessel.

Encl: (1)

STUDY

OF

COAST GUARD ENFORCEMENT

OF

200-MILE FISHERY CONSERVATION ZONE

(P.L. 94-265)

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I. INTRODUCTION

A. GENERAL

Currently some 17 nations actively fish off the United States coast in areas which will be regulated by the United States under P.L. 94-265. The provisions of this legislation extends United States fisheries management authority (effective 1 March 1977) to those species which are found within the 200-Mile Fishery Conservation Zone (FCZ) and, beyond the FCZ, to Continental Shelf fishery resources (CSFR) which appertain to the United States as well as to anadromous species which spawn within the United States but spend part of their life on the high seas where they are susceptible to exploitation.

The fisheries within this 200-mile zone (including CSFR and anadromous species for ease of reference) currently are regulated by a complex regime which includes United States law, treaties, and international agreements, all of which are intended to reduce exploitation. Had this objective been achieved, there would have been little need for the new legislation. Still, the experience gained from working within these laws and international agreements has lessons for the future.

This introductory discussion will not deal with those treaties relating to the highly migatory species such as tuna, which are not included in P.L. 94-265, or those species exploited exclusively by the United States (e.g. menhaden); nor will it detail agreements regulating fisheries conducted by citizens of neighboring countries because of the uncertainties in granting reciprocal fishing rights which may arise from the simultaneous extension of jurisdiction.

The greatest burden for United States fisheries management and enforcement is imposed by the large distant-water fleets of highly mechanized trawlers competing for the same fish stocks normally sought by American fishermen in areas off the Atlantic coast, the Pacific Northwest and Alaska (Appendix A). It is in these geographical areas that the greatest experience with fisheries enforcement has been generated; therefore, they serve as the best starting point for discussions of the fisheries enforcement problem.

B. ACTIVITIES RELATED TO FOREIGN FISHING OFF THE COAST OF THE UNITED STATES

1. Extent of foreign fleet activity,1975. An average of 539 foreign fishing vessels (Appendix B) operated off the coasts of the United States each month. The range of activity ran from a high of 996 in June to a low of 269 in November. Average concentrations of foreign fishing vessels by region are presented in Table I.

TABLE I

FOREIGN FISHING VESSEL CONCENTRATIONS, 1975

U.S. Coastal Region*	Average Number/Month
N.W. Atlantic Ocean	189
Gulf of Mexico	15
Pacific Ocean	57
Alaska	278
	539

*See geographic charlets in Appendix I.

These vessels operated under the obligations imposed by United States law and/or one or more international agreements. U.S. enforcement activities in 1975 relating to these laws and treaties are summarized in Table II. A comprehensive listing of cases involving foreign fishing vessel violations of U.S.exclusive fishing rights during the period January 1964 to April 1976 is contained in Appendix C.

TABLE II

SUMMARY OF U.S. COASTAL FISHERY ENFORCEMENT ACTIVITY, 1975

Region	Seizures	Avg Penalty	Int`l Insp/Boardgs
N.W. Atlantic Ocean	11	$157,252	539
Gulf of Mexico	1	(Vsl Forfeited)	0
Pacific Ocean	3	$117,191	48
Alaska	5	$442,500	87
National Tot/Avg	20	$188,978+ Avg	674

In addition to mere presence, another measure of the level of foreign fishing activity is the amount of fish caught. Because sources are incomplete for all coastal regions affected, the following are the latest available figures on foreign and domestic catches in the three major areas of concern.

TABLE III

COMPARATIVE CATCHES OFF U.S. COASTS

1974 Actual/(1975 Quota) in Metric Tons

Region	United States	Foreign
N.W. Atlantic	207,626 (211,600)	730,984 (638,400)
Pacific	105,757 (163,000)	** (238,000)
Alaska	228,432	** (1,930,000)

**Catch totals not available as of this writing.

2. Enforcement patrols. To enforce the laws, treaties and agreements off the coasts of the United States, the Coast Guard and the National Marine Fisheries Service (NMFS) cooperate in scheduled patrols using both cutters and aircraft. NMFS enforcement agents accompany a majority of the Coast Guard's patrols to advise the commanding officer or aircraft commander on certain fisheries-related aspects of enforcement, including applying their expertise to substantiating violations, and to perform the NMFS function of gathering information (e.g., collecting data on fisheries activities and trends) necessary for the proper management of the fisheries.

TABLE IV

CURRENT FISHERIES PATROL STANDARDS

Region	Sq. Miles	Cutters on Patrol*	Flights/week*
N.W. Atlantic Ocean	60,000	3 (year-round)	4
Gulf of Mexico	34,000	1 (Jun-Aug)	3 (Jun-Aug)
Pacific Ocean	19,000	1 (1Mar-1Nov)	3
Alaska	350,000	2 (year-round)	5

*See Appendix B for fishing vessel density by season and area.

To meet these patrol schedules as well as search and rescue, marine environmental protection, military readiness commitments, and drug traffic interdiction operations, the Coast Guard currently uses a mix of multi-mission resources available from the following inventory:

16 High Endurance Cutters (WHEC)

23 Medium Endurance Cutters (WMEC)

18 C-130 (LRS) Fixed Wing Aircraft

21 HU-16 (MRS) Fixed Wing Aircraft

33 HH-3 Helicopters

61 HH-52 Helicopters (some deployed aboard flight-deck equipped cutters to extend and enhance surface patrol coverage and effectiveness)

C. CURRENT LAWS, TREATIES, AND AGREEMENTS

1. United States Law. The Bartlett Act (16 U.S.C. 1081 et seq.) prohibits foreign vessels, except as authorized by international agreement, from fishing or conducting fisheries support operations in the territorial waters (TW, 3-mile limit) or the contiguous fisheries zone (CFR, 12-mile limit) of the United States and from engaging in the taking of Continental Shelf fishery resources (CSFR; e.g., lobster, crabs, etc.) which appertain to the United States. Violations of these prohibitions subject the master of a vessel found in violation to criminal penalties of up to $100,000 and/or a year imprisonment, and civil penalties which include the possibility of the forfeiture of the vessel, its gear, and the catch. Essentially, the first two prohibitions are boundary regulations, enforced by determining the position of the vessel and its activity, and: in the case of fishing operations within the 3-12 mile CFZ establishing whether the activity is sanctioned by an agreement between the United States and the flag state government of the vessel involved (i.e., to conduct the activity in the position at which the vessel is located), and, if no such agreement exists, seizing the vessel and bringing it to port for prosecution by the Department of Justice; such seizure/prosecution is undertaken in all cases of foreign fishing operations within U.S. territorial waters.

CSFR violations are somewhat more complex. The enforcement officer must first establish the position of the violator as being over what is clearly the United States' continental shelf (which may be beyond 12 miles), determine whether the vessel might reasonably be taking CSFR, and, if so, board to search the vessel. At this writing, CSFR violations consist of three different offenses:

a. Conducting a directed fishery for CFSR without an agreement with the United States (e.g. deliberate fishing operations with the intent of harvesting lobster, crab, or other designated continental shelf species);

b. Retaining CSFR caught while conducting directed fisheries for other species (e.g., lobster caught incidental to trawling for squid and not returned to the sea);

Failing to return CSFR, caught while conducting directed fisheries for other species, to the sea with a minimum of injury (e.g., an incidental catch of lobster is not sorted and returned to the sea at the first opportunity).

Once the boarding officer establishes that any of these offenses has been committed, he may seize the vessel and take it to port for prosecution by the United States Attorney.

2. Treaties. Beyond the provisions of the Barlett Act, which govern the taking of U.S. CSFR and foreign fishing activity within 12 miles of the U.S. coast, the United States is party to a number of treaties which "regulate" coastal fisheries. Two of the most important are the International Convention for the Northwest Atlantic Fisheries (ICNAF) and the International Convention of the High Seas Fisheries of the North Pacific Ocean (INPFC). The regulations agreed to and promulgated by the commissions established through these Conventions are made binding on United States fishermen by the Northwest Atlantic Fisheries Act (16 U.S.C. 981 et seq.) and the North Pacific Fisheries Act (16 U.S.C. 1021 et. seq.), and on foreign fishermen by their flag state's domestic legislation. These Conventions provide comprehensive fisheries regulations affecting the United States coasts north of Cape Hatteras (North Carolina) in the Atlantic and the North Pacific Ocean off the U.S. west coast, although their function in each area differs to some degree (Appendix D).

ICNAF's 18 member governments (Appendix E) meet annually to decide on the regulations required to manage the entire stock of fish in the Northwest Atlantic Ocean from Greenland to North Carolina. The ICNAF members each have commissioners who, through a system of geographically-oriented Panels, collectively determine the regulations for all fisheries in the convention area. Within each subarea, proposed regulations must be approved by a majority of the members, or unanimously approved in the case of a proposal which the Panel wishes to enter into force immediately rather than delaying the date of entry into force for the usual six-month period. In

Panel 5, which considers the Atlantic waters off the U.S. and has thirteen members, there must usually be seven affirmative votes to approve a proposed conservation measure. Abstentions, "no" votes, and absentees all detract from this total. After approval by the Panel, the Commission must recommend the proposal to the Member Governments for adoption by unanimous vote. For the waters off the United States Atlantic coast, regulations for 13 different species of fish are established, as well as the overall management scheme for all finfish and squid which inhabit the subarea. The regulations center around a quota allocation system, but also include closed areas, gear restrictions, and administrative requirements (e.g., logbook keeping, vessel registration).

The INPFC (United States, Canada, Japan) also meets annually. Rather than establishing comprehensive regulations for the fisheries, the Commission establishes regulations for the salmon and halibut fisheries and recommends regulations for other species to be implemented on a bilateral basis between the coastal states and countries having distant-water fleets. Since the Soviet Union is not a member of INPFC, a significant interest in North Pacific fishery activity is not formally represented at the Commission's meeting.

Enforcement of both of these Conventions is carried out by the flag states, although inspectors from the other member countries may, under terms of the Convention, act, on behalf of the flag state by stopping, boarding, inspecting to determine the vessel's compliance with commission regulations, and, in the case of the INPFC, detaining vessels found in violation of that Commission's regulations. In ICNAF, the inspector, upon discovery of a violation, may attempt to communicate with a flag state inspector or "designated authority" and, if the inspector or authority agrees, remain aboard the vessel until a flag state inspector or official arrives at the scene to take custody of the evidence. In each case, prosecution is undertaken by the flag state of the vessel found to be in violation.

3. International Agreements. The United States is currently party to seven formal bilateral agreements with countries that fish off the United States coast (Appendix F). These bilaterals cover matters not otherwise addressed by existing conventions. One agreement with Canada covers reciprocal fishing arrangements off both coasts of the two countries. In the Pacific, there are agreements with Poland, Japan, the Soviet Union, and South Korea; while in the Atlantic, Poland and the Soviet Union have agreements with the United States.

These agreements provide for restrictions on the high seas fishing activities of the distant-water vessels in exchange for port privileges in the United States as well as the use of specified areas within the United States CFZ for fishing and fisheries support activities. The Pacific agreements provide the type of quota regulation found under the ICNAF arrangements in the Atlantic, and include time and area closures and gear restrictions. The Polish agreement (Pacific) provides for a forward-looking effort limitation regulation which limits Polish operations to 936 vessel-days in an area off the coasts of California, Oregon, and Washington. The Atlantic agreements provide primarily for closed areas, some quotas on fish included in the "Others" category under ICNAF, and fishing gear restrictions. The agreements with Poland and the Soviet Union also include arrangements for the prevention of fishing gear conflicts at sea, investigations if conflicts do occur, and bilateral claims boards to arbitrate claims arising from conflicts between nationals of the countries party to the agreement.

Unlike the treaties, previously described, enforcement of the regulations contained in the bilateral agreements is strictly a flag state responsibility. Violations which are observed during Coast Guard surveillance flights or surface patrols are reported through diplomatic channels to the flag state government in each case, and to the fleet commander of the vessel violating, as appropriate. Under the terms of these agreements, boardings by United States enforcement personnel are generally permitted on a voluntary or courtesy basis only (i.e., with the consent of the vessel's master); thus, enforcement actions are limited in both scope and effectiveness.

II. ENFORCEMENT OF EXCLUSIVE FISHERIES MANAGEMENT AUTHORITY

A. CURRENT ENFORCEMENT SITUATION.

Fisheries off the coasts of the United States are, for the most part, managed by international organizations whose function is to provide for the conservation of fish stocks while permitting its members to harvest fish at some level. "Violations" of these agreements often cannot be isolated as to time and place, because a single violation may involve many ships of the same nationality fishing under a single national quota. There are a number of factors which should be recognized when considering a quota violation. First is the nature of the quotas themselves: established by scientists whose objectivity may be tempered by the political and economic realities which arise from their own country's interests, and allocated by negotiators who are also acutely aware of those same pressures. Inherently, the quotas do not reflect the "conservative" approach one would expect from the scientific analysis. Rather they tend to push the upper limits of any range of catches recommended by the scientists as not overly detrimental to the species. Coastal state interests, such as those of the United States, require an evaluation of the entire fish stock; the foreign nationals often are interested in a particular species, without regard to whether their fishing for that species results in damage to other species, either by incidental catch or by removal of a portion of the food chain. Conservation-oriented estimates of the allowable fish catch may be forgotten by these organizations in the desire to satisfy protein demands at home.

Secondly, to compound the problem, although the USSR (in both the Atlantic and Pacific) and, to a lesser degree, Japan (in the Pacific) mount the only distant-water control effort of any significance off the U. S. coast, most distant-water fishing countries have a great deal of difficulty managing/controlling their fishermen. The expense of providing an enforcement presence with the fishing fleet and an inevitable time lag in communications impedes effective control of a distant-water fishery. The United States demanded and got (for the most part) schemes in ICNAF and INPFC which allow U.S. inspectors to perform the enforcement function on behalf of the flag state. However, the lack of positive, direct flag state enforcement effort is felt most acutely in the enforcement of quota regulations--the mainstay of fisheries management today--because the foreign vessels are able to catch huge quantities of fish beyond the quota in a relatively short period of time. Even well intentioned flag nation efforts generally fall short of preventing this over-fishing.

The coastal state must now rely on flag state data to substantiate quota fulfillment projections developed from surveillance and boarding reports. Coupling the over-fishing with quotas that are set too high to begin with, one begins to see that the difficulties in fisheries management and enforcement do not lie as much with the defense of boundaries and violations, that can be tallied empirically, as they do with more subtle specie and quota regulations that are not easily enforced. When a violation occurs, such as excessive incidental catch of haddock (a species regulated in ICNAF to protect the special interests of U. S. fishermen by imposing a 1% possession limit relative to all fish on board), there is little wonder that: (a) the catch is not properly logged, and (b) violations are not detected; when, in order to stay within this regulation, the foreign fisherman would have to cease his directed fishery. The foreign fisherman's reaction is to throw the fish over the side and not log anything.

The two other types of regulations currently employed under international regulatory schemes are time/area closures and gear restrictions. These are established primarily to protect fisheries of special interest to United States fishermen. The objectives of these regulations are first, to protect areas where important species spawn or conduct migrations; and secondly, in the case of the gear restrictions, to reduce the incidental catch of species by foreign nationals conducting a directed fishery for another specie(s). These types of regulations are enforced today by cutter and aircraft patrols, and through boardings (if boardings are allowed under the applicable convention's enforcement scheme), to document the violations and turn the offender over to the flag state, as appropriate. The more than 460,000 square miles to be patrolled, the significant foreign fishing effort outside of closed areas, and the limited resources available to patrol the closures all increase the problems of enforcement. Gear restrictions are difficult to enforce because it is virtually impossible to precisely determine the kind of gear deployed unless there is boarding or other close surveillance to determine if the vessel is in compliance.

1. Current Problems Associated with Enforcement. In summary, the major problems associated with the enforcement of international treaties and agreements are:

a. Bilateral.

(1) Since these are executive agreements, in virtually all cases the enforcement provisions may not have the force of law and thus may not be made mandatory for the vessels of each party on a reciprocal basis. As such, boardings are conducted on a voluntary or courtesy basis.

(2) Prosecution of any violations discovered is handled by the flag state.

b. Multilateral.

(1) Regulations are extremely complex.

(2) Enforcement becomes mandatory, as the enforcement provisions are enacted into law in each party's state; vessels are required to accept boarding.

(3) Prosecutions are handled by the flag state.

(4) Performance of enforcement obligations in the Conventions is unsatisfactory both from the control exerted over the distant-water fleets on the fishing grounds and in terms of the results of prosecutions by the flag state.

B. EFFECTS OF P.L. 94-265 (H.R.200) ON CURRENT TREATIES

The Conference Report accompanying H.R.200 in its final form states, in part, that "the conference committee intends that governing international fisheries agreements {as defined in the bill} will be the primary mechanism through which foreign fishing is authorized" within the 200-mile FCZ. Further, the committee established the primary ground rule that "foreign nations {will be} limited to that portion of the optimum yield of any fishery subject to the fishery management authority of the United States which will not be harvested by vessels of the United States...Both the optimum yield and the surplus to be made available for foreign fishing are to be determined by the appropriate Regional Fishery Council or by the Secretary {of Commerce} in fishery management plans and amendments to such plans." (Report of the Committee on Conference on H.R.200, Senate Report 94-711/House Report 94-948, at 44.) This language,

simplifying the specific provisions of the bill, clearly states that the setting of quotas and allocations for foreign catch will no longer be a matter of agreement between the United States and those foreign countries that wish to fish off our coasts. The Conference report adds that Section 303 of the Act specifies that the Council may designate the manner in which fishing shall be limited (i.e., by zones, vessels, or gear).

Current international agreements will, following the mandate of the Congress, be terminated, and a new series of "governing international agreements" will be negotiated to meet the requirements of the legislation. These requirements, the knowledge of which is important to analysis of anticipated enforcement needs, specify:

"(1) That each foreign nation and its vessels will abide by all regulations promulgated by the Secretary of Commerce implementing this Act and any applicable fishery management plan;

(2) that each foreign nation and its vessels will abide by all applicable enforcement procedures;

(3) that each foreign nation and its vessels will adhere to all requirements for observers to enforce the Act and will pay for the cost of such observers;

(4) that each foreign nation and its vessels prepay any license fee to the United States;

(5) that each foreign nation and its vessels have appointed agents on whom legal process can be served.

(6) that each foreign nation will assume responsibility for reimbursement of United States citizens for any loss or damage of their fishing gear or catch caused by any fishing vessel of such nation." (Source: Senate Report 94-711/House Report 94-948, at 44).

The Department of Commerce (National Marine Fisheries Service) will promulgate regulations developed from the regional councils' fishery plans. At the outset, such regulations probably will not be dissimilar to those contained in the agreements today; the basic enforcement change is that the United States will board and inspect as a matter of right and will prosecute the offenders vice the flag state. ICNAF and INPFC could continue

to play their current role of supplying, in part, the scientific information vital to stock assessment, and could become forums for allocating the "surplus" of stocks among the competing foreign nations.

C. FUTURE TRENDS

It is clear that future regulations should be, if nothing else, enforceable. To this end, the recently established "vessel-days" limitation on Polish vessel operations off the Pacific coast of the United States appears to hold great promise as the next stage beyond the quota system for overall fisheries management. It is foreseeable that overall regulation will be based on some form of effort limitation, with specific gear and time/area closure regulations providing protection for the species and areas of greatest concern to American fishermen.

1. Fishing Effort Limitation. These regulations are likely to be based on the historical performance of foreign fishing vessels. Simply stated, the amount of fish caught by the foreign fishermen can be accurately estimated by the number of vessel-days that the foreign vessels are observed in a particular area off the U.S. coast. By multiplying the number of days the vessels are present by a performance factor for each type of vessel involved, an estimate of the total catch being taken can be made. The performance factor can be refined by type of vessel, fishing gear in use, species sought, time in transit and time in repair, to arrive at an expected amount of fish that the vessel is able to catch on a given day. After the catch which the foreign vessels will be allowed to take is calculated (by establishing the total catch and deducting the amount that the United States' fishermen will be able to harvest), a vessel-day limit can be allocated and licenses issued for those vessels the foreign government wishes to have fish. If the United States also (1) establishes dates for the beginning and the ending of a fishing season, and (2) defines the areas in which fishing can take place, neat and enforceable restrictions would then regulate any allowed foreign fishing operations.

There are a number of reasons for enforcement patrols in this scheme. First, it is necessary to have a presence in the area to conduct surveillance to establish the number of days that the vessels are actually present and to verify that no unauthorized fishing vessels are present.

Second, boardings are required to update the data base (actual catch, species mix, factors relating to performance) in order to use the results of the current year's allocation of effort in the establishment of future allocations. Third, at the conclusion of the fishing season, a presence is required to ensure that there are no violations of the closure. Closures will not all occur at the end of the calendar or fishing year. For example, the Soviet mackerel fishery in the Altantic Ocean is generally conducted in the first three months of the year when there is a relatively small by-catch of other species. Even if that fishery were closed on the first of March, the mid-Atlantic squid fishery, the Soviet hake fishery, and the Spanish cod fishery would just be getting started. It is, therefore, necessary to have patrols covering the active fishing areas throughout the year to ensure that those who are allowed to fish do not exceed the bounds of their licenses.

2. Time/Area Closures, Gear Restrictions. These types of regulatory schemes will be used to protect the areas and fisheries of particular significance to United States management objectives by providing protection for stocks during certain times of the year. Vessels operating on an "effort limitation" basis may still be required to use a certain type of gear (e.g., midwater trawls would be required in the Soviet mackerel fishery to protect flounders and CSFR) and spawning stocks may have to be protected to ensure yields of fish in the future. Absent significant improvements in technology, these regulations will have to be enforced much as they are today (i.e., observation of fishing operations). These types of regulatory schemes may also be applied to U.S. vessels, and so would require enforcement at sea.

3. Quotas. As a result of effort limitation regulations, quotas (per se) will, in all probability, be phased out.

D. BASIC ENFORCEMENT OPTIONS.

Although there are a number of enforcement schemes, there are only two basic enforcement alternatives; namely: (1) flag state enforcement, and (2) coastal state enforcement.

1. Flag State Enforcement. Often considered in the development of enforcement strategies for extended jurisdiction is the concept of flag state enforcement; first, as a means to reduce the United States' expenditures necessary to maintain an effective level of enforcement and, second, to reduce the potential for international conflict on the fishing grounds. The value of each of these points is subject to considerable debate, but the historical performance of flag state enforcement under current agreements does not support a reliance on the flag states to enforce fishery regulations in the United States' FCZ.

Today, as has been discussed, enforcement of the international agreements is primarily the obligation of the flag states; under the convention systems, United States officers may sometimes act on behalf of the flag state in carrying out their inspections. Only two countries, Japan in the Pacific and the Soviet Union in the Atlantic and Pacific, maintain enforcement vessels with their fishing fleets, although other nationalities do have inspectors aboard fishing vessels who exercise limited control. This is reflected in the boarding statistics published by ICNAF for at-sea inspections in 1974.

TABLE V

ICNAF AT-SEA INSPECTION DATA, 1974

Nationality	Total of Own Vessels Inspected	Other Flag Vessels Inspected
Canada	63	105
Japan	8	
Poland	72	
Spain	55	
UK		6
USSR	168	1
USA	24	322

It is clear that only the Soviet Union, Spain, and Poland, among the 14 distant-water fishing states in ICNAF, exert any control over their fleet's operations. As an example, the Soviet Union detected 23 violations in 578 inspections of its vessels inport and at sea, while the United States

detected 71 violations in only 115 inspections of Soviet vessels at sea. Penalties for these violations levied by the distant-water states, when reported to the Commission, have ranged from "instructions to the master," to fines ranging from $100 to $1000; and, in the case of the 1975 Soviet violation of a restricted gear area, summary demotion of the vessel's master and forfeiture of the fish caught while fishing illegally. The United States detected 104 violations aboard foreign vessels in 322 inspections during 1974; the situation did not improve much in 1975 when inspectors from the United States discovered the same number of violations in 388 ICNAF inspections.

From this record in the Atlantic, and recognizing that, with the possible exception of the USSR and Japan, the flag states exert less control over their fleets in the Pacific, the ability and willingness of flag states to enforce must be seriously and objectively questioned. It is clear that, historically, they have not self-policed themselves; the only meaningful enforcement has been by the United States. The clearest example of failure to control a fleet occured in 1975, four years after the United States made known its intention to enforce fishery regulations. Polish vessels were observed fishing in ICNAF Division 5Y during November 1975 after that area had been closed. On Friday, 8 November 1975, the Polish fleet commander was advised of the closure during a meeting with Coast Guard and NMFS enforcement personnel; he then promised to keep his vessels out of the restricted area. Yet, on the following Monday, a Polish trawler was seized for fishing within the CFZ inside Division 5Y. This failure to exercise control over the vessel's operation is representative of the situation and does not auger well for the effectiveness of flag state enforcement when one considers that the Poles operate one of the most efficient and modern fleets fishing off the coast of the United States. Even with flag state enforcement, it would be necessary at the outset for the United States to conduct patrols of its own to ensure that the foreign trawlers were living up to the regulations. The state of the fish stocks is too critical today to allow for any lapse in enforcement.

The risk of confrontation with other countries at sea over enforcement actions taken against their vessels within the FCZ exists. The potential for this can be reduced by timely, diplomatic action. A challenge to the United States' claim of jurisdiction may be exerted by diplomatic or economic pressure, perhaps even seizures of Unites States vessels by other countries. However, if prior to implementation of P.L. 94-265, the United States notified those countries that have "traditionally" fished areas included in the FCZ of:

(1) the amount of catch they would be allowed to share,

(2) the nature of the regulations within the FCZ and the procedures for enforcing them,

(3) the standards of conduct to which vessels fishing in the FCZ will be held,

much of the uncertainty that could lead to confrontation may be eliminated.

It is the Coast Guard's conclusion that flag nation enforcement is not reliable enough to meet U.S. objectives for fisheries management. It follows that the U.S. enforcement option is the only way the intent of P.L. 94-265 will be met. The questions which remain are how much enforcement is enough, what character should enforcement take, and what alternatives exist for enforcing fisheries laws.

2. United States/Coastal State Enforcement. At present, United States enforcement of fishery related law (TW/CFZ, CSFR) is effected through the seizure of offending vessels and the subsequent levy of fines and penalties as provided by current domestic statute. This has led some of the foreign countries to establish buffer zones at 13 to 15 miles off the coast in order to leave a margin for navigational error and to reduce inadvertent violations of the CFZ. Similar flag state initiatives could be taken with regard to regulations in the FCZ; for example, a country might leave a margin of error in its scheduled deployments of vessels or reissue licenses for a period shorter

than that authorized by the United States to ensure that no violations occur. Such actions would reduce the catches below that authorized. Based on past performances, however, it is doubtful that foreign governments would take such positive initiatives except in response to a visible, fair, professional, and credible enforcement program on the part of the United States. Without significant United States presence in the areas where foreign fishing will take place in the FCZ immediately upon the effective date of the legislation, there will be no credibility in the minds of the foreign governments and fishermen. Fish resources are scarce enough and the demand for fish products is high enough to justify both the risk of violating the regulations to catch them and strict enforcement of the regulations to conserve and manage them.

There have been considerable differences over the cost/benefit of enforcing fishing restrictions. Most of these differences have been provoked by what is perceived to be excessive costs to the United States. It is important, therefore, to resolve the question of costs and benefits of fisheries enforcement before discussing alternative U.S. enforcement systems.

III. COSTS AND BENEFITS OF FISHERIES ENFORCEMENT

A. GENERAL DISCUSSION.

1. Calculating Cost/Benefit Ratios.

Any discussion of cost/benefit ratios in fisheries management should be prefaced by some notes of caution. The number of violations detected, the dollar value of fines assessed, or the impact of enforcement on the United States market may not, in themselves, accurately reflect the impact of a violation on the fishery.

The starting point of the calculations has as much to do with the value of enforcement as does the effort expended for enforcement. It may be possible to establish today's level of a stock as the level for sustained exploitation for the foreseeable future; it is also possible that it will be in everyone's interest to manage the total take in the near-term in a manner which will raise that sustainable yield to some higher level. There are biological and economic reactions that will impact on the benefits of enforcement resulting from either of these basic decisions. The future U. S. market price for a species whose stock size was held at a low level could increase, resulting in an increase in benefits associated with a deterred violation. A decision not to manage fisheries in a manner which will insure sustainable yields in the future may result in alteration of the food chain to the extent that residual effects would impact on a species of greater value to United States fishermen. Conversely, there may, in fact, be no short-term direct cost of a violation to American fishermen. The principles of the FCZ call for foreign allocations only after the United States fishermen have an allocation to meet our needs. Strictly speaking, foreign violations would not hurt the domestic fishing industry until violations depressed the stocks to the point where there were not enough fish for U.S. fishermen to catch. This, of course, ignors the decrease in his catch-per-unit of fishing effort. There also exists the possibility of developing American export markets based on the exclusion of foreign vessels from the FCZ when the stocks reach the level that United States fishermen can take the entire allowed catch. This latter possibility would have both balance of payment and foreign policy implications.

Quantification of benefits accruing from FCZ enforcement is addressed in Appendix H and applied to enforcement efforts in later sections.

2. Status of the U. S. Fishing Industry. Congressional and federal agency studies have concluded that both foreign fishing operations off the coast of the United States and development of highly mechanized mobile fishing fleets generally have contributed to the decline of the United States' fishing industry. Species such as haddock, herring, flounder, mackerel, ocean perch, crabs, and lobsters were the mainstays of the United States fleet in the late 1950s. Since that time, the level of domestic catch has remained essentially static, while this country's fish consumption has nearly doubled. In 1950, seafood imports comprised 23.4% of the fish products consumed in the United States. That figure rose to 60% by 1974. In this regard, the adverse balance of payments for fish and fish products increased more than 300% in the period from 1960 to 1972. These changes have affected domestic fishing, an industry which currently consists of:

a. 130,000 fishermen and 14,000 vessels (over 5 GRT);
b. 1,800 processors and 1,200 wholesalers employing 85,000 persons;
c. 2,100 importers/exporters;
d. frozen/canned food distributors, and store, restaurant and institutional buyers.

3. Impact of Fisheries on the U. S. Economy. The potential annual sustainable catch from the United States' coastal waters is between 20 and 40 billion pounds, worth at least $12 billion retail. The impact of fish and fish products on the United States economy in 1973 is indicated by Table VI.

TABLE VI
IMPACT OF FISH PRODUCTS ON THE U. S. ECONOMY, 1973

Source	Quantity	Value
U. S. Landings	4.7 billion lbs	$2.625 billion
Imports	7.1 billion lbs	3.964 billion
Exports	.2 billion lbs	.111 billion
Total	12.0 billion lbs	$6.700 billion

Effective management of the fish resources off the United States could not only restore the sustainable yields of the stocks to higher levels than allowed today, but could serve to reverse the relative status of the United States fishing industry that

landed only 4.4 billion pounds of the 12.3 billion pounds of fish taken from United States coastal waters in 1973. Effective enforcement of a well implemented regulatory scheme will be a significant part of the total management plan to restore the stocks and provide the United States industry with the potential to grow.

B. COST/BENEFIT METHODOLOGY APPLIED TO CURRENT ENFORCEMENT EFFORT.

1. Fisheries Law Enforcement Planning Model

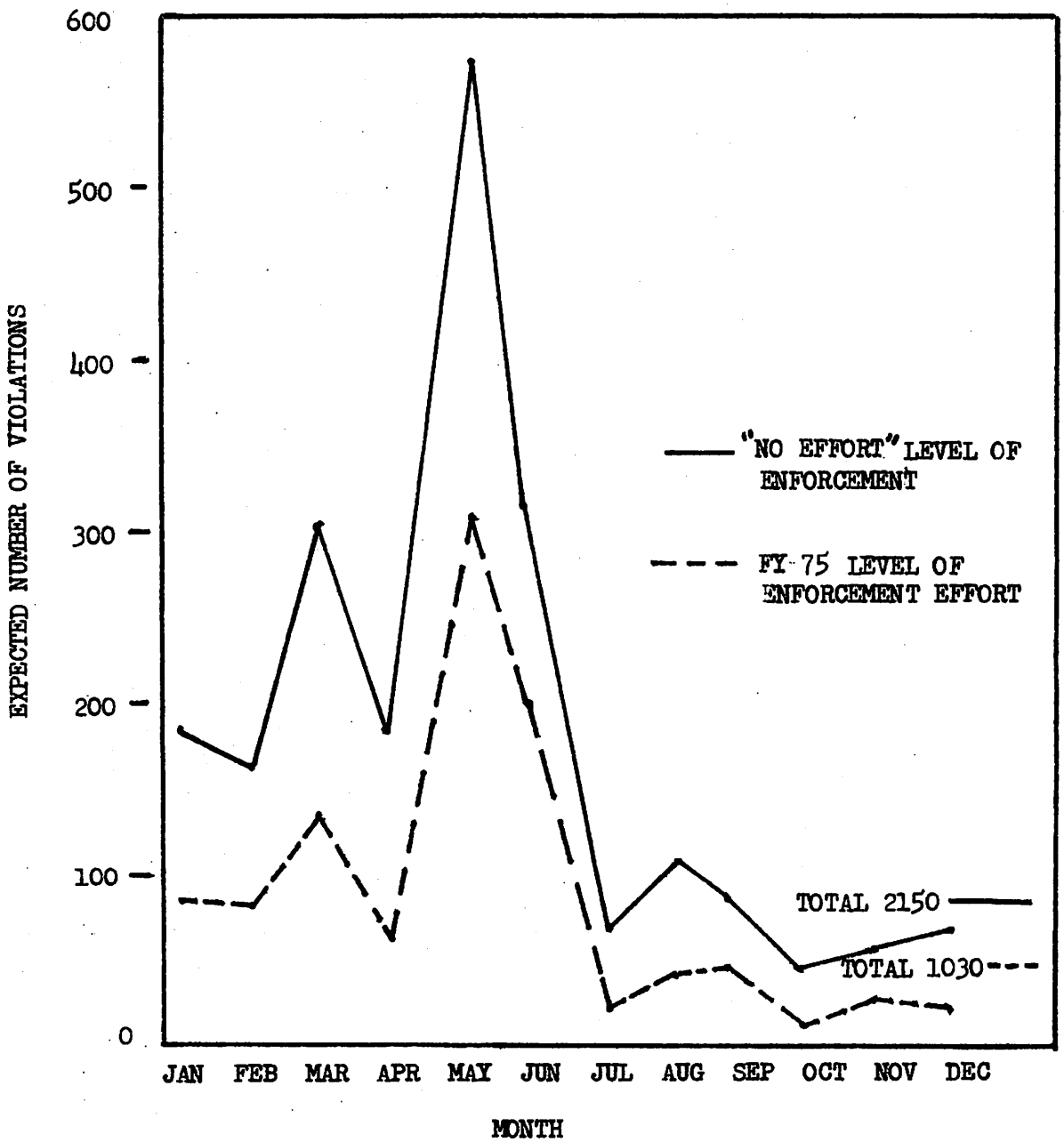
The Enforcement of Fisheries Laws and Treaties Study, conducted by the U. S. Coast Guard in 1972, developed a Fisheries Law Enforcement Planning Model to evaluate the effectiveness of various levels of ship and aircraft employment. The model was designed to be used primarily as a budget planning tool. It serves this purpose in the analysis of Coast Guard resource requirements for extended jurisdiction. A detailed explanation of the model is included in Appendix H; but, in essence, the Fisheries Law Enforcement Planning Model (FLEPM) measures the effectiveness of various levels of ship and aircraft employment by predicting the percentage reductions in violations which occur as a result of varying levels of operations from the number occurring at "no effort" level. The model was used to produce a series of tables which were aggregated to indicate the expected number of violations which would occur under model conditions at various levels of effort. Figure 1 shows, by month, the number of treaty and statute violations expected under a "no effort" condition and the number of violations expected based on the fisheries patrol effort in FY-75. A proper interpretation of this graph must consider a number of important points:

a. The graph includes only those areas and requirements which were in existence or included when the model was last exercised in 1974. Consequently, this excludes the CSFR fishery, the Gulf of Mexico fisheries, gear conflict requirements, and the Alaskan summer herring and salmon fishery patrol requirements.

b. Only treaty and statute violations which constitute an intrusion into territorial or contiguous fishing zones, or into prohibited fishing areas established by treaty are considered. Violations which involve over-fishing and/or administrative violations are not included in the expected numbers.

FIGURE 1

EXPECTED NUMBER OF UNDETECTED VIOLATIONS
BY MONTH
UNDER "NO EFFORT" AND FY-75 LEVEL



c. The "no effort" level of enforcement is not meant to imply a complete lack of any enforcement. Rather, it is a situation which occurs when basically honest fishermen are no longer deterred by expectations of enforcement patrols and a "steady-state" probability of violations is reached for the enforcement effort being put forth. The tendency, then, would be to violate in much the same way as people have a tendency to violate speed limits which driving (e.g., in the complete absence of enforcement patrols, there would no doubt be an increase in the effect on the fisheries due to violations just as there would be on average automobile speeds in the absence of speed limits).

As a result of the above factors, the estimates of the number of violations which are expected to take place under existing conditions are conserative. Conservative values were used wherever possible in this analysis, in an attempt to place any bias in results on the side of reducing the benefit/cost ratio for fisheries enforcement. The resulting analysis provides a conservative estimate of the resources required for fisheries enforcement.

2. Costs and Benefits

The FY-75 level of resource employment was used as a base from which to develop the benefit/cost technique applied to alternative levels of ship and aircraft employment in later sections of this study. In general, costs are those associated with the Coast Guard Law Enforcement Program at various levels of enforcement effort (operating costs, support costs, and average acquisition costs attributable to the program). Benefits are related to the value of violations deterred or detected by enforcement efforts. In order to assign some value or associate some cost with a violation, several possibilities were considered (i.e., value of the catch; levels of fines assessed violators; budget allocation as it directly relates to the level of enforcement operations; "fisheries management", a collective consideration of direct costs as well as indirect costs associated with future or secondary effects of violation (over-fishing, time required for fish stock recovery, effects of enforcement on the stocks themselves, etc.)). Since the benefit analysis did not produce a definitive value for a violation deterred or detected, a range of values has been plotted to indicate the relationship of benefit/cost ratios to the value assigned to benefits. The result of this for the FY-75 level of employment is shown in Figure 2. The points which are plotted on the graph indicate the total expected benefits derived at FY-75 employment levels for various values associated with reduction in fisheries violations. Table VII summarizes the range of values associated with benefits derived from reducing the number of fisheries violations which occur. Details of cost/benefit methodology are contained in Appendix H.

FIGURE 2

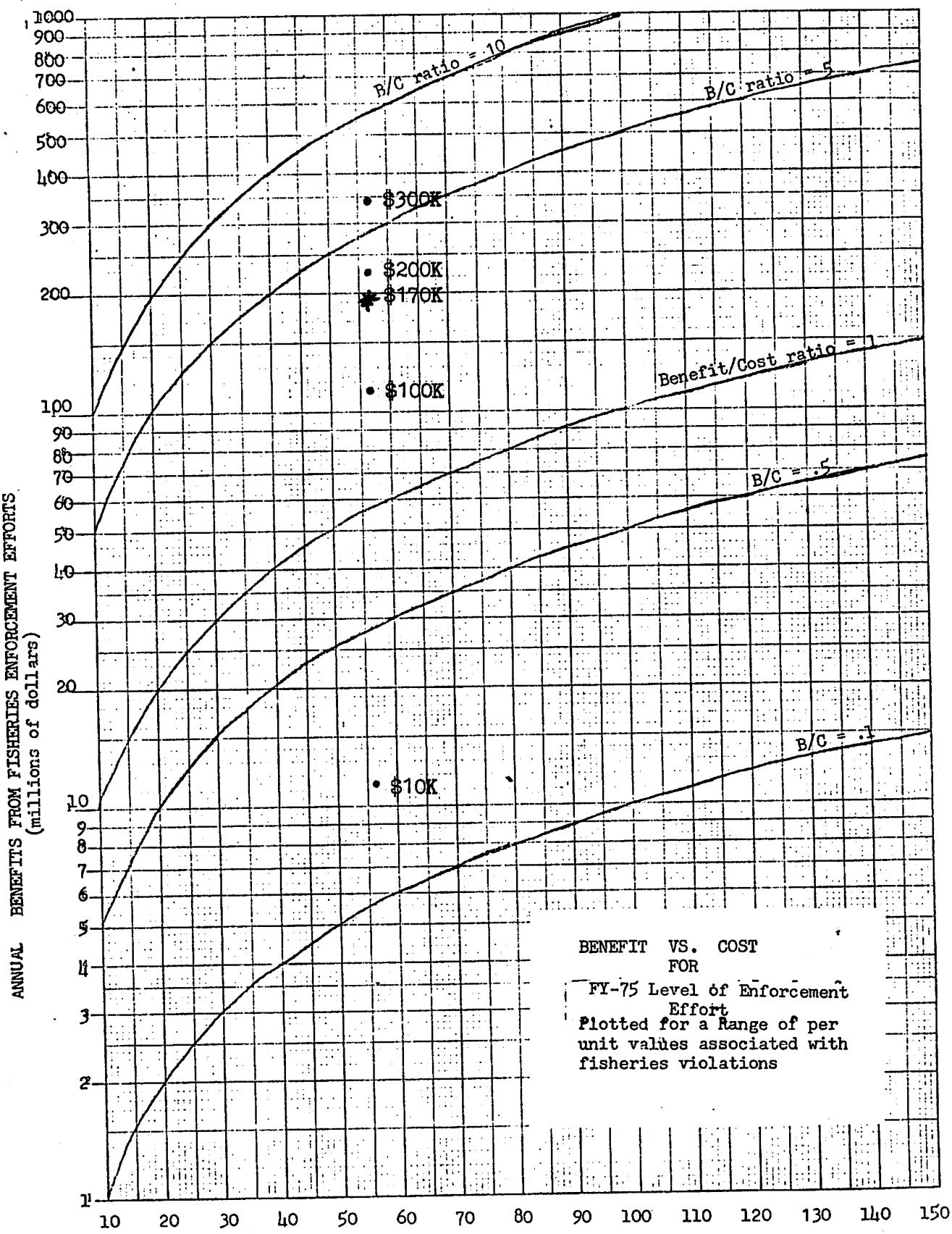

B/C ratio = 10
B/C ratio = 5
$300K
$200K
$170K
$100K
Benefit/Cost ratio = 1
B/C = .5
B/C = .1
$10K
BENEFIT VS. COST
FOR
FY-75 Level of Enforcement
Effort
Plotted for a Range of per
unit values associated with
fisheries violations
ANNUAL BENEFITS FROM FISHERIES ENFORCEMENT EFFORTS
(millions of dollars)
ANNUAL COST OF FISHERIES ENFORCEMENT EFFORTS
(millions of dollars)

TABLE VII

SUMMARY OF RANGE OF AVERAGE BENEFITS ASSOCIATED WITH FISHERIES VIOLATIONS, 1975-1976

Method of Determining Benefits	Min	Max	Average/Most Reasonable Value
Direct Cost	6,400	44,800	$10,000 - $20,000
Fine Levels	600	600,000	$189,000
Operations Level	50,000	50,000	50,000
Fisheries Management	170,000	400,000	170,000

The methodoloy used to develop these values is contained in Appendix H. Generally these methods are:

a. Direct Cost - The value of fish taken by an average foreign vessel during a violation of closed areas or present U.S. exclusive fisheries zone (TW/CFZ).

b. Fine Levels - Average fines assessed in various regions during 1975.

c. Operations Level - Average cost associated with the FY-75 operations required to detect or deter violations.

d. Fisheries Management Approach - Using one region of the Atlantic Ocean as a model, the numbers of violations estimated for various levels of enforcement were translated into effectiveness measures and compared to ICNAF management schemes for attaining a sustained yield. Benefits were evaluated by determining the impact of enforcement operations on total catch and on the time required for fish stocks to attain the desired sustained yield.

Levels of fines and implicit operating costs are not very satisfactory means of assessing the value of enforcement effort, since the link to a rigorous quantification is tenuous at best. Direct costing is a gross under estimation of violation costs, since it fails to account for the cumulative long terms impact of violations on fish stocks. Both direct costing, per se, and the model on which the direct costing calculations were based fail to account for the most damaging type of violations---over-fishing.

The analysis of cost as it relates to the status of fisheries appears to more adequately describe not only the cost of violations, but also the effects of enforcement on the stocks themselves. This is the closest link between system objectives and enforcement operations. Granted, this is a simplification of a complex problem, however, the benefits assessed in the "Fisheries Management" approach discussed previously are most consistent with the objectives of P.L. 94-265. Although these values range from approximately $10,000 upward to over $400,000 per violation detected or deterred, it is the Coast Guard position that the most reasonable value for use in analysis is the low-end figure developed in the Fisheries Management Approach to benefits contained in Appendix H. The figure of $170,000 per violation will be used for comparison of benefit/cost ratios for alternatives throughout this analysis. In order to show the range of values which could be used, benefit/cost ratios for $50,000 and $300,000 per violations will be examined along with the ratio for the $170,000 figure.

For FY-75, the benefit/cost ratio has been determined to be 3.37:1. For the $50,000 to $300,000 range, the benefit/cost ratio is from .99:1 to 5.95:1.

C. CONCLUSION

The present level of Coast Guard enforcement effort is cost-effective when tied to reasonable values for the effects of violations. Subjective and objective analyses support an increase in the enforcement effort. Specific alternatives are developed and analysed in the sections that follow. Before turning to analysis, however, it is important to briefly examine the essential requirements of a fisheries enforcement system and define the basic elements which must exist in any system which is developed.

IV. ENFORCEMENT ALTERNATIVES

A. FUNCTIONAL ELEMENTS OF ENFORCEMENT.

Enforcement is one subsystem of the total fisheries management system. It supplies information about fishing activity through operations while providing the detection, surveillance, and apprehension elements necessary to achieve system objectives. Data collection is a function common to all subsystems of the management system; however, the operational elements are unique to the enforcement subsystem and are essential elements in any alternative enforcement scheme. The concept of each element is described below. It must be emphasized that each of these three elements must exist irrespective of the enforcement option ultimately selected.

1. Detection. The detection element is concerned with knowledge of the existence of fishing vessels and level of activity within the area of concern. Some means of detecting that presence is required and implies, not only the ability to determine that an object is within the zone, but also the ability to identify the object as a fishing or fishing support vessel.

2. Surveillance. The surveillance or monitoring element of the enforcement system supplies a more detailed level of information. Once the vessel has been detected and determined to be of interest, there is a need to categorize its activity and obtain more detailed operating data. In order to effectively enforce the regulations set forth by the management system, there is a requirement to positively determine, potentially to the satisfaction of a court:

a. Is the vessel fishing?

b. What kind of fishing gear is being employed?

c. Is the vessel fishing on the bottom of the ocean?

d. What kind of fish is the vessel taking?

e. What is the size of the catch?

f. Is the vessel in violation of established laws, regulations or treaties?

g. It is also necessary under the surveillance element of the enforcement scheme to gather other information which will be useful in the administration of regulations and management of the fishery.

3. Apprehension. If it is determined that the vessel is in violation of established U.S. laws or regulations, there must be a capability to apprehend, detain, or continue tracking the violator until an arrest or other action can be concluded.

An analogy of the entire process can be drawn from describing the law enforcement problem on a stretch of highway. The highway patrolman must have a means of covering the highway to detect the existence of potential violators. This is usually done using radar setups or by patrol car cruising over selected or random streets and highways. This is equivalent to the detection element in fisheries enforcement.

The surveillance or monitoring element has a parallel as well. Knowing that there are automobiles on the highway, the patrolman must be able to sort out those which are in violation of the law. In the case of speeders, this may be accomplished using a passive surveillance element, but in the case of persons carrying contraband or engaged in interstate flight, there must be a capability for a more localized and positive method of gathering information. In the case of fisheries, this is most easily accomplished by boarding a vessel. The highway patrolman "pulls over" a suspected lawbreaker for much the same reason.

Once the fact or implication exists that a violation has occurred, there must also exist some way for the enforcing agency to conclude the arrest or citation of the violator. The highway patrolman either writes a ticket or physically arrests the violator and takes him into custody. The analogous response on the part of a fisheries enforcement element is to seize the vessel in violation, put agents of the enforcing agency aboard, and escort the vessel into port for disposition of the case.

IN ESSENCE THEN, ALTHOUGH VARIOUS OPTIONS MIGHT EXIST TO CONDUCT A FISHERIES ENFORCEMENT PROGRAM, SUCCESSFUL EXECUTION MUST INCLUDE CAPABILITIES FOR:

DETECTION,

SURVEILLANCE, and

APPREHENSION.

B. ENFORCEMENT ALTERNATIVES

Having established the functional elements of a fisheries enforcement system, consideration of alternative methods of execution is in order. For purposes of this examination, each alternative will be analyzed in terms of its ability to perform certain tasks associated with a given functional element. The tasks are as follows:

1. Detection Element.

   a. Detection of vessel presence.

   b. Initial classification of the contact as a fishing vessel.

   c. Identification of the vessel (nationality, type, hull number).

   d. Verification--the ability to ensure that all vessels in an area have been located and identified.

2. Surveillance Element. Determination of:

   a. Vessel activity--is the vessel fishing?

   b. Gear in use.

   c. Placement of the gear--bottom fishing or mid-water.

   d. Species being caught.

   e. Amount of the catch.

   f. Administrative information--logbook keeping, scientific data collection, etc.

3. Apprehension Element.

   a. Notification of violator.

   b. Initiate/maintain "hot pursuit."

   c. Apprehend the violator.

NOTE: Hot Pursuit is requisite under international law to preserve the jurisdiction of the coastal state over a vessel which violates its laws and then flees to the high seas beyond the jurisdictional "zone" where the offense occurred. Hot pursuit must be established within the jurisdictional "zone" by giving a visible or audible signal to stop, and continuous visual or radar contact must be retained thereafter until the vessel is boarded and seized. Once hot pursuit is broken, coastal state jurisdiction over the violator ceases.

Following a discussion of the pros and cons of each enforcement resource alternative, the alternatives are summarized in tabular form to show the relative ability of the alternative to accomplish the functional elements, and, in the end, to support the total fisheries enforcement system. This is done by assigning a value to the ability of an alternative to perform a given task. In the case of the detection element, there are four tasks which must be executed. The relative degree with which they are performed is used as the basis for assigning values to a matrix. The range of values assigned is:

H = 8 -- Highly capable of performing the task

M = 4 -- Moderately capable of performing the task

L = 2 -- Low capability to perform the task

O = 1 -- Negligible capability to perform the task

The rationale for using this scale is taken from studies concerning human thought processes. People think in terms of doubling or halving. Subjective judgments of "good" and "better" generally imply "good" and "twice as good."

The values assigned to the alternatives are added horizontally and normalized. The resulting "Normalized" column gives an indication of the ability of that alternative to perform the tasks of the functional element. Value is in relative terms compared with other alternatives and is not tied to cost or availability. These factors are treated in the pro and con sections and in the conclusions following the discussion of each functional element.

The alternatives which were analyzed for possible inclusion in a fisheries enforcement system are:

a. Licenses. Under P.L. 94-265, licenses or permits are one of the preconditions for fishing inside the FCZ. Each foreign fishing vessel will have to carry a permit or license issued by the United States. This permit could specify, together with information that identifies the vessel, limits on the period that the vessel will be able to fish, the species and/or quantity that the vessel may seek, any gear restriction, or time/area closures in effect for the period of the permit. In addition, it may indicate a requirement that the vessel carry a transponder or other position-fixing device.

b. Vessel Reporting. Vessels could be required to report their position and activity daily while operating within the FCZ.

c. Transponders. "Black boxes" could be placed aboard each licensed vessel as a precondition to fishing within the FCZ. These black boxes could simply transmit an identification code when interrogated or could be made more sophisticated with the capability of transmitting position (determined independently of the vessel).

d. Underwater Acoustic Sensors. Enforcement vehicles could carry devices or a fixed system could be developed to provide information concerning vessel activity and identity within the FCZ.

e. Aircraft. Patrols by aircraft could provide wide area coverage to determine fishing vessel presence and activity, and to initiate necessary enforcement activity.

f. Ships. Ship patrols of the fishing areas could be used to conduct boardings, monitor foreign fishing activity, and apprehend violators.

g. Shipriders/Observers. Observers could be used aboard vessels to ascertain compliance with gear and time/area restrictions, record catch and fishing performance data, and conduct biological sampling.

h. Satellites. Satellites could be used to provide coverage of large areas with a single sweep.

C. DETECTION ALTERNATIVES ANALYSIS

1. Analysis

(a) Licensing:

Pro (1) Provides a list of authorized vessels to check against sightings.

(2) Costs could be offset by fees charged.

(3) Provides an indication of expected activity within a given area.

(4) Provides the master with positive notice of the terms of his authorization to fish.

Con (1) It does not detect vessel presence in the FCZ.

(2) Cannot classify or identify vessels.

(3) Provides no assurance that vessels are in compliance with regulations.

(b) Vessel Reporting:

Pro (1) Indicates presence of "cooperating" vessels.

(2) Identifies "cooperating" vessels.

Con (1) There is no verification of position or activity.

(2) Gives no information about "non-cooperating" vessels.

(3) Provides no assurance that vessels are in compliance with regulations.

(c) Transponders:

Pro (1) Would provide information on presence, identity, and location independent of vessel reporting.

Pro (2) Remote sensing could reduce requirements for local detection capability.

(3) Cost of transponders could be borne by the foreign vessels.

Con (1) Fishermen could interfere with transponder so it would provide erroneous information or no information at all.

(2) Does not detect presence of non-transponder equipped ships.

(3) Provides no assurance that vessels are in compliance with regulations.

d. Underwater Acoustic Sensors:

Pro (1) Could provide information on presence, location, and classification of vessels.

(2) Some systems are relatively inexpensive for fairly large area coverage.

(3) Would be most effective in establishing boundary violations.

Con (1) Considerable and costly development is required in order to achieve sound signature and identification capability which is required.

(2) Probably will not be able to identify individual vessels.

(3) Operational limitations exist as to its use in high activity areas.

(4) Cost of installation and maintenance high compared to capability.

e. Aircraft:

Pro (1) Can establish presence, level, and type of activity, and, in most cases, identify vessels.

(2) Provides, through visible presence, an expression of active interest and control by the coastal state.

(3) Presence serves as a greater deterrent to potential violators than most other alternatives.

(4) Provides some verification of compliance with regulations.

Con (1) Costs.

f. Ships:

Pro (1) Can establish presence, level, and type of activity, and vessel identity.

(2) Ship presence exerts maximum deterrence in area where it operates.

(3) Provides, through visible presence, an expression of active interest and control by the coastal state

(4) Provides verification of compliance with certain regulations.

Con (1) Limited speed results in a limited area of coverage. (This is somewhat mitigated when helicopters are carried.)

(2) Costs.

g. Shipriders/Observers:

Pro (1) Presence on board a fishing vessel provides the maximum deterrent to violations by that fishing vessel.

Pro (2) Verifies and provides positive statistics for the management and enforcement systems.

Con (1) Relatively high cost for complete coverage of the foreign fleet.

(2) Complex logistic problems--probably requires on-scene support for complete system.

(3) Minimal capability to detect. Does not assure that other vessels are in compliance with regulations.

h. Satellites:

Pro (1) Could cover large areas, providing information from transponders or active detection sensors.

(2) Operating costs may be less than other alternatives.

Con (1) Current unclassified state-of-the-art satellites do not assure compliance with regulations and are limited by cloud cover.

2. Conclusions

a. Licensing, by itself, does little for the detection element; rather, it helps the enforcing agencies (if they can identify the vessel) to determine whether or not it is permitted to fish in the FCZ, and what restrictions apply to its activity.

b. Most of the detection alternatives considered have merit as elements of the enforcement system, and a mix of alternatives is probably the best solution to the detection problem.

TABLE VIII

DETECTION ELEMENT TASKS

Relative Effectiveness of Alternatives

H = 8
M = 4
L = 2
O = 1

ALTERNATIVE / TASKS	DETECTION OF PRESENCE	INITIAL CLASSIFICATION	SPECIFIC IDENTIFICATION (Nationality-Specific ID)	SELF-VERIFYING	TOTAL	NORMALIZED SCORE
LICENSE	O	O	O	O	4	.3
VESSEL REPORTING	M	M	M	L	14	1.0
TRANSPONDERS	M	M	M	M	16	1.2
UNDERWATER SENSORS	M	M	M	M	16	1.2
AIRCRAFT	H	H	M	H	28	2.0
SHIPS	M	H	H	H	28	2.0
SHIPRIDERS/OBSERVERS	L	L	L	H	14	1.0
SATELLITES	H	L	L	M	16	1.2
TOTAL					136	10.0

D. SURVEILLANCE ALTERNATIVES ANALYSIS

1. Analysis

a. Licensing, Vessel Reporting, Transponders: These alternatives are not capable of performing the surveillance function or determining compliance with regulations.

b. Underwater Acoustic Sensors:

Pro (1) Could potentially provide some information on vessel activity in support of surveillance element.

Con (1) Requires development to attain level of information required.

(2) Costs uncertain.

(3) Limited applicability - cannot be used in high density traffic areas.

c. Aircraft:

Pro (1) Can observe certain aspects of fishing operation - type of gear in use/fishing activity.

(2) Can conduct localized activity external to vessels under surveillance.

(3) Relative large area, all-weather coverage.

Con (1) Cannot provide internal inspection of vessel.

(2) Confirmation of observations is often difficult.

(3) Does not provide the level of detailed information required.

d. Ships:

Pro (1) Combination of close observation and detailed on-board examination or inspection permits positive:

(a) Determination of whether or not vessel is fishing.
(b) Determination of type of fishing gear being employed.
(c) Determination of whether or not vessel is bottom fishing.
(d) Determination of kind of fish being taken.
(e) Determination of size of the catch.
(f) Determination if the vessel is in violation of established laws, regulations, or treaties.
(g) Determination of other information concerning administration of regulations and management of the fishery.

(2) Large deterrent effect provided by the capability to conduct a boarding.

(3) Ships are the only practicable platform from which to dispatch/disembark boarding parties.

Con (1) Cost.

e. Shipriders/Observers:

Pro (1) Difficulty and danger of boarding in adverse sea conditions can be avoided.

(2) Detailed on-board examination or inspection permits positive:

(a) Determination of whether or not vessel is fishing.
(b) Determination of type of fishing gear being employed.
(c) Determination of whether or not vessel is bottom fishing.
(d) Determination of kind of fish being taken.
(e) Determination of size of the catch.
(f) Determination if the vessel is in violation of established law, regulations, or treaties.
(g) Determination of other information concerning administration of regulations and management of the fishery.

Con (1) Same as in detection analysis.

f. Satellites: Unclassified state-of-the-art satellites are not capable of performing the surveillance element.

(1) Costly development, well beyond current state-of-the art capabilities, is required in order to even partially satisfy surveillance requirements.

(2) It is doubtful that technological advances can be made to provide cost-effective performance of surveillance functions before the year 2000.

2. Conclusions

a. A ship's boarding capability and observers embarked on vessels offer the best alternatives for determining detailed information in support of the surveillance and monitoring subsystem. The effective use of shipriders for surveillance is dependent on having an enforcement ship present in the general area for support or requiring all foreign fishing vessels to call at a U.S. port. Boarding is effective in all situations except when sea conditions are adverse.

b. Satellites should not be considered as a potential solution to the surveillance function until after the year 2000, because of cost and significant technological advancements necessary to make such a system possible.

TABLE IX

SURVEILLANCE ELEMENT TASKS

Relative effectiveness of Alternatives

H = 8
M = 4
L = 2
O = 1

ALTERNATIVES / TASKS	VESSEL ACTIVITY	GEAR IN USE	GEAR PLACEMENT	SPECIES CAUGHT	AMOUNT OF CATCH	ADMINISTRATIVE INFORMATION	TOTAL	NORMALIZED SCORE
LICENSE	O	O	O	O	O	O	6	.4
VESSEL REPORTING	L	L	L	L	L	L	12	.8
TRANSPONDERS	O	O	O	O	O	O	6	.4
UNDERWATER SENSORS	M	M	M	O	O	O	15	.9
AIRCRAFT	H	L	O	L	L	O	16	1.0
SHIPS	H	H	H	H	H	H	48	3.0
SHIPRIDERS/OBSERVERS	H	H	H	H	H	H	48	3.0
SATELLITES	L	O	O	O	O	O	7	.5
TOTAL							158	10.0

E. APPREHENSION ALTERNATIVES ANALYSIS

1. Analysis

a. Aircraft:

Pro (1) Can signal a violator and continue tracking to satisfy the requirements of "Hot Pursuit".

Con (1) Limited endurance often necessitates sequential relief by several other aircraft until an enforcement vessel arrives on scene.

(2) Boarding party, which is necessary to effect apprehension or detention/seizure/arrest, cannot be safely disembarked from an aircraft.

b. Ships:

Pro (1) Can signal a violator and establish and maintain "Hot Pursuit".

(2) Can be used to disembark a boarding party to effect apprehension.

(3) Capable of providing protection and ready support for boarding party personnel on board another ship for the purpose of effecting a seizure.

Con (1) Lacks the speed of an aircraft for quickly arriving on scene to initiate "Hot Pursuit" on a violator.

(2) Cost.

c. Shipriders/Observers:

(1) Credibility of the observer as an "enforcer" without local support from other enforcement elements is questionable.

(2) An observer is not envisioned, in the management scheme, as functioning as a seizing agent.

d. Others:

Other enforcement alternatives do not have the capability to perform the apprehension function. At best, they can notify another enforcement resource that a violation has occurred.

2. Conclusions

a. While ships, aircraft and observers can effectively serve notice of violation on a vessel, only aircraft and ships can establish "hot pursuit".

b. A ship is required in order to effect an apprehension in any form.

c. Considering the advantage of an aircraft in establishing "hot pursuit", a flight deck equipped cutter with a helo embarked offers an optimum solution leading to the apprehension of violators in many instances.

d. Observers, without the active support of a vessel capable of effecting apprehension, would appear to have limited effect in completing the apprehension act.

TABLE X

APPREHENSION ELEMENT TASK

Relative Effectiveness of Alternatives

H = 8

M = 4

L = 2

O = 1

ALTERNATIVES / TASKS	NOTIFICATION OF VIOLATOR	INITIATE/MAINTAIN HOT PURSUIT	EFFECT APPREHENSION	TOTAL	NORMALIZED VALUE
LICENSE	O	O	O	3	.5
VESSEL REPORTING	O	O	O	3	.5
TRANSPONDERS	O	O	O	3	.5
UNDERWATER SENSORS	O	O	O	3	.5
AIRCRAFT	H	H	O	17	2.5
SHIPS	H	H	H	24	3.6
SHIPRIDERS/OBSERVERS	H	O	O	10	1.5
SATELLITES	O	O	O	3	.5
TOTAL				66	10.0

F. SUMMARY OF ENFORCEMENT ALTERNATIVES ANALYSIS

Table XI summarizes the potential contribution of the enforcement alternatives toward achieving the basic objectives of fisheries enforcement:

TABLE XI

SUMMARY OF ENFORCEMENT ALTERNATIVE'S SUPPORT
OF THE
FUNCTIONAL ELEMENTS OF FISHERIES ENFORCEMENT

H = 8

M = 4

L = 2

O = 1

ALTERNATIVES / ELEMENTS	DETECTION	SURVEILLANCE	APPREHENSION	TOTAL	NORMALIZED SCORE
LICENSE	O	O	O	3	.4
VESSEL REPORTING	M	L	O	7	.9
TRANSPONDERS	M	O	O	6	.7
UNDERWATER SENSORS	M	L	O	7	.9
AIRCRAFT	H	L	M	14	1.7
SHIPS	H	H	H	24	3.0
SHIPRIDERS/OBSERVERS	M	H	L	14	1.7
SATELLITES	M	O	O	6	.7
TOTAL				81	10.0

1. Licensing is a requirement under the provisions of P.L. 94-265. Since the costs of licensing can be passed directly to the foreign fishermen, licensing can be an aid to other elements of the enforcement system.

2. Vessel Reporting and Transponders may similarly be an aid to the enforcement system by providing information concerning the position and activity of "cooperating" vessels. They have limited ability to monitor activity, however; and no ability to detect and monitor "non-cooperating" vessels or to perform the apprehension element necessary within a complete enforcement program.

3. Satellites and Underwater Sensors show promise as elements of the detection subsystem. Their ability to cover large areas covertly could, with considerable development, be an important aspect of the detection process. Both of these sensing devices have a limited ability to perform the surveillance function, and no capability to apprehend violators.

4. Shipriders/Observers are considered important to the detection and surveillance elements. To the extent that it is feasible to have observers aboard foreign fishing vessels to monitor operations and collect scientific data, they support the fisheries management and enforcement program very effectively. The major drawbacks to a complete enforcement system which relies primarily on observers are that (1) observers can not verify or monitor the operations of "non-cooperating" vessels, (2) a complete system would be costly to operate because of the numbers of people involved as well as logistics problems, and (3) the fact that the observers can not perform the apprehension element without specific support from ships.

5. Ships and Aircraft, in combination, perform all of the functional elements of the fisheries enforcement system effectively. The wide area coverage capability of aircraft coupled with the ability to notify a violator and initiate "hot pursuit" supports the limited area coverage capability of ships. Ships, on the other hand provide the best alternative, external to the fishing vessels, to monitor operations through boardings and to complete the apprehension act when it is required. The unique ability of ships to satisfactorily execute the apprehension act, in addition to performing detailed surveillance/monitoring,support and other enforcement-related operations makes them vital to any conceivable effective enforcement program.

G. GENERAL CONCLUSIONS

The Coast Guard will, in the long run, be as much affected by regulations actually imposed on foreign fishing vessels as by any extension of the coastal fisheries zone. Regulations will change from time to time depending on such things as the status of fish stocks off our coasts, the availability of protein from other sources, and the harvesting capacity of the U. S. coastal fishing fleet. The probability of violation will vary with such things as the status of fish stocks in other parts of the world, the attitude of coastal nations towards foreign harvesting of their coastal stocks, the degree of acceptance of U.S. regulations by the nations whose vessels are fishing off our coasts, and, importantly, the level of the U. S. enforcement effort. Composite plots of foreign fishing vessel sightings over a recent two year period give good indications of where and for what species foreign fishermen are now fishing off U.S. coasts. Although, the patterns change from time to time and new fisheries are developed, there is no reason to believe that the present active fishing areas will expand following the extension of jurisdiction. Accordingly, the approach considered below reflects our assessment of the most practical Coast Guard response to the 200-Mile Fishery Conservation Zone.

1. An immediate, flexible response is required to deal with the interim period between extension of jurisdiction and the time when a clear assessment of the effects of the extension can be made.

2. Future directions and technologies have potential as elements in the enforcement system and should be actively pursued.

3. A combination of alternatives involving a mix of ships and aircraft best satisfies near-term enforcement needs which require capabilities for detection, surveillance and apprehension.

4. Shipriders/observers, licensing schemes and transponders may serve as <u>complementary elements</u> of the proposed enforcement systems.

V. COAST GUARD RESOURCE REQUIREMENTS

A. CONCEPT OF OPERATIONS - "PLANNED APPROACH".

1. The basic concept of operations in the "Planned Approach" is one of coordinated air/surface operations seasonally adjusted for fishing vessel density, to reduce violations to the level depicted in Figure 3 (page V-5) and conducted as follows:

a. Regular coverage of the active fishing areas within the 200-mile FCZ by:

(1) Surveillance patrols of each area by long and medium range search aircraft at a frequency varying from monthly to three times a week depending on the season;

(2) Patrols by high and medium endurance cutters, with helicopters aboard cutters having flight decks; the number of vessels on patrol at any one time depending on the season; and

(3) Ship-helo teams and other cutters conduct coordinated surveillance, boarding and data-gathering activities in their own right and in response to information from the surveillance aircraft and other sources.

b. Less extensive coverage of the remaining portion of the 200-mile FCZ to detect changes in fishing fleet operations, illicit fisheries support activities and other unauthorized operations by:

(1) Weekly surveillance patrols to the limits of jurisdiction by long and medium range search aircraft; and

(2) Periodic surface projections to the limit of jurisdiction by high and medium endurance helo-equipped cutters.

2. Appendix I gives a seasonal and geographical breakdown of resource utilization for the Planned Approach. The deficit between the FY-75 level of operations and the Planned Approach is shown in Table XII.

TABLE XII

RESOURCE REQUIREMENTS FOR FISHERIES ENFORCEMENT

	Provided in FY-75	Total Required for Planned Approach	Present Deficit
Aircraft (LRS/MRS) Patrol-Hours	3,981	11,534	7,553 hrs (6-LRS, 4-MRS)
Cutter (WHEC/WMEC) Patrol-Days	2,493	3,444	951 days (6-WMEC)

B. ADDITIONAL COSTS FOR IMPLEMENTATION OF PLANNED APPROACH.

A phased program for implementing the Planned Approach has been developed and the following funding schedule is proposed:

Category 1: Immediate requirements for reactivation and operation of interim ships and aircraft (FY-76/77).

Category 2: Procurement of permanent replacement ships, aircraft and related support facilities for which contracting can be carried out promptly (FY-76/77).

Category 3: Permanent ships/aircraft replacements and associated operating funds which will be requested in FY-78.

Category 1 (Dollars in Thousands)

Reactivate/Operate Interim Resources	Procurement Costs	Activation Cost	Operating Cost	Total Cost
2 - WHEC	-	$2,374	$4,386	$6,760
2 - WLB (refit)	-	1,500	1,800	3,300
6 - LRS (augment crews)	-	-	875	875
4 - MRS	-	1,322	2,408	3,730
Start Up Costs	-	1,165		1,165
Sub-Total	0	$6,361	$9,469	$15,830

Total personnel requirements is 863 military and 6 civilians; costs are included in operating category above.

Category 2 (Dollars in Thousands)

Procure New Resources	Procurement Costs	Activation Cost	Operating Cost	Total Cost
2 - WHEC	$49,000	-	-	$49,000
6 - LRS	60,000	-	-	60,000
Support Package	18,250			18,250
Sub-Total	$127,250	0	0	$127,250

Funding of categories 1 and 2 requirements will be needed in the fiscal year preceding the effective date of the new jurisdication.

Category 3 (Dollars in Thousands)

Additional Resource Requirements	Procurement Costs	Activation Cost	Operating Cost	Total Cost
2 - WHEC	-	-	$3,133	$3,133
2 - WLB	-	-	360	360
4 - MRS	-	-	482	482
6 - LRS	-	-	4,971	4,971
4 - MEC	$98,000	-	-	98,000
4 - MRS	30,700	-	-	30,700
5 - SRR	8,500	-	2,080	10,580
Sub-total	$137,200	0	$11,026	$148,226
			Grand Total	$291,306

Funding of Category 3 requirements will be addressed in the budgets following the effective date of the legislation.

WITH FUNDING OF THE ABOVE, THE PLANNED APPROACH REQUIREMENTS FOR 6 EACH WMEC, 6 EACH LRS, 4 EACH MRS, AND 5 EACH SRR ADDITIONAL TO CURRENT RESOURCES WILL HAVE BEEN MET ALONG WITH ANNUALIZED FUNDING FOR INTERIM FACILITIES ACTIVATED AT THE OUTSET OF THE PLANNED APPROACH FOR P.L. 94-265 ENFORCEMENT.

C. BENEFIT/COST RATIO OF THE PLANNED APPROACH

Using the methodology and results developed in Appendix H, the expected number of violations derived from the Fisheries Law Enforcement Planning Model is shown in Figure 3. A cost/benefit graph (Figure 4) has been developed for the Planned Approach. The series of points plotted indicates the expected benefits for the planned level of operations using annual costs and a range of values for benefits at that level of enforcement operations. Using the most reasonable range of values for benefit ($50,000 to $300,000), the benefit/cost ratio for the Planned Approach ranges from 1.06 to 4.8. At $170,000 per violation, the benefit/cost ratio is 3.6.

This range, however, assumes that acquisition costs are averaged for the program. In actuality, there is a high initial cost associated with gearing up for extended jurisdiction. To compensate for opportunity costs associated with the Planned Approach, costs were segregated, and acquisition and operating costs and benefits were discounted at 10% over a twenty-five year period. In addition, only incremented costs and benefits were used to reflect the benefits associated with additional enforcement efforts. The resulting range of benefit/cost ratios for the Planned Approach is .8 to 4.2. The benefit/cost ratio for the $170,000 per unit value for violations is 2.7.

FIGURE 3

EXPECTED NUMBER OF UNDETECTED VIOLATIONS
BY MONTH
UNDER "NO EFFORT" AND PLANNED APPROACH

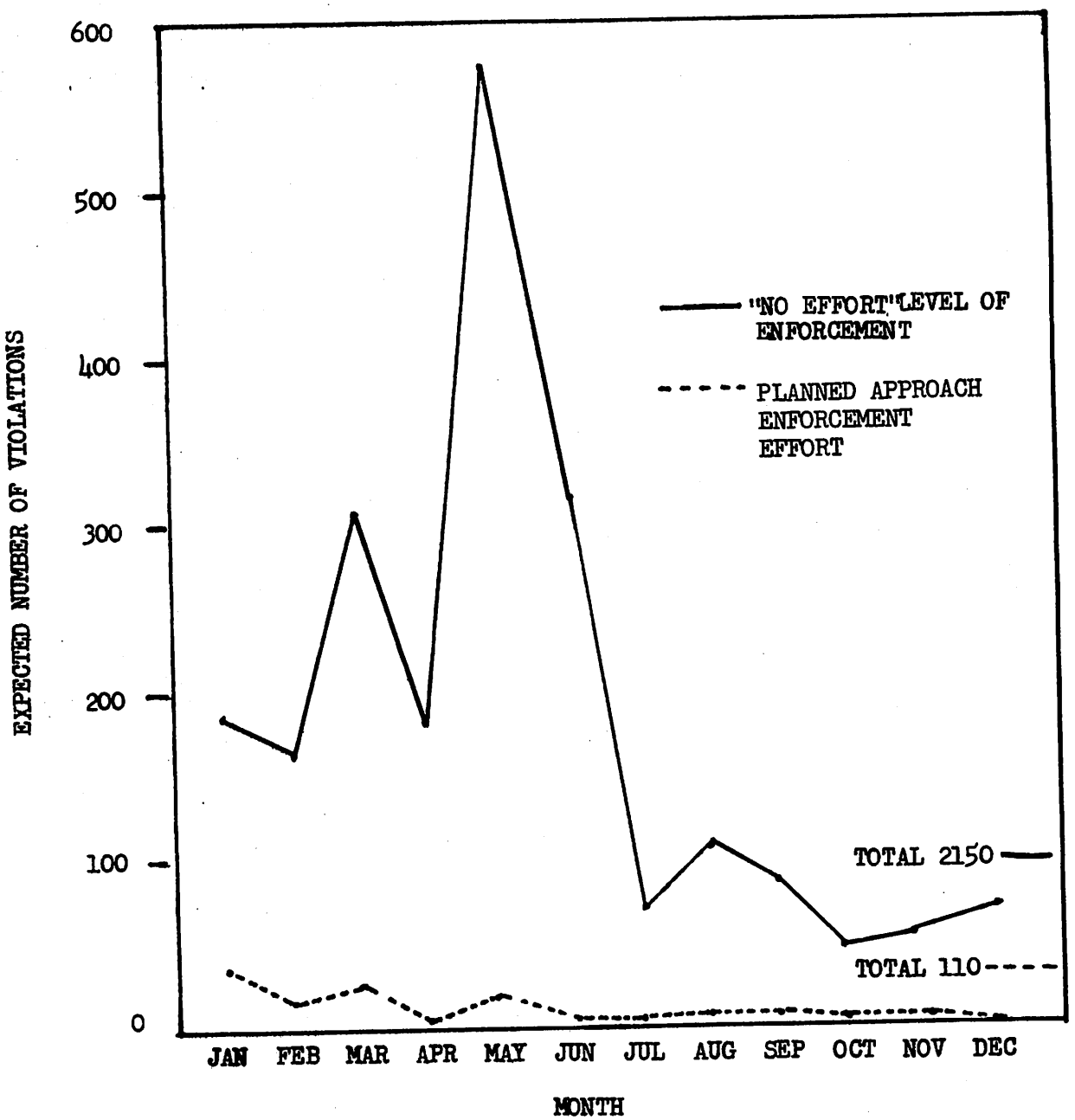
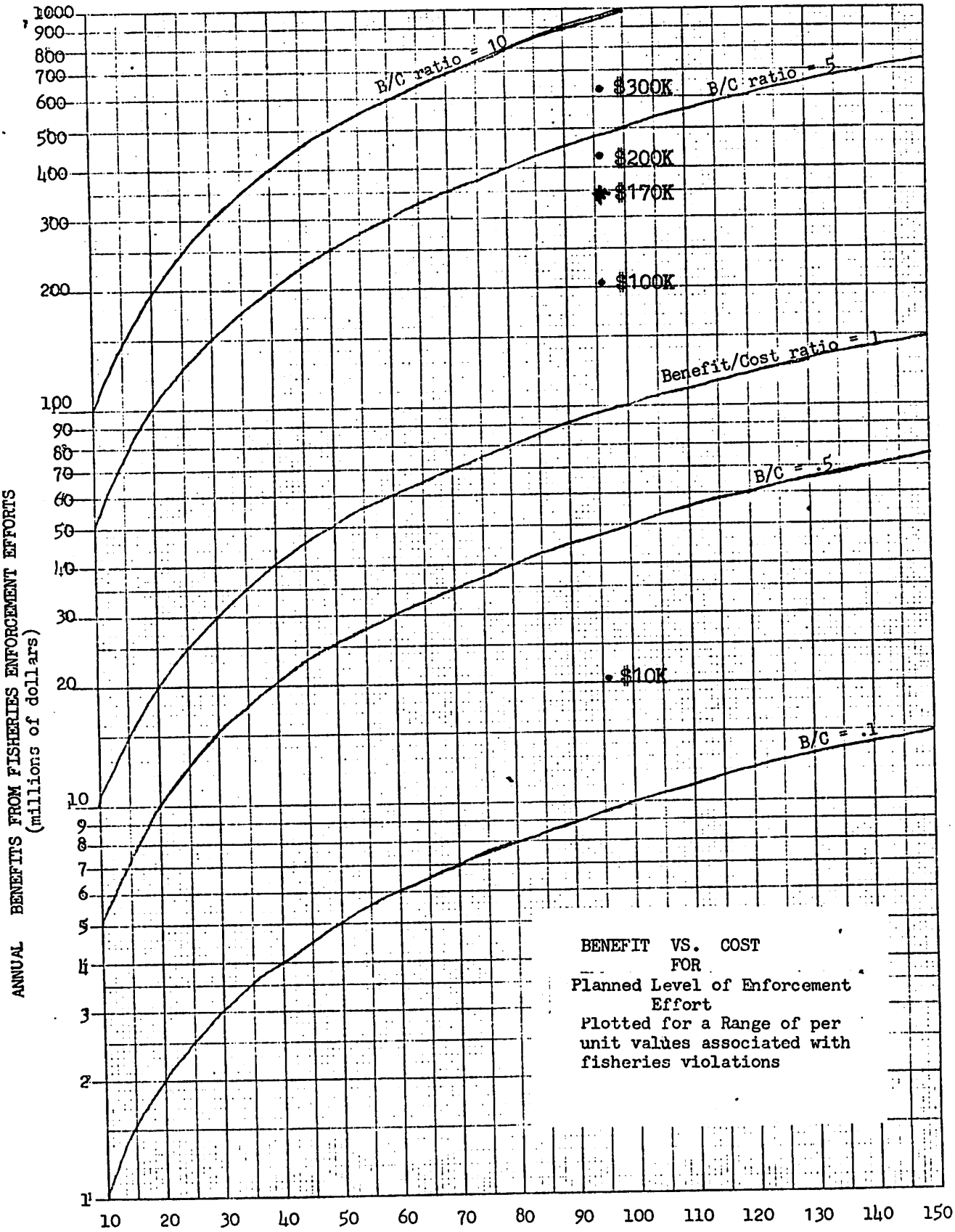


FIGURE 4


B/C ratio = 10
B/C ratio = 5
Benefit/Cost ratio = 1
B/C = .5
B/C = .1
$300K
$200K
$170K
$100K
$10K
BENEFIT VS. COST
FOR
Planned Level of Enforcement Effort
Plotted for a Range of per unit values associated with fisheries violations
ANNUAL BENEFITS FROM FISHERIES ENFORCEMENT EFFORTS (millions of dollars)
ANNUAL COST OF FISHERIES ENFORCEMENT EFFORTS (millions of dollars)

D. FIVE-YEAR RESUME OF ESTIMATED PROGRAM COSTS AND BENEFITS OF COAST GUARD FISHERIES ENFORCEMENT PLAN
(FY-76 Dollars in Thousands)

	FY 77	FY 78	FY 79	FY 80	FY 81
Estimated Program Captial Costs	$132,446	$137,200	-	-	-
Estimated Program Operating Cost*	53,740	64,766	$64,766	$67,406**	$72,206**
Total Program Estimated Cost	$186,186	$201,966	$64,766	$67,406	$72,206
Estimated Number of Violations Prevented	1,500	2,050	2,050	2,050	2,050
Estimated Value of Violations Prevented (at $170,000 per violation)	$255,000	$348,500	$348,500	$348,500	$348,500

* Total program costs (existing and new resources) are based upon FY-75 ELT Programs operating costs of $43,106K (FY-76 dollars) plus the funding requirements for the Planned Approach.

** Includes estimated $2,400K operating costs for each 270' WMEC.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS.

1. Although several alternatives for fisheries surveillance offer promise as elements of the enforcement system, none of those presently under consideration can provide the credibility of the on-scene vehicle for direct enforcement.

2. The Planned Approach is specifically designed to be responsive to the vast, dynamic and loosely defined environment that will exist during the initial implementation period of an effective management program for extended fisheries jurisdiction.

3. The proposed interim plan is phased to provide a credible immediate response to the requirements of P.L. 94-265 while maintaining the flexibility to tailor the need for additional resources from projected capital investments as the effects of extended jurisdiction are clarified.

4. Future directions and technologies are being addressed. Once the fisheries management system has evolved from the initial implementation of extended fisheries jurisdiction, we will be in a better position to evaluate new technologies and concepts of operations as they relate to a known regulatory framework.

B. RECOMMENDATIONS.

1. That the Planned Approach be adopted as an initial concept of operations (1977-1985) for extended fisheries jurisdiction under P.L. 94-265.

2. That the phased approach developed in Section V be used as the basis for budget requests.

3. That examination of alternative enforcement systems be pursued, with special attention being given to assessing the future of the maritime law enforcement system.

4. That research and development of new concepts and technologies, having potential for enforcement application, be an intergal part of any program for future enforcement efforts.

APPENDIX A

NATIONALITIES OF FOREIGN FISHING VESSELS OPERATING OFF THE US COASTS

(In Approximate Order of Fleet Size)

NW Atlantic Ocean	Gulf of Mexico	Pacific Coast	Alaska
USSR	Cuba	USSR	Japan
Poland	Mexico	Canada	USSR
East Germany	Japan	Poland	Canada
Spain	USSR	Japan	S. Korea
Japan		S. Korea	Poland
Canada		Rep of China	Rep of China
Bulgaria		East Germany	
West Germany			
Romania			
Italy			
Cuba			
France			
South Korea			
Iceland			
Rep of China			
United Kingdom			

APPENDIX B

FOREIGN FISHING ACTIVITY OFF U. S. COAST, 1975

	All	N.W.Atl	MidAtl	Gulf	Pac	Alaska
Jan	384	128	106	0	14	136
Feb	523	223	111	0	19	170
Mar	502	186	80	0	66	170
Apr	574	159	92	0	94	229
May	787	155	28	13	107	484
Jun	996	186	18	50	111	631
Jul	856	103	34	74	114	531
Aug	509	112	30	46	82	239
Sept	449	127	6	0	28	288
Oct	345	136	10	1	23	174
Nov	269	80	32	0	9	145
Dec	282	68	57	0	13	144
Monthly Average	539	139	50	15	57	278

APPENDIX C

FOREIGN FISHING VESSELS VIOLATING U.S. EXCLUSIVE FISHING RIGHTS

1964 - 1976

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1964	NONE						
1965	12 May	trawler	USSR	TW		Alaska	Aerial, seizure impossible
1966	16 Sep	longliner	Canada	TW	$5,000	Alaska	
	21 Dec	trawler	USSR	TW		Alaska	Aerial, seizure impossible
	28 Dec	trawler	USSR	TW		Alaska	Aerial, seizure impossible
1967	19 Jan	trawler	USSR	TW		Alaska	Aerial, seizure impossible
	28 Feb	5 trawlers	USSR	TW		Alaska	Aerial, seizure impossible
	2 Mar	SRTM 8-413	USSR	TW	$5,000	Alaska	
	17 Mar	8 trawlers	USSR	CFZ		Alaska	Aerial, seizure impossible
	22 Mar	SRTM 8-457	USSR	CFZ	$10,000	Alaska	Aerial
	26 Jun	trawler	USSR	TW		Alaska	Aerial, seizure impossible
	27 Jun	trawler	Japan	TW		Alaska	Aerial, seizure impossible
	16 Jul	Tenyo Maru No. 3	Japan	TW	$5,000	Alaska	
	3 Aug	SRTM 8-457	USSR	CFZ	$20,000	Alaska	

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1968	10 Jan	trawler	USSR	CFZ		Alaska	Aerial, seizure impossible
1969	3 Jun	4 gill-netters	Japan	TW		Alaska	Aerial, seizure impossible
	3 Jun	10 gill-netters	Japan	CFZ		Alaska	Aerial, seizure impossible
	4 Jun	gill-netter	Japan	TW		Alaska	Aerial, seizure impossible
	4 Jun	14 gill-netters	Japan	CFZ		Alaska	Aerial, seizure impossible
	5 Jun	20 gill-netters	Japan	CFZ		Alaska	Aerial, seizure impossible
	7 Jun	Zenpo Maru	Japan	CFZ	$5,500	Alaska	
	7 Jun	Koai Maru	Japan	CFZ	$3,500	Alaska	
	22 Aug	Matsuei Maru	Japan	CFZ	$10,000	Alaska	Aerial

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1970	3 May	2 longliners	Canada	TW		Alaska	Aerial, seizure impossible
	27 Jun	Akebono Maru	Japan	CFZ	$30,000	Alaska	Aerial
	2 Jul	Conrad	W. Germany	CFZ	$20,000	Mass.	
	18 Aug	Kahi Maru	Japan	CFZ	$35,000	Alaska	
	20 Aug	Kiyo Maru No. 18	Japan	CFZ	$45,000	Alaska	Aerial
	17 Sep	Clipper II	Canada	TW	$5,000	Alaska	
	27 Sep	Kyoyo Maru	Japan	CFZ	$50,000	Alaska	

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1971	9 Jan	cargo	Japan	CFZ		Alaska	
	10 Feb	SRTM 8484	USSR	CFZ	$50,000	Alaska	
	24 Feb	Lambda 54	Cuba	CFZ	$25,000	Florida	
		Lambda 102	"	"		"	
		Lambda 91	"	"		"	
		Sondero 25	"	"		"	
	16 May	Canadian longliner	Canada	TW		Alaska	Aerial, seizure impossible
	21 May	Japanese gillnetter	Japan	CFZ		Alaska	Aerial, advised to leave area
	25 May	Canadian troller	Canada	CFZ		Washington	Aerial, advised to leave area
	25 May	Lambda 107	Cuba	CFZ	$40,000	Florida	
		Lambda 110	Cuba	CFZ		Florida	
	29 May	Japanese trawler	Japan	CFZ		Alaska	Aerial
	24 Jun	Canadian gillnetter	Canada	TW	300 +catch	Alaska	
	9 Jul	ALL STAR	Canada	TW	$3800	Alaska	
	Jul - Aug	3 trawlers	Canada	TW	1500	Washington	
	10 Aug	Japanese longliner	Japan	CFZ		Alaska	Seized unattended gear
	18 Sep	Vodolaz	USSR	CFZ	50,000	Alaska	
	6 Nov	Ryusho Maru No. 5	Japan	CFZ	115,000	Alaska	

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1972	18 Jan	LAMUT, KOLYVAN	USSR	CFZ	250,000	Alaska	
	18 Mar	KOYO MARU No. 31	Japan	CFZ		Alaska	Aerial, seizure impossible
	3 Apr	KOHOKU MARU 31 RYUYO MARU	Japan	CFZ	180,000	Alaska	
	4 Jul	ALVA MEX 20	Mexico	CFZ	$6,500	Texas	
	26 Oct	YAMASAN MARU	Japan	CFZ		Alaska	Aerial, seizure impossible
1973	21 Jan	MAURITIUS	Italy	TW		New York	Not fishing, escorted out
	27 Jun	Crab Pots	Japan	CFZ	Seized over 4000 pots.	Alaska	F/V's not identified
	12 Jul	DONG BANG No. 71	S. Korea	CFZ	$90,000	Alaska	
	15 Sep	MITSU MARU No. 30	Japan	CFZ	$230,000	Alaska	Ves ran 150 mi.
1974	26 Jan	LIMOZA	Bulgaria	CFZ	$125,000	New Jersey	
	5 Feb	ARMATURSCHCHIK	USSR	CFZ	$250,000	Alaska	Refused to follow under his own power
	7 Feb	LUNNITY GRIGORY ORDZHONIKIDZE	USSR	CFZ	None	Alaska - Determined action of vsl: humanitarian transfer not fishe operations support.	
	20 Mar	EBISU MARU NO. 88	Japan	TW	$300,000	Alaska	
	26 Mar	INAU	Romanian	CFZ	$100,000	North Carolina Virginia Border	$25,000 criminal, penalty dropped by U.S. Attorne

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1974 (cont.)	17 Jul	DON JULIAN	Mexico	CFZ	$3900	Texas	
	28 Jul	E-39-SA	Cuba	CFZ	$25,000 criminal, forfeiture of vessel	Texas	Vessel sold for $16,000 in April 1975
	5 Sept	TAIYO MARU No 28	Japan	CFZ	Vessel released on $450,000 bond	Maine	Case pends
	13 Sept	WENDY MAUREEN	Canada	TW	$1,531.60	Washington	
		ARLENE			$1,478.50		
		SILVER ANN			$1,933.50		
		DIXIE FIVE			$1,696.90		
		DEBBIE MAC			$1,717.90		

Foreign Vessels Violating U.S. Exclusive Fishing Rights - 1975

1975	31 Jan	TONTINI PESCA	Italy	CSFR	$25,000	New York	Vessel retained 20kg of lobster and 5 whole lobsters
	11 Feb	ANTONIETTA MADRE	Italy	CSFR	$40,000	New York	Vessel retained 13.62kg of lobster parts
	3 APR	EIKYU MARU NR 33	Japan	TW	$8,000 criminal Forfeiture of vessel	Alaska	

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1975 (cont.)	17 May	KALMAR	Poland	CFZ	$350,000	California	
	29 May	WICKO	Poland	CSFR	$150,000	New Jersey	Seized by Customs Agents while making port call in Newark
	6 June	JUKYU MARU Nr 17	Japan	TW	$450,000	Alaska	
	12 June	ARGONAVT	Bulgaria	CSFR	$425,000	Mass	
	12 July	DAISHUN MARU	Japan	CSFR	$110,000	Virginia	
	15 July	TOKACHI MARU	Japan	CSFR	$ 10,000	Virginia	Failed to return CSFR to the sea
	2 Aug	E-82	Cuba	CFZ	Forfeiture of vessel	Texas	
	7 Aug	KUM KANG SAN	S. Korea	CFZ	$415,000	Alaska	
	17 Aug	ZARAYSK	USSR	CSFR	$100,000	New York	Vessel was processing incidentally caught CSFR
	18 Aug	PLAYA DE VARADERO	Cuba	CSFR	None	Mass	Vessel using incidentally caught CSFR for crew consumption Vessel released by U.S. Attorney
	2 Sept	PACIFIC RANGER II	Canada	TW	$587.95	Wash.	

Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

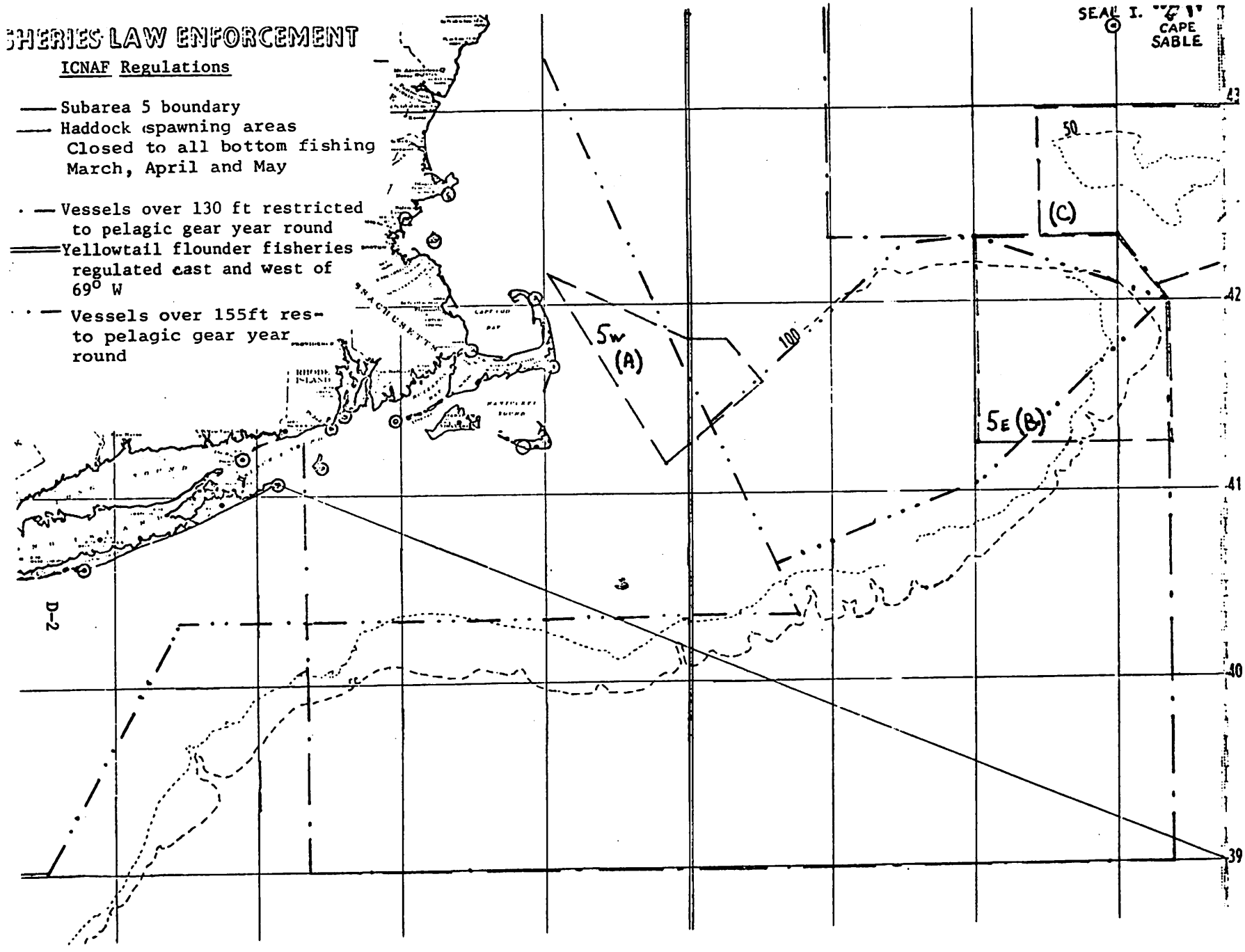
Year	Date	Violator	Nationality	Violation	Penalties	State	Remarks
1975 (cont.)	10 Sep	TONG HONG NR3	Taiwanese	CFZ	$225,000	Alaska	
	26 Sep	JAN JAC ANN	Canada	TW	987.00	Wash	Criminal: 500.00 Catch: 487.00
	22 Oct	SOUTHSIDE	Canada	TW	None	Ohio	CGC PT STEELE seized fish worth $18.00 and net worth $2300.00
	4 Nov	EIKYU MARU NR 35	Japan	CFZ	$600,000	Alaska	
	11 Nov	HUMBAK	Poland	CFZ	$560,000	Mass	
	17 Dec	TEUCRO	Spain	CSFR	$125,000	N.J.	Criminal charge dropped by U.S. Atty
	28 Dec	LEPUS	Poland	CFZ	$185,000	N.Y.	

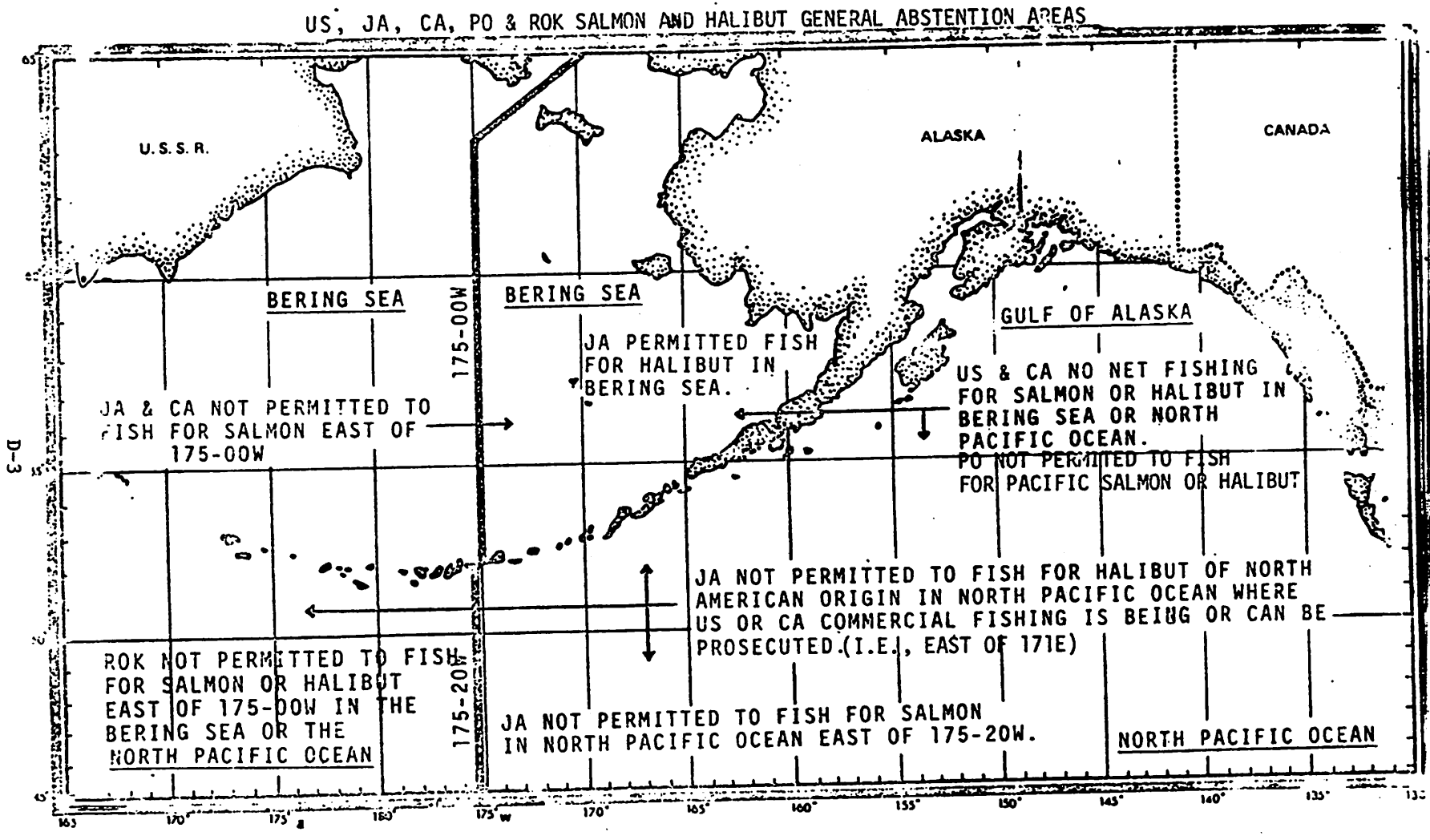
Foreign Fishing Vessels Violating U.S. Exclusive Fishing Rights

Year	Date	Violator	Nationality	Violation	State	Penalty	Remarks
1976	7 Jan	GOLFO DE TONKIN	Cuba	CSFR	Mass.	$40,000	Seized 120 mi SE of Nantucket Is.
	19 Feb	DONG WON NR 709	S. Korea	CFZ	Alaska	$530,000	
	9 Mar	ANTON TAMSAARE	USSR	CSFR	Mass.	$410,000	Seized 100 mi SE of Nantucket Is.
	30 Mar	EIKYU MARU NR81	Japan	CFZ	Alaska	$580,000	
	4 Apr	ANNA MARIA GANDON	Spain	CSFR	N.J.	$100,000	Seized 90 mi east of Cape May, N.J. Case pends.
	14 Apr	KOHOKU MARU NR12	Japan	CSFR	Alaska		Seized 15 miles NNW Semisopochnoi Is. (central Aleutians, Bering Sea side)

APPENDIX D

ICNAF AND INPFC AREAS OF JURISDICTION


SHERIES LAW ENFORCEMENT
ICNAF Regulations
Subarea 5 boundary
Haddock spawning areas Closed to all bottom fishing March, April and May
Vessels over 130 ft restricted to pelagic gear year round
Yellowtail flounder fisheries regulated east and west of 69° W
Vessels over 155ft res- to pelagic gear year round
SEAL I.
CAPE SABLE
43
42
41
40
39
50
100
(C)
5w (A)
5E (B)
D-2


US, JA, CA, PO & ROK SALMON AND HALIBUT GENERAL ABSTENTION AREAS
U.S.S.R.
ALASKA
CANADA
BERING SEA
BERING SEA
175-00W
JA PERMITTED FISH FOR HALIBUT IN BERING SEA.
GULF OF ALASKA
US & CA NO NET FISHING FOR SALMON OR HALIBUT IN BERING SEA OR NORTH PACIFIC OCEAN.
PO NOT PERMITTED TO FISH FOR PACIFIC SALMON OR HALIBUT
JA & CA NOT PERMITTED TO FISH FOR SALMON EAST OF 175-00W
JA NOT PERMITTED TO FISH FOR HALIBUT OF NORTH AMERICAN ORIGIN IN NORTH PACIFIC OCEAN WHERE US OR CA COMMERCIAL FISHING IS BEING OR CAN BE PROSECUTED.(I.E., EAST OF 171E)
ROK NOT PERMITTED TO FISH FOR SALMON OR HALIBUT EAST OF 175-00W IN THE BERING SEA OR THE NORTH PACIFIC OCEAN
175-20W
JA NOT PERMITTED TO FISH FOR SALMON IN NORTH PACIFIC OCEAN EAST OF 175-20W.
NORTH PACIFIC OCEAN
65
55
45
165
170
175
180
175 W
170
165
160
155
150
145
140
135
130

CURRENT MEMBERS

INTERNATIONAL COMMISSION FOR THE

NORTHWEST ATLANTIC FISHERIES (ICNAF)

BULGARIA

CANADA

CUBA

DENMARK

FRANCE

FEDERAL REPUBLIC OF GERMANY

GERMAN DEMOCRATIC REPUBLIC

ICELAND

ITALY

JAPAN

NORWAY

POLAND

PORTUGAL

ROMANIA

SPAIN

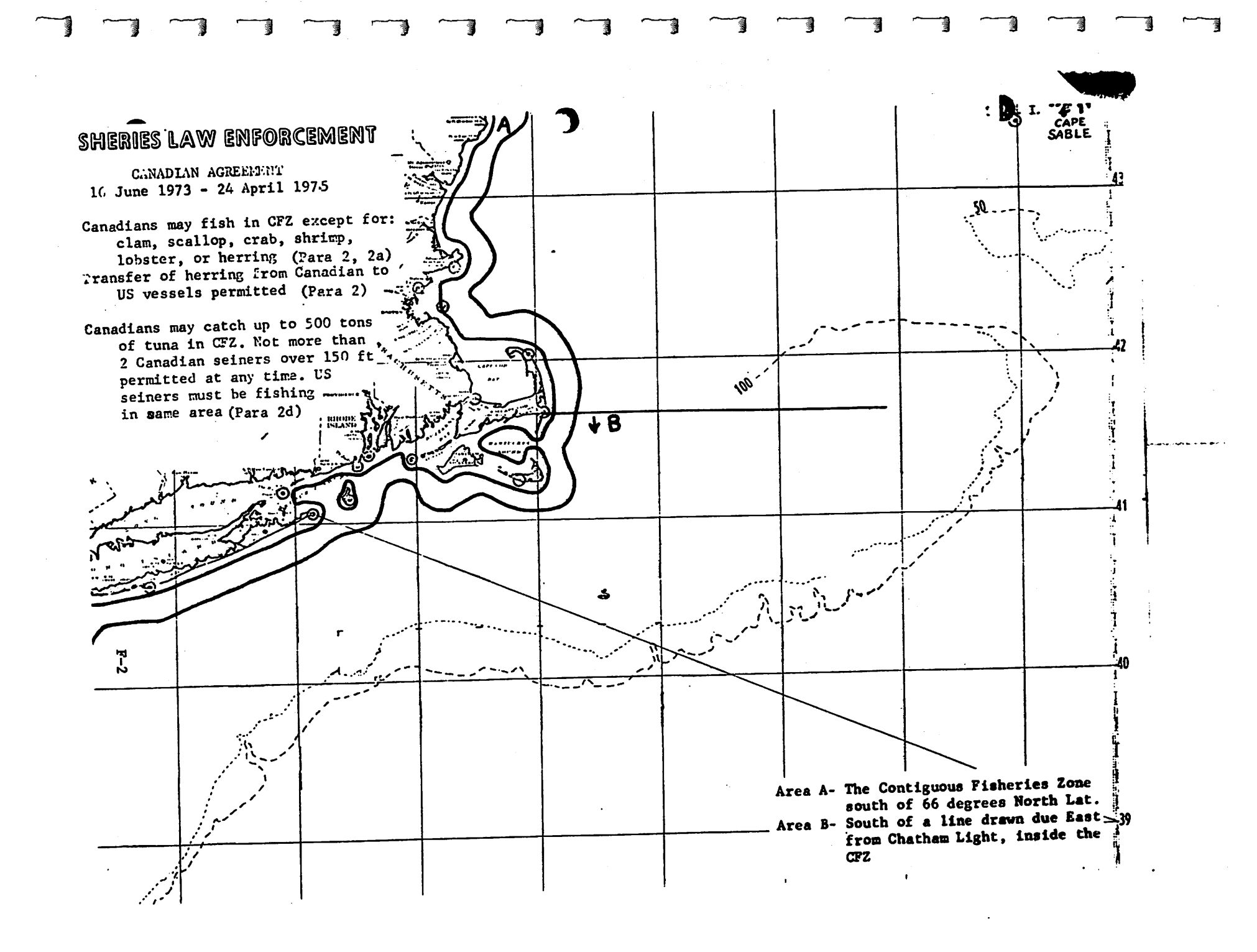
UNION OF SOVIET SOCIALIST REPUBLICS

UNITED KINGDOM

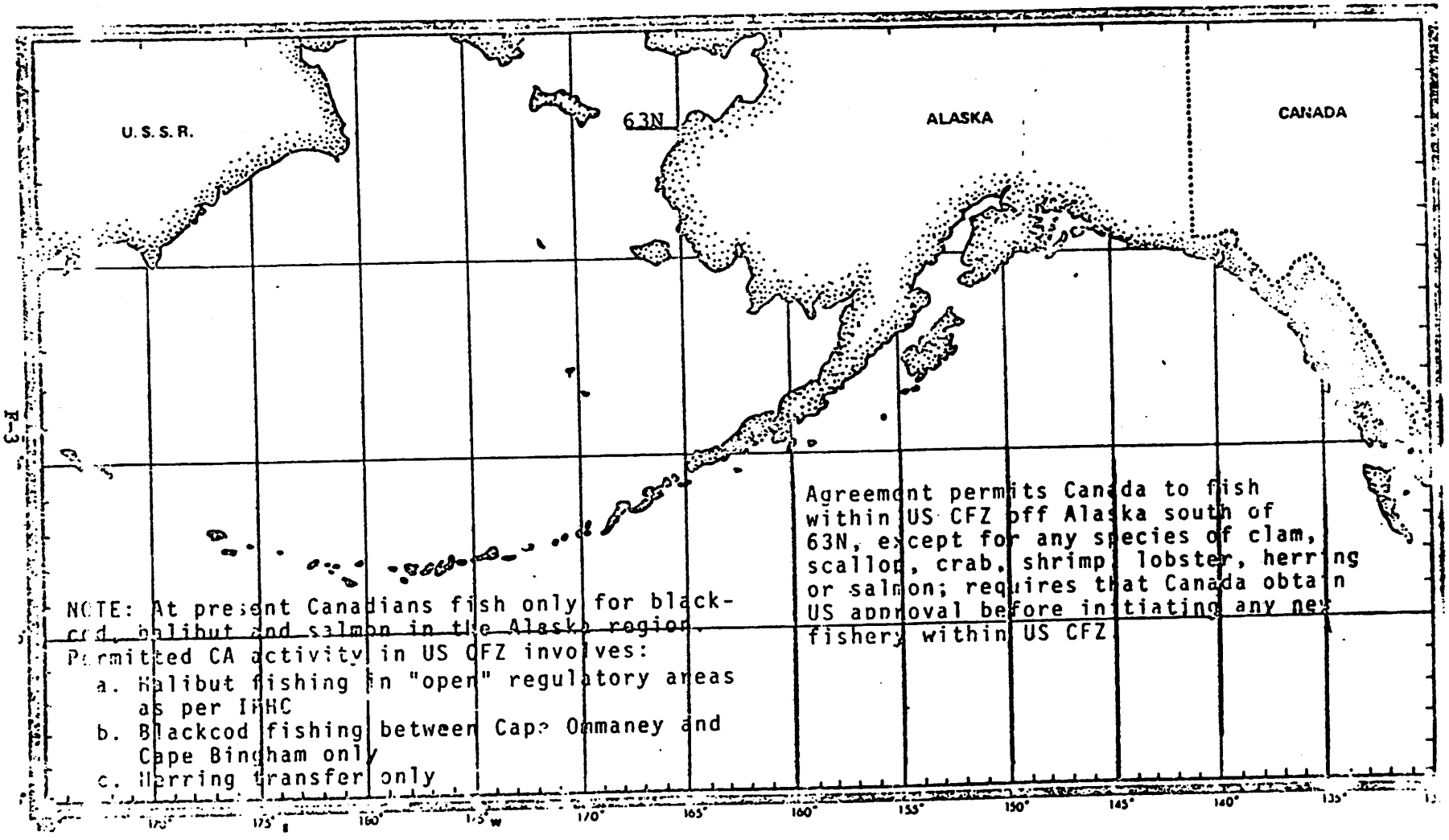
UNITED STATES

APPENDIX F

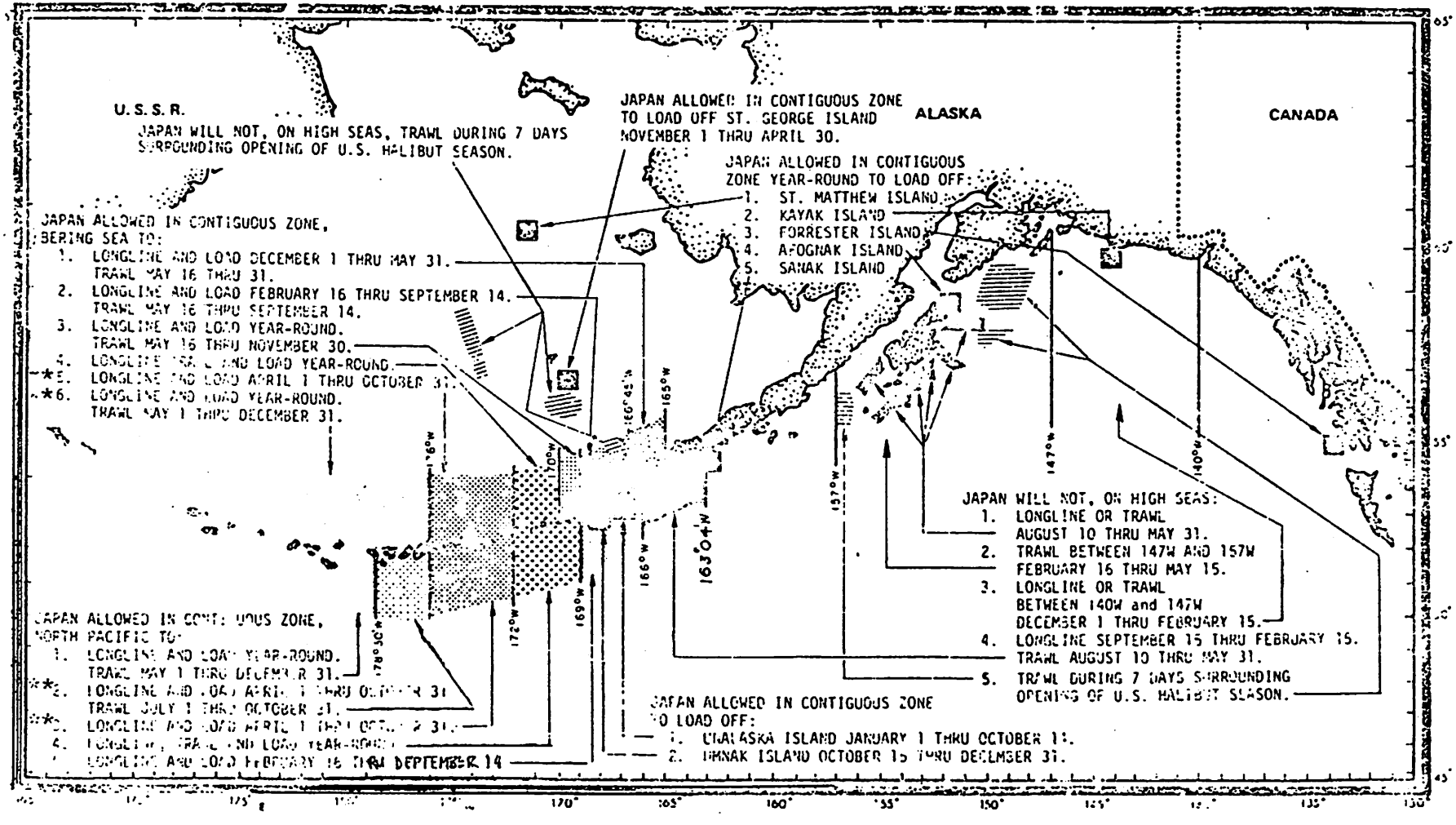
CHARTLETS OF CURRENT BILATERAL AGREEMENTS

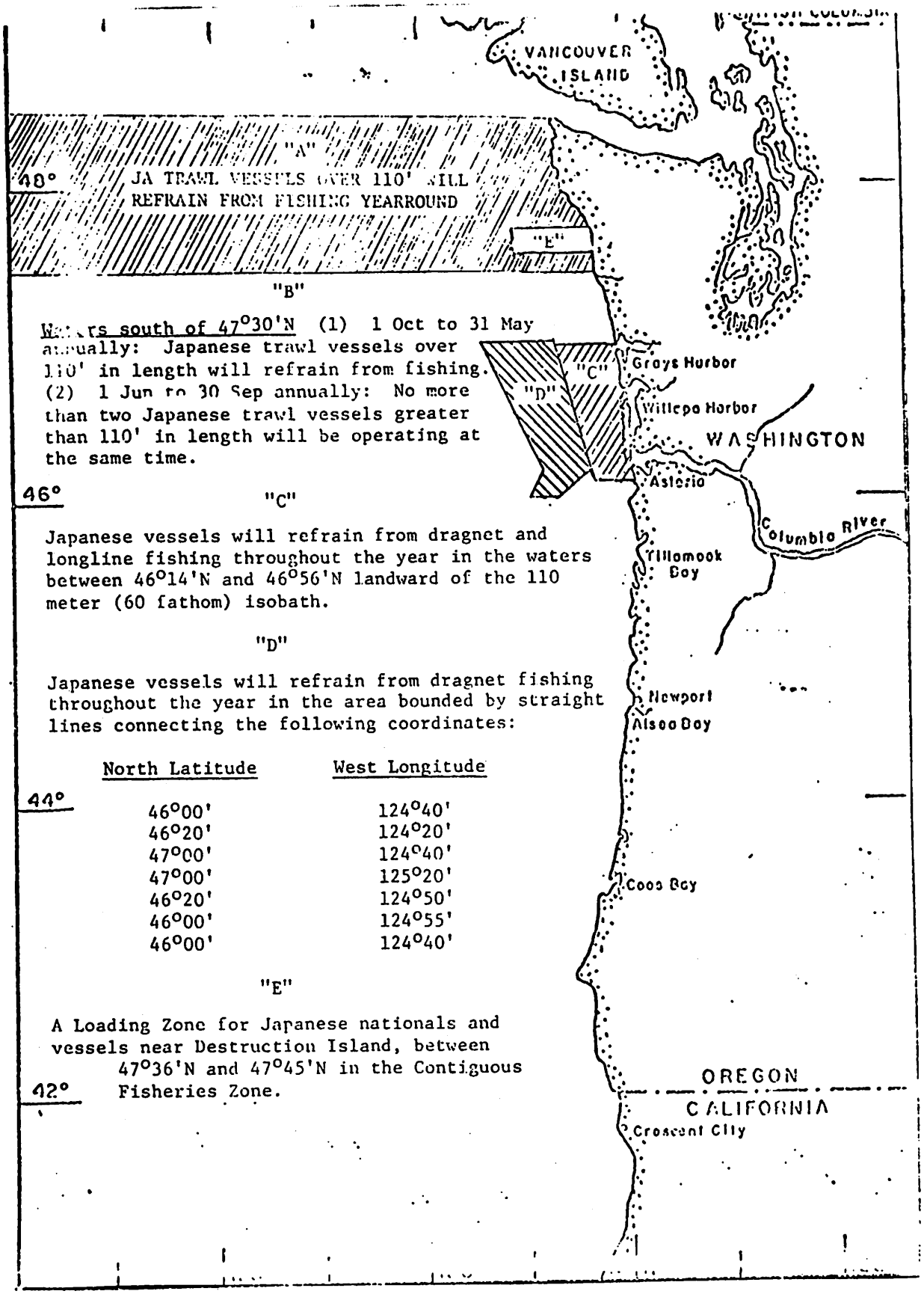

SHERIES LAW ENFORCEMENT
CANADIAN AGREEMENT
16 June 1973 - 24 April 1975
Canadians may fish in CFZ except for:
clam, scallop, crab, shrimp,
lobster, or herring (Para 2, 2a)
Transfer of herring from Canadian to
US vessels permitted (Para 2)
Canadians may catch up to 500 tons
of tuna in CFZ. Not more than
2 Canadian seiners over 150 ft
permitted at any time. US
seiners must be fishing
in same area (Para 2d)
A
B
I. "E"
CAPE
SABLE
50
100
43
42
41
40
39
F-2
Area A- The Contiguous Fisheries Zone
south of 66 degrees North Lat.
Area B- South of a line drawn due East
from Chatham Light, inside the
CFZ

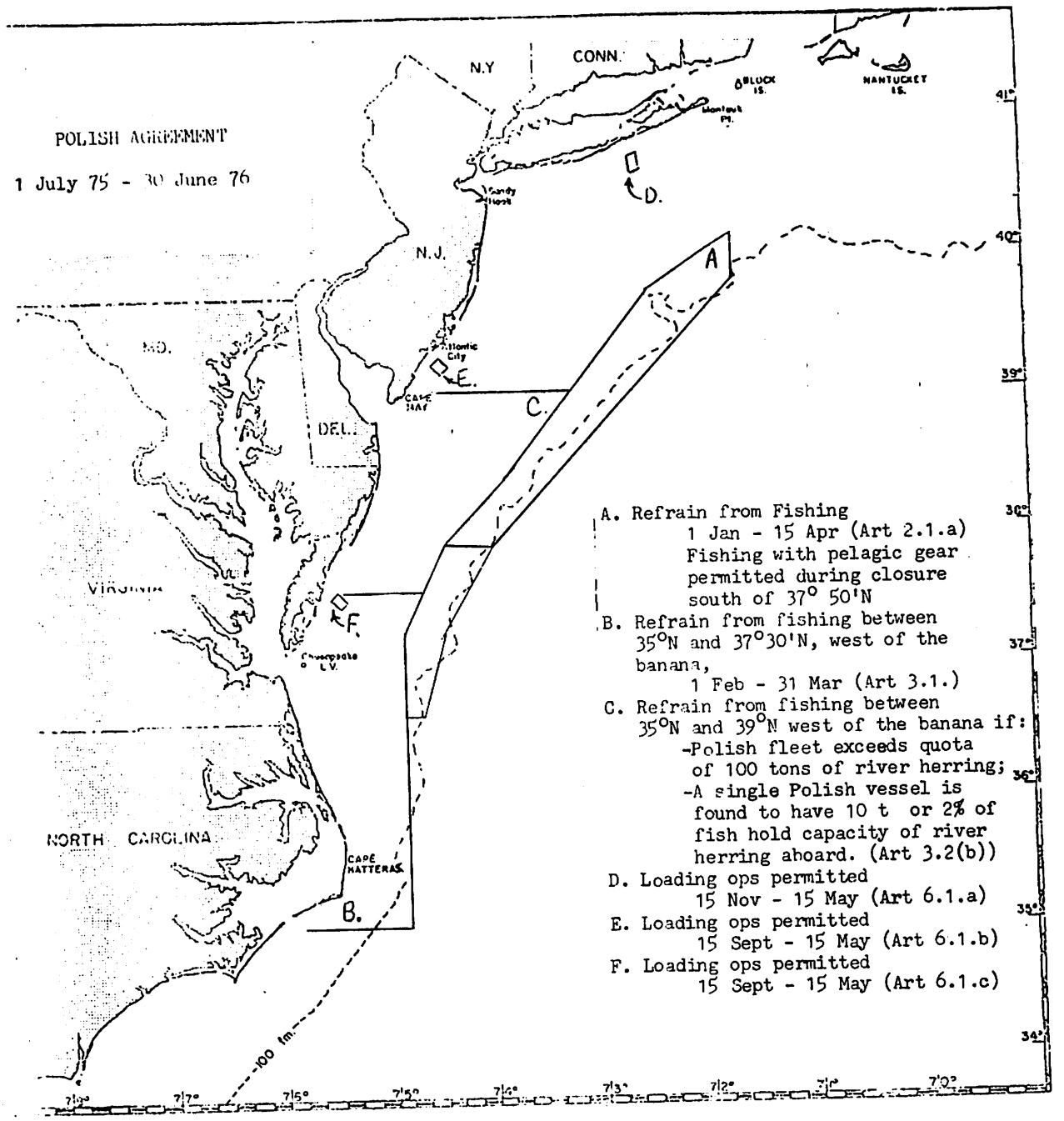
UNITED STATES - CANADA
RECIPROCAL FISHING AGREEMENT
15 June 1973



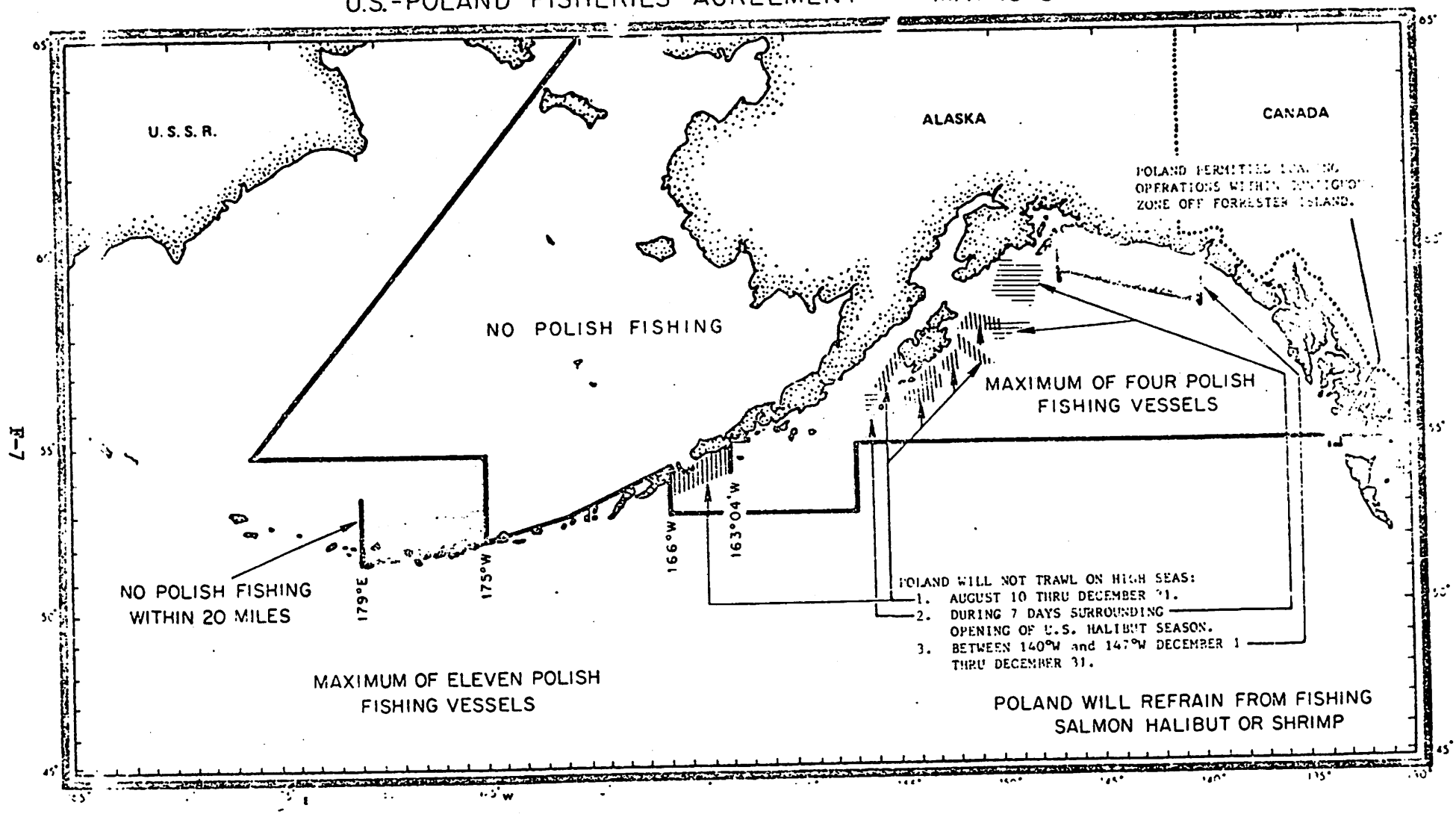
U.S.-JAPAN FISHERIES AGREEMENTS CONCERNING THE U.S. CONTIGUOUS FISHERY ZONE OFF ALASKA--DECEMBER 1974



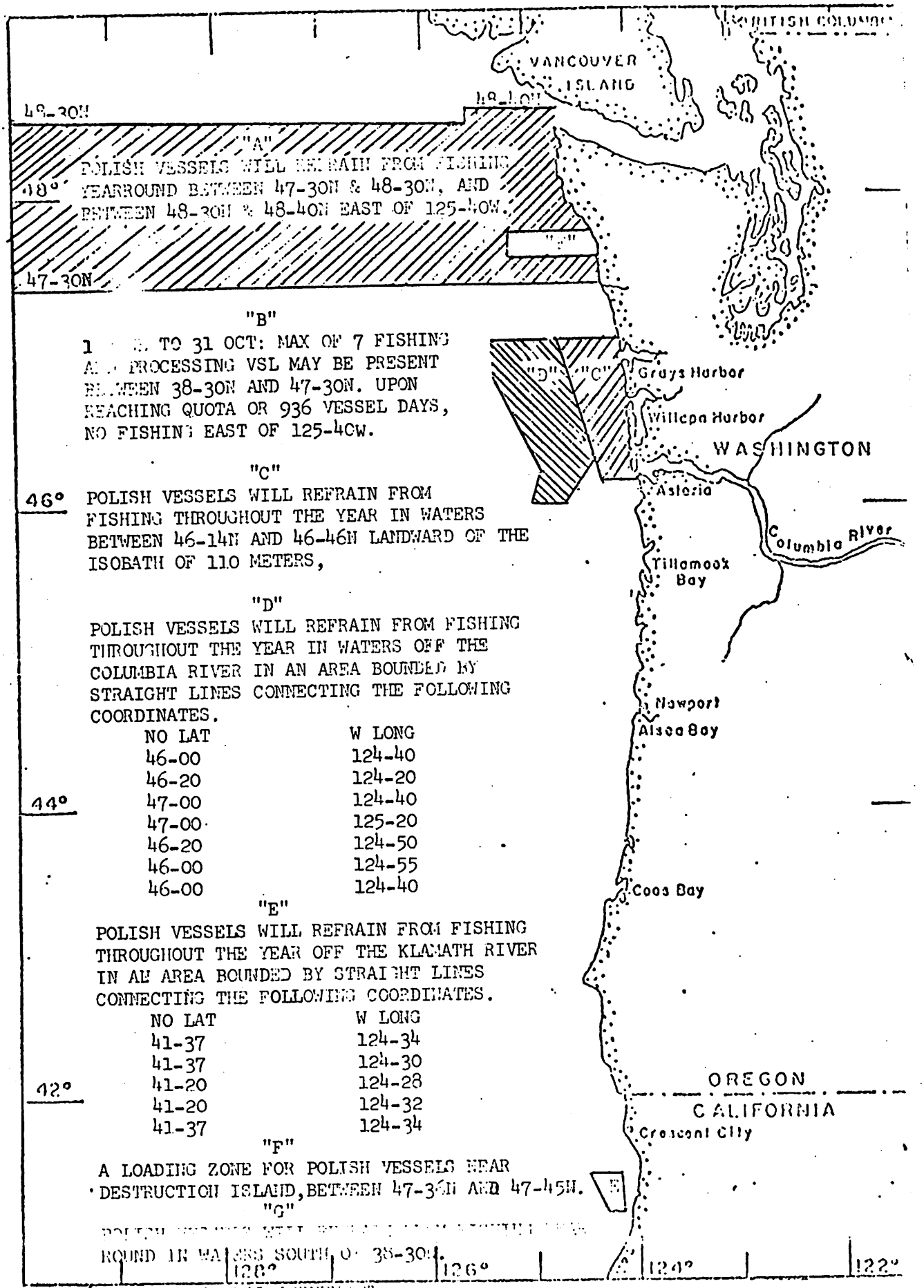

VANCOUVER ISLAND
"A"
48°
JA TRAWL VESSELS OVER 110' WILL REFRAIN FROM FISHING YEARROUND
"E"
"B"
Waters south of 47°30'N (1) 1 Oct to 31 May annually: Japanese trawl vessels over 110' in length will refrain from fishing. (2) 1 Jun to 30 Sep annually: No more than two Japanese trawl vessels greater than 110' in length will be operating at the same time.
"D"
"C"
Grays Harbor
Willapa Harbor
WASHINGTON
Astoria
46°
"C"
Japanese vessels will refrain from dragnet and longline fishing throughout the year in the waters between 46°14'N and 46°56'N landward of the 110 meter (60 fathom) isobath.
Columbia River
Tillamook Bay
"D"
Japanese vessels will refrain from dragnet fishing throughout the year in the area bounded by straight lines connecting the following coordinates:
Newport
Alsea Bay
North Latitude
West Longitude
44°
46°00' 124°40'
46°20' 124°20'
47°00' 124°40'
47°00' 125°20'
46°20' 124°50'
46°00' 124°55'
46°00' 124°40'
Coos Bay
"E"
A Loading Zone for Japanese nationals and vessels near Destruction Island, between 47°36'N and 47°45'N in the Contiguous Fisheries Zone.
OREGON
42°
CALIFORNIA
Crescent City


POLISH AGREEMENT
1 July 75 - 30 June 76
N.Y
CONN.
BLOCK IS.
NANTUCKET IS.
Montauk Pt.
Sandy Hook
D.
N.J.
A
MD.
Atlantic City
E.
CAPE MAY
C.
DEL.
VIRGINIA
F.
Chesapeake L.V.
NORTH CAROLINA
CAPE HATTERAS
B.
100 fm
41°
40°
39°
38°
37°
36°
35°
34°
75°
74°
73°
72°
71°
70°
A. Refrain from Fishing
1 Jan - 15 Apr (Art 2.1.a)
Fishing with pelagic gear permitted during closure south of 37° 50'N
B. Refrain from fishing between 35°N and 37°30'N, west of the banana,
1 Feb - 31 Mar (Art 3.1.)
C. Refrain from fishing between 35°N and 39°N west of the banana if:
-Polish fleet exceeds quota of 100 tons of river herring;
-A single Polish vessel is found to have 10 t or 2% of fish hold capacity of river herring aboard. (Art 3.2(b))
D. Loading ops permitted
15 Nov - 15 May (Art 6.1.a)
E. Loading ops permitted
15 Sept - 15 May (Art 6.1.b)
F. Loading ops permitted
15 Sept - 15 May (Art 6.1.c)

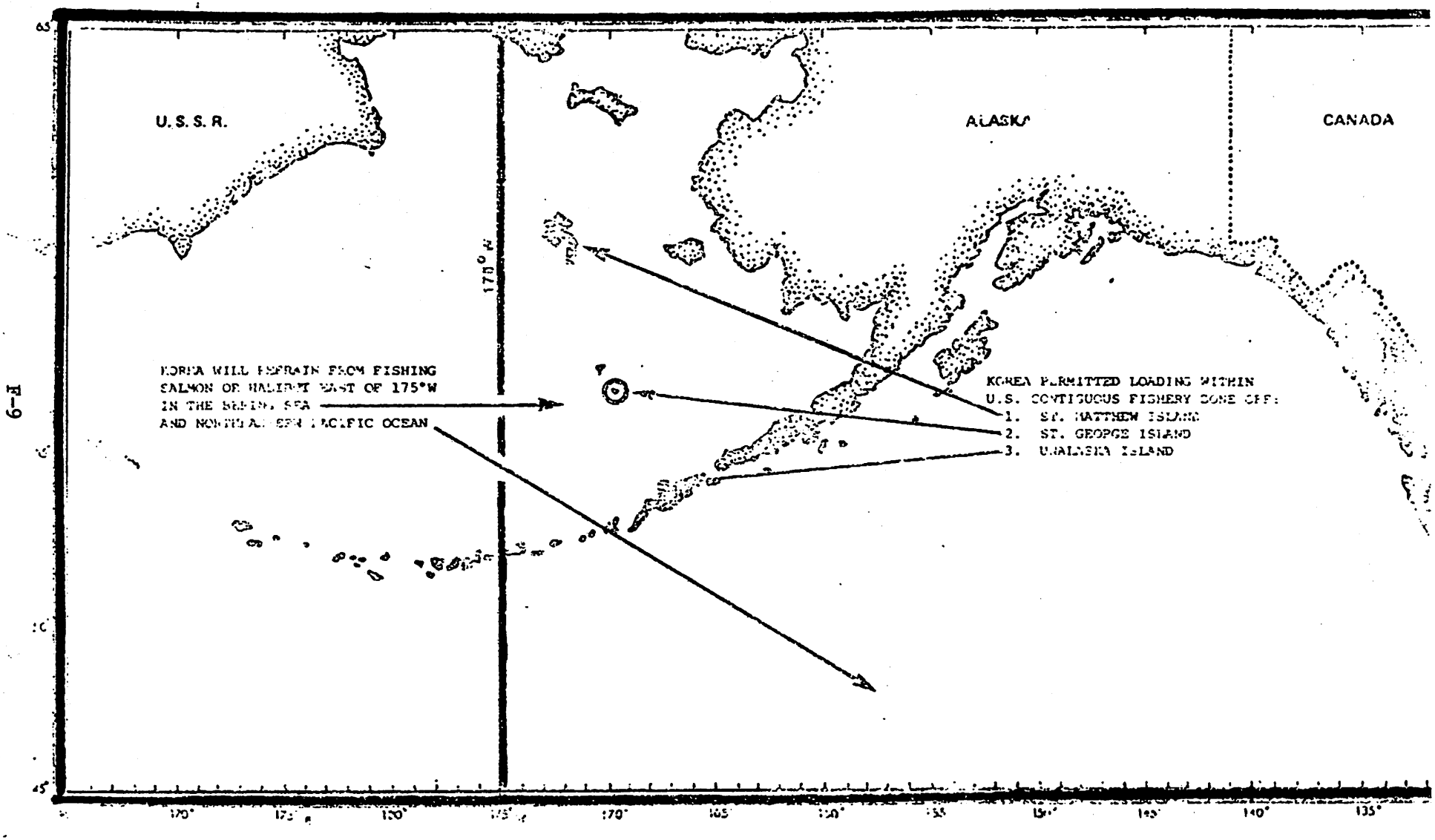
U.S.-POLAND FISHERIES AGREEMENT MAY 1975



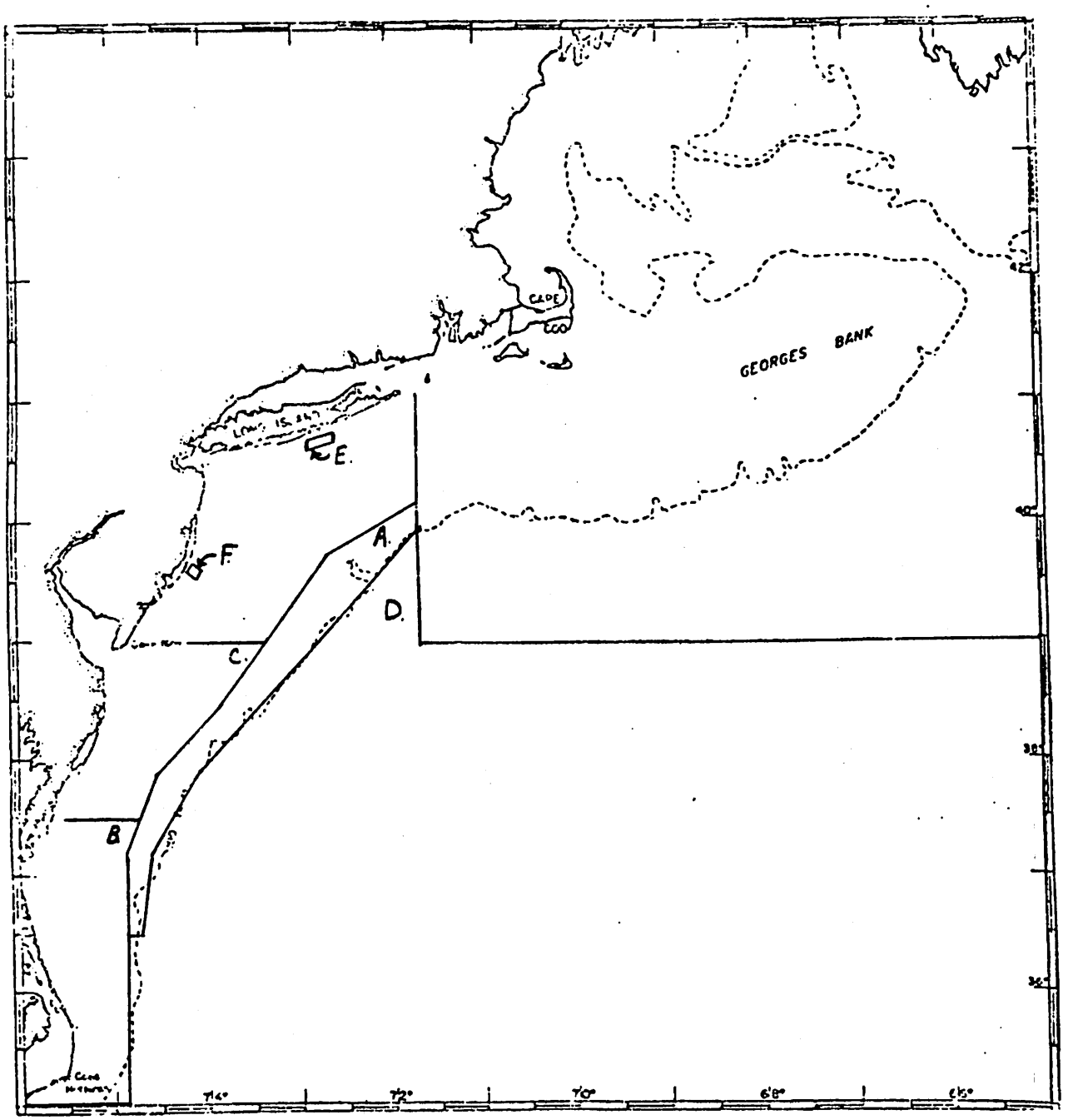
R-7


VANCOUVER ISLAND
48-30N
48-10N
"A"
POLISH VESSELS WILL REFRAIN FROM FISHING YEARROUND BETWEEN 47-30N & 48-30N, AND BETWEEN 48-30N & 48-40N EAST OF 125-40W.
48°
47-30N
"B"
1 MAY TO 31 OCT: MAX OF 7 FISHING AND PROCESSING VSL MAY BE PRESENT BETWEEN 38-30N AND 47-30N. UPON REACHING QUOTA OR 936 VESSEL DAYS, NO FISHING EAST OF 125-40W.
"C"
46° POLISH VESSELS WILL REFRAIN FROM FISHING THROUGHOUT THE YEAR IN WATERS BETWEEN 46-14N AND 46-46N LANDWARD OF THE ISOBATH OF 110 METERS,
"D"
POLISH VESSELS WILL REFRAIN FROM FISHING THROUGHOUT THE YEAR IN WATERS OFF THE COLUMBIA RIVER IN AN AREA BOUNDED BY STRAIGHT LINES CONNECTING THE FOLLOWING COORDINATES.
NO LAT W LONG
46-00 124-40
46-20 124-20
44° 47-00 124-40
47-00 125-20
46-20 124-50
46-00 124-55
46-00 124-40
"E"
POLISH VESSELS WILL REFRAIN FROM FISHING THROUGHOUT THE YEAR OFF THE KLAMATH RIVER IN AN AREA BOUNDED BY STRAIGHT LINES CONNECTING THE FOLLOWING COORDINATES.
NO LAT W LONG
41-37 124-34
41-37 124-30
42° 41-20 124-28
41-20 124-32
41-37 124-34
"F"
A LOADING ZONE FOR POLISH VESSELS NEAR DESTRUCTION ISLAND, BETWEEN 47-34N AND 47-45N.
"G"
ROUND IN WATERS SOUTH OF 38-30N
"D"
"C"
Grays Harbor
Willapa Harbor
WASHINGTON
Astoria
Columbia River
Tillamook Bay
Newport
Alsea Bay
Coos Bay
OREGON
CALIFORNIA
Crescent City
128°
126°
124°
122°

U. S. - REPUBLIC OF KOREA (SOUTH KOREA) FISHERIES AGREEMENT
NOVEMBER 1972



F-9

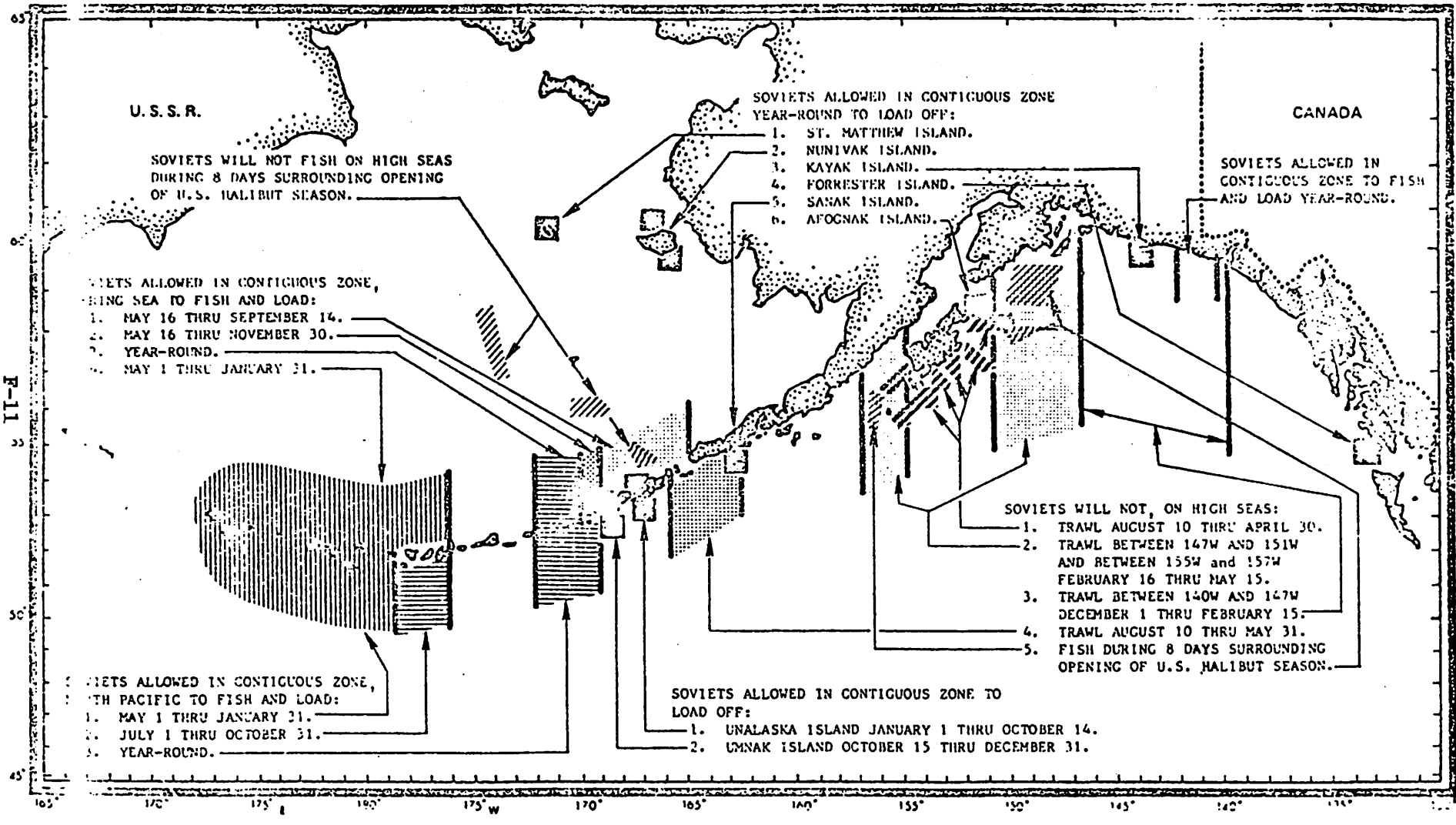


U.S. - U.S.S.R. Agreement of 26 Feb 1976
In force 1 Mar 76 through 30 April 1977

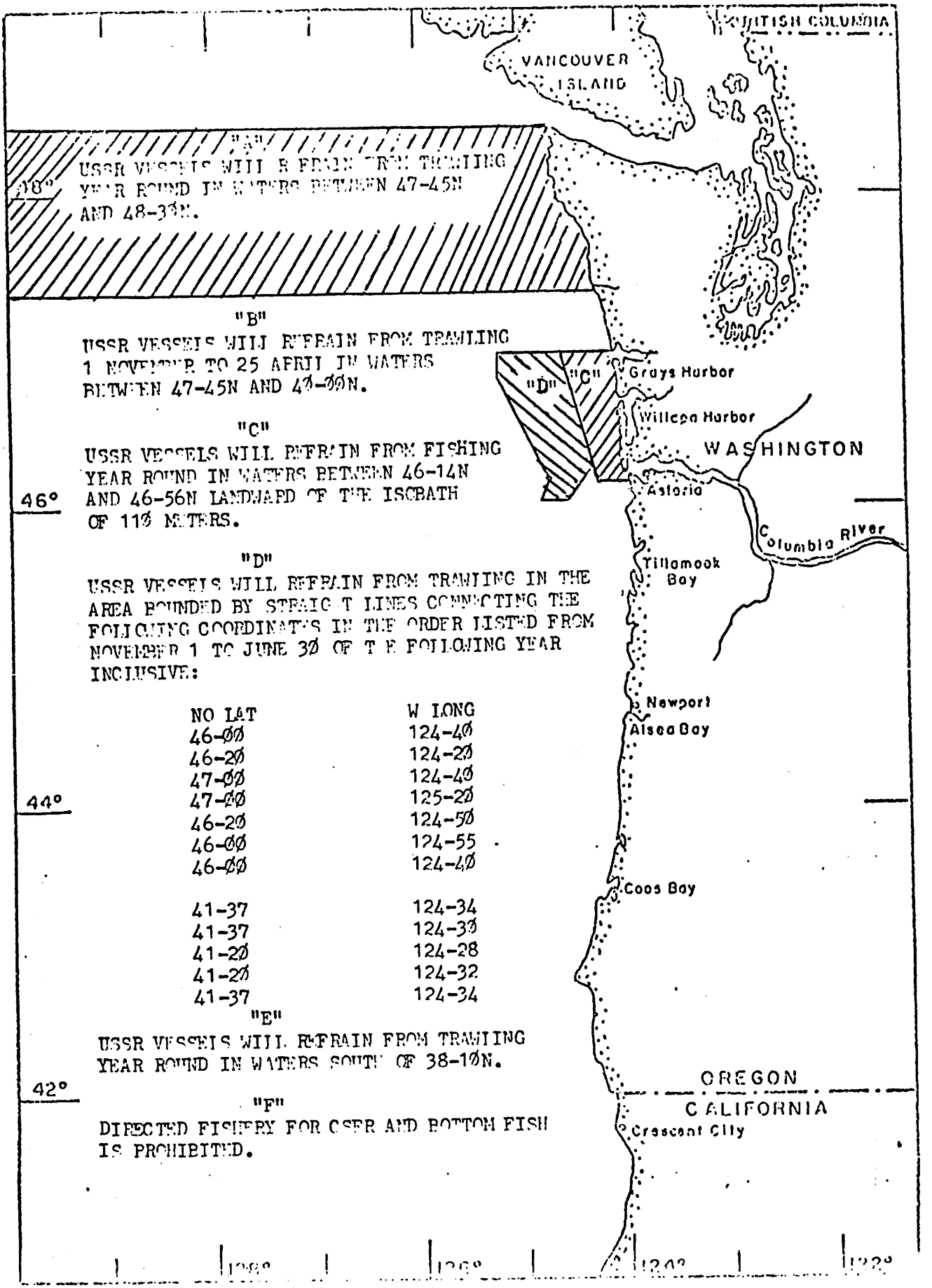
A. Refrain from fishing: 1 Jan - 30 Apr (Art II, para 1)*
B. Refrain from fishing: 1 Feb - 31 Mar (Art II, para 2)*
C. If UR vessels take 210 tons river herring, UR fleet will refrain from fishing for remainder of year 35N - 39N (Art II, para 5.b)
D. Refrain from using demersal gear in entire area of Agreement (Art II, para 6)
E. Loading operations permitted 15 Nov - 15 May (Art VI, para 1)
F. Loading Operations permitted 15 Sept - 15 May (Art VI, para 2)

* Does not apply to vessels under 130 ft.

U.S. - U.S.S.R. FISHERIES AGREEMENT CONCERNING THE U.S. CONTIGUOUS FISHERY ZONE OFF ALASKA JULY 1975



F-11


BRITISH COLUMBIA
VANCOUVER ISLAND
"A"
USSR VESSELS WILL REFRAIN FROM TRAWLING YEAR ROUND IN WATERS BETWEEN 47-45N AND 48-30N.
48°
"B"
USSR VESSELS WILL REFRAIN FROM TRAWLING 1 NOVEMBER TO 25 APRIL IN WATERS BETWEEN 47-45N AND 47-00N.
"C"
USSR VESSELS WILL REFRAIN FROM FISHING YEAR ROUND IN WATERS BETWEEN 46-14N AND 46-56N LANDWARD OF THE ISOBATH OF 110 METERS.
46°
"D"
USSR VESSELS WILL REFRAIN FROM TRAWLING IN THE AREA BOUNDED BY STRAIGHT LINES CONNECTING THE FOLLOWING COORDINATES IN THE ORDER LISTED FROM NOVEMBER 1 TO JUNE 30 OF THE FOLLOWING YEAR INCLUSIVE:
NO LAT W LONG
46-00 124-40
46-20 124-20
47-00 124-40
47-00 125-20
46-20 124-50
46-00 124-55
46-00 124-40
41-37 124-34
41-37 124-30
41-20 124-28
41-20 124-32
41-37 124-34
"E"
USSR VESSELS WILL REFRAIN FROM TRAWLING YEAR ROUND IN WATERS SOUTH OF 38-10N.
44°
"F"
DIRECTED FISHERY FOR OSER AND BOTTOM FISH IS PROHIBITED.
42°
Grays Harbor
Willapa Harbor
WASHINGTON
Astoria
Columbia River
Tillamook Bay
Newport
Alsea Bay
Coos Bay
OREGON
CALIFORNIA
Crescent City
126°
124°
122°

APPENDIX G

FOREIGN VIOLATIONS OF TREATIES AND AGREEMENTS TO WHICH THE UNITED STATES IS A PARTY, 1975

Treaty	Closed Area	Gear	Quota	Other
ICNAF		1 USSR	USSR (Mackerel) France (5Y Herring) Poland (5Y Herring) Spain (1 vessel, excess haddock)	104 (Log book)
Agreement				
USSR (Atlantic)	1			4 (CSFR)
(Pacific)	3		6 (excess rockfish)	2 (CSFR)
Poland (Atlantic)	3		2 (excess rockfish) 1 (salmon)	
(Pacific)	1		Fleet (overfished) hake quota	
Japan	2			
Other				
Taiwan				1 (directed fishery for salmon)

APPENDIX H

DEVELOPMENT OF FISHERIES LAW ENFORCEMENT PLANNING MODEL AND METHODOLOGY USED TO EXTEND THE MODEL TO THE CURRENT COST/BENEFIT ANALYSIS

FISHERIES LAW ENFORCEMENT PLANNING MODEL

1. BACKGROUND AND PURPOSE

As the primary maritime law enforcement agency of the Federal Government, the Coast Guard is responsble for the enforcement of Federal laws upon the navigable waters of the United States and its possessions, and upon the high seas. The maritime laws enforced by the Coast Guard can be divided into two groups:

(1) Laws relating to marine safety for which the Coast Guard has sole responsibility, and

(2) Laws relating to other matters that generally fall within the jurisdiction of other agencies for which (a) the Coast Guard has direct and primary enforcement responsibility, (b) the Coast Guard shares enforcement responsibility, or (c) the Coast Guard`s unique authority and facilities are required to effect marine law enforcement. Included within this group are those laws concerning living marine resources which appertain to the United States or to which the United States has a treaty-generated obligation. The Enforcement of Laws and Treaties (ELT) Program is concerned principally with this second group of laws, and also with international and executive agreements in this area.

The national goals of conservation of living marine resources and exclusion of foreign fishing in coastal areas were and are the central forces in the establishment of most laws, treaties and agreements associated with fisheries. In addition to these conservation and exclusion motivated responsibilities, a few agreements are based on reducing the occurrence of "gear conflicts" caused by fishermen using different types of fishing apparatus (e.g. pots vs. trawls). The National Marine Fisheries Service (NMFS) shares responsibility with the Coast Guard for the enforcement of nearly all fisheries laws where the Coast Guard is the primary at-sea enforcement agency.

At the present time, there are in excess of twenty laws, treaties and agreements (relevant to fisheries) covering an immense geographical area for which the Coast Guard attempts to meet its fisheries enforcement responsibilites and achieve the ELT Program objectives by: conducting vessel and aircraft patrols to deter potential violators and to monitor the activities of

foreign fishing fleets; responding with vessels and/or aircraft to reported violations; and gathering and analyzing information concerning the location, density and type of foreign fishing activity. For effective management of the program, a method must exist by which the resource levels required to accomplish the program objectives can be determined. Such a method requires the existence of criteria for measuring the effectiveness or the degree of achievement of the Program objectives associated with any particular resource level. The need to have such a method to aid in making more informed judgments in determining resources requirements gave rise to Phase I of the Enforcement of Fisheries Laws and Treaties Study.

Specifically, the study had two fundamental objectives:

(1) To quantify, where possible, the elements of fisheries law enforcement, and

(2) To develop a mathematical model which would permit evaluation of different levels of ship and aircraft employment in terms of specific system performance measures.

II. FISHERIES LAW ENFORCEMENT PLANNING MODEL

The product of Phase I of the ELT Study is the Fisheries Law Enforcement Planning Model (FLEPM). The model relates resource requirements to a set of system performance measures.

The model is based on an analysis of the fisheries law enforcement system. This system includes the legal responsibilities of the Coast Guard, the Coast Guard enforcement activities, the nature of the fishing activity and the assumed behavioral characteristics of fishermen. For purposes of the analysis, the fisheries law enforcement system was divided into five geographical areas:

(1) Northweast and Mid-Atlantic,

(2) South Atlantic and Gulf of Mexico,

(3) Eastern Topical Pacific,

(4) Pacific Northwest, and

(5) Alaska.

Because the fisheries law enforcement problems and their solutions for the South Atlantic, Gulf of Mexico, and the Eastern Tropical Pacific areas were well-formulated, those areas were excluded from analysis. The remaining areas, Northwest and Mid-Atlantic, Pacific Northwest, and Alaska, have a common characteristic that permitted them to be analyzed with one general approach. Specifically, each of those areas can be characterized as containing large concentrations of fishermen of different nationalities fishing for different species using a variety of methods.

The analysis made some behavioral assumptions concerning the fishermen. All fishermen were characterized by an average fisherman whose behavior is representative of fishermen in general. A fundamental behavioral assumption was that fishermen, in general, do not intentionally set out to violate a given statute or agreement; their primary motivation is to catch as many fish as possible. In the absence of any enforcement efforts, there exists a steady-state probability of violation. In the absence of historical data, subjective estimates of steady-state probabilities were made. These probabilities were revised in later iterations of the model using empirical data. The effect of deterrence (related to enforcement effort) was incorporated by considering that the fisherman's behavior varied with the level of enforcement effort. In particular, the probability of violation was hypothesized to vary with the time since the last enforcement patrol.

Given this set of behavioral characteristics of fishermen, the fishing activity, and the many laws, treaties and agreements which are applicable, the ELT program objectives, for purposes of this analysis, were simplified as follows:

(1) Enforce Federal fisheries statutes

(2) Enforce international fisheries treaties and agreements, and,

(3) Conduct surveillance in support of (1), (2), and other agencies for fisheries conservation purposes.

The types of resources used in the Program are aircraft and ships. Aircraft are the primary surveillance vehicles and have a detection and deterrence function effective over a large area. Ships are the primary seizure vehicles, and are capable of detailed data collection and boarding. The deterrence and detection function of ships is effective only over a local area, but the existence of a surface patrol serves to reinforce the credibility of the aircraft detection and deterrence role. This distinction in role of aircraft and ships led to them being analyzed separately. To do this the FLEPM used three sub-models.

The sub-models are the Aviation Resources Planning Model (ARPM), the Surface Resources Planning Model (SRPM), and the ARPM-SRPM Interface Model. Before describing these sub-models and their functions, it is necessary to develop the concept of "Getaway".

The ideal situation is that no violations occur. Short of that, it is desired that every violation which does occur is detected, that is, no violators "get away." Thus, a getaway is defined to be an undetected violation. A practical resource planning goal is to reduce the expected number of getaways to an acceptable level commensurate with resource cost. An important consideration in the FLEPM was effectiveness. The effectiveness at a particular level of resource utilization is the percentage reduction in "getaways" from those occurring at a "no effort" level of effort. At the "no effort" level, violations occur at the steady-state rate, no detection or deterrence of violators occurs, and all violations are getaways. At any other level of resource utilization, some would-be violators are deterred from committing a violation, and of those that actually do violate, some are detected. Thus, the original number of getaways is reduced by those that are detected. The percentage reduction determines the effectiveness at that resource level.

The concept of "no effort" requires further explanation. It is not a no enforcement situation. Rather it is the situation which occurs when honest fishermen are no longer deterred by expectations of enforcement patrols. In other words, they have reached a "steady-state" probability of violation for the enforcement effort being put forth. In the absence of any enforcement effort, deliberate violators would almost certainly become more brazen in their disregard for laws and regulation and the number of violations would increase.

The "no effort" level of violations is probably analogous to enforcement where there is some perceived probability of being detected while violating, but where the effects of active enforcement have been forgotten. It is from this benchmark that all other levels of effort are measured.

The Aviation Resource Planning Model (ARPM) is concerned with the effect of aircraft patrols on fishing activity. The fishing activity of primary interest is foreign activity. The direct quantitative input to the ARPM includes:

(1) The location and density of foreign fishing activity determined from historical data or forecasts,

(2) The probabilites of violation pertaining to each fishery and type of violation,

(3) The probability of detection associated with searching a particular fishery.

The ARPM generates a set of tables that contain the expected results in terms of sightings, expected treaty getaways and expected statute getaways, and the associated effectiveness, corresponding to the particular resource level. These are evaluated on the basis of the expected numbers of getaways and the effectiveness to determine the effect of various air craft operating levels.

This operating level forms part of the input into the ARPM-SRPM Interface Model. The remainder of the input involves the location and description of surface patrol areas. The purpose of the Interface Model is to develop measures of the relative value of having a surface patrol in the different patrol areas. The surface patrol is considered to have the following functions:

(1) Collect detailed fishing data,

(2) Conduct boarding operations,

(3) Deter or detect treaty violations,

(4) Deter or detect statute violations, and

(5) Seize detected violations.

The Interface Model uses the results from aircraft patrols (ARPM) at the operating level to determine the value associated with having a surface patrol in the different patrol areas for each of the five categories. The total value for each patrol area is called the "figure of relative merit" for the patrol area and expresses the relative importance of having a surface patrol in that area. The figure of relative merit is the basic output of the ARPM-SRPM Interface Model.

The purpose of the Surface Resources Planning Model (SRPM) is to combine the effects of aircraft patrols and ship patrols at their specific operating levels. The SRPM inputs are the fishery characteristics, and the aircraft and ship operating levels (flight hours and ship days). The output from the SRPM is a table, for each month and geographical area, depicting the combined results in terms of expected numbers of treaty getaways and statute getaways, and the associated effectiveness.

The Fisheries Law Enforcement Planning Model is a management tool which incorporates historical data and experienced judgement to quantitatively relate resource requirements to Program objectives described by a set of performance measures. The result provides a quantitative basis for making resource allocation decisions.

III. COST/BENEFIT ANALYSIS METHODOLOGY

Empirical information was gathered to validate the effectiveness of the model and several changes were incorporated. The Fisheries Law Enforcement Model was last exercised in June of 1974. At that time alternative resource allocations were considered and a series of matrices was produced which described the level of violations expected for alternative ship and aircraft allocations by geographical area and season. An example of one such matrix is shown in Table H-I.

TABLE H-I

NUMBER OF UNDETECTED/UNDETERRED VIOLATIONS EXPECTED IN THE NORTH ATLANTIC DURING MARCH FOR VARIOUS LEVELS OF SHIP DAYS AND AIRCRAFT HOURS.

Atlantic Area March

Ship Days	Aircraft Hours*				
	0	123	143	162	202
0	75.0	33.0	23.8	22.9	13.7
60	67 **	27.8	20.2	19.7	11.2
70	64 **	25.9	18.8	18.2	11.0
80	61 **	23.8	17.3	16.8	10.1
90	57 **	22.8	16.6	16.4	9.8
100	54 **	22.1	16.1	16.0	9.6
110	51 **	21.4	15.5	15.6	9.3
120	48 **	20.8	15.0	15.2	9.0

*Values for aircraft hours were determined somewhat arbitraily, this accounts for the non uniformity of the increments.

**These values were not provided by the FLEPM, but are reasonable extrapolations of the methodology used therein.

Thirty-six of these matices were developed for the three principle fishing regions (Atlantic, Pacific, Northwest, Alaska). The following serves to illustrate the use of these matrices: In the month of March, the model expects 75 undetected/undeterred violations to occur in the Atlantic area if no Coast Guard patrols are conducted. If 60 ship days and 143 aircraft hours are allocated to patrolling these Atlantic fisheries areas, the model estimates that 20.2 undetected/undeterred violations would occur in the month of March.

From these matrices, expected numbers of undetected/undeterred violators for various areas were aggregated and are displayed in Figures H-1 and H-2 based on specific levels of ships and aircraft time.

FIGURE H-1

EXPECTED NUMBER OF UNDETECTED VIOLATIONS
BY MONTH
UNDER "NO EFFORT" AND FY-75 LEVEL
(Aggregated Data)

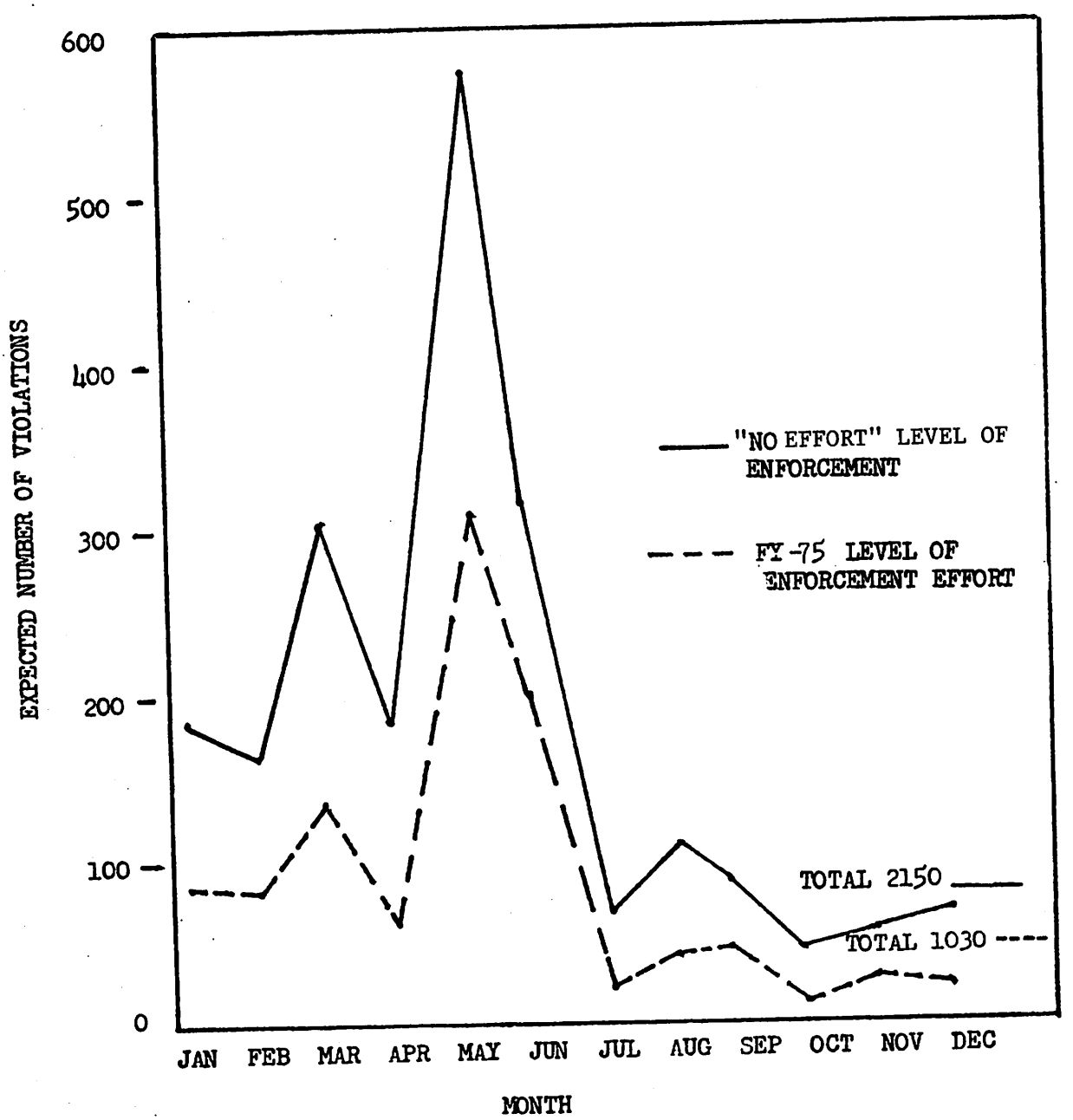
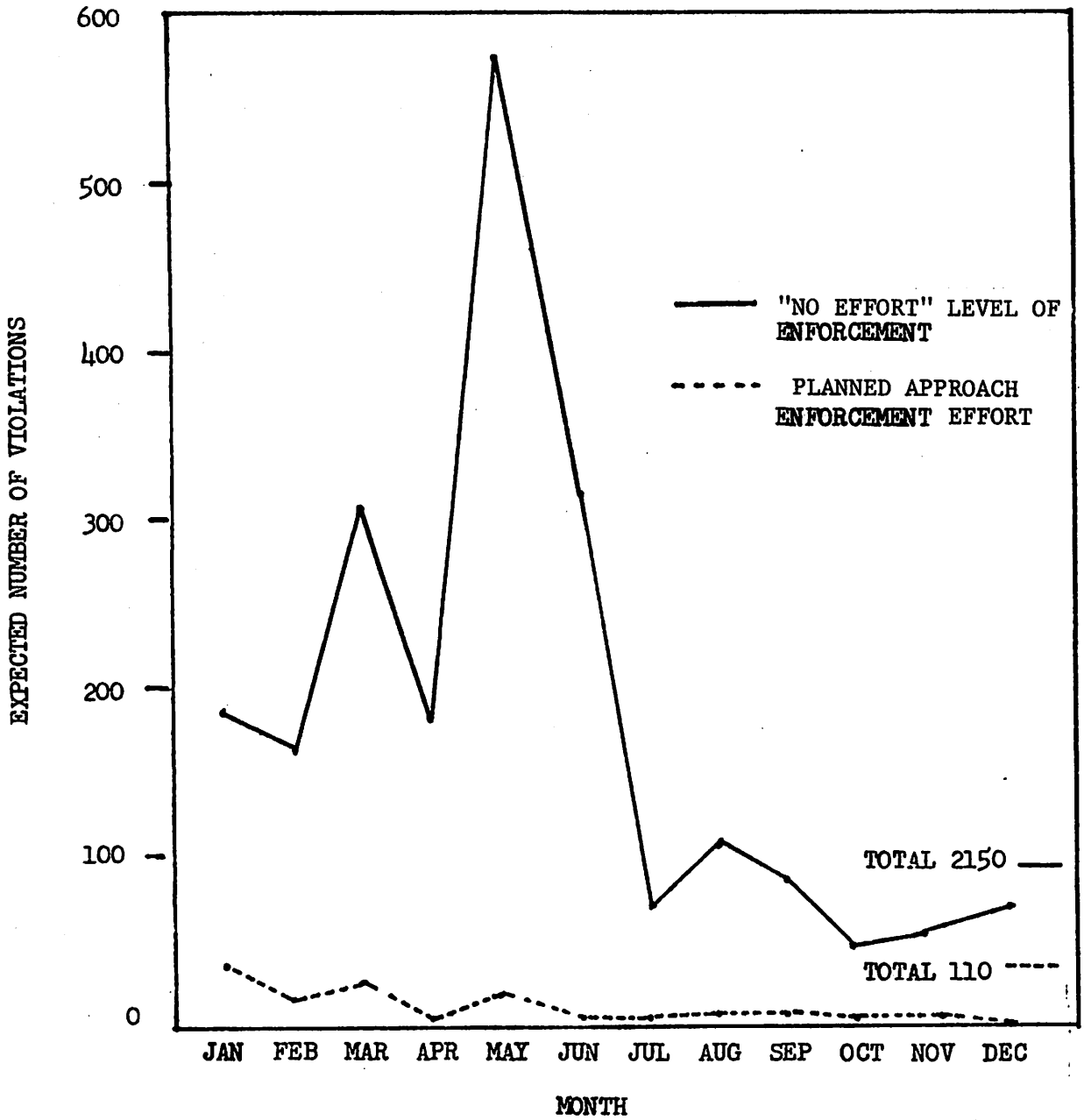


FIGURE H-2
EXPECTED NUMBER OF UNDETECTED VIOLATIONS
BY MONTH
UNDER "NO EFFORT" AND PLANNED APPROACH
(Aggregated Data)



COST

Costs for a given level of ship and aircraft employment were developed using costs for the Enforcement of Law and Treaties (ELT) Program produced by the Cost Analysis Branch, Budgeting Division of the Coast Guard. These cost estimates are determined by allocating cost of operations, maintenance, personnel, and general overhead and administration to the various programs within the Coast Guard. To determine the portion of acquisition and construction costs to be allocat ed to the ELT program, the number of aircraft-hours or ship days employed by the program are divided by the average operating hours/days per year for the resource. This quotient is multiplied by the estimated replacement cost of an average cutter or aircraft using FY-76 cost estimates, and is further divided by the average life expectancy of the resource. The value obtained is the approximate annual cost of requisition and construction associated with the ELT program for a given resource. For cutters this formula is:

$$\frac{\text{Ships days allocated to ELT}}{\text{Average ship operating days/year}} \times \frac{\text{Acquisition costs for average vessel}}{\text{Expected Platform life}}$$

A similar formula is used for aircraft:

$$\frac{\text{Aircraft hours allocated to ELT}}{\text{Average a/c operating hours/year}} \times \frac{\text{Acquistion costs for average aircraft}}{\text{Expected Platform life}}$$

Annual acquisition costs are added to the annual operating and overhead costs to determine the cost of the ELT program for a given level of operation. Since fisheries enforcement accounts for approximately 90% of the ELT program, the total cost figure is multiplied by .9 to arrive at the cost of fisheries enforcement under given conditions.

(Operating Costs + Overhead + Acquisition Costs) X .9 = Total cost of fisheries

The costs associated with moving from the FY-75 level to the planned level are those incremental operating costs

which will be requested plus the amortized cost of reactivation and acquistion of new ships, aircraft, and major support facilities. As in the previous section, acquisition and construction costs are amortized by a straight-line method over the average platform life.

The FY-75 cost of the ELT program was determined to be $40.1 million dollars plus the annual allocation of acquisition costs. These costs are:

Cutters $\frac{2500 \text{ days}}{120 \text{ days/year}} \times \frac{\$25,000,000}{25 \text{ years}} = \$20,000,000$ annually

Aircraft $\frac{6000 \text{ hours}}{700 \text{ hours/yr}} \times \frac{\$5,500,000}{25 \text{ years}} = \$\ 1,880,000$ annually

TOTAL = $22,680,000 annually

The total cost of the FY-75 ELT program for purposes of this analysis, then, was:

$40.1M (operating + overhead) + $22.7M (annual acquisition allocation factor) multiplied by .9, the cost of fisheries enforcement was determined to be $56.5 million dollars ($62.8M x .9).

The Planned Approach was treated similarly using the incremental acquisition and operating costs associated with the change in operational level. Incremental costs were not discounted by the .9 factor since all costs relate directly to fisheries enforcement. Incremental program operating costs of the planned effort are approximately 29 million dollars annually, and acquisition costs associated with extended jurisdiction average 10.5 million dollars a year. The cost of enforcement at the planned level has, for analysis or comparative purposes, been determined to be $96M annually.

$56.5M (FY-75 cost) + $39.5M (incremental costs) = $96M

BENEFITS

The objective of fisheries law enforcement, ultimately, is to reduce the effect of violations on renewable fisheries resources. The costs associated with enforcement efforts have been developed; however, the benefits associated with a given level of fishery enforcement operations are not as

easily quantified. If a per unit cost of violation could be determined, it would be a simple matter to compare enforcement costs with the benefits of reducing the level of violations to determine an aggregate cost/benefit ratio. A marginal analysis could also be easily conducted and an optimum enforcement level could be calculated. The complexity of the fisheries problem in terms of dynamics and inter-relationships between species makes determination of per unit benefit exceptionally difficult. In actuality the value is probably a function of a number of factors: geographical area, species available, time of the year, desirability of the species, availability of other protein sources to the fishing nation, and others.

For purposes of the analysis, a number of alternative approaches were used to set a range of values associated with a violation of fisheries law or regulation. They are simplifications of the real world; however, theyy will serve to provide a range of values within the relevant range of fisheries enforcement resource allocation levels that will be useful for approximating a complex system. Throughout the analysis the benefit achieved from a reduction in violation has been equated with its cost.

VALUE OF CATCH - DIRECT COST METHOD

The first method of determining the benefit of deterring or detecting a violation is to evaluate the value of fish taken during an average violation. Using statistical fisheries data from the International Commission for the North Atlantic Fisheries (ICNAF) Redbook 1975, it was determined that a total of 287,000 standard days were fished in ICNAF Subarea 5 in 1973. A standard day of effort is that exerted by a specific class of U. S. fishing vessel. The total catch for all fisheries in that area was 1,050,000 metric tons. Dividing total catch by number of standard days fished yields an average catch per standard day for 1973.

$$\frac{1,050,000}{287,000} = 3.66 \text{ metric tons/day}$$

At 440 dollars a metric ton, this equates to $1,600 per standard day. (Source NMFS U. S. Fisheries Review, 1975)

The average foreign fishing vessel takes approximately 4 standard days worth of fish in one day of operation. This was determined by dividing the number of standard days fished by foreign vessels by the actual number of fishing days reported.

$$\frac{\text{\# of standard days fished}}{\text{Actual days fished}} = \frac{256,000}{64,500}$$

It can, therefore, be assumed that the average foreign fishing vessel takes approximately $6,400 worth of fish in a day.

The next step in determining direct cost is to analyze the expected length of violation.

Violations are assumed to occur in increments of days (i.e., they are not momentary incursions). If patrols are conducted once a week, on the average, the average lengths of violations will be greater than one and less than seven (violations will attempt to avoid routine patrol detections). The range of values for a violation that results is from $6,400 to $44,800 with an assumption that the actual range is from 10-20 thousand dollars. This follows from one of the original assumptions that the probability of violation is a function of the time since the last patrol. Most violations occur soon after a patrol has passed and would tend to continue until the cumulative perceived probability of a patrol returning is sufficiently high to deter the violator. The average length of a violation appears to be about 2 or 3 days depending on the probability function used.

FINE LEVELS

Another way to measure benefits is to take the value of fines assessed as an implicit determination of the value for a violation. In 1975 the average fine collected from foreign violators was $189,000 overall. Broken down into geographical areas the average fines were as listed in Table H-II.

TABLE H-II

AVERAGE FINES COLLECTED FROM FOREIGN FISHING VESSEL VIOLATIONS, 1975

Pacific Northwest	$151,200
Atlantic Ocean	$157,250
Alaska	$422,500

OPERATIONS LEVEL (BUDGET ALLOCATION)

Another implicit method of valuing a violation is to determine how much is spent trying to prevent an average violation. Some economists argue that if the budget process allocates "X" dollars to a program, it is thus determined that the program is worth that number of dollars. Total ELT Program costs were $56.5 million in FY-75; the associated program efforts result in an expected decrease of 1100 violations. An average violation, then, must be worth approximately $50,000.

"FISHERIES MANAGEMENT" APPROACH

A usable value determination must account for more than just the direct costs of violations. It must address the indirect costs associated with future or secondary effects of the violation. An example might be to examine the case of the ICNAF Subarea 5 discussed earlier. It has been determined that Subarea 5 is capable of sustaining an annual yield of one million metric tons under effective management. Over-fishing has already reduced this capacity to the point where catches must be maintained well below the optimum level in order to return the fisheries to the maximum sustainable level. The following table lists the time to recovery for four potential 1976 fishing effort limitations. The right hand column indicates the probability that recovery will begin in the year the specific quota is established.

TABLE H-III

TIME TO ATTAIN MAXIMUM SUSTAINABLE YIELD OF ONE MILLION METRIC TONS/YR IN ICNAF SUBAREA 5 FOR VARIOUS LEVELS OF ALLOWABLE NEAR-TERM ANNUAL TOTAL CATCH LEVELS BEGINNING IN 1976

Total Allowable Catch in Metric Tons	Time to Recovery 1 Million Tons (Years)	Prob (recovery) Begins 1976
800,000	13	59%
750,000	11	67%
650,000	7	80%
550,000	5	90%

(Source: ICNAF Redbook 1975)

The quota for 1976 is set at 650,000 metric tons. There are indications that 1977 quotas will be approximately 500,000 metric tons.

If the fishery were left to a "no effort" level of enforcement, it is likely that fishermen would take all the fish available. Based on a conservative catch estimate of about 840,000 tons in 1975 and a 650,000 ton quota for 1976, it is assumed that fishermen would be capable of harvesting at least 840,000 tons if no limit were placed on their catch. Violations could be expected to account for 190,000 tons worth of over-fishing. Our current effort appears to be about 80% effective in the Atlantic toward reducing the number of violations that occur. Therefore, we could expect to recover 80% or approximately 150,000 tons of the potential over-fishing through present level enforcement. In terms of the Fisheries Model, the present effort deters or detects 160 violations in the Atlantic from the "no effort" level; thus, we can conclude----at least empirically----that, based on an exvessel price of $440/ton, each violation prevented/deterred or detected is worth approximately $412,000, calculated as follows:

$$\frac{(150{,}000 \text{ tons}) \times (\$440/\text{ton})}{160 \text{ violations}} = \$412{,}500$$

*NOTE: The FLEPM predicts that 200 violations will occur in the Atlantic each year under the "no effort" enforcement level. 80% effectiveness (FY-75 level of effort) deters or detects 160 violations, leaving 40 violations undetered and undetected.

Another way of evaluating the effects of over-fishing is to determine the long-term effects on future revenues. The present level of enforcement is approximately 80% effective in reducing violations in the Atlantic from the "no effort" level of enforcement. Assuming that over-fishing accounts for the remaining 20% of the 190,000 tons expected under "no effort" enforcement (840,000 - 650,000 tons), violators are taking approximately 40,000 tons over their quota from this area each year.

190,000 tons x .2 = 38,000 tons/year.

This over-fishing extends the time to recovery of the fish stocks. Using Table H-III, and interpolating, between allowable catch limits of 750,000 tons and 650,000 tons appears that the time to recovery to sustained yield will be increased between one and two years. Assuming that over-fishing will extend the time to recovery by a minimum of one year, there is a loss that results from the approximately 300,000 tons which will not be harvestable in year eight.

The loss of approximately 300,000 tons of catch potential eight years in the future at the present exvessel price of 440 dollars a ton equates to $132,000,000. Discounted by 10% to present value and distributed over the eight year period, this amounts to 6.7 million dollars annually.

$$\underset{\text{discounted for 8 yrs}}{\$132M \times .404} = \frac{\$53.3}{8} = \$6.7M/\text{year}$$

The average benefit derived from reducing the 40* remaining violations expected in the Atlantic is approximately $170,000.

$$\frac{\$6.7M}{40} = \$167,500$$

*Note: The FLEPM predicts that 200 violations will occur in the Atlantic under the "no effort" level of enforcement. An 80% effectiveness (FY-75 level of operations) leaves 40 undeterred or undetected violations in the area.

The average cost of a violation, therefore, appears to fall somewhere between $400,000 and $170,000. The benefit associated with reducing violations from FY-75 enforcement levels to a 100% effective program averages $170,000.

BENEFIT SUMMARY

The preceding discussion shows a range of values which could be attributed to the cost of a violation and, consequently, to the benefit of preventing a violation. As the objectives of fisheries management shift from principles of exclusion of foreign fishing to conservation of renewable resources, more emphasis will be placed on enforcement options which achieve these objectives. Table H-IV summarizes the benefit analysis.

TABLE H-IV

SUMMARY OF THE RANGE OF AVERAGE BENEFITS ASSOCIATED WITH FISHERIES VIOLATIONS, 1975-1976

Method of Determining Benefits	Min	Max	Average/Most Reasonable Value
Direct Cost	$ 6,400	$ 44,800	$10-20,000
Fine Levels	600	600,000	189,000
Operations Level	50,000	50,000	50,000
Fisheries Management	170,000	400,000	170,000

Levels of fines and implicit operating costs are not very satisfactory means of assessing the value of enforcement effort, since the link to a rigorous quantification is tenuous, at best. Direct costing is a gross under-estimation of violation costs, since it fails to account for the cumulative long-term impact of violations. Since the most damaging type of violation is over-fishing, the direct cost method of calculating benefits grossly understates those benefits.

The analysis of cost from a fisheries management view point is the most comprehensive assessment since it not only includes the cost of violations, but also the effects of enforcement on the stocks, themselves. This is the

closest link between system objectives and enforcement operations. The approach used in this study is a simplification of a complex problem, however, the benefits assessed in the "Fisheries Management" approach discussed previously are most consistent with the objectives of P.L. 94-265.

One hundred seventy thousand dollars ($170,000) in benefits/violations prevented has been used as the basis for the Coast Guard analysis of requirements for the 200-mile FCZ, although benefit/ cost ratios will be calculated for $50,000 and $300,000.

BENEFIT/COST OF THE PLANNED APPROACH (i.e., the enforcement tactic being advocated by the Coast Guard)

In the case of the Planned Approach, there is an initial incremental acquisition and construction cost for ships, aircraft, personnel, and support facilities to meet the deman ds of extended jurisdiction. To compensate for opportunity costs, it is possible to discount the costs and benefits associated with the incremental increase. Using a 10% discount factor, the incremental costs and benefits are discounted over a 25-year period (i.e. The expected life of the newly acquired resources). This yields more conservative benefit/cost ratio values for use in evaluating the planned effort.

TABLE H-V

DISCOUNTING COST/BENEFITS OF
INCREMENTAL COAST GUARD REQUEST FOR PLANNED APPROACH RESOURCES

Incremental Costs FY-75 to Planned Level

Acquisition

FY-76/77	$ 132,446K	X 1.0	=	$132,446K
FY-78	137,200K	X .909	=	124,715K
Present Value of Incremental Acquisition Costs				$257,161K
Operating Costs	$ 29,000K	X 9.077	=	$263,333K
Total Present Value of Incremental Costs				$520,394K

TABLE H-V (continued)

Incremental Benefit FY-75 to Planned Level
(1030 violations estimated in FY-75 compared to 110 estimated for the Planned Level)

920 X $ 50K per violation = $ 46,000K X 9.077 = $417,542K

920 X $170K per violation = $156,000K X 9.077 = $1,419,643K

920 X $300K per violation = $276,000K X 9.077 = $2,505,252K

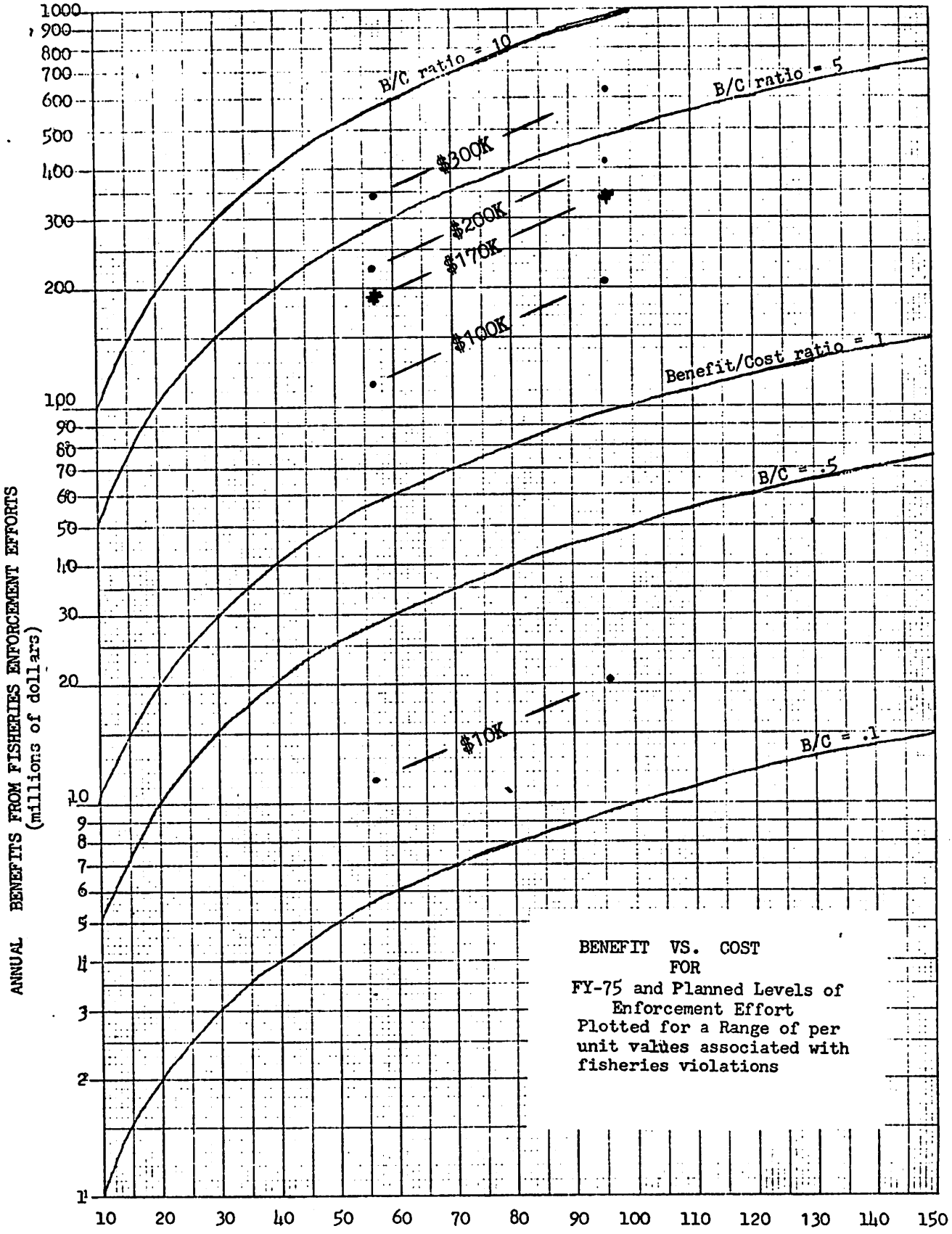
Benefit/Cost Ratio at $50K = .8
at $170K = 2.7
at $300K = 4.8

CONCLUSION: BASED ON "FISHERIES MANAGEMENT" APPROACH, THE PLANNED APPROACH FOR ENFORCEMENT (B/C = 2.7) IS JUSTIFIED.

Using the range of values developed for cost of violations, an aggregate cost/benefit graph was drawn for present and planned operations using a family of curves to indicate how the valuation of benefits affect the benefit/cost ratio (Figure H-3).

The methodology used herein is an attempt to conservatively state the effects of additional enforcement efforts on the reduction of violations of fisheries laws and regulations, while recognizing the difficulties of quantifying a matter which, by its very nature, is both complex and abstract.

FIGURE H-3



BENEFIT VS. COST
FOR
FY-75 and Planned Levels of
Enforcement Effort
Plotted for a Range of per
unit values associated with
fisheries violations

APPENDIX I

DEVELOPMENT OF THE PLANNED APPROACH UNDER P.L. 94-265

GENERAL:

Essentially the Planned Approach is based on the present level of enforcement effort in the active fishing areas plus additional effort within the same areas to reduce violations to an acceptable level plus periodic projections to the limits of jurisdiction in order to detect changing fishing patterns and illegal activities (principally fisheries support operations).

Basis:

The "Active Fishing Areas" approach was based on the following observations.

1. Fish congregate in commercial quantities in certain areas that can be roughly defined.

2. Fish congregate in these areas on a seasonal basis, which can be roughly defined.

3. Fishermen fish where and when the fishing is best.

4. This approach does not apply to highly migratory species.

Development:

The National Marine Fisheries Service (NMFS) publishes a monthly "Report on Foreign Fishing off U.S. Coasts" based on USCG-NMFS patrol observations. This report lists the foreign fishing vessels by nationality and location. From this series of reports over a 2-1/2 year period, the following was developed:

1. A composite plot of the location of the foreign fleets and what they were fishing for off all our major fishery areas.

2. A graph of the number of different foreign fishing vessels sighted each month vs. time, for all our major fishery areas.

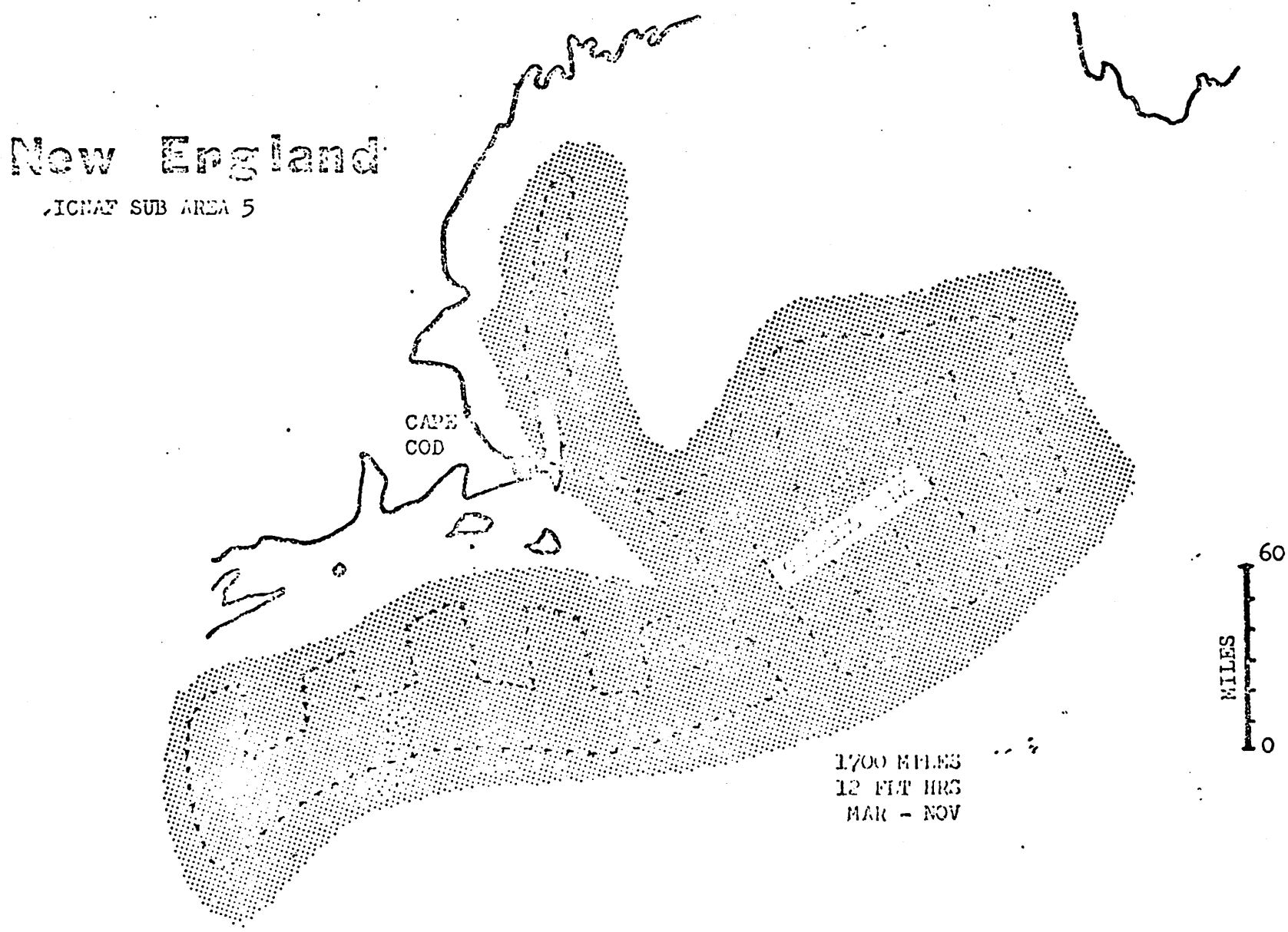
An envelope was then drawn around the composite plot of fishing vessel locations. This line encompasses an area where the fishing activities will take place. An air search trackline, using 20-mile track spacing, was laid out in the area and its length measured in nautical miles; the number of hours at 150 knots to traverse it was then calculated.

The seasonality of fishing activities for each fishery was developed from the graph of the number of vessels vs. time.

The validity of the envelope and the seasonality are checked with each NMFS monthly "Report on Foreign Fishing off U.S. Coasts." To date, it is viable; the areas within and adjacent to the 100 fathom curve with expected highest primary productivity in the biological food chain are encompassed. These areas are defined as the "Active Fishing Areas". Areas of the ocean outside these areas will not foreseeably support a commercial fishery.

Based upon the seasonal nature of fishing activities, as discussed earlier, the frequency of air patrols was calculated to vary from 3 times a week (max season concentrated area) to 1 time a month or none at all (during nil or low season). Similarly, cutters vary from 3 in an area to "standby" for situational response. These have been tabulated to develop resource requirements by area and for the total Coast Guard.

With the extension of fisheries jurisdiction to 200 miles, there is a requirement for some coverage of the area outside of the "active fishing area" to detect the development of new fisheries, illegal fisheries support operations and other unauthorized activities. A "head off" response to reports of fleeing violators is required. The following pages describe the active fishing areas and the requirements for Coast Guard aircraft and ship time for both the active fishing areas and the areas beyond to the limit of the 200-mile Fishery Conservation Zone. This approach to resource requirements is called the "Planned Approach."


New England
ICNAF SUB AREA 5
CAPE
COD
1700 MILES
12 FIT HRS
MAR - NOV
60
MILES
0

NEW ENGLAND FISHERIES

Coverage for "Active Fishing Areas Approach."

Aircraft - MRS Hours				
Dec-Jan	1 Flt/week(southern half)	8 x 7	=	56
Feb	2 Flt/week(southern half)	2 x 4 x 7	=	56
Mar-Apr	2 Flt/week	2 x 8 x 12	=	192
May	3 Flt/week	3 x 4 x 12	=	144
June	2 Flt/week	2 x 4 x 12	=	96
July	1 Flt/week	4 x 12	=	48
Aug	2 Flt/week	2 x 4 x 12	=	96
Sep	3 Flt/week	3 x 4 x 12	=	144
Oct	2 Flt/week	2 x 4 x 12	=	96
Nov	1 Flt/week	4 x 12	=	48
		Total		976

*Cutters	MEC days	HEC days	TOTAL days
Dec-Feb		90	90
Mar		62	62
Apr	60		60
May	62	31	93
Jun	90		90
Jul	31		31
Aug	62		62
Sep	90		90
Oct	31	31	62
Nov		60	60
Totals	426	274	700

Coverage for "Planned Approach" (full 200 mile economic zone)

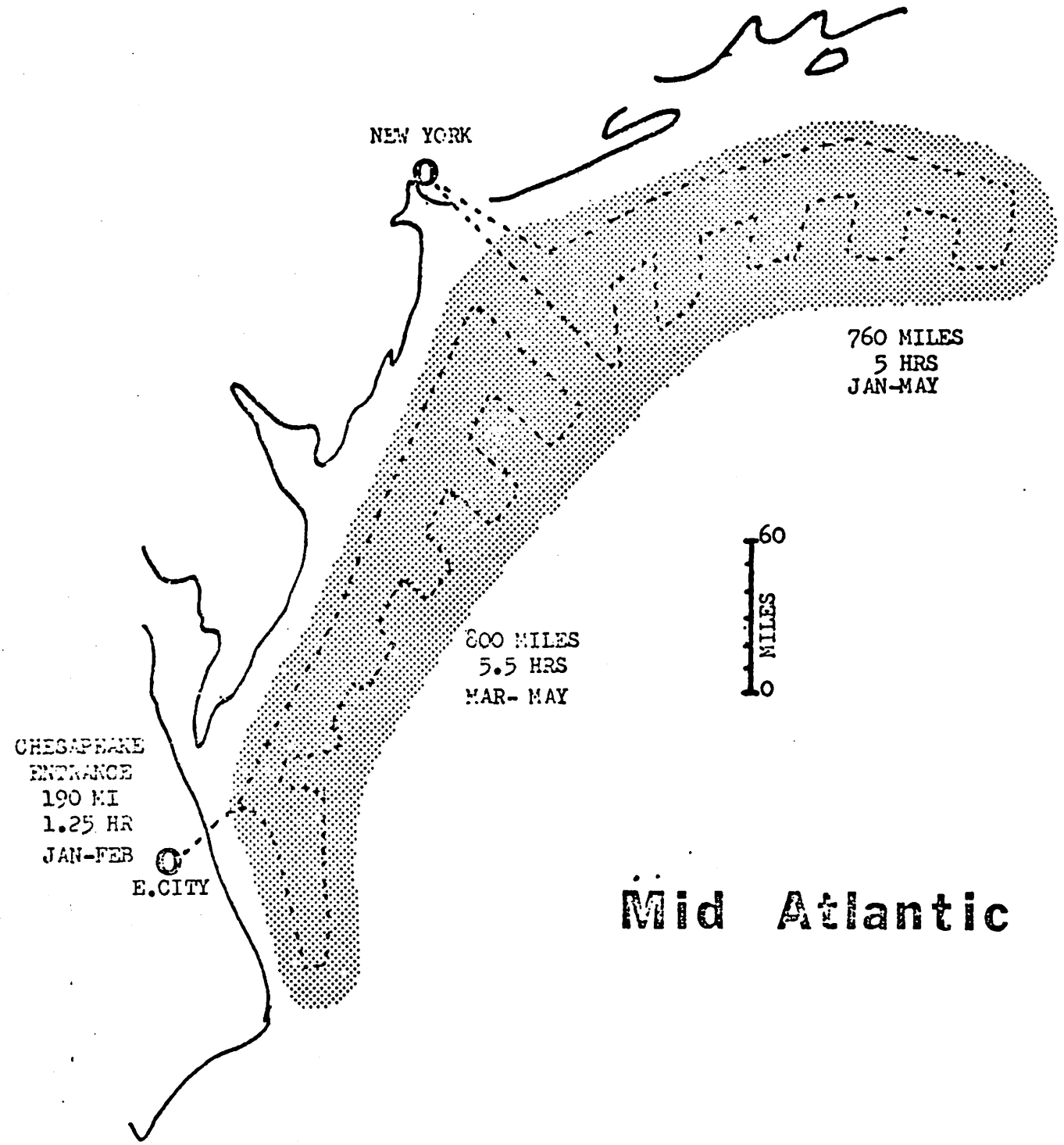
Add the following "Additional Planned Coverage" to the "Active Fishing Areas Approach":

Aircraft - weekly MRS flights all year	156 hours
Cutters - seasonal WHEC patrols	119 days

Totals for "Planned Approach":

Aircraft	*Helos	1132 MRS hours
Cutters	393 WHEC days	426 WMEC days

*Two shipboard HELO's are required from Jan-May. Three are required from Jun-Dec or when the foreign fleets move up from mid-Atlantic. When this occurs, the third HELO is transferred to New England.


NEW YORK
760 MILES
5 HRS
JAN-MAY
800 MILES
5.5 HRS
MAR- MAY
60
MILES
0
CHESAPEAKE
ENTRANCE
190 MI
1.25 HR
JAN-FEB
E.CITY
Mid Atlantic

MID ATLANTIC FISHERIES

Coverage for "Active Fishing Areas Approach"

Aircraft - MRS Hours

North Half - 2 Flt/week Jan-Apr (16 x 2 x 5)	=	160
1 Flt/week May (4 x 5)	=	20
South Half - 1 Flt/week entrance Chesapeake Bay Jan-Feb (8 x 1.25)	=	10
1 Flt/week - Mar-May (3 x 4 x 5.5)	=	66
Total		256

Cutters

Jan - May	WMEC with *HELO	151 WMEC days

* Helo assigned New England Jun - Dec.

Coverage for "Planned Approach"

Add the following "Additional Planned Coverage" to the "Active Fishing Areas Approach":

Aircraft - Weekly MRS flights all year	182 hours
Cutters - Seasonal WHEC Patrols	119 days

Totals for "Planned Approach":

Aircraft	* Helo	438 MRS hours
Cutters	119 WHEC days	151 WMEC days


Gulf
Of
Mexico
NEW ORLEANS
CORPUS
CHRISTI
460 MILES
3 FLT HRS
APR - AUG
440 MILES
3 FLT HRS
MAY - AUG
ST
PETE
940 MILES
6 FLT HRS
FEB - JUL
180
120
60
0
MILES

GULF OF MEXICO FISHERIES

Coverage for "Active Fishing Areas Approach"

Aircraft --- MRS Hours				
Feb-July - West Florida	1 Flt/week	6 x 4 x 6	=	144
Apr-Aug - Texas	1 Flt/week	5 x 4 x 3	=	60
May-Aug - Louisiana	1 Flt/week	4 x 4 x 3	=	48
Aug-Jan - West Florida	1 Flt/month	6 x 6	=	36
Sep-Mar - Texas	1 Flt/month	7 x 3	=	21
Sep-Apr - Louisiana	1 Flt/month	8 x 3	=	24
		Total		333

Cutters WMEC with 2 * Helos available
Feb-Aug 424 days

Coverage for "Planned Approach"

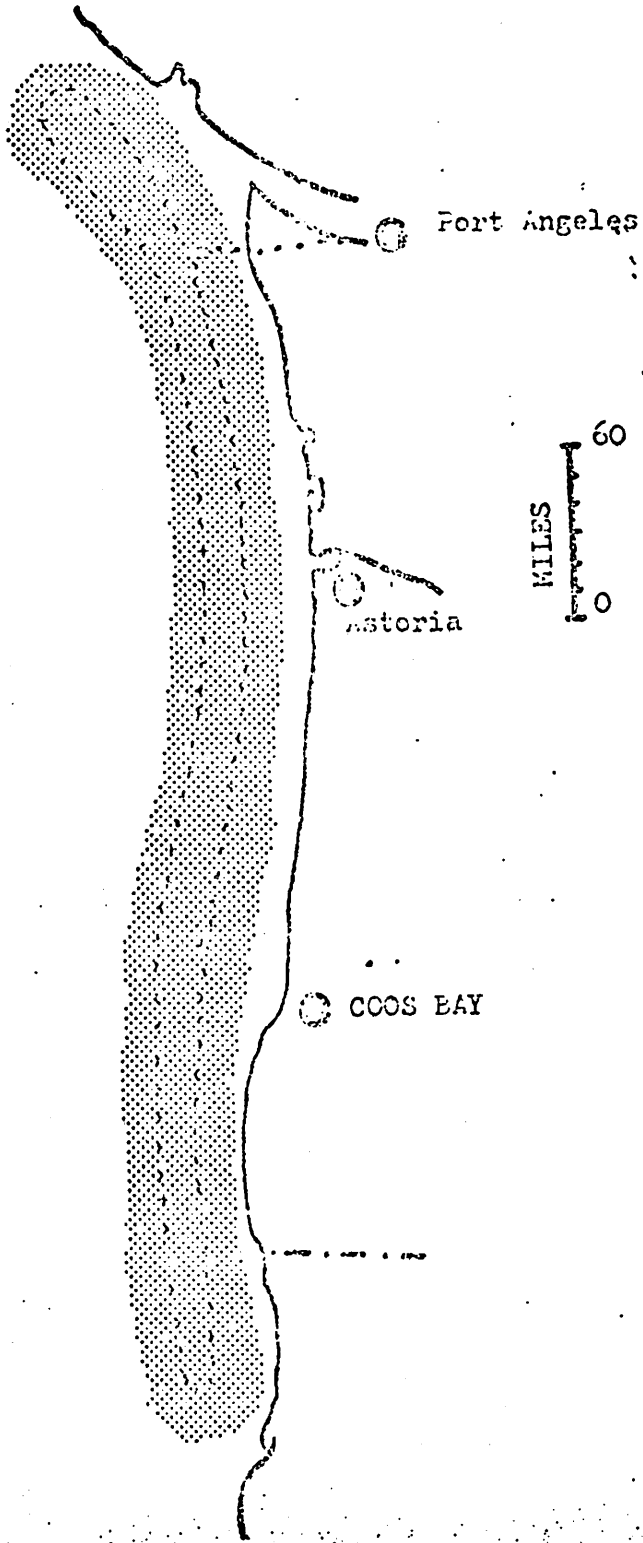
Add the following "Additional Planned Coverage" to the "Active Fishing Areas Approach":

Aircraft - Weekly MRS flights all year	286 hours
Cutters - Seasonal WHEC patrols	119 days

Totals for "Planned Approach":

Aircraft	2 Helos*		619 MRS hours
Cutters	119	WHEC days	424 WMEC days

West Coast



1070 MILES
7.5 FLT HR
APR - NOV

WEST COAST FISHERIES

Coverage for "Active Fishing Areas Approach"

Aircraft --- MRS hours			
Apr	1 Flt/week	4 x 7.5	30
May	2 Flt/week	2 x 4 x 7.5	60
Jun-Sep	3 Flt/week	3 x 4 x 4 x 7.5	360
Oct	2 Flt/week	2 x 4 x 7.5	60
Nov	1 Flt/week	4 x 7.5	30
		Total	540

Cutters	WMEC with 1 Helo* available	
Apr-May		61
Jun-Sep		244
Oct-Nov		61
	Total	366

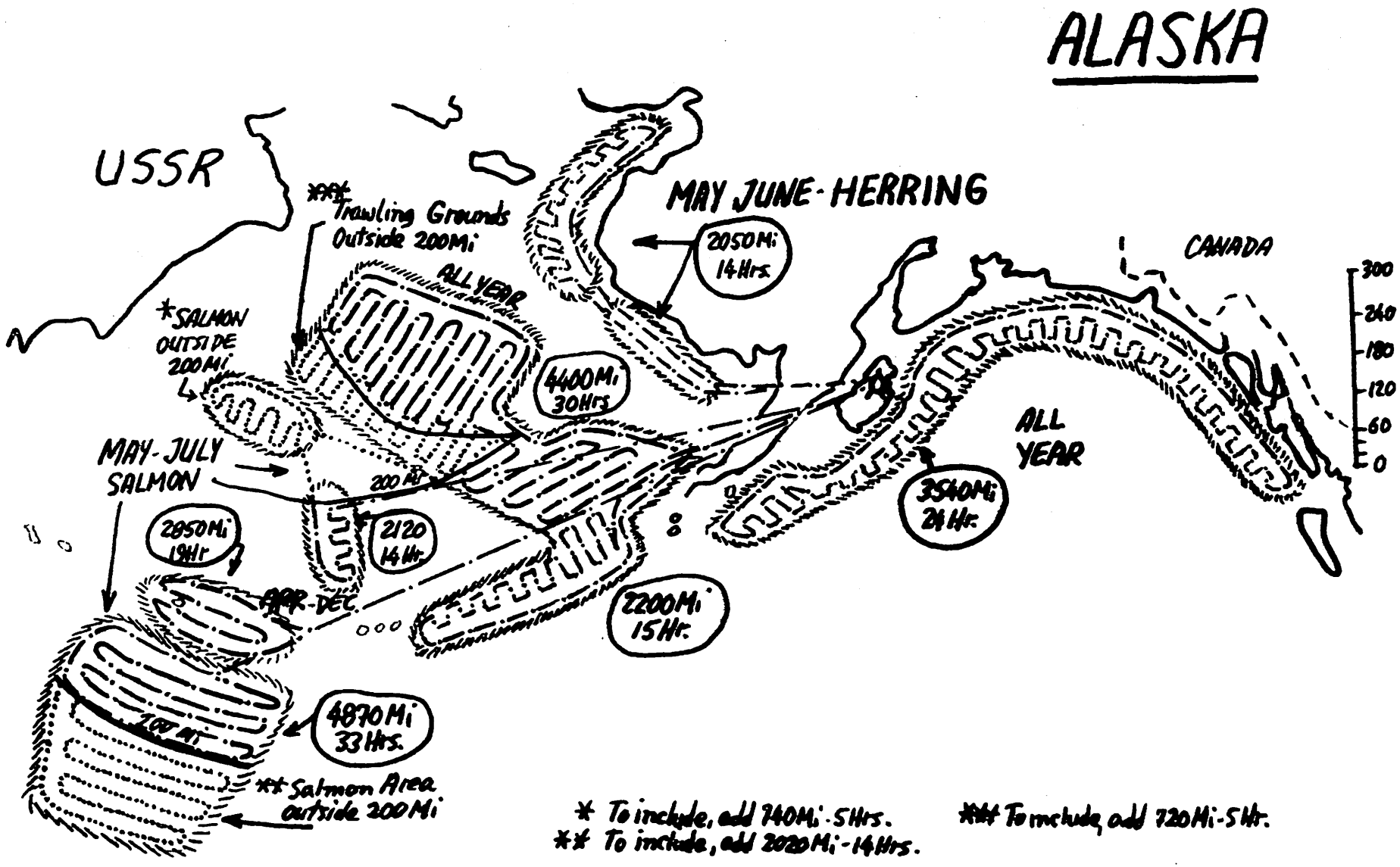
Coverage for "Planned Approach"

Add the following "Additional Planned Coverage" to the "Active Fishing Areas Approach":

Aircraft - weekly MRS flights all year	338 hours
Cutters - seasonal WHEC patrols	157 days

Totals for "Planned Approach":

Aircraft	1 Helo*	878 MRS hours
Cutters	157 WHEC days	366 WMEC days


ALASKA
USSR
***Trawling Grounds Outside 200Mi
MAY JUNE - HERRING
2050Mi 14Hrs.
CANADA
ALL YEAR
*SALMON OUTSIDE 200Mi
4400Mi 30Hrs.
MAY - JULY SALMON
200 Mi
2850Mi 19Hr.
2120 14Hr.
3540Mi 24Hr.
ALL YEAR
APR - DEC
2200Mi 15Hr.
4870Mi 33Hrs.
100 Mi
**Salmon Area outside 200Mi
300
240
180
120
60
0
* To include, add 740Mi - 5Hrs.
** To include, add 2020Mi - 14Hrs.
*** To include, add 720Mi - 5Hr.

ALASKA FISHERIES

Coverage for "Active Fishing Areas Approach"

Aircraft hours

All year - S.E. Alaska	1 Flt/week	52 x 24	MRS	1,248
All year - Ground fish area	1 Flt/week	52 x (45+5)	LRS	2,600
May-June - Summer Herring	1 Flt/week	8 x 14	LRS	112
Apr-Dec - Far Aleutians	1 Flt/week	43 x 19	LRS	817
May-July - Salmon	2 Flt/week	2 x 12 x (47+19)	LRS	1,584
		Totals 1248 MRS		5113 LRS

*Cutters		MEC days	HEC days	Total
All year	S.E. Alaska	184	181	365
All year	Ground fish area and far Aleutians		365	365
May-June	Summer Herring		61	61
May-July	Salmon		184	184
Totals		184	791	975

* 4 Shipboard Helos required

Coverage for "Planned Approach"

Add the "Additional Planned Coverage" to the "Active Fishing Areas Approach":

Aircraft - weekly LRS flights all year	1326 hours
Cutters - seasonal WHEC patrols	157 days

Totals for "Planned Approach":

Aircraft	* 4 Helos	1248 MRS hours	6439 LRS hours
Cutters	948 WHEC days		184 WMEC days

HAWAII & LINE ISLANDS

"Planned Approach"

Aircraft - Weekly LRS flight all year	780 hours
Cutters - Response WHEC patrol	157 days

RECAPITULATION OF PLANNED APPROACH

A. RESOURCE EMPLOYMENT

FISHERIES AREA	ACTIVE FISHING AREAS APPROACH	ADDITIONAL PL. COVERAGE	PLANNED APPROACH
New England			
Aircraft hours	976 MRS, 2 HELO	156 MRS	1132 MRS 2 HELO
Cutter days	426 WMEC, 274 WHEC	119 WHEC	426 WMEC 393 WHEC
Mid Atlantic			
Aircraft hours	256 MRS 1 HELO	182 MRS	438 MRS 1 HELO
Cutter days	151 WMEC	119 WHEC	151 WMEC 119 WHEC
Gulf			
Aircraft hours	333 MRS 2 HELO	286 MRS	619 MRS 2 HELO
Cutter days	424 WMEC	119 WHEC	424 WMEC 119 WHEC
West Coast			
Aircraft hours	540 MRS 1 HELO	338 MRS	878 MRS 1 HELO
Cutter days	366 WMEC	157 WHEC	366 WMEC 157 WHEC
Alaska			
Aircraft hours	1248 MRS 5113LRS	1326 LRS	1248 MRS 6439 LRS
HELOS	4		4
Cutter days	184 WMEC 791 WHEC	157 WHEC	184 WMEC 948 WHEC
Hawaii			
Aircraft hours		780 LRS	780LRS
Cutter days		157 WHEC	157 WHEC
Totals			
Aircraft hours	8466	3068	11534
Cutter days	2616	828	3444

B. RESOURCE REQUIREMENT:

Resource	Active Areas Approach	+	Add. Coverage	=	Planned Approach	-	Actual Patrol FY-75	=	Enf. Patrol Deficit	=	Additional Resource Need
MRS hours	3353	+	962	=	4315	-	1880	=	-2435	=	4-MRS
LRS hours	5113	+	2106	=	7219	-	2101	=	-5118	=	6-LRS
Helo's	10	+	0	=	10	-	5	=	-5	=	5-SRR
WMEC days	1551	+	0	=	1551	-	1574	=	+23	=	(None)
WHEC days	1065	+	828	=	1893	-	919	=	-974	=	6-WMEC 270'

The enforcement resources and employment identified herein reflect the requirements validated by the Fisheries Law Enforcement Planning Model and those additional requirements associated with the CSFR, salmon and herring fisheries which were not addressed in the Planning Model. This total enforcement program (i.e., Planned Approach) is based upon conservative estimates for the values used in its development and provides an estimated 95% reduction in the number of undetected/undeterred violations (i.e., 2150 violations/year) expected from the "no effort" level of enforcement.

APPENDIX J

GLOSSARY

DEFINITION OF TERMS FOR THE PURPOSES OF THIS STUDY

Administrative Regulations - these regulations, generally not considered within this study, are those which would require foreign vessels in the FCZ to keep log books or report scientific data. Violation of such regulations do not directly affect the fish stocks, but would affect the data available to manage those stocks.

Anadromous Species - those species which spawn in fresh water, spend their adult lives on the high seas and return to spawn in fresh water. The salmons and river herring are examples of anadromous species.

Closed Areas - areas closed to fishing on a seasonal basis to protect spawning stocks of fish or large concentrations of species. Often coupled with gear restrictions to provide a limited closure.

Coastal State - nation having some part of its territory adjacent to the shore of an ocean; a littoral state.

Continental Shelf - sea bed and subsoil of the submarine areas adjacent to the coast, but outside the area of the territorial sea to a depth of 100 meters, or beyond that limit, to where the depth of a superadjacent waters admits of the exploritation of the natural resources of the said areas.

Directed Fishery - fishery conducted with the intention of catching a particular species. Determined for enforcement purposes by ascertaining the location of the fishery, noting the depth of water, type of bottom, the type of gear being used by the fishermen, season of the year, and the history of fishing activity in the area.

Distant-Water - a description applied to fishing operations conducted by countries whose nationals deploy long range trawlers and/or support vessels to fishing grounds a great distance from their shores.

Fisheries Support - those activities uniquely associated with the conduct of fishing operations

such as transferring fish, personnel, supplies, fuel, water, fishing machinery, or fish processing equipment, or repairing foreign fishing vessels. These activities may not generally be carried out within the United States' exclusive fishing zone.

Fishing - taking of fish, molluscs, crustacea or other forms of marine animal or plant life by any vessel or vessels. The placement of gear in the water is to be considered fishing, no fish need have been caught.

Gear Conflicts - vessels conducting directed fisheries for different species in the same area may use different typed of fishing gear. For example, United States fisheries seeking crustacea such as lobster or crabs, will fish with fixed traps (pots) while foreign vessels may be conducting a directed fishery for other species using mobile fishing gear, such as trawls. Gear conflicts are often complicated by the fact that the vessel employing fixed gear is not tending its gear when the damage occurs and so cannot attribute the loss to a specific vessel or period of time.

Gear Restrictions - these regulations specify the types of fishing gear that may be used in a particular area. For example, there is a prohibition on bottom trawling for vessels over 150 feet over a large area in the NW Atlantic, midwater trawls are allowed. Other examples of gear restriction specify mesh size and type of attachments that may be put on fishing gear to protect it from chafing on the bottom.

High Seas - all parts of the sea not included in the territorial sea or internal waters of a state. Zones beyond the territorial sea have been established for specific purposes as in the case of the United States exclusive fishing zone. The prohibitions established within that zone apply only to fishing and do not otherwise affect the high seas rights of foreign flag vessels. Such "contiguous" zones are also established for customs, sanitary, fiscal or immigration purposes.

Incidental Catch - those species caught while conducting a directed fishery for other species. In the bottom fisheries, especially a directed fishery for a particular species (hake, pollock) will result in the taking of other species (flounders, haddock, ocean perch, CSFR). Regulations may state that it is illegal to retain any or all of the inccidental catch, or specify limits on what may be retained. Also refered to as by-catch.