2 Summary

In March 1977, the Fishery Conservation and Management Act of 1976 became effective, extending U.S. jurisdiction over offshore fisheries within 200 miles of its coast and possessions, and making it the policy of the land to use some of the most advanced ideas available about ways to mange marine fisheries.

Implementation of the law will require a level of understanding about the fishing resources and industry that has never before been attempted by the U.S. Government. It will require development of methods of balancing biological, economic, and social factors relating to fisheries in order to best serve the national needs. Most of the information necessary for this process does not yet exist.

The law establishes Regional Councils to work with the National Marine Fisheries Service of the Department of Commerce in managing fishery resources and setting out regulations, including allocation of the catch of commercial species between domestic and foreign fishermen. Preliminary regulations and catch allocations have been drawn up, but better working relationships between all interested parties are needed and many changes will be necessary in early management activities as experience is gained.

Management of the 200-mile fishery zone will, of necessity, have enforcement of regulations as an integral part if it is to accomplish restoration and conservation of fish stocks and provide the domestic fishing industry with incentive to grow. The U.S. Coast Guard will be primarily responsible for enforcing regulation of foreign fishermen and the National Marine Fisheries Service will oversee domestic fishing. Both enforcement groups are beginning their tasks by increasing existing activities. This appears appropriate for the time being, but it is likely new enforcement techniques and advanced equipment will be needed in the future. Improvements are needed in long-term evaluation of enforcement needs, costs and benefits, and attention should be given to coordinating some military information and equipment with Coast Guard requirements for fisheries.

The Office of Technology Assessment's analysis of implementation of the new 200-mile fisheries zone can be expressed in terms of the conclusions reached during the assessment, the practical and organizational problems which were discovered, and the OTA suggestions for resolving those problems.

The overall conclusions of the assessment are given here for each of the major subject areas of the report. These conclusions are grouped as they relate to:

- enforcement of the U.S. fisheries regulations and jurisdiction;
- management of the new fisheries zone;
- data which will be needed for implementation of the law; and
- opportunities for expanding and revitalizing the U.S. fishing industry which may result from implementation of the law.

These overall conclusions include four pilot projects, which are OTA's major suggestions for determining the most successful and cost-effective means of enforcing U.S. jurisdiction in the 200-mile fisheries zone.

Enforcement

Also included in this Summary are some of the specific problems which stand in the way of full implementation of the Fishery Conservation and Management Act of 1976.

It is the practice of the Office of Technology Assessment to make an objective analysis of a subject and not to recommend specific policy actions to the US. Congress. Adhering to that practice, OTA has made no policy recommendations in this report. However, due to the practical nature of this report and the desires of the congressional committee which requested this study, it seemed appropriate in this case to make a number of specific suggestions for more effective implementation of the Fishery Conservation and Management Act of 1976. These recommendations are outlined in this section and discussed in more detail where appropriate in later sections.

Throughout this Summary, page numbers are noted after individual conclusions in order to simplify reference to fuller discussion in the main text of the report.

Need for Enforcement

Adequate management and strict enforcement offer the opportunity for future increase in fish stocks and yields due to tighter controls to prevent overfishing, less pressure on stocks which are normally taken as bycatch, less conflict among fishermen for certain grounds, less conflict between different types of equipment, and assurance of workable allocation of catch quotas among foreign and U.S. fishermen. (See pages 27 to 29.)

The Existing Coast Guard Enforcement Plan for Foreign Fisheries

The Coast Guard plan of increasing its present fishery enforcement capabilities is a reasonable first step in enforcement. It is flexible in that resources can be added at a reasonable first cost and the program can be curtailed or accelerated as assumptions and need are proven or disproven by experience. (See pages 29 to 31.)

Enforcement of Domestic Fisheries by NMFS and USCG

The National Marine Fisheries Service's present approach to enforcing regulations in domestic fisheries by means of dockside inspections may be sufficient under the new law if it is combined with a program of random at-sea inspections, However, if regulations for domestic fisheries duplicate the kinds of gear restrictions and operational controls used in foreign fisheries, more at-sea enforcement capability will be needed. (See pages 29 to 31.)

In the event that an at-sea enforcement capability is needed in domestic fisheries, the Coast Guard could use the same types of equipment and techniques which are planned for enforcement activities in

foreign fisheries. However, additional facilities would be needed to cover the different areas used by domestic fishermen and the additional fishing vessels. (See pages 29 to 31.)

Techniques To Improve Near-Term Enforcement Effectiveness

Several fairly simple strategies which could be activated almost immediately for enforcement have not been given favorable consideration by the Coast Guard and the National Marine Fisheries Service. Three of these are:

1) establishment of an efficient reporting system which would allow domestic fishermen to aid in observing foreign fishing vessels,

2) more extensive use of observers onboard foreign fishing vessels, and

3) creation of specific guidelines to be followed in granting annual fishing permits and renewing Governing International Fishery Agreements. (See pages 38 to 42.)

Extensive use should be made of observers in a dual role: to collect data needed for management of fisheries and to observe fishing operations for enforcement functions. A near-blanket program of observers may be necessary for a dependable, cost-effective enforcement program. (See pages 38 to 43.)

Planning Needed for Long-Term Enforcement

It is likely that proposed near-term enforcement capabilities will not be adequate for long-range demands. Therefore, plans should be made for further improvements in enforcement by use of remote-sensing devices and other advanced technology. (See pages 43 to 45.)

Remote-Sensing Systems for Future Enforcement Needs

The cost of most remote-sensing systems is high and it will probably be necessary to share the cost of such systems with other users. However, remote-sensing devices could be expected to improve enforcement by better coverage, better performance, and a reduction of the need for expanding conventional ship and aircraft patrols of fishing areas in the future. (See pages 46 to 47.)

Transponders have good future potential for use in fisheries enforcement. Particularly when combined with Loran-C, transponders can be used to detect, identify, and classify fishing vessels. (See pages 47 to 49.)

New microwave radar equipment has the technical potential to supplement or supplant existing airborne radar for fisheries enforcement within the next 10 years, but the cost would be very high. (See pages 50 to 52.)

Over-the-horizon radar techniques have good potential for use in fisheries enforcement. However, due to both the classified nature of most of the military work in the field and the high cost, use of this system will be contingent upon close cooperation between the Department of Defense and the Coast Guard. (See pages 52 to 53.)

Recommendations on Enforcement Levels and Evaluation (see pages 24 to 29)

Problem 1: No desirable level of enforcement has been determined, based on a policy decision, as to what level of enforcement is most desirable.

Recommendation: In order to determine the type of effort and equipment necessary, there should be a specific definition of the desirable level of enforcement, followed by regular assessment of changing enforcement needs and the actual level of enforcement which has been achieved compared to the desired level. In addition, the Regional Councils should make a projection of desired enforcement actions in their areas, possible compliance inducements for fisheries in their areas, and potential domestic enforcement plans.

Problem **2:** The existing Coast Guard analysis of the appropriate level of enforcement was made without benefit of an adequate method for assessing the benefits and the cost (in social, economic, political, and scientific terms) of various enforcement strategies, that is, the various combinations of aircraft, ships, electronic devices, and imposition of penalties.

Recommendation: A general analytical system is needed to provide quantitative estimates of the impacts of alternative management techniques and enforcement strategies on the quantities and prices of fish available, the state of recreational fishing, and other measures of the benefits of management.

Problem **3:** Fisheries management-modeling efforts currently being supported by the National Oceanic and Atmospheric Administration, such as the one at Stanford University, do not include enforcement components.

Recommendation: The Coast Guard should develop the enforcement component, so that its model could be used in conjunction with one adopted by NOAA.

Recommended Pilot Projects in Enforcement

The cost of enforcing fishery regulations in the new 200-mile zone may escalate as experience is gained in managing the fisheries, and it may be learned that a higher level of enforcement is necessary than that which is now planned. Therefore, a reasonable approach to gaining experience with different enforcement techniques is desirable in order to determine which are the most successful and cost-effective methods of achieving the goals of the Fishery Conservation and Management Act of 1976.

The research conducted during this study suggests that such experience might be most efficiently gained through a series of pilot programs in various areas of enforcement. The following four projects are an outline of the types of work which may be useful. These projects are suggested with the assumption that in the long-run, the cost of gaining sufficient experience on which to make informed choices and trade-offs in enforcement activities would be less than the cost of possible erroneous decisions about the use of very expensive, electronic-surveillance systems, the cost of adding large numbers of new and possibly unnecessary air and sea craft, and the cost of possibly failing to protect the fishery resources by adequate enforcement of regulations.

Included in the project discussions are rough-cost estimates whenever such fiscal information was available to OTA. However, it should be pointed out that one of the primary reasons for conducting these projects would be to obtain information that will allow the appropriate agencies to make estimates of the costs of full-scale setup and operation of certain programs. Presently, such information does not exist.

It is suggested that these projects should be conducted for at least a year, possibly more, in order to cover the entire fishing season and range of activities on any given area. At the end of the project, each should be evaluated with special attention to determining the completeness of coverage provided, the cost, the timeliness and usefulness of information obtained, and a comparison of each method with traditional enforcement activities, and other possible alternatives to the pilot method.

Shipboard Observers (for background discussion, see pages 38 to 42)

OTA's analysis suggests that much could be learned from a pilot project in which a foreign fishery is nearly blanketed with shipboard observers who have both management and enforcement duties.

The New England region would be most suitable for such a pilot project because the fishing grounds are concentrated and foreign-fishing practices are well known; many of the foreign vessels fish in groups which could simplify the arrangement of vessels with observers and control vessels without observers; and the stocks in that region are generally depleted and information for use in restoring stocks is badly needed.

About 150 foreign vessels, on the average, have traditionally fished within the 200-mile zone off New England. At this writing, the number of permit applications which had been received suggested that this number will probably go down because of the 1977 catch allocations. Therefore, it appears that a total of about 100 shipboard observers would be suitable for the pilot project. These observers should be selected on the basis of experience in fishing practice and knowledge of fishery matters. If they are given enforcement duties, they should be Coast Guard personnel, instead of NMFS personnel. However, they should receive some training from NMFS in observing, collecting, and reporting information of value. Some familiarity with the nation on whose vessel the observer serves would also be helpful.

Based on NMFS estimates for their existing limited-observer program the cost of a 100-man pilot program would be roughly $2 million plus funds for an accurate evaluation of the pilot.

Under the law, this cost is passed on to the foreign vessels. However, other fees and charges are also levied, under the law, to reimburse the United States for management and enforcement activities in the 200-mile zone. Since the observer program would presumably make some other expenditures covered by these levies unnecessary, the gross-tonnage fee or tax on ex-vessel value of the catch could be reduced accordingly.

Transfer of Military Data (for background discussion, see pages 43 to 44)

OTA proposes a pilot program utilizing one of the existing military systems for the collection and transfer of available surveillance data for one specific region. Some precedent for such a project already exists at the Naval Ocean Surveillance Information Center where the Coast Guard has recently detailed one officer to work on data which are of interest to the Coast Guard and have not, in the past, been processed by Navy personnel.

OTA has not investigated the feasibility of using a specific system in any region, but it appears that the Navy's west coast network could be a likely pilot region. Any pilot project should begin with an indepth investigation of the Navy's existing system and its ability to

provide information needed for fisheries enforcement.

Some funding would be necessary to add personnel who would coordinate the transfer of fisheries-related data from the Navy to the Coast Guard district in charge of fisheries enforcement in that zone.

On one hand, there may be difficulties in working with and protecting classified information and there may be a danger that this extra task might not receive adequate attention in a facility oriented to an existing military mission. However, such an information-sharing program could ultimately cut costs substantially by reducing duplication of effort and facilities. It could also provide cooperative experience which might lead to sharing of other services and resources needed for enforcement and the opportunity to evaluate new technology which may be of use in fisheries enforcement.

Joint Research (for background discussion, see pages 45 to 46)

OTA suggests that a pilot project for cooperation and joint research could bring together the Coast Guard, Department of Defense, and the National Aeronautics and Space Administration to develop new systems and find efficient ways of using technology in a multimission context.

Such a pilot project could include joint preparation of long-range plans for determining the most appropriate research and development strategy for new technologies, identifying the needs of all potential users of such technology, and analyzing the costs and benefits of developing and utilizing new technology, especially remote-sensing devices.

Transponders with Loran-C (for background discussion, see pages 47 to 49)

OTA suggests early implementation of a pilot program utilizing transponders in two specific regions-the Bering Sea off Alaska and the Georges Bank off New England. Since each of these areas are traditional fishing grounds, but with very different prevailing conditions, the usefulness of transponders could be evaluated for a broad range of applications by this pilot project.

The pilot programs would require the design and manufacture of Loran-C transponder equipment specifically for this purpose. The Loran-C network is already planned or in operation in the regions proposed. A licensing arrangement and installation technique for fitting transponders on each foreign fishing vessel entitled to fish in the region would need to be devised. Control stations and receivers on patrol ships or aircraft would need to be installed.

It is estimated that the transponder which would go on board each foreign vessel would cost less than $2,500. Once the system were developed and installed, operational costs would be roughly equivalent to the operational cost of the aircraft carrying each control station, $1 million to $1.6 million annually. Funds for evaluating the pilot project would be in addition to these costs.

The Georges Bank pilot program would require about 150 transponder units and a control station most likely at a Coast Guard shore base in New England. Each vessel entering the 200-mile zone at Georges Bank for fishing would be required to activate its transponder which would automatically transmit identification and location to the shore base. The shore base would keep plots of all foreign fishing activity on the banks and give this to patrol craft. Regular patrols of the region would use this information to check on any

fishing activity that was not reported by this system.

In the Bering Sea region a similar network of transponders could be required aboard foreign fishing vessels. In this region it may be desirable to combine the transponder network with microwave radar systems already used aboard Coast Guard patrol aircraft and receiving stations also aboard the patrol craft. In this way a specific region could be covered by regular overflight, all vessels operating in the region located by radar, each vessel interrogated to determine whether an approved transponder is aboard stating identification and location, and any vessels without transponders investigated. There are several advantages to a system thus described, especially in Alaska where long distances and large areas can best be covered by aircraft and where frequent cloud cover makes visual observation difficult or impossible.

New Management Concepts Needed

New research concepts need to be developed and much new data must be gathered in order to obtain an integrated view of all the fisheries of the United States and to determine the optimum yield of each fishery. Optimum yield is a judgmental decision on the size of fish catch which will achieve the most advantageous combination of biological, economic, and social results. However, there is presently no agreed-upon method of determining optimum yield. (See pages 62 to 63.)

Even when analytical methods and reliable data are generated, there will be uncertainty about stock assessments and other projections used for fishery management. Techniques for dealing with that uncertainty will be necessary. (See pages 62 to 63.)

Relationships Between Federal Agencies and Regional Councils

It is possible that better accountability for the existence and the reliability of data provided by the National Marine Fisheries Service (NMFS) to the Regional Councils could be achieved if the NMFS member on the councils were the head of the regional fisheries research center rather than, or in addition to, the Regional Director. (See pages 63 to 69.)

Conflicts can probably be expected in the future between the Regional Councils and the NMFS laboratories over the division of research funds because of some local fishermen's mistrust of national NMFS operations and council desires to break out of the traditional NMFS research patterns. Conflicts may evolve over who does specific research tasks. Such conflicts may delay collection of much-needed information or cause duplication of research effort;

however, there is no framework--other than informal negotiations between NMFS and the councils—for resolving such conflicts. (See pages 63 to 69.)

NMFS Management Guidelines Needed

No decisions have been made within NMFS as to who will be responsible for research, data collecting, and development of analytical methods. There is a division of opinions among NMFS staff as to whether recommendations on data and methods should be made by NMFS to the councils or by the councils to NMFS. (See pages 69 to 73.)

The preliminary management plans prepared by NMFS were not coordinated in content or format. Guidelines for presentation of management plans were not promulgated. This failure to standardize operations with NMFS before the initial plans were written may have complicated the councils' job of preparing succeeding plans by failing to give them a model after which to pattern their work. It may also perpetuate regional differences within NMFS and complicate the national review process. (See pages 69 to 73.)

Management Information Needed

Much must be learned about the effectiveness of management techniques and presentation of plans. However, the most pressing need for improvement is in the area of developing and considering economic, social, and biological data to be used to modify the catch figures presented in the preliminary plans. (See pages 69 to 74.)

Recommendation for Management Planning (See pages 73 to 74.)

Problem: There is no deadline for preparation of domestic fishery-management plans and no priority listing of domestic fisheries for which management plans should be prepared.

Recommendation: NMFS should prepare a priority listing of domestic fisheries for which management plans are needed, delineating the needs and citing available data.

Information Needed To Implement Public Law 94–265

New Evaluation of Fisheries Stock Information Needed

The new Regional Councils could make a substantial improvement in the old system of making estimates of fishery yields and advice about health of stocks available only to international governing bodies. The councils could interpret scientific data on stocks, publish it widely, and provide an opportunity for continual access to information and debate of the issues by interested parties. Input by and involvement of users and other public parties is crucial to the success of fishery management. (See pages 77 to 79.)

Status of Stock Information

Present assessments of heavily utilized stocks are quite accurate. However, projections of sustainable yields in the future are subject to large uncertainties due to effects of interspecies relationships, environmental change, fishing effort, and other unknown natural variations. (See pages 77 to 79.)

Presently no stock has adequate quantitative data on all items necessary to develop estimates of maximum potential yields that can be harvested without reducing the parent stock. (See page 78.)

Stock Assessment Needs

Since estimates about the condition of a stock are basically judgmental anyway, it may be far more cost-effective to agree upon a few key indicators of the health and size of the stock rather than to attempt to assess all possible indicators. (See pages 79 to 81.)

Because of pressures to expand existing stock assessment methodologies to provide data for near-term decisions, pressure to treat fishery information as a precise science, and the lack of validity for existing methods of research, a program should be undertaken to improve the stock assessment data which will be used and establish future research priorities. (See pages 79 to 81.)

Foreign Investment Information

Mandatory disclosure of the actual extent of foreign investment in U.S. fish processing and wholesale operations would be necessary in order to determine if foreign investment results in uncontrolled foreign fishing or if it has an adverse effect on the competitive position of U.S. firms. However, such disclosure is not presently required. (See pages 81 to 85.)

Economic Information Needs

Economics and statistics staffs are being added to Regional Fisheries Research Centers, but these staffs are not likely to have the time or direction to address national problems. These staffs cannot be considered a substitute for a central economics research and planning capability in NMFS. (See pages 86 to 88.)

Information Needed on Social Effects of Fisheries Management

The Regional Councils will need to know the major social effects of the decisions made under the new law in order to make sensible alterations in fisheries regulations as conditions continue to change. (See pages 88 to 92.)

Recommendation for Improved Management Information (See pages 81 to 86.)

Problem: Most of the regional economic studies which have been done and the economic and social data generated by NMFS would be of limited use to the Regional Councils in their management work because it is outdated or not maintained in a format applicable to fisheries managers.

Recommendation: The National Marine Fisheries Service consulting with the Regional Councils could evaluate the economic and social-data needs and the suggestions for improvement which are outlined in this report and develop a comprehensive management information system.

Information Needed To Evaluate Opportunities

In order to make decisions on how to improve an existing fishery or develop a new fishery by enhancement techniques, new information is necessary. This includes an intensive and integrated examination of all facets of a fishery: resource assessment, harvest and processing technologies and costs; market potentials; and institutional factors including artificial barriers to trade. None of this information presently exists within the Federal agencies. (See pages 96 to 99.)

Sufficient data about various segments of the fishing industry are not now available for determining what, if any, actions should be taken by the Government to encourage growth in the fishing industry. (See pages 99 to 104.)

Underutilized Species Not Defined

In addition to the possible prices which presently underutilized species might bring, stock assessments and projections of yield from the species are needed in order to determine if the stocks can sustain a market. (See pages 98 to 99.)

Recommendations for Addressing New Opportunities (See pages 95 to 104.)

Recommendation: Data collected by the General Accounting Office, the Eastland Resolution group, the Office of Technology Assessment, and NMFS should be synthesized and analyzed by a committee of the Regional Councils which could identify missing information, fill the gaps itself or contract for research, and make recommendations for congressional action or administrative changes which would be helpful in revitalizing the fishing industry.

Recommendation: The Federal fishery information structure that exists in Sea Grant and NMFS should be expanded and improved to reach a larger segment of the industry with a variety of information from many sources.