

# **5 Information Needs for Implementation of Public Law 94-265**

## Biological Information

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Fisheries management has traditionally been based on biological considerations. Therefore biological data are more sophisticated and research concepts are better understood than those for economic or social information, and biological research has been funded at a high level by Federal and State agencies concerned with fisheries management.

The principal biological data tool is stock assessment,<sup>63</sup> the study of marine fish populations in terms of their potential commercial yield, as well as the limits of that yield. Stock assessment attempts to develop an understanding of marine ecosystems and the effects of man's activities upon them. The mechanisms that drive marine ecosystems, as well as those that drive fishing activities, if understood and if properly applied, serve as one means to predict the effects of future activities. Therefore, stock assessments can and do contribute to fisheries management decisions.

Stock assessments seek to develop information on what the maximum sustainable yield (MSY) of a fishery is. That is, fisheries are viewed as a renewable resource, dependent upon:

- the introduction of young fish into the population (recruitment);
- their rate of growth;
- their natural mortality;
- the mortality caused by fishing activities.

The management goal is to not remove more from the population than can be replaced, thus allowing maintenance on a steady basis of an allowable surplus over and above the parental stock necessary to produce that surplus. The principle that catch should not exceed the MSY has found nearly universal acceptance in the international fishing community.<sup>64</sup>

Stock assessment has traditionally served two purposes: provision of information and data for the development of new fisheries, and provision of information to maintain a stock or to restore depleted fisheries.

There exist a large number of uncertainties with existing stock assessment science: problems with the data generated and more importantly, problems concerning the use of that data.<sup>65</sup> Of paramount importance is the fact that offshore marine fisheries, particularly ground fish (demersal species), constitute populations that are nearly impossible to observe until harvested. As a result, assessment must depend upon inference, statistical probabilities, and the measures developed to understand the complicated and interrelated marine environment. As such, assessments depend upon the analysis of past information and trends to predict future fisheries developments.

Fishing activities have continually changed as technologies have developed. These changes force adjustments in past-data analysis to reflect future realities. Further, as fishing activities have varied, there are environmental fluctuations and trends that are long-term in nature and are, as yet, poorly understood. This understanding is extremely difficult when technological changes continually alter the data simultaneously.

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## Status of Current Information

In the past, estimates of fisheries yields and advice on the health and viability of stocks has been given to management bodies like the International Commission for Northwest Atlantic Fisheries (ICNAF) without disclosure to the general public and with little involvement of domestic fishermen or other interest groups. The new Regional Councils could make a substantial improvement in this procedure by interpreting scientific data on stocks, publishing and widely disseminating stock data and advice, and providing an opportunity for continual access to information and debate of the issues by interested parties. Good scientific data by itself will not promote conservation or adequate management of stocks. Input by and involvement of users and other public parties is crucial.

At present, most population estimates of heavily utilized stocks appear to be quite accurate, in spite of some problems in gathering information and evaluating the effects of fishing activity decisions. 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.

Public Law 94-265 has put tremendous pressure on the stock assessment science to provide a major part of the data base upon which quotas are set and restoration strategies are determined. However, 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. The information necessary includes:<sup>66</sup>

- an understanding of species-stock biology;
- quantification of the commercial indices which allow trends in abundance to be followed;
- survey information that demonstrates changes in total stock abundance and age composition;
- survey information giving pre-recruit indices;
- accurate knowledge of species/stock abundance and area location;
- accurate age and size composition;
- historical catch-effort data;
- understanding of movements and migrations;
- knowledge of the effect of such factors as temperature and water quality; and
- knowledge concerning the interrelatedness among species.

Historically stock assessment has studied individual populations of fish, and the biological basis for management has thus concentrated on the "single species" approach. This approach has assessed the resource potential of one or another species of fish that has had commercial value to fishermen or that has promise of future value. However, to be of the most use in setting optimum yields, stock assessments must take a multispecies approach, looking at the relationship of one species to the survival of another. Biologists have not yet developed a multispecies approach which is generally accepted by the scientific community.<sup>67</sup>

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## Methods of Improving Information Base

The National Marine Fisheries Service budget for stock assessment is \$11.1 million for fiscal 1978, up \$2 million from fiscal 1977 with most of the increase needed to provide information for management in the 200-mile zone.<sup>68</sup> The budget is projected to double in the next 5 years, but this may not be sufficient. The time and budget needs to provide additional information are enormous. Yet, while such information may well become necessary in the future, the immediate short-term needs for assessment data are for use in designing restoration strategies. Restoration does not demand the same level of accuracy in assessment data that is required for long-term management. In the meantime, increased accuracy of assessment data carries with it cost implications that may be enormous; therefore, it may be far more cost-effective to choose key indicators upon which to make decisions with all parties participating in those decisions aware that, in the end, yield judgments will remain judgments.

It would be desirable to establish clear research priorities for future stock assessment efforts and to define the level of assessment accuracy required for specific management decisions. In addition, clear relationships need to be established between fisheries stock assessment and the needs of other Federal agencies which are responsible for programs which require environmental baseline data. For example, the Department of the Interior requires such information in regions that may be leased for oil and gas development. If properly structured, much of the fisheries assessment work could also be utilized for such purposes and much of the duplication which now occurs could be avoided.

There are two basic problems which arise in the consideration of how to proceed with stock assessments:<sup>69</sup>

1. Because of the threatened status of many marine stocks, much stock assessment information is needed for immediate short-term management decisions. Therefore, the pressures to expand existing assessment methods are great.
2. Fisheries managers have been pressured to treat stock assessment information with the same precision as other resource managers treat their data. However, while forest managers, for instance can count the board feet of available timber, fish populations cannot be counted with such accuracy. Therefore, the new pressures to determine sustainable yields may require more precision than stock assessments have delivered in the past or can be expected to deliver in the future.

These problems should be considered along with two other facts:<sup>70</sup>

1. Assessment history has demonstrated that existing methods have not been properly validated, primarily due to inadequate data, even concerning those species of traditional value to domestic fishermen.
2. The status of stocks—and, in fact, the primary motivation for extension of jurisdiction—requires a reduction of fishing pressure to the extent possible so that the marine biomass can recover.

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When these four items are considered together, it appears logical that a program should be undertaken to improve the stock assessment data which will be used. Such a program could include the following steps:

*1. Test the validity of existing assessment methods during a chosen restoration period*

During this period, fishing pressure on some stocks should be reduced drastically. Estimates of yields should be on the low side; then if they are incorrect, the major consequences are that stocks will recover more rapidly while some economic opportunity is delayed.

During this restoration period, time-series of data could be developed through accurate catch and effort figures gained via the use of observers on foreign fishing vessels and a strict enforcement system. In addition, automatic plankton sorting and fish-aging techniques could be developed along with design and development of hydroacoustics, expanded survey cruises for several well-known stocks, and use of improved research vessels for survey dependability.

The accuracy of existing assessment methods could also be evaluated under this program to determine the degree of utility the information gained has for management decisions.

*2. While assessing existing methodology, establish research priorities for the future*

During the restoration period, the level of accuracy required for assessments under different management goals could be established. For each chosen goal (for example, "catch the last ton," "resource revitalization," "maximum yield for today," "maximum yield for the future," etc.), the key indicators that will be required to achieve the determined level of precision could be outlined. Then, for each level of precision and those indicators that achieve that precision the following items could be determined:

- the probable cost;
- the time necessary to provide useful results; and
- the relationship of each variable to assessment accuracy under the existing system.

*3. Design a program strategy*

As the existing accuracy of assessment is determined, and as differing management goals have been chosen with regard to required level of accuracy, costs, time needs, and level of increased utility with regard to existing methods, the following program strategy could be established:

- a listing of information needs, their utility, and their cost;
- the precision of information necessary to achieve various management goals; and
- choices for a cost-effective and useful assessment research program.

## Economic Information

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There has been some work in the field of fisheries economics during the past 25 years to begin a body of data and theory concerning the application of economics to fisheries management problems, and the impact of economists on Public Law 94-265 is clear.

However, additional economic information is necessary under the new law for several purposes:

- to determine the optimum yield;
- to project the domestic catch and capacity to catch;
- to promote efficiency in the harvest sector of the fishing industry;
- to understand and manage the impact of foreign fishing and imports of fish to U.S. markets;
- to determine the greatest overall benefit to recreational fishing; and
- to define fisheries on economically relevant terms.<sup>71</sup>

The following is a discussion of what information is important in each of these areas:

1) *Optimum Yield*.—The information base of the Regional Councils must be adequate to permit determination of the optimum yield. The biological data which exists or can be generated by existing procedures are not sufficient alone. Economic and social data are required under the law. Economic data necessary to help in determining the optimum yield would include cost and returns, price projections and regional employment considerations for a range of management options. Whenever management plans will cause variations in the quantities of fish which will reach markets, price- and market-structure analyses will be necessary for the people whose incomes will be affected. Expenditure

and employment data will also be required on sectors of the economy, such as processing, transportation, and sales outlets which have strong links with the fishing industry and will feel induced or secondary impacts of fisheries management.

2) *Domestic Catch Projections*.—How much of the optimum yield will be harvested by U.S. fishermen depends, to a large extent, on new investments which are influenced by the economic returns of fishermen. Domestic catch, therefore, cannot be reliably projected without a knowledge of the cost and revenue relationships of the U.S. fleets. In addition to the normal free-market forces which affect cost and revenue, there are various domestic and foreign policies which are important. Among these are vessel-construction subsidies, marketing programs, fisheries development policies, and trade barriers to U.S. exports.

3) *Efficiency in the Harvest Sector*.—Efficiency in the harvest sector is one of the goals of the various management schemes which may be implemented. Consideration of efficiency requires a formal integration of biological and economic concepts and an adequate data base to express concepts in quantitative terms. The economic data required include cost and earnings information by vessel and gear type, demand relationships and potential nonfishing employment and earnings opportunities for fishermen.

4) *Impact of Foreign Fishing and Imports*.—Economic information on foreign fleets is of particular importance where the fish harvested affect international trade of U.S. importers or exporters. On the import side, fish may

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be caught in U.S. waters, processed in a foreign nation and exported to U.S. markets with obvious implications for domestic prices, employment, and incomes.

A more subtle import market effect may also take place. A foreign nation may have inventories of fish products produced partly from fish caught in U.S. waters and partly in waters outside U.S. jurisdiction. Foreign suppliers could fill U.S. import demands with products made from fish caught outside U.S. jurisdiction and satisfy their own demands or other world markets with fish caught from U.S. waters. Under these circumstances the foreign nation could claim, correctly, that the fish captured in U.S. waters are not entering U.S. markets. However, the end effect in U.S. markets is the same as if fish caught in U.S. waters had been directly exported to U.S. markets.

In terms of U.S. exports, domestic exporters must be able to deliver products at prices competitive with foreign producers. One of the factors affecting competitive status is the level of subsidies received by foreign fleets and/or processors. Thus, to assess the international trade aspects of U.S. fisheries, information on the economics of foreign fleets operating in U.S. waters may be necessary.

This is a complex area because costs and returns of foreign fleets may include hidden impacts of government intervention, widespread subsidization, and various social welfare policies.

Public Law 94-265 specifies that foreign fleets fishing in waters under U.S. jurisdiction

must supply certain information. For economic analysis, that data should include direct information on major inputs and costs of foreign fleets, in a form which permits isolation of operating costs in transit to waters under U.S. jurisdiction from the operating costs while in U.S. waters. It should also include information on capital construction costs and foreign subsidies. In addition, physical data on vessel construction, vessel size, and gear characteristics collected for management purposes may be useful in measuring technical efficiency of the fleets by analysis of variances in catch per unit of effort.

There is a further need for information on activities of foreign fishing interests which has arisen since the Fishery Conservation and Management Act was passed. The need is for accurate, up-to-date information in three areas: a) foreign investments in U.S. owned fishing vessels; b) foreign investment in processing plants and wholesale operations; and c) the impact of these investments.

a) *Foreign investment in U.S. owned fishing vessels:* By law,<sup>72</sup> the U.S. Maritime Administration must approve the transfer of majority ownership of U.S. documented fishing vessels to foreign ownership. Under a policy published in the Federal Register in 1973,<sup>73</sup> NMFS agreed to review all fishing vessel transfer applications, giving due consideration to all social and economic factors involved on an individual basis, to determine if such transactions were consistent with U.S. interests or if new regulations would be required to protect fishery resources. However, information on the reasons and results of the transfers is very limited. Through January 1977, more than 1,200 U.S. fishing vessels, ranging from 5 to 500 gross tons, have been transferred to foreign owners or foreign flags.<sup>74</sup> Once the vessels carry foreign flags they are subject to the same regulations and quotas which apply to foreign-built vessels.

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However, these ships can be returned to the U.S. flag fleet by an equally simple procedure, and records should be monitored to determine if this is happening in order to give foreign investors access to U.S. fisheries.

There are also foreign investments of less than majority ownership which may influence the economics and activities of fishing vessels, But there are no data at all on these investments, although such investments may ultimately increase the number of U.S. vessels competing for scarce stocks. A larger number of vessels may cause the resource to be spread among more fishermen and make operation inefficient.

b) *Foreign investments in processing plants and wholesale operations:* The last look at foreign investments in this category was a very limited report which resulted from a special survey of foreign direct investment in the United States, conducted by the Bureau of Economic Analysis of the Department of Commerce in 1974.<sup>75</sup>

The report, prepared by the Economic and Marketing Research Division of NMFS in April 1976, showed that 47 U.S. commercial fish processing and wholesale firms were at least partially owned by foreign interests which held 10 percent or more of the voting stock. The total value of the foreign investment in U.S. firms was (in 1974) \$129 million. More than half of the firms involved had received foreign investments since 1970 and during 1974 investments rose 30 percent, according to the report.

More than half the total value of foreign direct investment in fishing firms at that time

was from the United Kingdom, Japan, and Canada. Other countries investing were Denmark, Iceland, Norway, Kuwait, and Mexico. The firms in which these countries invested operate 107 facilities, located mostly in Alaska and the State of Washington, but also spread along the east coast.

In its report, NMFS acknowledged that a major reason for foreign investment is probably the desire to gain a more certain access to additional supplies of fishery products beyond what the countries can harvest off their own coasts. As the United States and other coastal nations moved to extend their jurisdiction over fisheries out to 200 miles, investments in firms which could export products appeared to be one way of keeping some access to fishing areas which might be closed to foreign vessels. Instead of being frozen out by the U.S. 200-mile fishery jurisdiction, foreign nations with investments in U.S. firms share in benefits and protections of the law.

Presently, there is no mandatory disclosure of the actual extent of foreign investment in U.S. fish processing and wholesale operations. Such disclosure would be necessary in order to determine if foreign investment has increased along lines that would support the NMFS theory that such investments could be used as a hedge against low-catch allocations for foreign fishermen.

In addition, there are no data on the point of origin of fish products imported to this country. Such data, which could identify if fish had been caught in U.S. waters, could be collected by the Bureau of Customs and would help in assessing the impact of foreign fishing activities.

c) *The impact of foreign investments:* Concern has been expressed by the public and some Members of Congress that foreign investments may allow some countries to circumvent some provisions of Public Law 94-265 or

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that foreign interests may directly or indirectly exert a political influence on policies for fisheries management and regulation.<sup>76</sup>

Concerns about foreign investments in fishing vessels and processing or wholesale operations are that any of the following may result:

- Less processing of fish may be done locally, leaving part of the work to be done in a foreign country by low-cost labor, thus reducing the value of the local industry.
- It may be possible for a vertically integrated company to operate a fish processing plant in the United States on a breakeven basis and take profits abroad thus escaping Federal and State taxes in the United States,
- The firms may be able to operate at lower cost or pay higher prices for fish, thus making competition difficult for firms wholly owned by U.S. interests.
- Large-scale export of products from U.S. plants owned by foreign investors may be a way of avoiding catch quotas and permit fees for foreign fishing vessels.
- Increased demand for fish from foreign-owned firms which want to export products may cause increased pressure on stocks from U.S. fishermen.

On the other hand, there is also some support for foreign investment in U.S. firms. Supporters point out that the following can also happen:<sup>77</sup>

- Higher prices may be paid to fishermen for their catch,

- More money may be available for plant expansion and product diversification.
- Risk of production may be reduced by firm commitments from foreign markets for fish products.
- Good markets may be found for products not currently saleable in the United States.
- The fish trade deficit could be reduced which would be beneficial to the U.S. balance of payments.

As a result of passage of the Fishery Conservation and Management Act, NMFS is again pondering the meaning and impact of foreign investments in the fishing industry, but no specific studies have been undertaken yet to determine if these investments will have favorable or unfavorable impact on the overall U.S. fishery and fishing industry. In order to adequately address this problem, a wide range of economic information will be needed, including investment and export data plus all those factors already mentioned as necessary for assessing the impact of foreign fishing and imports,

5) *Recreational Fishing*.—Although the law is vague on details, it is clear that recreational opportunities in U.S. fisheries are to be considered by the managers. There is a substantial body of literature on recreational benefits, including recreational fishing benefits, but there are gaps in the data and in measurement techniques needed for devising a comprehensive economic data base for recreational fisheries.

6) *Definition of Fisheries*. —The resources most immediately affected by the law may be classified by species or type of gear and vessel used to harvest them. Classification by species is most relevant for biological data collection and research; however, that definition is not generally relevant to economic considerations. This is because multiple species fisheries are

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involved, and frequently the same vessel can be employed in fishing for several species. In many cases, the same vessel catches several species simultaneously. Classification by type of vessel and gear seems to be indicated for economic purposes, but there is no accurate inventory of vessels by size, gear, and fishing effort.

### Status of Current Information

Presently the responsibility for collecting economic information relative to U.S. fisheries is left almost entirely to the Federal Government through the National Marine Fisheries Service (NMFS). There are no comprehensive regional data collection programs to augment the Federal information base. Few of the regional studies which have been made are based on primary data; most piece the Federal data together with an assortment of ad hoc studies done in the region.

The information in regional studies is often not current by the time they are published and the retrievability and validity of the raw data decay quickly because continuity is lacking and the institutional context of the studies is not favorable to maintaining a continuing data base. Most of the regional studies which have been done would be of limited use to the Regional Councils in their fisheries management work.

Two divisions of the NMFS have been primarily responsible for the collection of economic information. These are the Statistics and Market News Division (SMND), which is specifically charged with the collection of data and preparation of periodic statistical reports, and the Economics and Marketing Research Division (EMRD), which was oriented toward economic research and analysis of SMND and other data.

However, NMFS recently phased out EMRD. In view of the new economic information requirements of Public Law 94-265, this decision raises serious questions about the sources of data and analysis for carrying out provisions of the law.

In the past, the two divisions of NMFS collected information, either directly or from State agencies, on landings by species, value, area of capture, depth, fishing effort, and days absent from port for each vessel trip in the New England offshore fisheries and the Gulf of Mexico shrimp fishery. This information is stored on computer tape or market report sheets and is available at the Northeast Fisheries Center at Woods Hole, Mass., and at the Washington, D. C., office of SMND. Among the other data series collected by NMFS are:<sup>78</sup>

- retail price data for major fish products in New York,
- wholesale price data for selected fish products,
- ex-vessel price data,
- production and cold-storage holdings for many fish products,
- import-export data for various fish products,
- a limited amount of foreign statistics,
- supply, utilization, and stocks of selected fish products,
- commercial landings by State,
- regional summaries of landings,
- processing and foreign trade bulletins,
- historical statistics,
- economic analysis and indicators,
- market news, and
- recreational fishing statistics.

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These are generally accessible to the Regional Councils, but are of limited utility because the format is geared toward researchers rather than fisheries managers. Some, but not all, of these series are available in published form. The published data are more easily available to the Regional Councils, but are also likely to be of limited value because of the time lag between collection and publication.

There is another problem in gathering and using economic information which must be thoroughly considered before the law can be effectively implemented. That is the requirement that "any statistics submitted to the Secretary (of Commerce) by any person in compliance with any requirement (of P.L. 94-265) shall be confidential and shall not be disclosed except when required under court order."<sup>79</sup> The law specifically directs the Secretary to prescribe regulations to preserve confidentiality.

As long as the data made available are in such a form that individuals cannot be identified, there is probably no problem. However, the use of disaggregated data requires careful planning. Plans for using such data while still protecting its confidentiality were not included in the Interim Regulations<sup>80</sup> formulated by NMFS for use as the councils and Federal agencies prepared for the March 1, 1977 implementation of the Act. Presumably sections on confidentiality will be published shortly because without clarification of how disaggregated data will be handled and protected, Federal employees may be reluctant to supply such data to researchers.

#### Methods of Improving Information Base

The existing NMFS data base is deficient in several areas if it is to be used to carry out the intents of Public Law 94-265 cited at the beginning of this section. The areas in which additional or more accurate economic information are needed most urgently are vessel inventories; costs and earnings data; vessel construction costs; demand analysis data; vessel size, employment opportunities, skills of the labor force; and recreational fishing benefits.

A continuing annual data base is probably not required in all these areas. However, continuing information is required for vessel inventories, costs and earnings, vessel construction costs, and some components of demand analysis. These data are needed for monitoring and management decisions, which are repetitive and continuous. Data in the remaining areas are needed for working out various isolated problems which arise and which involve more or less unique, nonrepetitive decisions. Special purpose studies or periodic updating, such as once every 5 years, would be adequate for such purposes.

It is estimated that a program to develop this data over the next decade would cost from \$2 million to \$4 million per year (see figure 23). This range is a substantial increase over the combined budget of the EMRD and SMND of NMFS, but less than 40 percent of the budget for stock assessments. This reflects the low-funding priority which has been accorded economic research in the past.

It is assumed that the agency responsible for collecting this data would be NMFS acting as lead agency and contracting with other Federal agencies, such as the U.S. Department of Agriculture. This may also be an area in

**Figure 23  
Summary of Projected Program Costs for Economic Data Collection**

Task	Initiation Date	Schedule	Cost
1. Vessel Inventories	Immediate	Annual	\$250,000
2. Cost and Earnings	Immediate	Annual	\$1,000,000
3. Vessel Construction	Immediate	Annual	\$50,000
4. Household Survey	FY 1978	5-year intervals	\$150,000/5 Years + \$50,000/Year
5. Employment Skills	Immediate	5-year intervals	\$25,000/Year to 1980 \$400,000/Year in 1980 \$150,000/Year after 1980
6. Fisheries Development	Immediate	Annual	\$500,000/Year
7. Marine Recreation	Immediate	Periodic	\$200,000/Year First 2 Years \$1,000,000/Year for Years 3-5 \$400,000/Year for Years 6+

**Summary by Year**

Year	1	2	3	4	5	6	7	8	9	10
Thousand \$/Year	2,225	2,075	2,875	2,875	3,400	2,400	2,400	2,400	2,750	2,750

\*Estimates in 1975 dollars

Source: OTA

## Social Information

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which the Regional Councils would wish to contract outside the Federal Government for studies. Since only approximately eight-tenths of 1 percent of the NMFS personnel are classified as economists, NMFS has indicated plans to add economics and statistics staffs to each of the four regional Fisheries Research Centers. This would to some extent alleviate the shortage which exists. There are caveats, however. The plan to create these staffs has not been implemented. Concurrent with this, the economic analysis capabilities of NMFS have almost disappeared with the demise of the EMRD. Furthermore, several economists in the central office have left NMFS.

Even if the additions are made, it is questionable whether these regional staffs will have the time or direction to address economic issues from the national perspective which will be necessary in reviewing management plans. Therefore, although such regional economics staffs are desirable, they are not a substitute for a central economic research and planning capability.

To date, among social scientists only the economists have begun to build up a body of data and theory which is applicable to fisheries management. Other kinds of social scientists on the whole have not addressed fisheries problems in the United States. Social data on fishermen and the communities in which they live are almost conspicuously absent from the literature except for a small body of information on sociocultural systems of modern fishing communities in the United States and other industrialized nations. These data have been developed by anthropologists. Anthropologists have been attracted to fishing largely because of a growing interest in maritime communities and because traditional, rural fishing communities can be studied with the same sets of conceptual tools which anthropologists have developed for studying small, traditional societies in other parts of the world.<sup>81</sup>

Anthropologists who are now interested, prepared, and trained to deal with the social, cultural, and historical dimension of fisheries management could form the core of researchers who gather data on fishing cultures that will be required by fisheries managers. Historians might also be used for social data collection while other researchers with experience or interest in fisheries management are moving into this new field.

Extended jurisdiction and fisheries management will undoubtedly affect everything from fishing technology, crew size, catches, income levels, and employment levels, to migration rates, relative population of communities, and social problems such as the level of alcoholism, delinquency, and crime. Regional Councils will need to know the effect of decisions made under Public Law 94-265 in order to make sensible alterations in fisheries regulations as conditions continue to change.

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In order to develop a starting point in this field where little substantive work has been done, OTA commissioned a study of existing research and needs. This study, which is included in Working Paper No. 2, represents one view of the type of research which needs to be done in order to improve the social information base on fisheries. The OTA Working Paper suggests that three kinds of social data probably will be required by fisheries managers to determine an optimum yield that takes sociocultural factors into account, as mandated by the law:<sup>82</sup>

- baseline information on fishing communities in the United States;
- information on social and cultural factors influencing the acceptance of fisheries management proposals; and
- information on factors influencing the type and rate of technological change which can be expected in the fishing industry in the future.

1) *Baseline Information on Fishing Communities.* --Baseline data is essentially a picture of the total way of life of fishermen and the communities in which they live. The data will be necessary to the Regional Councils when they are faced with conflicting pressures to make regulations and alter the law in the face of changing conditions. In the absence of accurate baseline data, managers and politicians will have to rely on the recollections of interested parties. Under those conditions it will be difficult to assess exactly what effects specific regulations have had in the past.

Two kinds of baseline data need to be collected by different kinds of research techniques. First, there is a need for quantitative demographic, social, and economic data on a large sample of fishermen and fishing ports. This data could be obtained by:

- a) administering a questionnaire to a representative sample of household heads of

families in the fishing business to obtain data on family size; age and sex breakdown; range of occupations; consumption patterns; ethnicity; kinship ties; work experience; educational levels; alternative skills; political affiliations; fishing gear used; annual round; species caught; income; associational involvement; and some kind of indirect indicators of commitment to the industry, political awareness, etc.

- b) filling out a data sheet on every port in the United States to obtain information on transportation facilities; fish processing capabilities; size of community and size of fishing population; alternate employment opportunities; fisherman's organizations; fishing grounds and stocks; fishery statistics; fleet characteristics; marketing patterns; and facilities necessary for a fishing industry (e.g., hardware stores, repair facilities, docks, etc.).

Second, qualitative information needs to be obtained on the entire culture and social structure of "typical" fishing communities in key areas of the coastal United States. Information on the status and roles of people in fishing crews and cooperatives, the organization of groups in the communities, the values and goals of people in those communities, the kinds of problems people face, and patterns of cooperation and conflict are of special importance. The result of collecting such information would be a set of standard monographs on fishing communities similar to those which anthropologists and sociologists have done in the past. Of course, these monographs would not attempt to cover every aspect of the *life* and culture of the total community, but rather they would focus on the people and families directly involved in fishing.

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2) *Information on Acceptance of Fisheries Management Plans*--In the past, many efforts to manage marine fisheries to benefit stocks of fish and the consumer have failed, primarily because the proposals have been massively opposed by the fishing industry.

When people oppose proposals that involve planned social change, there are usually two reasons: a) the change is not economically profitable for them, or b) the change is not congruent with existing social institutions.<sup>83</sup>

If fisheries management plans under Public Law 94-265 are to succeed, they must gain enough acceptance in the fishing industry that they will not invite massive opposition. To gain that acceptance, it will be necessary to understand the costs and benefits of management and who is affected by each.

In most cases, imposition of new fisheries regulations is likely to represent a loss of income to fishermen. This means that the costs of management (in terms of decreased catches) will be borne by the men currently in the fishery. The benefits will be gained by future generations of fishermen. Even if the benefits of management were to, occur relatively quickly, the men currently in the fishery would bear the costs, but they would have to share the benefits with others who are lured into the industry by improved conditions.

Solid information will be needed on the way management plans will affect the costs and receipts of fishermen, distribution of income, and the traditional political, social, and institutional patterns which will be disturbed by changes.

This phenomenon of present fishermen bearing the cost of regulation while future fishermen gain the benefits is another argument for accurate information on foreign investments in U.S. fishing vessels and government subsidies of the foreign fishing companies which may make these investments. Such vessels may be able to bear short-term financial problems more easily than American-owned domestic vessels because the foreign investment or subsidy provides a cushion. In addition, the extra vessels made possible by foreign investments and subsidies will make it necessary to spread domestic allocations over a larger number of vessels.<sup>84</sup> This may have social as well as economic impacts on the U.S. fishing community,

3) *information on Technological Change*.— Under the law, catch limitations may be established for all species of fish. Foreign fleets will be allocated that part of the catch which the American fleet is incapable of harvesting. If the American fleet expands, in time foreign fishing efforts will decrease, perhaps cease entirely in some fisheries.

The boats that will do best under catch limitations will be modern boats that can catch fish quickly, before the allocation is used up. The larger, better equipped boats, and larger catches will require larger piers, better maintenance facilities, larger processing plants, and better transportation facilities. But the U.S. fishing industry will not revive or expand if there are no markets for fish, if capital for new boats and technology is not available, if piers, transportation facilities, and other kinds of infrastructure are not present.

The people of coastal areas will have little control over some of these factors, but it is reasonable to assume that the impact of extended jurisdiction and fisheries management

will depend, in large part, on the degree to which the people of coastal areas can take advantage of the opportunities which arise. Fishermen can respond to the new economic opportunities presented by extended jurisdiction by adopting new boats and sophisticated fishing equipment or by using existing equipment coupled with new fishing and marketing strategies. If large numbers of people are willing and able to change existing practices or to invest in new boats and processing equipment embodying new technology, then the effects throughout the social and economic structure



U.S. Navy Photo)

Many innovations may be necessary in the care of equipment and catch if the domestic fishing industry is to expand

of the coastal communities will be enormous. If fishermen cannot or will not respond, offshore fishing may be gradually taken over by large corporations.

A central problem then is to understand the ability of the people of the coastal areas to adopt innovation, particularly sophisticated fishing equipment. The effects of changes on the rest of the social system cannot be assessed until this is understood.

In order to assess this ability, fishery managers must have the answers to several basic questions.

- a) What assets must men have to successfully adopt new fishing technology?

To answer this question, it is necessary to have data on ability to amass capital, ability to save, lending institutions, certain kinds of kinship ties, skills that influence the maintenance and output of fishing boats and determine success in commercial fishing, crew organization, social ties, and the norms which regulate entry into fisheries.

- b) How many men in a particular area have the requirements for a successful large-scale fishing operation?

Some insight into the answer to this question could be gained by studying the strategies which men currently engaged in large-scale fishing have used in getting assets necessary for adoption of better fishing technology.

- c) How many of the men who have the requirements for a successful large operation, or can easily acquire them, are interested and motivated to invest in modern equipment?

In order to study patterns of adoption of new innovations, data should be gathered from both large and small operators about the characteristics of men who were "early adopters" of innovations in the past; the factors

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necessary for successful adoption of new technology; the social, economic, and cultural factors which in the very recent past have impinged on the decisions of men to innovate or not; and biographic and motivational information on men who control the requirements for adoption of new technology.

#### Status of Current Information

Almost none of the information is available to complete the kinds of studies suggested here.

There are only a few monographs on modern fishing communities and a few books on ancillary topics such as organization of fishing crews and marketing. Of course, the National Marine Fisheries Service compiles information on landings and fish prices. The National Marine Fisheries Service, however, collects little data about the fishing fleet and no information about fishing effort or any other kind of data on social and political institutions or economic performance. The Bureau of the Census has compiled general data on fishing as an occupation and on communities where fishing is done. The Census' data are very superficial and are aggregated in ways that give a picture of units no smaller than towns. Existing studies do not give socio-cultural data on the U.S. fishing industry as a whole.

#### Methods of Improving Information Base

The information needed for these studies overlaps a great deal. The first studies to be completed would be indepth studies of important fishing communities, since all the other

studies can to some degree draw on the information generated. It would be reasonable to expect, if 10 to 15 community studies were begun at the same time, a set of monographs could be completed in 2 to 3 years.

The second study should be a survey of attitudes towards management proposals and factors necessary for technical innovation. The questions to be included might very well depend on the part of the country being dealt with.

The amount of time such a study would take depends greatly on the number of interviews needed to obtain statistical reliability. It is estimated that as many as 6,000 interviews would be necessary in the entire coastal region of the United States, and it could take a year or more to collect and tabulate the data.

Once this information was available, the remaining studies on innovation and the acceptability of management alternatives could begin. All of these would involve indepth interviews—perhaps at the same locations where the community studies were done. These studies would take another year of interviews and analysis. However, these two groups of studies could not be done by the same person in any given area, since the kinds of people who have the analytical tools to analyze costs and benefits of various management alternatives probably would not be able to concentrate on the very different issues connected with studying technical innovation and impact.

A group of projects similar to those which are used as examples here could be completed in 4 to 5 years. However, these suggestions and others which may be offered should first be tested and refined by social scientists in order to devise an acceptable research plan. Such a plan should be implemented on both the regional and national level in order to develop data which will be useful to NMFS and the Regional Councils,