Northern and Western Gulf of Alaska Petroleum Development Scenarios Commercial Fishing Industry Analysis
The United States Department of the Interior was designated by the Outer Continental Shelf (OCS) Lands Act of 1953 to carry out the majority of the Act's provisions for administering the mineral leasing and development of offshore areas of the United States under federal jurisdiction. Within the Department, the Bureau of Land Management (BLM) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of offshore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socioeconomic and environmental information to improve OCS decision making at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, the BLM has initiated several investigative programs, one of which is the Alaska OCS Socioeconomic Studies Program (SESP).

The Alaska OCS Socioeconomic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS Petroleum Development upon the physical, social, and economic environments within the state. The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, the nature, and the timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, technological, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current endogenous and exogenous sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes also are included.

The third research component focuses on an evaluation of the changes that could occur due to the potential oil and gas development. Impact evaluation concentrates on an analysis of the impacts at the statewide, regional, and local level.

In general, program products are sequentially arranged in accordance with BLM's proposed OCS lease sale schedule, so that information is timely to decisionmaking. Reports are available through the National Technical Information Service, and the BLM has a limited number of copies available through the Alaska OCS Office. Inquiries for information should be directed to: Program Coordinator (COAR), Socioeconomic Studies Program, Alaska OCS Office, P. O. Box 1159, Anchorage, Alaska 99510.
ALASKA OCS SOCIOECONOMIC STUDIES PROGRAM

NORTHERN AND WESTERN GULF OF ALASKA PETROLEUM DEVELOPMENT SCENARIOS:
COMMERCIAL FISHING INDUSTRY ANALYSIS

PREPARED FOR

BUREAU OF LAND MANAGEMENT
ALASKA OUTER CONTINENTAL SHELF OFFICE

DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE
5285 PORT ROYAL ROAD
SPRINGFIELD, VIRGINIA 22161

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The North Slope

North Sea

Competition for Ocean Space

Competition for the Services of the Infrastructure

Potential Impacts,

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Mean Find Cases

High Find Cases

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Cordova
Seward

Lease Sale No. 55, Mean Find Case:
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Seward

Lease Sale No. 55, High Find Case:
Yakutat
Cordova
Seward

Lease Sale No. 46, Low Find Case:
Kodiak
Seward

Lease Sale No. 46, Mean Find Case:
Kodiak
Seward

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Kodiak
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1. INTRODUCTION

This report is a product of the Alaska Outer Continental Shelf Socio-economic Studies Program (SESP). The principal objective of the Studies Program is to analyze potential impacts and changes likely to occur at the statewide, regional, and community levels as a result of proposed Outer Continental Shelf (OCS) lease sales in federal offshore areas of Alaska. The Studies Program has completed impact studies of the proposed federal/state Beaufort Sea lease sale and is completing impact studies of the proposed federal lease sales in the Northern and Western Gulf of Alaska.

The Studies Program has focused attention on several key issues about which relatively little was known, but which are of particular concern to the impact analysis of the Gulf of Alaska lease sales. Principal among these issues is the potential relationship between the commercial fishing and oil industries. This relationship is of particular importance in the Gulf of Alaska for two reasons: (1) the commercial fishing industry currently dominates the economic base of the communities adjacent to the proposed lease sale areas and (2) due to the Fisheries Conservation and Management Act of 1976 with which the United States claimed the rights to fishery resources within 200 miles of the U.S. coastline, due to improved fishery resource management, rehabilitation, and/or enhancement programs, and due to favorable market conditions, the growth potential of the Gulf of Alaska commercial fishing industry is significant. Therefore, the potential for competition between the commercial fishing and oil industries is increased.
General Objective and Methodology

The objective of this study is to increase our understanding of the potential relationships between these industries and to project the potential impacts on the commercial fishing industry of the Gulf of Alaska that may occur as a result of the proposed OCS lease sales No. 46 and No. 55.

The methodology used to meet this objective is as follows:

- The history and current trends of the Gulf of Alaska commercial fishing industry were documented and examined to develop a basis for projecting fishery development and potential interaction with the oil industry.

- Methods were developed and used to forecast the level of commercial fishing industry activity in the absence of OCS oil activity pursuant to lease sales No. 46 and No. 55.

- The nature and magnitude of projected activities of the commercial fishing and oil industries were analyzed to determine the potential impacts of lease sales No. 46 and No. 55.
The projections of commercial fishing industry activity in the absence of OCS activity, that is, the non-OCS case projections, serve two purposes. They provide a measure of the importance of the commercial fishing industry which may be jeopardized by OCS activity, and they provide a development scenario of the commercial fishing industry that, together with the OCS petroleum development scenarios, is used to analyze the potential impacts of lease sales No. 46 and No. 55.

The impact evaluation process of the Studies Program is divided into three parts: preparation of petroleum development scenarios, analysis of statewide and regional impacts, and analysis of community impacts. The scenarios presented in Technical Report Number 29, Northern Gulf of Alaska Petroleum Development Scenarios, and Technical Report Number 35, Western Gulf of Alaska Petroleum Development Scenarios, are the oil and gas development hypotheses driving the impact analysis. Four scenarios of different magnitudes were prepared for each lease sale. One scenario was constructed for each of three U.S. Geological Survey (USGS) resource estimates and the fourth was constructed assuming that exploration occurs but that commercial quantities of gas and/or oil are not found. The petroleum development scenarios provide a range of potential direct employment and equipment characteristics together with the hypothesized timing and location of both in a region. The latter two parts of the evaluation process are dependent on the petroleum development scenarios and are themselves interdependent.

The studies that are summarized in the following reports are of particular importance in forecasting the development of the commercial fishing industry:
These studies hypothesize: (1) the OCS petroleum activity that may occur, (2) economic and demographic conditions, (3) the nature of the transportation system that will serve and interact with the commercial fishing industry, and (4) the availability of the local public services upon which the industry is dependent. In short, these studies project many of the characteristics of the environment in which the commercial fishing industry may operate and which affects the development of the fisheries.
The Gulf of Alaska OCS petroleum development scenarios constructed in Technical Reports Number 29 and Number 35, have identified Kodiak and Seward, and Seward, Cordova, and Yakutat as potential sites for onshore OCS activity and have identified adjacent areas of the Gulf of Alaska as potential areas of OCS ocean space use associated with lease sales No. 46 and No. 55 respectively. The focus of this study, therefore, is on the fish processing activities in Kodiak, Seward, Cordova, and Yakutat and the fishing activities in the adjacent waters of the Gulf of Alaska. The latter are included in the fishing grounds of the Kodiak, Cook Inlet, Prince William Sound, and Yakutat management areas (see Figure 1.1).

The commercial fishing industry of a community is defined as the processing activities in the community and the harvesting activities which occur in the adjacent management area. This definition of a community’s commercial fishing industry will include some harvesting activity that is not closely associated with the community and will exclude some harvesting activity that is. The reason for this is that fishermen and fishing boats are extremely mobile; fishermen and boats from each of the four study area communities participate in the fisheries of both near and distant communities and fishermen and boats from outside the study area participate in the Kodiak, Cook Inlet, Prince William Sound, and Yakutat Management Area fisheries.

With this problem in mind, the definition of a commercial fishing industry was selected in consideration of: (1) the objective of this study,
Figure 1: Gulf of Alaska Study Areas.
which is to determine the impact of OCS petroleum activity that is encompassed in these management areas, (2) the expectation that OCS activity will primarily compete with fishing industry activities included in this definition, and (3) the absence of the data required to measure and project industry activity with alternative definitions of a commercial fishing industry.

Past levels of harvesting and processing activity are documented, future levels of activity are projected through 2000 in the absence of OCS petroleum activity pursuant to lease sales No. 46 and No. 55, and the potential differences that may occur as a result of various levels of OCS activity are analyzed for each commercial fishing industry. The indexes of harvesting activity include:

- weight and value of harvest by species and/or species groups,
- number of boats,
- employment and income,
- frequency and seasonality of ocean and harbor space use.

The indexes of processing activity considered are:

- number of processing plants,
- employment and income,
- processing capacity,
- requirements for water and electricity.

The items that are discussed in the development and assessment of the forecasts of these indexes of commercial fishing industry activity
include:

- local participation in harvesting and processing activities,
- market channels and arrangements,
- factors of change,
- ocean space use conflicts,
- conflicts between recreational and commercial fisheries,
- the organization of the commercial fish industry and potentially critical economic and political trends.

The Nature of the Non-OCS Projections

There are two reasons one cannot predict with complete certainty the level of activity of a commercial fishing industry: (1) the level of activity is determined by complex and generally poorly understood relationships among the level of activity and the elements of the biological, physical, governmental, and market environments a fishery inhabits and (2) the future characteristics of these environments are not known with certainty. However, based both on the past relationships between industry activity and a small number of elements of these environments and on the expected characteristics of these elements, one can determine how the level of activity is expected to change. The projections presented in this study, therefore, indicate how a commercial fishing industry is expected to change and not necessarily how it will, in fact, change. For example, if the probability of an industry expanding is 90 percent and the probability that it will decline is 10 percent, we would expect the industry to expand although it may, in
The projections, therefore, indicate where an industry appears to be headed. The models on which the projections are based and the projections themselves are presented and discussed in later chapters.

**The Nature of the Impact Analysis**

This study considers three potential sources of OCS impacts on the commercial fishing industries of Kodiak, Seward, Cordova, and Yakutat. They are the competition for (1) labor, (2) components of a community's infrastructure, and (3) ocean space. The competition can potentially have beneficial and/or adverse impacts on a commercial fishing industry. It is generally not possible to quantify the potential impacts and thus calculate the level of fishing industry activity in the presence of OCS activity. The reasons for this are as follow:

- Past experiences of interactions between the commercial fishing and OCS petroleum industries such as have occurred in the North Sea, the Gulf of Mexico, or Upper Cook Inlet, are not sufficiently well documented to indicate whether changes which occurred in the associated fisheries once OCS activity began were a result of the OCS activity or other factors.
- The nature of the fisheries, OCS activity, and other economic activities may be sufficiently different in the Gulf of Alaska that experiences elsewhere may not
indicate the magnitude of potential impacts in the Gulf of Alaska.

- The impacts that will occur will be determined by the degree of compatibility which exists between the activities of these industries and efforts that are taken to reduce the adverse effects and increase the beneficial effects; but since the Studies Program is not a planning study seeking alternative or mitigating solutions and is not intended to make recommendations for actions, it is inappropriate to make impact projections on the basis of assumptions as to what mitigating actions will be taken.

- Although the fisheries will be potentially impacted by the changes in the biological environment that will result from OCS activities, the potential biological effects are so varied and at this time so poorly understood that there is not sufficient information to generate scientifically defensible projections of the biological changes that will occur and the resulting impacts on the activity of the commercial fishing industry.

This does not, however, mean that no meaningful impact analysis is possible, but it does mean that neither an empirically nor a theoretically sound basis exists which can, for example, be used to forecast a 15 percent reduction in catch in 1995 due to the OCS activity associated with the
high find case. The characteristics of the activities of these industries and, in some instances, the data of past experiences can be used to analyze the nature of the interactions that are expected to occur and to determine which aspects of commercial fishing activity may potentially be affected.

It should be remembered that projected impacts are based on hypothetical levels, timings, and locations of OCS activity reacting with hypothetical levels of fishing activity and, therefore, indicate what may happen if the commercial fishing and OCS petroleum industries attempt particular activities at a particular time and place; the projected impacts, therefore, indicate what can happen and not what will necessarily happen.

**Study Outline**

The remainder of this chapter consists of a brief outline of the subjects addressed in subsequent chapters and appendixes.

- Chapter II includes a discussion of the specific methods and assumptions, (i.e., the models) used to forecast the levels of activity of the Kodiak, Seward, Cordova, and Yakutat commercial fishing industries in the absence of OCS activity associated with lease sale No. 46 and/or No. 55. The specifications of the forecast models are included in the appendix to Chapter II,
- Chapter III is divided into four sub-chapters, one for each of the four commercial fishing industries. Each
sub-chapter includes: (1) a brief introduction to one of the four industries, (2) the non-OCS case projections generated for that industry using the models developed in Chapter II, and (3) an assessment of the feasibility of such forecasts in terms of the projections of population, employment, physical systems, and transportation systems presented in other Studies Program reports and in terms of the components of the market and governmental environments that are not included in the projection models. The introduction to each commercial fishing industry includes selected historical data; the remainder of the historical data are presented in an appendix.

Chapter IV consists of: (1) a summary presentation of both the OCS petroleum scenarios and the associated pertinent projections of economic conditions, physical systems, and transportation systems presented in other SESP reports, (2) an analysis of the potential impacts on the commercial fishing industries of projected OCS activity, and (3) a summary of potential impacts.

Appendix A, which is entitled Fishery Biology, includes reference material that is useful in: (1) analyzing the future of the fisheries for both the OCS and non-OCS cases, and (2) understanding the difficulty associated with projecting the biological base of a fishery. The latter is of particular importance in comprehending the nature of the commercial fishing industry projections.
The topics presented include causes of fluctuation of resource abundance and life histories.

Appendix B is an overview of the Alaska commercial fishing industry and as such it provides a reference to the development, market structure, and statistics of the industry, as well as a description of the market and governmental environments in which the industry operates. This material serves as a basis for determining the market and governmental environments that are expected to exist during the forecast period (1980-2000).

Appendix C consists of tables which document the development of the commercial fishing industries of Kodiak, Seward, Cordova, and Yakutat.
II. MEASURING AND FORECASTING COMMERCIAL FISHING INDUSTRY ACTIVITY

Two of the principal objectives of this study are to document the past levels of activity of the commercial fisheries of Kodiak, Seward, Cordova, and Yakutat and to develop forecast models of fishery activity. The indexes of fishery activity used in this documentation and the models used to project the value of these indexes are the subject of this chapter.

Measures of the Activity of a Commercial Fishing Industry

A commercial fishing industry consists of a harvesting sector and a processing sector. There are also industries or sectors of industries that are directly and perhaps wholly dependent on one or both sectors of the fishing industry but are not strictly part of the fishing industry. Examples of this include, but are not limited to, firms which sell fuel, repair services, and mechanical or electronic gear to fishing boats and firms that provide transportation, construction, and/or maintenance services for fish processing plants. Although the levels of activities of these industries are interdependent, the focus of this study is on the commercial fishing industry, and therefore the measures or indexes of activity discussed in the following two sections are those for the harvesting and processing sectors of the commercial fishing industry and not those for peripheral industries.

HARVESTING

Several of the measures of harvesting activity addressed in this study are quite straightforward and require little explanation; others due to
their less frequent usage and/or more ambiguous meanings require a more complete explanation. Both types of measures are defined and discussed in this section.

**Catch**

Catch refers to the weight and/or value of a harvest during a specific period of time. Typically the weight is stated in pounds and the value is in dollars, however, for herring and groundfish the weight is often stated in tons. When catch is measured in terms of dollars, it is typically the value of the harvest to the fishermen that is being measured. This will, of course, equal the product of the average ex-vessel price of the fish harvested and pounds harvested, where the ex-vessel price is the price, in dollars per pound, paid by whoever buys the fish from a fisherman.

It should be noted that there are two sources of bias in the harvest value and ex-vessel price data that are available: (1) accurate records of the ex-vessel price of each sale have not been kept by the Alaska Department of Fish and Game (ADF&G) or the other governmental agencies (e.g., Commercial Fisheries Entry Commission (CFEC)) which publish average ex-vessel price and/or harvest value data; therefore, these data are estimates and at times rather rough estimates of prices and values, and (2) in addition to the direct payments per pound of fish, processors may on occasion also pay bonuses to fishermen or provide non-monetary rewards such as storage space or assistance in obtaining credit. These
monetary and non-monetary payments that are not made per pound of fish sold are indeed part of the value of the catch to fishermen but they are not included in ADF&G or CFEC estimates of value or average ex-vessel price.

Number of Boats.

"The number of boats that participate in a fishery is a limited measure of fishery activity since the degree of participation measured in terms of the number of landings, days fished, or catch varies greatly among boats. Data on the number of boats are, however, available from the ADF&G and CFEC and, as will be seen, they serve as a basis for estimating employment.

Employment

Employment statistics for the harvesting sector of a commercial fishing industry are not available from the Alaska Department of Labor because fishermen, including crew members, are typically considered to be self-employed and, therefore, are excluded from the Department of Labor's chief source of employment statistics, the quarterly reports of employers. In the absence of historical employment data, employment is defined as participation in a fishery, and the historical and projected time series data of employment by fishery are calculated based on estimates of the number of boats and the average crew size by fishery; that is, employment is defined as the product of the two. This measure of employment does
approximate the number of fishermen who are at one time during the year associated with a fishery but it does not indicate the amount of time spent in a fishery. When the employment data are summed over all the fisheries in a management area to calculate the employment in the harvesting sector of a commercial fishing industry, double counting occurs since a fisherman often participates in more than one fishery. The method used to reduce the latter problem is discussed in a subsequent section.

**Income**

There are numerous ways to define income in the harvesting sector, but the data that are available dictate which definition is used in this study. Alternative measures of income and a discussion of the measure used are presented below.

Gross income, net income, and fishermen's income are three alternative measures of income. Gross income equals the income directly generated by harvesting activities and as such would include all payments both monetary and non-monetary made in exchange for the harvesting activity of vessels. Net income equals gross income minus non-labor costs, and fishermen's income equals the pre-tax monetary and non-monetary income received by the crews including skippers in exchange for the labor services they provide.

The measure of income that is used in this study, harvest value, is an
approximation of gross income which in turn is the basis of the other measures of income. As was mentioned in a previous section, the harvest value data that are available exclude bonuses and non-monetary payments that are made in exchange for harvesting activities and, therefore, understate gross income. But the values of the excluded payments are not available, therefore, the harvest value data as reported by the ADF&G and CFEC are used to approximate gross income. Time series data on net income and fishermen's income are not available nor are the data necessary to accurately estimate them. It is, therefore, not possible to estimate net or fishermen's income on the basis of estimates of gross income. Changes in gross income, however, accurately reflect changes in the other two measures of income if the three measures of income change proportionately. If the cost of fuel and other non-labor costs increase more rapidly than gross income, the rate of growth of gross income will exceed that of net income; however, in the past large increases in ex-vessel prices have tended to prevent this from happening and expected increases in ex-vessel prices may do the same in the future. Differences in the rates of growth of gross and net income and/or changes in crew share agreements can cause a divergence between the rates of growth of gross income and fishermen's income. Due to the complexity and variety of crew share agreements within a fishery and among fisheries, it is not possible to determine if the average crew share is becoming a larger or smaller fraction of gross or net income; it is, therefore, not known which will tend to grow more rapidly, gross income or fishermen's income. Industry sources have indicated, however, that the ratio of fishermen's income to gross income may be decreasing. If this assessment
is and continues to be correct, the forecasted rates of increase in gross income will tend to overstate the rates of increase in fishermen's income.

In addition to being the most readily available measure of income, gross income may also be the most useful concept in terms of community impact analysis. Some of the expenses that are subtracted from gross income in calculating net income are for goods and services purchased locally and the boat's or owner's share that is not included in fishermen's income may be income to a local resident and, therefore, part of the economic base as is local fishermen's income.

Frequency and Seasonality of Ocean Space and Harbor Use

The frequency and seasonality of ocean space and harbor use is the final index of harvesting activity considered. There is very little historical data concerning the movements of fishing vessels. Their use of ocean and harbor space has not been as well monitored and reported as that of larger vessels. ADF&G and CFEC data on the annual number of landings by fishery, however, provide a measure of ocean space use, data of varying levels of detail from the local harbormasters provide measures of harbor use, and ADF&G and CFEC data on the number of boats and landings per month provide a measure of the seasonality of ocean space use.

Local Fishing Activity

Due to the mobility of fishermen and boats among geographically dispersed
fisheries, it is difficult to define local fishing effort in a meaningful way; and, due to the lack of data concerning the expenditure and work patterns of fishermen, it is difficult to measure local effort once a definition is selected. The difficulties of defining and measuring local effort in a way that is useful for local economic base analysis is demonstrated by the following example. Consider two fishermen (1) a fisherman from Cordova who fishes for salmon in Prince William Sound and in Oregon and Washington and who resides in Hawaii during the winter, and (2) a shrimp fisherman from Washington who resides in Kodiak with his family during the shrimp season. The proportions of the Cordova fisherman's Prince William Sound fishing income that is spent in Cordova may not be greater than the proportion of the Washington fisherman's Kodiak fishing income that is spent in Kodiak.

Although precise definitions and measures of local fishing effort are neither meaningful nor feasible, the rough measures of local participation that are available do indicate whether or not a fishery is predominately local in nature. For a fishery in which gear permits are area specific (e.g., salmon, herring, and king crab), the index of local participation is the ratio of locally owned permits to total permits. For the other fisheries, statewide gear permits are issued and the index of local participation equals $P$ in the following equation:

$$P = \frac{(PF/TP)LP}{B}$$

where $PF$ is the number of permits fished statewide, $TP$ is the number of
fishable permits statewide, LP is the number of locally owned permits, B is the number of boats that participated in a local fishery, and a gear permit is defined to be locally owned if the gear permit holder listed the local community as his home address on the gear permit application form.

This index is intended to measure the proportion of harvesting activity that is local. The range of such an index would be from zero to one, with zero indicating no local participation and one indicating no non-local participation. For fisheries with permits that are not area specific, the index can exceed one; each index which exceeded one was set equal to one.

PROCESSING

The indexes of processing activity to be addressed in this study require only brief explanations.

**Number of Plants**

A fish processing plant is defined as a semi-autonomous fish processing facility, therefore, a single firm may have more than one plant in a community or in a management area.

**Employment**

Average monthly and/or average annual employment statistics are used.
Income

Annual income data are used. For small coastal communities of the Gulf of Alaska, more income and employment data are often available for manufacturing of food and kindred products than for food processing or fish processing alone due to confidentiality requirements. When employment data are not available for fish processing alone and when the category for which data are available is dominated by fish processing, the data are reported for the broader category.

Existing Capacity

The concept of processing plant capacity is ambiguous. There are typically a number of constraints of varying strengths and durations. Consider, for example, a canning operation in a plant with unused floor space. It may be possible to process 50 metric tons (110,000 pounds) of fish per day using two ten-hour shifts, but if the machinery cannot be operated at this rate for long before it wears out, the long-term and short-term capacities differ. The long-term capacity is, however, not necessarily less than the short-term capacity since, given time, equipment can be replaced and/or additional equipment can be installed. The measure of capacity reported in this study is intended to approximate the level of output that could be processed on a sustained basis given the existing plant and equipment and assuming fish are available.
Values and prices can be stated in real (i.e., constant) dollars or in nominal (i.e., current) dollars, the difference being that a nominal measure is the number of dollars whereas a real measure is the number of dollars adjusted for changes in the value of a dollar since a base period. For example, the nominal value of the Alaska red salmon harvest increased from $17.5 million in 1961 to $19.2 million in 1975, but since the U.S. Consumer Price Index (CPI) for all goods increased by 80 percent during this period, the real value of the 1975 harvest in terms of 1961 dollars was $10.6 million. In this example, the number of dollars received from the harvest (i.e., the nominal value) increased by 9.7 percent while the amount of goods and services that could be purchased with the dollars received for the harvest (the real value) decreased by 39.4 percent. Since intertemporal comparisons of nominal dollar measures are relatively meaningless during periods of inflation (i.e., during periods in which the CPI is increasing and, therefore, the value or purchasing power of the dollar is decreasing) and since the forecast period of 1980 through 2000 is expected to be characterized by inflation, projections of values and prices are presented in real dollars. But since many people are accustomed to thinking in terms of current or nominal dollars, the projections are also presented in nominal dollars and the real dollar projections use the current period (i.e., 1978) as the base year. The U.S. CPI for all goods and services was approximately 200 at the end of 1978; the real prices and value projections with 1978 as the base year can, therefore, be converted into real prices and
values with 1967 as the base year by dividing by two.

**Forecasting Traditional Commercial Fishing Industry Activity in the Absence of the OCS Development Associated with Lease Sale No. 46 and No. 55**

The models used to forecast the development of the traditional commercial fishing industries of Kodiak, Seward, Cordova, and Yakutat in the absence of OCS activity pursuant to proposed lease sales No. 46 and No. 55 are the topic of the remainder of this chapter.

The fishery development forecasts or scenarios that are constructed are similar to the OCS petroleum development scenarios in that they are based upon estimated or hypothesized levels of resource abundance. A brief outline of the forecast methodology which is used precedes a detailed discussion of the bases of the resource abundance hypotheses and of how they are used to forecast harvesting and processing activity. The methodology is as follows:

- Forecasts of resource abundance provided by the Alaska Department of Fish and Game (ADF&G) or the North Pacific Fisheries Management Council (NPFMC) or based on historical catch data are used to forecast catch.

- The catch forecasts serve as bases for projecting the other indexes of harvesting and processing activity.
The feasibility of the projections is evaluated in terms of the economic and demographic conditions, transportation systems, and local public services hypothesized in associated SESP reports or elsewhere in this report.

**Harvesting**

Resource abundance is the principal determinant of harvesting and subsequent processing activity in all but a few of the traditional fisheries of Alaska. In a majority of these fisheries, quotas set by the Alaska Department of Fish and Game (ADF&G) or the North Pacific Fisheries Management Council (NPFMC) on the basis of its assessments of resource abundance are binding constraints, that is, in any one year-and fishery the catch would be larger if it were not for the quotas. The salmon, herring, halibut, king crab, Tanner crab, and shrimp fisheries of the Gulf of Alaska are typically in this group of fisheries. For a small number of relatively minor traditional fisheries, such as those for Dungeness crab, razor clams, and scallops, resource abundance is a major but perhaps not the principal determinant of fishery activity. The economic conditions are such that it is not profitable for fishermen to harvest the maximum amount the ADF&G or the NPFMC thinks is acceptable. For these fisheries the market constraints are binding, not the quotas based on resource abundance. The market constraints are, however, in part determined by resource abundance. Catch per unit effort and thus costs per unit harvested are related to resource abundance and the ex-vessel price is directly related to the quality of the fish which, in
turn, is related to stock abundance. The quality of the catch is influenced by resource abundance because changes in abundance are often accompanied by changes in age and size structure of the stock.

The dependence of commercial fishing activity on resource abundance creates forecasting problems because the prediction of resource abundance, within reasonable confidence limits, presupposes detailed knowledge of a number of physical and biological processes operating in the marine environment. The need for detailed information can be seen in the prediction that a $0.8^\circ C$ temperature anomaly in the southern Bering Sea can result in a 11,300 metric ton (24.9 million pound) change in herring production (Laevastu, 1978). Pioneering efforts in the short-term assessment of fisheries production are now taking place in the form of complex computer simulation models. Since the extension of these pioneering efforts to the Gulf of Alaska is beyond the scope of this study, such models have not been used to forecast resource abundance. The forecasts of stock abundance that are used are provided by the ADF&G and the NPFMC or are based on historical catch. The use of these forecasts of stock abundance as a basis for projecting the indexes of harvesting activity is discussed in the following sections.

**Catch by Weight**

Similar types of resource abundance forecasts are not available from the ADF&G and/or NPFMC for all the commercial fisheries of the Gulf of Alaska, therefore, it is not appropriate to apply the same method of
forecasting catch to all the fisheries. The nature of the resource abundance forecasts and the ways they are used to project catch are discussed by species.

**Salmon.**

The ADF&G has stated short-term and long-term catch objectives by management area for the commercially important species of salmon. These objectives are based on historical catch data and on both public and private fishery development programs including enhancement and rehabilitation. The method used to forecast annual catch based on ADF&G's catch objectives is as follows:

2. The annual catch is increased from 1980 through 1985 at the rate that will result in the 1985 catch being equal to the short-term objective. For example, if the mean catch for 1973-1977 is 1.0 million pounds and the short-term objective is 1.25 million pounds, the 1980 and the 1985 catch forecasts would be 1.0 and 1.25 million pounds respectively and the annual rate of growth during the period would be 4.5 percent.
The annual catch is increased from 1985 through 2000 at the rate that will result in the year 2000 catch being equal to the long-term catch objective.

If the short-term objective is less than the five year mean, the annual catch for 1980 through 1985 is set equal to the short-term objective.

For the salmon fisheries which are of minor importance to commercial fishermen and for which there are no stated objectives, annual catch for the forecast period (i.e., 1980-2000) is set equal to the five year mean.

The resulting forecasts of annual catch by species are then allocated among gear types (e.g., purse seine, drift gillnet, etc.) on the basis of the historical allocations of catch by species by gear type.

The mean five year catch, the short-term and long-term catch objectives, the resulting rates of growth, and the allocation factors are summarized in Table 2.1.

Halibut.

The NPFMC and the International Pacific Halibut Commission (IPHC) have
TABLE 2.1
BASIS OF SALMON CATCH PROJECTIONS

Kodiak

<table>
<thead>
<tr>
<th></th>
<th>Kings</th>
<th>Reds</th>
<th>Pinks</th>
<th>Cohos</th>
<th>Chums</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Catch 1973-1977 (1,000 lbs)</td>
<td>9.2</td>
<td>2,565</td>
<td>19,258</td>
<td>158</td>
<td>4,316</td>
</tr>
<tr>
<td>Short Term Objective (1,000 lbs)</td>
<td>--</td>
<td>3,571</td>
<td>27,778</td>
<td>--</td>
<td>6,327</td>
</tr>
<tr>
<td>Long Term Objective (1,000 lbs)</td>
<td>--</td>
<td>5,952</td>
<td>31,746</td>
<td>--</td>
<td>6,790</td>
</tr>
<tr>
<td>Rate of Growth 1980-1985</td>
<td>0%</td>
<td>6.85%</td>
<td>7.60</td>
<td>0%</td>
<td>7.95%</td>
</tr>
<tr>
<td>Rate of Growth 1986-2000</td>
<td>0%</td>
<td>3.47%</td>
<td>0.09%</td>
<td>0%</td>
<td>0.48%</td>
</tr>
<tr>
<td>Catch Allocated to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purse Seine Fleet</td>
<td>92.8%</td>
<td>75.0%</td>
<td>90.0%</td>
<td>70.0%</td>
<td>94.2%</td>
</tr>
<tr>
<td>Beach Seine</td>
<td>0.0%</td>
<td>0.5%</td>
<td>1.3%</td>
<td>20.0%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Set Gillnet Fleet</td>
<td>7.2%</td>
<td>24.5%</td>
<td>8.7%</td>
<td>10.0%</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

Cook Inlet

<table>
<thead>
<tr>
<th></th>
<th>Kings</th>
<th>Reds</th>
<th>Pinks</th>
<th>Cohos</th>
<th>Chums</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Catch 1973-1977 (1,000 lbs)</td>
<td>260</td>
<td>8,206</td>
<td>4,424</td>
<td>1,250</td>
<td>6,279</td>
</tr>
<tr>
<td>Short Term Objective (1,000 lbs)</td>
<td>176</td>
<td>8,930</td>
<td>5,952</td>
<td>1,874</td>
<td>6,329</td>
</tr>
<tr>
<td>Long Term Objective (1,000 lbs)</td>
<td>1,540</td>
<td>8,930</td>
<td>9,127</td>
<td>2,249</td>
<td>6,329</td>
</tr>
<tr>
<td>Rate of Growth 1980-1985</td>
<td>15.55%</td>
<td>0.0%</td>
<td>2.89%</td>
<td>1.22%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Rate of Growth 1986-2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catch Allocated to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purse Seine Fleet</td>
<td>0.1%</td>
<td>2%</td>
<td>37%</td>
<td>1.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Drift Gillnet Fleet</td>
<td>5.6%</td>
<td>55%</td>
<td>17%</td>
<td>35%</td>
<td>80%</td>
</tr>
<tr>
<td>Set Gillnet Fleet</td>
<td>94.3%</td>
<td>43%</td>
<td>46%</td>
<td>63.4%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Continued on next page.,
## TABLE 2.1'
(Continued)

### Prince William Sound

<table>
<thead>
<tr>
<th></th>
<th>Kings</th>
<th>Bod</th>
<th>Pinks</th>
<th>Cohos</th>
<th>Chum$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Catch 1973-1977 (1,000 lbs)</td>
<td>700</td>
<td>5,303</td>
<td>12,000</td>
<td>1,380</td>
<td>3,433</td>
</tr>
<tr>
<td>Short Term Objective (1,000 lbs)</td>
<td>700</td>
<td>4,170</td>
<td>13,000</td>
<td>1,500</td>
<td>3,620</td>
</tr>
<tr>
<td>Long Term Objective</td>
<td>700</td>
<td>5,360</td>
<td>21,000</td>
<td>1,500</td>
<td>5,420</td>
</tr>
<tr>
<td>Rate of Growth 1980-1985</td>
<td>0%</td>
<td>1.75%</td>
<td>1.70%</td>
<td>1.05%</td>
<td></td>
</tr>
<tr>
<td>Rate of Growth 1986-2000</td>
<td>0%</td>
<td>1.69%</td>
<td>3.45%</td>
<td>0.00%</td>
<td>2.73%</td>
</tr>
<tr>
<td>Percentage Allocated to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purse Seine Fleet</td>
<td>1%</td>
<td>6%</td>
<td>92%</td>
<td>3%</td>
<td>72%</td>
</tr>
<tr>
<td>Drift Gillnet Fleet</td>
<td>97%</td>
<td>92%</td>
<td>7%</td>
<td>97%</td>
<td>27%</td>
</tr>
</tbody>
</table>

### Yakutat

<table>
<thead>
<tr>
<th></th>
<th>Kings</th>
<th>Bod</th>
<th>Pinks</th>
<th>Cohos</th>
<th>Chum$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Catch 1973-1977 (1,000 lbs)</td>
<td>67</td>
<td>816</td>
<td>148</td>
<td>610</td>
<td>66</td>
</tr>
<tr>
<td>Short Term Objective (1,000 lbs)</td>
<td>67</td>
<td>1,257</td>
<td>353</td>
<td>683</td>
<td>88</td>
</tr>
<tr>
<td>Long Term Objective</td>
<td>67</td>
<td>2,094</td>
<td>373</td>
<td>1,036</td>
<td>132</td>
</tr>
<tr>
<td>Rate of Growth 1980-1985</td>
<td>0%</td>
<td>9.0%</td>
<td>19%</td>
<td>2.3%</td>
<td>6%</td>
</tr>
<tr>
<td>Rate of Growth 1986-2000</td>
<td>0%</td>
<td>3.4%</td>
<td>0.4%</td>
<td>2.82%</td>
<td>2.75%</td>
</tr>
<tr>
<td>Allocation in 1,000 lbs to the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Gillnet Fleet</td>
<td>66.0%</td>
<td>100.0%</td>
<td>85.4%</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>Troll Fleet</td>
<td>34.0%</td>
<td>0.0%</td>
<td>14.6%</td>
<td>0.0%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

**NOTE:** Catch objectives are provided by the Alaska Department of Fish and Game.
jointly set both short-term and long-term catch objectives for the Gulf of Alaska. Since the halibut fleet is very mobile with each boat typically fishing many areas in the Gulf of Alaska, the NPFC/IPHC objectives for Area 3 are used to forecast catch. Area 3 includes the Gulf of Alaska (see Figure 2.1). The forecast method is as follows:

- The short-term catch objective is less than the five year mean because it is not believed that the past level of catch will permit the desired recovery. The annual catch for 1980 through 1985 is, therefore, set equal to the short-term objective.

- The annual catch is increased from 1985 through 2000 at the rate that results in the year 2000 catch being equal to the long-term catch objective.

- The catch forecasts for Area 3 are allocated to a community on the basis of the historical ratio of halibut landings in the community to Area 3 catch.

The numerical specifications of this forecast method are summarized in Table 2.2.

Herring.

Neither the ADF&G nor the NPFMC currently has catch objectives for the
Figure 2.1 Internation Pacific Halibut Commission Management Areas
<table>
<thead>
<tr>
<th><strong>TABLE 2.2</strong></th>
<th><strong>BASIS OF HALIBUT CATCH PROJECTIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Catch Area 3 1973-1977 (1,000 lbs)</strong></td>
<td>13,648</td>
</tr>
<tr>
<td><strong>Short Term Objectives (1,000 lbs)</strong></td>
<td>11,000</td>
</tr>
<tr>
<td><strong>Long Term Objectives (1,000 lbs)</strong></td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Short Term Rate of Increase in Catch</strong></td>
<td>--</td>
</tr>
<tr>
<td><strong>Long Term Rate of Increase in Catch</strong></td>
<td>3.85%</td>
</tr>
</tbody>
</table>

**ALLOCATION OF CATCH BY COMMUNITY**

- **Kodiak** 40%
- **Seward** 30%
- **Cordova** 3%
- **Yakutat** 1.5%

**Source:** Alaska Sea Grant Program

\(^1\)Catch objectives are provided by the International Pacific Halibut Commission and the North Pacific Fisheries Management Council.
Gulf of Alaska herring fisheries. The catch forecasts for these fisheries are, therefore, based on information provided by the ADF&G area biologists (see Table 2.3).

King Crab.

Short-term stock assessments provided by the NPFMC and/or ADF&G area shellfish biologist are used as the basis of the catch forecasts. The catch forecasts were held constant during the forecast period or increased at a constant rate during the first five years of the forecast period depending upon the information provided by each area shellfish biologist. The numerical specifications of the king crab catch forecasts are presented in Table 2.4.

Tanner Crab.

The stock abundance information that is available for Tanner crab and the methods of forecasting catch based on such information parallel those of the king crab fishery. The specifications of the Tanner crab catch forecasts appear in Table 2.5.

Dungeness Crab.

Neither the ADF&G nor the NPFMC has sufficient stock assessment data to estimate current or future resource abundance. In the absence of such information, historical catch data and the assessments of the local
TABLE 2.3

BASIS OF HERRING CATCH PROJECTIONS

<table>
<thead>
<tr>
<th>Area</th>
<th>Estimated Sustainable Yield (1,000 Pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kodiak</td>
<td>4,000</td>
</tr>
<tr>
<td>Cook Inlet</td>
<td>6,436</td>
</tr>
<tr>
<td>Prince William Sound</td>
<td></td>
</tr>
<tr>
<td>Roe Herring</td>
<td>10,000</td>
</tr>
<tr>
<td>Roe on Kelp</td>
<td>417</td>
</tr>
</tbody>
</table>

These estimates of the sustainable yield are based on the historical catch and information provided by the area finfish biologists.
<table>
<thead>
<tr>
<th>Location</th>
<th>Average Annual Catch 1973-1977 (1,000 lbs)</th>
<th>Short Term Objective (1,000 lbs)</th>
<th>Long Term Objective (1,000 lbs)</th>
<th>Short Term Rate of Increase in Catch</th>
<th>Long Term Rate of Increase in Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kodiak</strong></td>
<td>18,446</td>
<td>18,446</td>
<td>30,000</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Cook Inlet</strong></td>
<td>3,674</td>
<td>4,211</td>
<td>4,211</td>
<td>2.77%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Prince William Sound</strong></td>
<td>90</td>
<td>100</td>
<td>100</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Yakutat</strong></td>
<td>2</td>
<td>2.7</td>
<td>6.6</td>
<td>6.15%</td>
<td>6.15%</td>
</tr>
</tbody>
</table>

1 NPFMC Fishery Management Plan for Alaska King Crab, 1977; also Martin Eaton, ADF&G Westward Region Area Shellfish Biologist.
2 Fishery Management Plan for Alaska King Crab, 1977; also Tom Schroeder, ADF&G Area Management Biologist for Cook Inlet.
3 Alan K. Kimker, ADF&G Shellfish Biologist for Prince William Sound.
4 Based on Historical Catch.
### TABLE 2.5

**BASES OF TANNER CRAB CATCH PROJECTIONS**

**Kodiak**

<table>
<thead>
<tr>
<th></th>
<th>Average Annual Catch 1973-1977 (1,000 lbs)</th>
<th>Short Term Objective (1,000 lbs)</th>
<th>Long Term Objective (1,000 lbs)</th>
<th>Short Term Rate of Increase in Catch</th>
<th>Long Term Rate of Increase in Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24,473</td>
<td>28,000</td>
<td>28,000</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Cook Inlet**

<table>
<thead>
<tr>
<th></th>
<th>Average Annual Catch 1973-1977 (1,000 lbs)</th>
<th>Short Term Objective (1,000 lbs)</th>
<th>Long Term Objective (1,000 lbs)</th>
<th>Short Term Rate of Increase in Catch</th>
<th>Long Term Rate of Increase in Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6,541</td>
<td>5,313</td>
<td>5,313</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**Prince William Sound**

<table>
<thead>
<tr>
<th></th>
<th>Average Annual Catch 1973-1977 (1,000 lbs)</th>
<th>Short Term Objective (1,000 lbs)</th>
<th>Long Term Objective (1,000 lbs)</th>
<th>Short Term Rate of Increase in Catch</th>
<th>Long Term Rate of Increase in Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7,241</td>
<td>5,000</td>
<td>5,000</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Yakutat**

<table>
<thead>
<tr>
<th></th>
<th>Average Annual Catch 1973-1977 (1,000 lbs)</th>
<th>Short Term Objective (1,000 lbs)</th>
<th>Long Term Objective (1,000 lbs)</th>
<th>Short Term Rate of Increase in Catch</th>
<th>Long Term Rate of Increase in Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,650</td>
<td>3,000</td>
<td>3,000</td>
<td>12.55%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

---

1. NPFMC Fishery Management Plan for the Commercial Tanner Crab Fishery off the Coast of Alaska, 1978; also Martin Eaton, ADF&G Westward Region Area Shellfish Biologist.
2. NPFMC Fishery Management Plan for the Commercial Tanner Crab Fishery off the Coast of Alaska, 1978; also Tom Schroeder, ADF&G Area Management Biologist for Cook Inlet.
shellfish biologists are used to forecast the Allowable Biological Catch (ABC) for each Dungeness crab fishery. However, since the Dungeness crab fisheries have typically been underutilized, that is, catch has often been below the ABC, market conditions and not resource abundance have been the binding constraint. To project catch in this fishery, it is therefore necessary to consider future market conditions. It is believed that favorable market conditions (e.g., increasing ex-vessel prices and the lack of growth of other crab stocks) will result in the Dungeness crab fisheries becoming fully utilized during the forecast period. In the past few years, annual catch has approached the ABC in Prince William Sound and Cook Inlet, therefore, the projected catch in these areas is held constant during the forecast period. In the Kodiak and Yakutat area, catch has been well below the ABC. In these areas, the 1980 and the 2000 catch forecasts are set equal to the five-year mean for 1973-1977 and the ABC respectively, and catch is projected to increase at a constant rate over the forecast period. The specifications of the Dungeness crab catch forecasts are in Table 2.6.

Shrimp.

It is very difficult to assess future stock abundance of shrimp in the Gulf of Alaska. In the Kodiak area which has dominated the Gulf shrimp fisheries, future stock abundance assessment is difficult because of the apparent dramatic decline in stock abundance in the past three years and the uncertainty as to the possibility and timing of a recovery. Stock abundance is difficult to assess in the Prince William Sound and Yakutat
### Table 2.6

**Basis of Dungeness Crab Catch Projections**

#### Kodiak

<table>
<thead>
<tr>
<th></th>
<th>1,000 lbs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Catch</strong></td>
<td>1973-1977</td>
<td>713</td>
</tr>
<tr>
<td><strong>Short Term Objective</strong></td>
<td>1,000</td>
<td>923</td>
</tr>
<tr>
<td><strong>Long Term Objective</strong></td>
<td>1,000</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Short Term Rate of Increase in Catch</strong></td>
<td></td>
<td>5.3%</td>
</tr>
<tr>
<td><strong>Long Term Rate of Increase in Catch</strong></td>
<td></td>
<td>5.3%</td>
</tr>
</tbody>
</table>

#### Cook Inlet

<table>
<thead>
<tr>
<th></th>
<th>1,000 lbs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Catch</strong></td>
<td>1973-1977</td>
<td>322</td>
</tr>
<tr>
<td><strong>Short and Long Term Objectives</strong></td>
<td>1,000 lbs</td>
<td>450</td>
</tr>
<tr>
<td><strong>Rate of Increase in Catch</strong></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

*It is assumed that annual catch will equal 450,000 pounds from 1980-2000.*

#### Prince William Sound

<table>
<thead>
<tr>
<th></th>
<th>1,000 lbs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Catch</strong></td>
<td>1973-1977</td>
<td>642</td>
</tr>
<tr>
<td><strong>Short and Long Term Objectives</strong></td>
<td>1,000 lbs</td>
<td>1,250</td>
</tr>
<tr>
<td><strong>Rate of Increase in Catch</strong></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

*It is assumed that annual catch will equal 1,250,000 pounds from 1980-2000.*

#### Yakutat

<table>
<thead>
<tr>
<th></th>
<th>1,000 lbs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Annual Catch</strong></td>
<td>1973-1977</td>
<td>1,035</td>
</tr>
<tr>
<td><strong>Short Term Objective</strong></td>
<td>1,000</td>
<td>1,180</td>
</tr>
<tr>
<td><strong>Long Term Objective</strong></td>
<td>1,000</td>
<td>1,750</td>
</tr>
<tr>
<td><strong>Short Term Rate of Increase in Catch</strong></td>
<td></td>
<td>2.65%</td>
</tr>
<tr>
<td><strong>Long Term Rate of Increase in Catch</strong></td>
<td></td>
<td>2.65%</td>
</tr>
</tbody>
</table>

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1. Based on Historical Catch; also Martin Eaton, ADF&G Westward Region Area Shellfish Biologist.
2. Based on Historical Catch; also Tom Schroeder, ADF&G Area Management Biologist for Cook Inlet.
3. Based on Historical Catch; also Alan K. Kimker, ADF&G Shellfish Biologist for Prince William Sound.
4. Based on Historical Catch.
areas for quite a different reason; in these areas, the shrimp resources have not been heavily fished for sustained periods, and it is therefore not known what levels of catch the existing resources can support. The Cook Inlet shrimp fishery is a mature fishery that has been and is expected to be relatively stable. The following catch projections are based on discussions with the area shellfish biologists:

- The annual Kodiak catch forecast for 1980 through 1989 is 4,540 metric tons (10 million pounds) and the forecast for 1990 through 2000 is 9,070 metric tons (20 million pounds).

- The Cook Inlet and Prince William Sound forecasts are held constant during the forecast period at 2,540 metric tons (5.6 million pounds) and 227 metric tons (500,000 pounds) respectively.

- No estimate is made for the Yakutat shrimp fishery which was inactive in all but one of the past ten years.

Razor Clams.

The razor clam fisheries in the Kodiak and Prince William Sound areas are today minor fisheries in comparison to other fisheries or in comparison to the past levels of activity in the razor clam fisheries. Decreases in resource abundance and adverse market conditions have caused the decline in these fisheries, however, the stocks appear to be increasing and the market conditions are improving. Therefore, a recovery
of the fisheries is expected. Constant incremental increase in stock abundance and catch are forecasted,

**Scallops.**

The scallop resources of the Gulf of Alaska were heavily utilized from 1968 through 1975. The resulting decrease in stock abundance and unfavorable market conditions have all but eliminated the scallop fishery in the Gulf of Alaska. The scallop resources are not believed to be sufficient to support more than a few boats, therefore no catch forecasts have been made.

**Catch By Value, Income**

The measure of the value of catch or harvesting income being used in this report is the product of the catch by weight and the *ex-vessel* price; therefore projections of catch by value require forecasts of both the catch by weight and the *ex-vessel* price. The methods used to forecast the former were discussed in the previous section; the methods used to forecast *ex-vessel* prices are the subject of this section.

*Ex-vessel* prices are estimated by management area fishery using a two-stage process:

1. Each statewide *ex-vessel* price is forecasted based on
   - an empirically determined relationship between *ex-vessel
prices and the determinants of demand and (2) the expected values of the determinants.

- Each management area ex-vessel price is projected based on the actual 1979 management area price and the projected increases in the statewide price.

The specifications of the statewide ex-vessel price models and the past and expected values of the determinants of demand are presented in Appendix 1. An example of how a forecast of a statewide price is used to forecast a management area price is as follows: if the statewide model for razor clams forecasts ex-vessel prices of $1.00 and $1.50, respectively, for 1979 and 1986 and if the actual 1979 ex-vessel price of razor clams is $0.90 in management area A, the 1986 ex-vessel price forecast for area A razor clams is $1.35 ($0.90 X $1.50/$1.00). This method of forecasting management area prices based on forecasts of statewide prices is valid if statewide prices and management area prices change proportionately; the regression results presented in Table 2.7 imply that they do.

There were two reasons for using statewide ex-vessel price models to forecast management area prices rather than directly forecasting area prices: (1) greater precision is usually achieved in forecasting with a longer time series, and longer time series are typically available for statewide prices than for management area prices and (2) the number of ex-vessel price models required was one fourth the number required had individual management area models been used.
TABLE 2.7
THE STATISTICAL RELATIONSHIP BETWEEN STATEWIDE AND PORT EX-VESSEL PRICES

**Halibut**

Kodiak ex-vessel price = \( 0.0276 + 0.855 \) P

Seward ex-vessel price = \( 0.0265 + 0.860 \) P

Dungeness Crab

Kodiak ex-vessel price = \( 0.0187 + 0.785 \) P

Seward ex-vessel price = \( 0.0292 + 0.965 \) P

Cordova ex-vessel price = \( 0.0045 + 0.979 \) P

Yakutat ex-vessel price = \( 0.00621 + 0.986 \) P

King Crab

Kodiak ex-vessel price = \( -0.0018 + 1.128 \) P

Seward ex-vessel price = \( 0.0216 + 1.153 \) P

Cordova ex-vessel price = \( 0.0705 + 0.927 \) P

Yakutat ex-vessel price = \( 0.0313 + 0.838 \) P

**Notes:**
- P = the statewide average ex-vessel price for each fishery.
- The statistical relationship is determined through t-tests and R-squared values, indicating the strength of the association between state and port prices.
Regression analysis did not successfully explain the past changes in the statewide ex-vessel prices of herring, shrimp, or razor clams; therefore, an alternative forecasting method is required for these fisheries. The projections of statewide ex-vessel prices for these fisheries are based on the historical rates of increase in real ex-vessel prices, the expected rate of increase of the Consumer Price Index (CPI), and expected changes in market conditions. A brief explanation of the projected rate of increase in the real ex-vessel price for each fishery in which regression analysis is inappropriate and the reasons regression analysis was not successful are presented below.

The statewide price of herring is difficult to project using historical data because there are distinct markets and prices for herring products such as roe herring, roe on kelp, and bait, and because the relative importance of these products has dramatically changed in the last ten years as a market for Alaska roe products has been established and expanded. In 1961 the statewide ex-vessel price for herring was $0.01 per pound and in 1979 the ex-vessel price for roe herring, which now dominates the herring fisheries, was approximately $1.00 per pound. This phenomenal increase in the price of herring during the past 18 years was due to a change in product mix and improvements in marketing opportunities that are not expected to occur again. The large price increases have resulted in a significant increase in fishery activity which is expected to moderate future price increases. The real ex-vessel price of herring is thus projected to increase at one percent a year; therefore the nominal price will increase at the rate of increase of the CPI plus 1 percent.
During most of the period for which statewide ex-vessel price data are available, the shrimp fishery was expanding rapidly and prices were relatively stable. During the last three years, there has been a dramatic decline in the fishery and the prices have increased significantly. From 1961 through 1978, the nominal ex-vessel price of shrimp increased from $0.04 to $0.165 per pound. In this same period, the CPI increased from 89.6 to 195.4, therefore, the real price in 1961 dollars increased from $0.04 to $0.076. The 90 percent increase in the real price in 17 years gives an average annual rate of increase of approximately 4 percent. Rapid increases in supply, such as those that moderated price increases through the mid 1970s, are not expected during the forecast period. The real ex-vessel price for shrimp is therefore projected to increase at an annual rate of 5 percent throughout the forecast period.

It is difficult to forecast the ex-vessel price of razor clams because the growth that is expected to occur in that fishery is principally due to increased marketing opportunities for clams for human consumption, while the price during the past ten years has been principally determined by the demand for razor clams as bait for the Dungeness crab fishery. The increases in supply that are expected will tend to moderate price increases and the nominal ex-vessel price is expected to increase at the same rate as the CPI.
In projecting the number of boats that will participate in a fishery, it is useful to distinguish between the fisheries in which entry is restricted by the Commercial Fisheries Entry Commission (CFEC) and those in which entry is not limited. The CFEC limits the number of boats that can operate in any one Gulf of Alaska herring roe or salmon fishery at any one time by requiring that a gear permit holder be on each boat and by limiting the number of permits issued for each fishery; and in practice, the number of boats participating in each fishery is therefore constrained. If the policies of the CFEC impose a binding constraint on the number of gear permit holders and boats that participate in a fishery, the CFEC’s policies alone determine the number of boats. The gear permits are transferable, and the high market values of permits indicate that the constraints are in fact binding. Therefore, to successfully forecast the number of boats in a fishery, one must know what the CFEC will do. Unfortunately, no one, including the CFEC, knows when, or if, or to what extent, it will increase the number of permits by issuing more permits or decrease the number of permits by initiating a buy-back program for a particular fishery. Due to the technical and political problems associated with changing the number of permits, the CFEC is not expected to radically change the number of gear permits. Another reason for expecting the number of permits to be held relatively constant is that the principal objective of the CFEC is to assure that the fisheries are economically viable; that is, that they provide a fair return to participants in the fishery. But once entry is limited and as long as the market value of permits is greater than zero, the market mechanism tends to assure fair
rates of return. If the rate of return is exceptionally high in one fishery, the price of a permit in that fishery will increase, the cost of participating in that fishery will increase, and the rate of return will decrease until it equals the expected rate of return in other fisheries. Similarly, if the rate of return is exceptionally low in one fishery, the price of the permit will decrease, the cost of participation will decrease, and the rate of return will increase until it equals the expected rate of return in other fisheries. Due to this automatic adjustment mechanism, it is not necessary for the CFEC to adjust the number of gear permits to maintain fair rates of return.

The expectation that the CFEC will not dramatically change the number of permits is also reflected in the high market values of permits; if it were generally believed within the industry that additional permits would soon be readily available, the permits would not be selling for tens of thousands of dollars. It should also be noted that the harvesting capacity of the existing number of boats in each fishery exceeds the projected catch for the forecast period, so it will not be necessary to increase the number of permits to allow full utilization of the fishery resources.

For the fisheries in which entry is not limited by the CFEC, the number of boats is projected based on the historical relationship between catch and the number of boats and on projected catch. The specification of these relationships for each fishery is summarized in Appendix 1.
**Number of Fishermen**

The number of fishermen is used as the measure of harvesting employment. For each fishery, the employment forecast is the product of the projected number of boats and the average crew size. The latter is held constant for the forecast period since crew sizes are expected to remain constant.

When the forecasts of the number of boats or fishermen are summed to project the number participating in a management area’s fisheries, double counting of both boats and fishermen occurs since each is counted once for each fishery in which it participates. For example, a fisherman who participates in the purse seine salmon fishery, the purse seine herring fishery, and the razor clam fishery would be counted three times. The same would be true of a boat which participated in these fisheries. Although this problem cannot readily be eliminated given the available data, it can be reduced by adjusting for the double counting which occurs within the shellfish fisheries and within the salmon fisheries. The method of adjustment is as follows. The number of boats participating in each shellfish fishery and the number of boats participating in the shellfish fishery as a whole, are available from the ADF&G. The same data are available for the salmon fisheries. The ratio of the sum of the boats in each shellfish (or salmon) fishery to the total number of boats in all shellfish (or salmon) fisheries provides a measure of the double counting which occurs in the shellfish (or salmon) fishery.
The ratio indicates the degree to which the double counting of boats occurs in a fishery; for example, if in 1977 the ratio for the shellfish fishery is 1.5, this indicates that the sum of boats overstates the actual total by 50 percent. Using such ratios to adjust the forecasts of total boats and total fishermen participating in a management area's fisheries reduces but does not eliminate double counting. There are two reasons for this: (1) the ratio correctly identified the degree to which double counting of boats occurs within the fishery, but since fishermen are more mobile than boats, the ratio tends to understate the actual double counting of fishermen, and (2) no correction is made for the double counting which occurs due to the mobility of men and boats among the shellfish, salmon and other fisheries. A more appropriate adjustment mechanism is not, however, readily available.

**Number of Landings**

Forecasts of the number of landings provide a measure of fishing boat traffic and harbor use. The forecasts are based on the historical relationship between the number of landings, catch, and the number of boats, and on forecasts of catch and the number of boats. The specifications of the relationships are summarized by fishery in Appendix 1.

**PROCESSING**

Processing plant activity is measured in terms of the quantity of inputs used and in terms of the income of processing plant employees. The
following sections discuss the methods used to project these measures of activity.

**Input Requirements**

The requirement for a particular input such as labor, electric power, or water can change due to a change in any or all of the following:

- the quantity of fish processed
- the product mix
- the technology
- the price of one input relative to the prices of other inputs.

The potential effect on input requirements of each type of change and a method of dealing with the uncertainty they present for input requirements are presented in this section.

For a particular area, the quantity of fish processed equals the quantity of fish landed if fish in the round are neither imported nor exported. Unfortunately this condition is not met in any of the management areas being studied, and the data required to determine the relationship between catch and processing within each area are not available. If, however, the relationship between catch and processing is relatively stable, the quantities harvested and processed increase at the same rate. Due to the lack of time series data on interregional movements of fish in the round and due to the rapid changes that are possible in such movements, there is substantial uncertainty concerning how the relationship between the quantities harvested and processed...
will change. An additional source of uncertainty as to the quantity of fish that will be processed is the groundfish industry. This industry has not developed sufficiently to determine the quantity of groundfish that will be processed in each area.

Another source of uncertainty is the relationship between the quantity of fish processed and the per-unit of product requirement for a particular input. If there are economies of scale the per-unit input requirement decreases as output increases, and therefore input requirements increase less rapidly than output. Conversely, if the production process is characterized by diseconomies of scale, input requirements increase more rapidly than output. The level of output can also affect the per-unit input requirement of a particular input if the desirable input mix changes with output. For example, a relatively capital-intensive method of production may only be feasible at high levels of output. The nature of the production function in the fish processing industry is not sufficiently well understood to determine how the per-unit requirement for each input is related to output.

The product mix, that is the species that are processed, and the product form of each species that is produced affect the input requirements. For example, relatively more labor and electric power are required to produce frozen salmon than to produce canned salmon, and relatively more water is required to process shrimp than to process crab. The data required to account for the changes in input requirements that will result from changes in product mix in terms of species processed are not available; however, there are discernible impacts due to changes in product mix with respect
Frozen products have steadily increased in importance relative to canned products. This is true for most finfish and shellfish species. This change is expected to continue; therefore, everything else being constant, the requirements for labor and electric power are expected to increase more rapidly than the quantity processed.

The effect of technical progress on the requirement of a particular input is ambiguous. If technical progress is characterized by proportional increases in the productivity of all inputs, the input requirements per unit of output will be reduced for all inputs. However, if it is characterized by a more rapid increase in the productivity of one input, the requirement for that input may increase as it is substituted for what have become relatively less productive inputs. The effect on input requirements therefore depends on both the rate and type of technical progress that will occur, and neither can be forecasted with much certainty.

Changes in relative input prices tend to change the input mix that processing plants use. For example, if the price of labor increases relative to the price of physical capital, processors will tend to substitute capital for labor, and everything else being constant, the labor requirement will decrease and the requirements for more automated processing equipment and electric power will increase. The change in input requirements that will occur due to changes in relative input prices will depend on both the extent to which relative prices change and the responsiveness of processors to such changes. Although few definitive statements can be made about either, it appears that the relative price of electric power will continue to increase and that the
increase will be substantial enough that processors will tend to substitute other inputs for electric power. For example, more expensive but more efficient freezer units will be used.

The preceding discussion of the factors that will determine input requirements indicates that there are a variety of reasons that input requirements cannot be forecasted with a high degree of certainty. To account for the uncertainty associated with both the rate of development of the groundfish industry and the factors that determine processing input requirements per unit of harvest, four sets of input requirement forecasts are presented. A set of forecasts is presented for both the traditional fisheries and all the fisheries with and without a 2 percent annual decrease in per-unit input requirements. The forecasts for the traditional fisheries are based on the projected changes in management area catch for the traditional fisheries and the current level of input use. For example, if the total traditional catch is projected to increase by 50 percent by 1988, input requirements are projected to increase by 50 percent assuming per-unit requirements do not change, or by 20 percent assuming a 2 percent annual decrease in per-unit requirements. The 1988 input requirements would be 120 percent of the current (i.e., 1977) requirements in the latter case, since \(0.98^{11}\) equals 0.80, and the product of 0.80 and 150 percent is 120 percent. The projected requirements for all fisheries are the sum of the requirements for the traditional fisheries plus the requirements for the groundfish fisheries; the methods used to project the latter are discussed in a separate section. The assumed decrease in per-unit input requirements can be thought of as an increase in efficiency.

The sets of forecasts that do not allow for increased efficiency tend to set an
upper bound on input requirements since the requirements are not expected to increase as rapidly as catch. Technical progress, economies of scale, economies of a more uniform rate of production, increasing input prices, and the gradual substitution of capital for labor will tend to reduce processing input requirements per unit of catch. Therefore, the sets of forecasts that allow for increasing efficiency are perhaps more realistic. A 2 percent rate of increase in efficiency is consistent with the 2.2 percent rate of increase in real income per capita used by the SESP and the long-term historical rate of increase in efficiency for the U.S.

Income

The income of processing plants, defined to equal their payrolls, is the product of employment measured in units of labor services and the average wage rate. Therefore, to forecast income, it is necessary to project the average wage rate and employment. The method used to project the latter was discussed in the previous section. The method used to project the wage rate is based on the historical relationship between the rates of increase in the CPI and the average hourly food processing wage in Alaska, and the projected rate of increase in the CPI. Between 1961 and 1977, the average hourly wage tended to increase 1.184 times faster than the CPI. Based on the assumption that this relationship will continue during the forecast period and based on the Studies Program's optimistic assumption that the CPI will increase at an annual rate of 5.5 percent, the average nominal wage rate will increase by approximately 6.5 percent a year.
The Nature of the Forecasts

The forecasting methodology described in this chapter does not generate projections of harvesting and/or processing activity which exhibit the cyclical fluctuations which have historically been characteristic of the commercial fisheries. In this section, the reasons for not attempting to project cycles and the nature of the forecasts are clarified.

There are three reasons cycles are not forecasted; they are as follows:

1. For many species, the length and amplitude of the cycles are not constant over time, and the determinants of cycles are not sufficiently well understood and/or predictable to allow one to successfully project cycles.

2. A major objective of the ADF&G, with respect to salmon, is to reduce the cyclical fluctuation in the commercial fisheries.

3. The accuracy of the forecasts is not sufficient that forecasts of cyclical deviations would be meaningful.

The accuracy problem in fishery forecasting is one that deserves additional attention. One example of the potential magnitude of the forecasting error is provided by the comparison of the ADF&G 1978 preseason estimate of the Bristol Bay pink salmon return of 3.2 million fish and the actual return of 13.8 million. The preseason forecasts are typically more successful than this one was, and perhaps a better measure of the magnitude of error that can normally be expected is provided by "The Preliminary
Forecasts and Projections for 1979 Salmon Fisheries.” In this publication, the point estimate of the statewide salmon harvest is 72 million fish and the range about this estimate is 50 to 100 million fish, that is, there is approximately a 40 percent range about the point estimate within which the actual harvest can fall without surprising anyone. Another example of the potential error associated with fishery forecasts is provided by the experience of the Kodiak shrimp fishery. Between 1969 and 1977, the shrimp catch ranged from 14,200 metric tons (31.5 million pounds) to 37,300 metric tons (82.2 million pounds) and averaged 24,900 metric tons (54.9 million pounds); then in 1978 it fell to 10,300 metric tons (22.8 million pounds) and is now expected to decline even further. Had long-range catch forecasts been made in the mid 1970s, they would have tended to overstate the catch in the late 1970s and early 1980s by a factor of three or four. This experience and others provide sufficient proof that unforeseen changes in the physical, biological, market, and/or governmental environments of the fisheries can cause a rapid decline in a booming fishery, and they can just as readily create new fisheries or turn marginal fisheries into very productive ones.

The inability to forecast cyclical changes in activity can be minimized by thinking in terms of expected or probabilistic levels of fishery activity; for example, if the 1985 salmon catch forecast for a management area is 20,000 metric tons, the implication is that in the mid 1980s, the catch will on average be 20,000 metric tons. The inability to identify secular trends that are or will be developing is a more fundamental problem for which there is no simple solution. As a result of this problem, the forecasts presented in the following chapter indicate the
levels of commercial fishing industry activity that are expected given the past and present performance of the industry.

Methods Used to Project Harvesting and Processing Activity for the Groundfish Industries

At this early stage in the development of the Alaska groundfish industry, it is not known how or at what rate the industry will develop. Questions as to the size and type of vessels that will dominate the industry, the importance of onboard versus onshore processing, the number of processing lines per fish processing plant, the average productivity per vessel, and the processing labor requirements have yet to be answered. In the absence of such information, the forecasts of the development of this fishery are by necessity based on a set of assumptions. These assumptions are as follow:

1. The allowable biological catch (ABC) for the various groundfish species in the Bering Sea and the Gulf of Alaska will remain at the levels presented in the North Pacific Fisheries Management Council's management plans for the Bering Sea (1979) and the Gulf of Alaska (1978).
2. The domestic fisheries will have completely replaced foreign fisheries by the year 2000.
3. Domestic catch by species or species group will exhibit constant annual rates of growth from the actual catch in 1978 to the ABC in 2000.
4. Catch per boat equals 1,600 metric tons (3,257,000 pounds) in 1978 and will increase at an annual rate of 5 percent.
The average number of landings per boat will be 50 per year.

The average crew size, including the captain, will be five.

The processing plant input of whole fish per man year of processing employment will increase at an annual rate of 3 percent from the current level of 91 metric tons (201,000 pounds).

Landings per processing plant will average 43,500 metric tons (96 million pounds).

The average processing plant will occupy 2,690 square meters (29,000 square feet) of interior space on 0.81 to 1.62 hectares (two to four acres) of land, and use 2.2 million kilowatt hours of electricity and 218 million liters (57.6 million gallons) of water per year. “

The Alaska groundfish catch will be processed onshore in Alaska.

The basis of each assumption is presented below. The data required to forecast the ABC for each species are not available. Some data suggest that the ABC for pollock may tend to increase and that the ABC’s for other species may also tend to change, but the magnitude of the change or, in some cases, the direction of change is not known; the current ABC’s thus provide the best available forecasts.

The domestic groundfish fishery has begun to develop but it is too early to know with a high degree of certainty how rapidly the domestic fishery will develop. There are, however, several reasons for believing that
the domestic groundfish fishery will replace the foreign fishery in the next 20 to 25 years; they are as follow: a goal of the Alaska Bottomfish Development Program is, “To develop within a period of approximately 20 years the domestic utilization of Alaska bottomfish resources to the fullest optimum yield.” (PDBI, 1979, p. 4); the Arthur D. Little report to the Office of the Governor states that, “Full development of Alaska’s bottomfish industry will require 15 to 20 years” (Little, 1978, p. 39); and many of the vessels that have been built for the Alaska shellfish fleets in the past few years have been designed to allow them to enter the groundfish fishery as it becomes more profitable and as the shellfish seasons become shorter. The history of the development of other fisheries and the current impediments to the development of the Alaska groundfish industry suggest that the annual increases in catch will at first be rather small but will become continuously larger as the initial impediments are removed. A growth path resulting from a constant annual rate of growth exhibits this characteristic. The current impediments to development which must be removed for the Alaska groundfish industry to develop and which will be removed as it develops include: the absence of both marketing arrangements between harvesters and processors and well established marketing channels, inadequate harvesting and processing knowledge, the high profitability of alternative traditional fisheries, and the uncertainty of the relative profitability of alternative methods of harvesting and processing.

Current estimates of catch per boat range from less than 1,600 metric tons to over 2,400 metric tons. However, vessel productivity will tend
to increase for the following reason: as the fishery develops, (1) vessels
designed specifically for groundfish will comprise an increasing proportion
of the fleet, (2) average boat size will tend to increase, (3) the
knowledge of resource location and harvesting methods will increase, and
(4) more efficient harvesting methods will be developed. The estimate
of the current catch per boat is based on information provided by
Petersburg Fisheries; the catch per boat of 4,680 metric tons forecasted

The number of landings per boat per year is based on one landing per
five days for 250 days a year; this allows for down time due to bad
weather, repairs, and holidays. The estimate of one landing per five
days is based on data provided by Petersburg Fisheries.

The average crew size will be in part determined by the degree to which
onboard processing occurs and the average catch per trawl; as either
increases, the crew size tends to increase. Mechanization will tend to
hold the crew size at a constant level despite increases in vessel size.
The estimated crew size of five allows for only a minor degree of onboard
processing such as, perhaps, gutting. The current crew size is typically
four to five.

The assumption of limited onboard processing and the resulting average
crew size of five is based in part on the reluctance of fishermen to
have even limited onboard processing. Jon Black of New England Fish
Company (NEFCO), which operates a groundfish processing line in Kodiak,
has indicated that he had great difficulty convincing fishermen to use
an onboard gutter because the fishermen thought that the guts are too slow. NEFCO has convinced fishermen to do onboard gutting by refusing to accept ungutted cod. Petersburg Fisheries has encouraged onboard gutting by offering a higher price for gutted cod. The processors’ preference for gutted fish is due to the higher product quality that onboard gutting provides; by gutting the fish shortly after they are caught, the enzymes in the digestive tract are removed before they can cause deterioration of the rest of the fish. A brief analysis of the cost effectiveness of onboard gutting also indicates that it is in the fishermen’s interest to perform onboard gutting. The analysis is as follows: if the ex-vessel prices of gutted cod and ungutted cod are $0.20 and $0.15 respectively per pound and if the weight of gutted cod is 85 percent of the weight of ungutted cod, the ex-vessel price of gutted cod in terms of pounds caught (in round weight comparison) is $0.17 per pound (85 percent of the gutted price of $0.20). If an extra crewman is required to man the gutter and a crew share is 8 percent of the value of landings, the cost of the extra crewman is $0.0136 per pound of gutted fish (8 percent of $0.17). The resultant price differential is $0.02 per pound ($0.17-$0.15) and there is, therefore, a net profit to the boat owner of $0.0064 ($0.0200-$0.0136) per pound, assuming that the use of the gutter does not interfere with the harvesting productivity of the boat and assuming that the gutter is provided free of charge by the processor. Of the two Alaska plants currently processing groundfish, one provides gutters and one does not. The $0.0064 profit per pound would amount to an annual profit of over $66,000 for a boat that harvests 4,680 metric tons per year, the average harvest per boat expected by 2000.
An analysis of the ability of a single gutting machine to keep pace with the harvesting capabilities of a fishing vessel also indicates that onboard gutting is feasible, however, the margin of feasibility is smaller. The Baader cod gutter has a capacity of approximately 30 fish per minute. Using an average gutted weight of 1.5 pounds per fish and an 85 percent recovery factor, approximately 52.94 pounds of catch can be gutted a minute (30 fish \times 1.50 \text{ pounds}/0.85) or assuming less than optimal conditions perhaps 2,647 pounds (50 minutes \times 52.94 \text{ pounds per minute}) can be gutted an hour. The question is how well does this hourly output match the hourly catch of what is expected to be the typical trawler. Using the catch per boat expected in the year 2000 of 4,680 metric tons and an average of 250 fishing days per year, the average daily catch is 18.72 metric tons (41,270 pounds); a gutter with a sustainable capacity of 2,647 pounds per hour could, therefore, handle an average day's catch in approximately 15.6 hours, a period which is often not a long working day on a fishing boat.

The replication is that although an onboard gutter may not be able to keep pace with the trawling gear during the hours in which catch is high, it has a comparable capacity for the period of the fishing trip as a whole. It should also be mentioned that by the time the average trawler is catching 41,270 pounds a day, the average onboard gutter will no doubt have a larger capacity than the currently available Baader cod gutter that is used in this example.

A summary of the results of the preceding analysis would be that onboard
gutting is currently profitable and technically feasible on even relatively small trawlers, given the ex-vessel price differential for gutted fish and fish in the round and given the onboard gutting equipment that is available. Also, it is essential to provide high quality in some groundfish species such as cod. Therefore, at least limited processing is expected to occur onboard, but due to onboard space limitations, more complete onboard processing will tend to be confined to the trawlers in excess of 45.7 meters (150 feet). The figures used in the preceding analysis were provided by industry sources.

The estimate of the current processing labor requirement per metric ton of whole fish is based on information provided by Petersburg Fisheries and New England Fish Company. Allowing for a 3 percent annual increase in the productivity of labor results in a productivity figure for the year 2000 that approximates the productivity figure cited in a June, 1978, groundfish research report of the Second Session of the Tenth Legislature of the state of Alaska.

The assumed levels of andings and utilization of building space, land, electricity, and water per processing plant are based on a plant with four fillet lines and accompanying roe and minced fish processing equipment. Stokes (1978) indicates that such a plant operating two eight-hour shifts a day can process 278 metric tons (480,000 pounds) of whole fish per day; and allowing for weekends, holidays, maintenance periods, and some irregularities in deliveries, such a plant would process 43,600 metric tons (96 million pounds) of fish a year (i.e., 218 metric tons
per day, 200 days per year). Assuming a 10-day cold storage holding reserve, the plant would occupy approximately 2,690 square meters (29,000 square feet) of interior space situated on 0.81 to 1.62 hectares (2-4 acres) of land. The assumed levels of water and electricity usage by such a processing plant are based on the assumed level of production and the water and electricity requirements identified in the previously mentioned 1978 groundfish research report of the Alaska Legislature.

In the absence of a well-developed trend toward either onboard or onshore processing, it is assumed that all processing will occur onshore in Alaska; this assumption will generate upper limit forecasts of the groundfish processing input requirements for individual communities and for the state as a whole since some processing will occur onboard and some of the onshore processing will occur out of Alaska. Processing pollock onshore has proved to be economically feasible in the case of Icicle Seafoods (Martin, 1978); however, Jaeger (1977) indicates that an onshore processor would have to offer a 76 percent price premium to compete with offshore processors due to the additional costs associated with delivering fish to an onshore processor as opposed to a processor located on the fishing grounds. It is not clear whether onshore processing is cost effective if such a premium is paid. The development plans of a number of onshore processors suggest, however, that they think it will be. But it is not known whether the industry will be dominated by the existing processors or by new entrants to fish processing with different perspectives as to the relative profitability of various methods of processing.
The 1978 catch and the ABC’s by species or species group by area and the corresponding annual rates of growth are summarized in Table 2.8 and the corresponding annual catch forecasts are presented in Table 2.9. The following comments concerning the forecasts of groundfish industry activity (see Table 2.10) that are generated by the catch forecasts (see Table 2.9) and the assumed relationships between catch and the other measures of industry activity help explain the meaning of the forecasts. The forecast of the number of boats is in fact a forecast of full-time equivalent boats since the assumed level of catch per boat and number of landings per boat are those that may be expected for a boat that participates in the groundfish fishery twelve months per year. Particularly in the early stages of the development of the fishery, many boats will participate in the fishery on a part-time basis; therefore, the number of boats in the fishery will exceed the forecast of full-time equivalents. The same is true for the forecast of fishermen; the forecast is of fishermen years and will therefore understate the number of fishermen who participate in the fishery during any one year. The forecast of the number of fish processing plants is based on the forecasted catch and an assumed level of output per plant; the characteristics of the plant on which the estimate of plant productivity is based are described above. If the characteristics of plants differ from those of the plant on which the estimate of productivity is based, the forecast will not be correct. For example, if the processing sector is characterized by a large number of plants with one to two groundfish lines, the forecasts will understate the number of processing plants by a factor of two to four; conversely, if there is more concentration and specialization in groundfish processing
### TABLE 2.8

**BASIS OF GROUNDFISH CATCH FORECASTS**

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TABLE 29a
DOMESTIC PROJECTED GROUNDFISH HARVEST
FOR ALASKA
1980-2000

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### TABLE 2.9b
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1980-2000

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FOR THE GULF OF ALASKA
1980-2000

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<td>0.739</td>
<td><strong>184.67</strong></td>
<td>1.625</td>
<td>161.00</td>
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</table>
and plants have more than four lines, the forecasts will overstate the number of plants. There are efficiencies associated with plants of four or more lines, but there is a tendency in the industry for existing processors to expand into a new fishery once it begins to develop and other fisheries begin to contract. The former will tend to result in fewer but larger plants but the latter will have the opposite effect. As the industry begins to develop, the latter may result in the forecasts understating the number of plants, but in the long run, efficiency may become the dominant factor in determining plant size. The forecast of the number of plants is also based on the assumption that two shifts of eight hours each are run 200 days per year. If fewer shifts are run per year, the forecast will tend to understate the actual number of plants. The forecasts of processing input requirements for labor, water, electricity and land are based on estimates of the input requirements per unit of whole fish and are therefore somewhat independent of plant size. The processing labor forecast is in terms of man years.

The two questions that remain to be answered are: (1) is the growth forecasted for the groundfish industry possible in terms of the availability of inputs and (2) where will the development occur? The answer to the first question appears to be yes, the inputs will be available for the following reasons: the increases in input requirements are at first relatively modest; there is currently excess capacity in both the harvesting and processing sections, the NPFMC's estimates of current domestic harvesting and processing capacity exceed the annual catch forecasts through the 1980's; and the large increases in input requirements will
occur only after the continued development of the industry is well assured and can thus be planned for.

Within the limits set by the location of the fishery resources, the answer to the question concerning the location of the groundfish industry will be determined by the type of boats that dominate the industry. The foreign fleets have consisted primarily of large catcher processors and/or mother ships serviced by large fishing vessels. With the exception of the actual harvesting and onboard processing, the foreign groundfish industry has been located in the home ports of these vessels and those who man them. If a similar fleet is developed in the domestic groundfish industry, it may not be centered in Alaska. However, the domestic trawl fleet is expected to be quite different from the foreign high seas fleet that it will replace. The domestic fleet is expected to consist of a large number of relatively small trawlers and/or multi-purpose vessels from 22.9 to 53.3 meters (75 to 175 feet) in length which will deliver the bulk of the groundfish catch to shore-based processing centers within perhaps 240 kilometers (150 miles) of the fishing grounds. The size of the present and proposed domestic boats limits their capacity to process and preserve fish and therefore tends to determine the ability of a given processing center to service particular fishing grounds. The location of groundfish processing centers will therefore depend on the location of the fishing grounds, however, it will also depend on the current location of traditional fishery processing centers; this is due to both the economies associated with locating a new processing plant where the infrastructure for fish processing already exists and the
propensity of existing processing plants to enter new fisheries as their profitability relative to existing fisheries increases and as declines in other fisheries result in excess capacity.

On the basis of the preceding analysis, it is assumed that the distance of a port to a fishing ground will determine the proportion of the harvest of each area that will be landed in each port. The distances used to determine the allocation of landings among ports are 80, 160 and 240 kilometers (50, 100, and 150 miles). In the case of overlapping areas, the allocation between ports is assumed to be proportional to the distances to the two ports. For example, it would be assumed that from the area within the 80 kilometer ring of port A and the 240 kilometer ring of port B, three-fourths of the catch would be landed in A and one-fourth would be landed in B since B is three times as far from the area.

There are two reasons for assuming that the proportion of catch that will be landed in a port is inversely related to its distance to the area; given that the ex-vessel price is the same in each port, it is more profitable for a vessel to land fish at the nearer port since it is less costly in terms of operating costs and time to land fish at the nearer port; and since the range of a vessel from a port is determined in part by its size, only large vessels can provide fish from distant grounds, but any boats can provide fish from grounds in the immediate area.
Based on this set of assumptions as to where fish will be landed and based on the distribution of the groundfish resources as measured by the mean annual Japanese catch in the Gulf of Alaska by species or species group and area, the percentages of catch by species to be landed in each community are as summarized in Table 2.11. The allocation of other groundfish is based on the mean Japanese trawl catch by area of all groundfish. Japanese catch data is used to measure relative resource abundance by area because only Japanese data is sufficiently widespread through the Gulf and reported in sufficiently fine resolution to be of use in this model.

The assumptions underlying the construction and implementation of this catch-landings allocation model are several and varied. They are as follow:

- Japanese catch data averaged over the ten-year period of 1964-1974 are representative of the actual catch and of the population biomass present in the statistical area.
- The above mean yields are relatively unbiased estimators of future or potential yield.
- American vessels and fishing strategies will be at least as efficient as Japanese vessels and strategies, and the catch-per-unit-effort values in each of the statistical regions reported as being fished by the Japanese will be sufficient to support profitable and continued U.S. operations.
TABLE 2.11
PROJECTED ALLOCATION OF GROUNDFISH CATCH BY COMMUNITY

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Kodiak</th>
<th>Seward</th>
<th>Cordova</th>
<th>Yakutat</th>
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<td>0.22</td>
<td>0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>Sablefish</td>
<td>0.18</td>
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<td>0.15</td>
<td>0.31</td>
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<tr>
<td>Other</td>
<td>0.25</td>
<td>0.22</td>
<td>0.11</td>
<td>0.24</td>
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</table>

The allocation figures indicate the percentage of the Gulf of Alaska catch of each species that is expected to be landed in each community. For example, it is expected that 35 percent of the pollock harvested in the Gulf will be landed in Kodiak. The data on which these allocations is based are presented in Figures 2.2 through 2.5 and Table 2.12.
Figure 2.2a  Mean annual catch (ret) of walleye pollock by the Japanese trawl fishery, 1964-1974.

Source: Compiled by Frank Orth and Associates from Ronholt, et al., 1978.
Figure 2.2b  Mean annual catch (mt) of Pacific cod by the Japanese trawl fishery, 1964-974.

Source: Compiled by Frank Orth & Associates from Ronholt, et al., 1978.
Figure 2.2c
Mean annual catch (mt) of sablefish (blackcod) by the Japanese trawl fishery, 1964-1974.

Source: Compiled by Frank Orth & Associates from Ronholt, et al., 1978.
Figure 2.2d Mean annual trawl fishery catch (ret) by Japan, 1964-1974.

Source: Compiled by Frank Orth & Associates from Ronholt, et al., 1978.

* Determined by vessel size, handling equipment, preservation qualities of individual species, and delivery schedules.
### TABLE 2.12

THE DISTRIBUTION OF GROUNDFISH RESOURCES IN THE GULF OF ALASKA

#### Pacific Cod

<table>
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<th>R50-100</th>
<th>R100-150</th>
<th>RO-100</th>
<th>RO-150</th>
<th>Proportion of total</th>
<th>Northern Gulf of Alaska catch in NGOA (mt)</th>
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</thead>
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<td>240.9</td>
<td>232.0</td>
<td>249.7</td>
<td>481.7</td>
<td>0.0058</td>
<td>0.1579</td>
</tr>
<tr>
<td>Seward</td>
<td>0.0</td>
<td>129.6</td>
<td>205.4</td>
<td>129.6</td>
<td>335.0</td>
<td>0.0000</td>
<td>0.0850</td>
</tr>
<tr>
<td>Cordova</td>
<td>0.5</td>
<td>80.0</td>
<td>69.0</td>
<td>80.5</td>
<td>149.5</td>
<td>0.0003</td>
<td>0.0524</td>
</tr>
<tr>
<td>Yakutat</td>
<td>17.0</td>
<td>90.0</td>
<td>34.2</td>
<td>107.0</td>
<td>1.41.2</td>
<td>0.0111</td>
<td>0.0590</td>
</tr>
</tbody>
</table>

#### Walleye Pollock

<table>
<thead>
<tr>
<th>Fishing Port</th>
<th>RO-50</th>
<th>R50-100</th>
<th>R100-150</th>
<th>RO-100</th>
<th>RO-150</th>
<th>Proportion of total</th>
<th>Northern Gulf of Alaska catch in NGOA (mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kodiak</td>
<td>87.3</td>
<td>1151.2</td>
<td>1833.4</td>
<td>1238.5</td>
<td>3071.9</td>
<td>0.0010</td>
<td>0.1313</td>
</tr>
<tr>
<td>Seward</td>
<td>4.6</td>
<td>499.4</td>
<td>1071.0</td>
<td>504.0</td>
<td>1575.0</td>
<td>0.0006</td>
<td>0.0577</td>
</tr>
<tr>
<td>Cordova</td>
<td>1.0</td>
<td>288.7</td>
<td>237.8</td>
<td>289.7</td>
<td>527.5</td>
<td>0.0001</td>
<td>0.0329</td>
</tr>
<tr>
<td>Yakutat</td>
<td>55.0</td>
<td>599.0</td>
<td>195.9</td>
<td>654.0</td>
<td>849.9</td>
<td>0.0063</td>
<td>0.0683</td>
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</table>
## TABLE 2.12 (continued)

### THE DISTRIBUTION OF GROUND FISH RESOURCES IN THE GULF OF ALASKA

<table>
<thead>
<tr>
<th>Fishing Port</th>
<th>RO-50</th>
<th>R50-100</th>
<th>R100-150</th>
<th>RO-100</th>
<th>RO-150</th>
<th>PROPORTION OF TOTAL</th>
<th>Northern Gulf of Alaska Catch in NGOA (mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RO-50</td>
<td>R50-100</td>
<td>R100-150</td>
<td>RO-100</td>
<td>RO-150</td>
<td>RO-50 total</td>
<td>R50-100 total</td>
</tr>
<tr>
<td>Kodiak</td>
<td>89.8</td>
<td>827.2</td>
<td>1175.0</td>
<td>917.0</td>
<td>2092.0</td>
<td>0.0078</td>
<td>0.0722</td>
</tr>
<tr>
<td>Seward</td>
<td>31.6</td>
<td>808.4</td>
<td>1797.2</td>
<td>840.0</td>
<td>2637.2</td>
<td>0.0028</td>
<td>0.0706</td>
</tr>
<tr>
<td>Cordova</td>
<td>58.0</td>
<td>892.9</td>
<td>760.3</td>
<td>950.9</td>
<td>1711.2</td>
<td>0.0051</td>
<td>0.0779</td>
</tr>
<tr>
<td>Yakutat</td>
<td>314.0</td>
<td>2390.6</td>
<td>844.7</td>
<td>2704.6</td>
<td>3549.3</td>
<td>0.0274</td>
<td>0.2086</td>
</tr>
</tbody>
</table>

### Mean Annual Trawl Fishery

<table>
<thead>
<tr>
<th>Fishing Port</th>
<th>RO-50</th>
<th>R50-100</th>
<th>R100-150</th>
<th>RO-100</th>
<th>RO-150</th>
<th>PROPORTION OF TOTAL</th>
<th>Northern Gulf of Alaska Catch in NGOA (mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RO-50</td>
<td>R50-100</td>
<td>R100-150</td>
<td>RO-100</td>
<td>RO-150</td>
<td>RO-50 total</td>
<td>R50-100 total</td>
</tr>
<tr>
<td>Kodiak</td>
<td>314.0</td>
<td>6707.4</td>
<td>6223.4</td>
<td>7021.4</td>
<td>13244.8</td>
<td>0.0060</td>
<td>0.1281</td>
</tr>
<tr>
<td>Seward</td>
<td>45.0</td>
<td>5344.4</td>
<td>6233.8</td>
<td>5389.4</td>
<td>11623.2</td>
<td>0.0008</td>
<td>0.1020</td>
</tr>
<tr>
<td>Cordova</td>
<td>82.5</td>
<td>2836.5</td>
<td>2855.5</td>
<td>2919.0</td>
<td>5774.5</td>
<td>0.0016</td>
<td>0.0542</td>
</tr>
<tr>
<td>Yakutat</td>
<td>1115.0</td>
<td>9046.1</td>
<td>2410.1</td>
<td>10161.1</td>
<td>12571.2</td>
<td>0.0213</td>
<td>0.1728</td>
</tr>
</tbody>
</table>
Each of the ports of interest has the potential of providing the necessary support for the number of trawling vessels engaged in the local fishery. Relatively small fishing vessels will initially predominate in the Gulf groundfish fishery with the advent of larger trawling/processing vessels being some years away.

Major criticisms of this model might certainly involve the adequacy of any of the above assumptions. A major problem facing this model is that a U.S. trawl fishery might well avoid large areas of the Gulf as being unprofitable, concentrating on regions of greatest concentration only. This concentration of fishing effort would have the effect of partitioning the groundfish catch to only one or two of the four processing centers. It appears, however, that this problem might only be present during particular seasons, the remainder of the year involving a more even distribution of the particular species over the Gulf. It remains the writers' assertion that this model is an adequate estimator of the partitioning of several major groundfish species among the ports of central Alaska.

The element of the groundfish industry forecast methodology yet to be explained is that used to forecast prices. The method used is similar to that used for the traditional fisheries. The rate of change in the average nominal price of groundfish is forecasted based on the historical relationship between the price and its determinants and on the expected values of the latter. The forecasted rate of change in the price is
applied to an approximation of the actual 1979 ex-vessel prices by species to project prices by species. The projected statewide ex-vessel prices were used in each community since there is no basis for determining the extent to which interregional price differentials will occur. The 1979 prices and the projected rates of increase on which the price forecasts are based are summarized in Table 2.13 and the specifications of the ex-vessel price model are presented in an appendix.

**TABLE 2.13**

**BASIS OF GROUNDFISH EX-VESSEL PRICE FORECASTS**

<table>
<thead>
<tr>
<th></th>
<th>1979 Prices' ($'s per pound)</th>
<th>Forecasted Percentage Increases in Nominal Prices from 1979</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pollock</td>
<td>Cod</td>
</tr>
<tr>
<td>1980</td>
<td>0.07</td>
<td>0.15</td>
</tr>
<tr>
<td>1982</td>
<td>8.40</td>
<td>1989</td>
</tr>
<tr>
<td>1983</td>
<td>11.37</td>
<td>1990</td>
</tr>
<tr>
<td>1985</td>
<td>17.80</td>
<td>1992</td>
</tr>
<tr>
<td>1986</td>
<td>21.22</td>
<td>1993</td>
</tr>
</tbody>
</table>

'Source: Petersburg Fisheries

'The current price of sablefish ranges from $0.52 to $0.84 per pound depending on the size of the fish.
This chapter is divided into four subchapters, one for each of the four study area communities. Each subchapter includes: (1) a brief introduction to the commercial fishing industry of the community, (2) the non-OCS case projections generated using the methodology discussed in the preceding chapter and (3) an assessment of the feasibility of the projections in terms of the projections of population, employment, physical systems, and transportation systems presented in other Studies Program reports and in terms of the expected characteristics of the market and governmental environments that are not incorporated in the projection models. Only selected historical data are presented in this chapter; the majority of the data on which the projections are based is relegated to an appendix.

The Kodiak Commercial Fishing Industry

The City of Kodiak is located on the northeast corner of Kodiak Island. Its economic base is dominated by the activities of the Kodiak commercial fishing industry. The fisheries which have contributed to making Kodiak one of the nation's top three commercial fishing ports in terms of landings in the past several years include the salmon, halibut, herring, groundfish, king crab, Tanner crab, Dungeness crab, shrimp, razor clam, and scallop fisheries. The absolute and relative importance of each Kodiak management area fishery in terms of pounds harvested are summarized in Table 3.1.
### CATCH BY FISHERY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HALIBUT</th>
<th>HERRING</th>
<th>KING CRAB</th>
<th>TANNER</th>
<th>DUNGENESS</th>
<th>RAZOR</th>
<th>SHELL-FISH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>58780</td>
<td>6338</td>
<td>2255</td>
<td>12796</td>
<td>6828</td>
<td>5835</td>
<td>4135</td>
<td>12</td>
<td>1000</td>
</tr>
<tr>
<td>1970</td>
<td>65416</td>
<td>8697</td>
<td>685</td>
<td>12070</td>
<td>7708</td>
<td>5741</td>
<td>6218</td>
<td>132</td>
<td>1418</td>
</tr>
<tr>
<td>1971</td>
<td>31184</td>
<td>9217</td>
<td>569</td>
<td>12364</td>
<td>7423</td>
<td>4616</td>
<td>8215</td>
<td>190</td>
<td>841</td>
</tr>
<tr>
<td>1972</td>
<td>19620</td>
<td>8640</td>
<td>475</td>
<td>16337</td>
<td>1909</td>
<td>2060</td>
<td>5836</td>
<td>152</td>
<td>1039</td>
</tr>
<tr>
<td>1973</td>
<td>5904</td>
<td>6591</td>
<td>1735</td>
<td>14716</td>
<td>31607</td>
<td>2601</td>
<td>7195</td>
<td>165</td>
<td>936</td>
</tr>
<tr>
<td>1974</td>
<td>16121</td>
<td>3742</td>
<td>1756</td>
<td>22979</td>
<td>25475</td>
<td>750</td>
<td>4677</td>
<td>198</td>
<td>148</td>
</tr>
<tr>
<td>1975</td>
<td>14144</td>
<td>4209</td>
<td>16</td>
<td>21410</td>
<td>17545</td>
<td>640</td>
<td>4675</td>
<td>6</td>
<td>294</td>
</tr>
<tr>
<td>1976</td>
<td>55255</td>
<td>4414</td>
<td>9</td>
<td>17424</td>
<td>23410</td>
<td>82</td>
<td>5121</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>1977</td>
<td>40114</td>
<td>4665</td>
<td>695</td>
<td>13175</td>
<td>20770</td>
<td>113</td>
<td>3154</td>
<td>0</td>
<td>6585</td>
</tr>
</tbody>
</table>

### PERCENTAGE OF CATCH BY FISHERY

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HALIBUT</th>
<th>HERRING</th>
<th>KING CRAB</th>
<th>TANNER</th>
<th>DUNGENESS</th>
<th>RAZOR</th>
<th>SHELL-FISH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>41.09</td>
<td>4.43</td>
<td>1.57</td>
<td>8.946</td>
<td>4.773</td>
<td>4.079</td>
<td>28.91</td>
<td>0.008</td>
<td>52.89</td>
</tr>
<tr>
<td>1970</td>
<td>34.39</td>
<td>5.30</td>
<td>0.418</td>
<td>7.358</td>
<td>4.699</td>
<td>3.500</td>
<td>28.91</td>
<td>0.080</td>
<td>59.84</td>
</tr>
<tr>
<td>1971</td>
<td>21.43</td>
<td>6.33</td>
<td>0.000</td>
<td>5.600</td>
<td>5.1(-)</td>
<td>1.004</td>
<td>66.48</td>
<td>0.131</td>
<td>71.79</td>
</tr>
<tr>
<td>1972</td>
<td>16.53</td>
<td>7.283</td>
<td>0.000</td>
<td>5.600</td>
<td>5.1(-)</td>
<td>1.004</td>
<td>66.48</td>
<td>0.131</td>
<td>75.73</td>
</tr>
<tr>
<td>1973</td>
<td>4.34</td>
<td>4.852</td>
<td>1.277</td>
<td>10.834</td>
<td>23.269</td>
<td>1.736</td>
<td>49.14</td>
<td>0.128</td>
<td>80.36</td>
</tr>
<tr>
<td>1974</td>
<td>13.36</td>
<td>3.101</td>
<td>1.435</td>
<td>19.844</td>
<td>21.113</td>
<td>0.222</td>
<td>40.42</td>
<td>0.164</td>
<td>86.49</td>
</tr>
<tr>
<td>1975</td>
<td>13.11</td>
<td>3.003</td>
<td>0.006</td>
<td>11.409</td>
<td>15.329</td>
<td>1.054</td>
<td>33.53</td>
<td>0.006</td>
<td>60.58</td>
</tr>
<tr>
<td>1976</td>
<td>35.18</td>
<td>2.890</td>
<td>0.006</td>
<td>11.767</td>
<td>18.506</td>
<td>0.010</td>
<td>28.17</td>
<td>0.006</td>
<td>59.15</td>
</tr>
</tbody>
</table>

### CATCH OF FISHERIES STUDIED AS A PERCENTAGE OF EACH GROUP OF FISHERIES

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SHELLFISH</th>
<th>FI SH</th>
<th>ALL FISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>39.636</td>
<td>99.867</td>
<td>94.516</td>
</tr>
<tr>
<td>1970</td>
<td>90.916</td>
<td>99.369</td>
<td>94.520</td>
</tr>
<tr>
<td>1971</td>
<td>100.000</td>
<td>91.186</td>
<td>99.962</td>
</tr>
<tr>
<td>1972</td>
<td>90.476</td>
<td>99.953</td>
<td>99.837</td>
</tr>
<tr>
<td>1973</td>
<td>100.000</td>
<td>91.011</td>
<td>99.897</td>
</tr>
<tr>
<td>1974</td>
<td>100.000</td>
<td>91.011</td>
<td>99.897</td>
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<tr>
<td>1975</td>
<td>100.000</td>
<td>91.011</td>
<td>99.897</td>
</tr>
<tr>
<td>1976</td>
<td>99.642</td>
<td>91.731</td>
<td>99.449</td>
</tr>
<tr>
<td>1977</td>
<td>94.541</td>
<td>52.099</td>
<td>99.160</td>
</tr>
</tbody>
</table>

Source: ADF&G Catch and Production Reports and Salmon and Shellfish Catch Reports
The importance of the Kodiak commercial fishing industry to the local economy can be measured in a number of ways. It can be measured in absolute terms such as the income of Kodiak fishermen or the number of commercial fishermen residing in Kodiak (see Tables 3.2 and 3.3) or it can be measured in relative terms; for example, in 1976, approximately one out of every six Kodiak residents had a commercial fishing license. Alaska Department of Labor statistics indicate that from 1970 through 1977, fish processing employment ranged from 29 to 38 percent of annual Kodiak Island employment, and that the income directly associated with this employment ranged from 22 to 31 percent of Kodiak Island income (see Table 3.4). The labor statistics used in this measure of the importance of the commercial fishing industry have two sources of downward bias. They include only employment and income that is covered by unemployment insurance and therefore exclude most fishermen, and they do not indicate the employment and income that is generated by other industries which are dependent on the employment and income of the fishing industry. Economic base analysis provides a measure of the total employment that is dependent on an industry.

The economic base of a community includes those industries which bring dollars into a local economy as opposed to the industries that circulate the dollars that the basic sector industries attract to a community.

When the basic sector of the Kodiak Island economy is defined to include manufacturing and the federal government, approximately 47 percent of the 1977 employment is in the basic sector and over 80 percent of the basic sector employment or over 70 percent of the basic sector income is...
### TABLE 3.2

**Estimated Gross Earnings of Kodiak Fishermen 1969 - 1976**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Number of Gear Operators</th>
<th>Estimated Gross Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>502</td>
<td>$10,912,000</td>
</tr>
<tr>
<td>1970</td>
<td>511</td>
<td>11,825,000</td>
</tr>
<tr>
<td>1971</td>
<td>420</td>
<td>9,135,000</td>
</tr>
<tr>
<td>1972</td>
<td>521</td>
<td>12,120,000</td>
</tr>
<tr>
<td>1973</td>
<td>526</td>
<td>23,427,000</td>
</tr>
<tr>
<td>1974</td>
<td>531</td>
<td>24,554,000</td>
</tr>
<tr>
<td>1975</td>
<td>526</td>
<td>18,529,000</td>
</tr>
<tr>
<td>1976</td>
<td>629</td>
<td>38,817,000</td>
</tr>
</tbody>
</table>


### TABLE 3.3

**Number of Kodiak Residents Holding a Commercial Fisherman’s License 1969 - 1976**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Number of Residents</th>
<th>Year</th>
<th>Number of Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>632</td>
<td>1973</td>
<td>819</td>
</tr>
<tr>
<td>1970</td>
<td>787</td>
<td>1974</td>
<td>902</td>
</tr>
<tr>
<td>1971</td>
<td>791</td>
<td>1975</td>
<td>846</td>
</tr>
<tr>
<td>1972</td>
<td>756</td>
<td>1976</td>
<td>1,120</td>
</tr>
</tbody>
</table>

*A Kodiak resident is anyone who uses a Kodiak address when applying for a license.*

Source: Commercial Fisheries Entry Commission, Commercial License File.
### TABLE 3.4
KODIAK FISH PROCESSING EMPLOYMENT AND INCOME: IN PERSPECTIVE 1970-1977

#### Average Quarterly Employment and Income

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TOTAL EMPLOYMENT</th>
<th>F&amp;KP EMPLOYMENT</th>
<th>F&amp;KP% of T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER OF FIRMS</td>
<td>NUMBER OF FIRMS</td>
<td>NUMBER OF FIRMS</td>
</tr>
<tr>
<td>1970</td>
<td>2469</td>
<td>726</td>
<td>23</td>
</tr>
<tr>
<td>1971</td>
<td>2619</td>
<td>737</td>
<td>26</td>
</tr>
<tr>
<td>1972</td>
<td>2878</td>
<td>842</td>
<td>31</td>
</tr>
<tr>
<td>1973</td>
<td>3576</td>
<td>1383</td>
<td>31</td>
</tr>
<tr>
<td>1974</td>
<td>3641</td>
<td>1220</td>
<td>31</td>
</tr>
<tr>
<td>1975</td>
<td>3777</td>
<td>1109</td>
<td>32</td>
</tr>
<tr>
<td>1976</td>
<td>4426</td>
<td>1513</td>
<td>23</td>
</tr>
<tr>
<td>1977</td>
<td>4104</td>
<td>1555</td>
<td>31</td>
</tr>
</tbody>
</table>

#### Employment by Quarter

<table>
<thead>
<tr>
<th>YEAR</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>2091</td>
<td>2538</td>
<td>2970</td>
<td>2277</td>
</tr>
<tr>
<td>1971</td>
<td>2292</td>
<td>2719</td>
<td>2872</td>
<td>2592</td>
</tr>
<tr>
<td>1972</td>
<td>2280</td>
<td>2866</td>
<td>3611</td>
<td>2754</td>
</tr>
<tr>
<td>1973</td>
<td>3090</td>
<td>3626</td>
<td>4060</td>
<td>3527</td>
</tr>
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<td>1974</td>
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#### Income by Quarter

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<td>1977</td>
<td>15074</td>
<td>13754</td>
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*Food and Kindred Products
**Food and Kindred Products as a percentage of the total.

attributable to fish processing (see Tables 3.5 and 3.6). The implication is that 80 or 70 percent of local employment or income, respectively, is generated directly or indirectly by the processing sector of the fishing industry, and that if the employment and income of fishermen were included, the measure of dependence on the commercial fishing industry would be greater. Although these are rough approximations of the relative importance of the Kodiak commercial fishing industry in the local economy, they are sufficient to demonstrate that the industry is the mainstay of the Kodiak economy. The following brief description of the projected growth of this industry indicates that the Kodiak commercial fishing industry will be the source of increasing economic activity.

During the next twenty years, the continued growth of the industry is expected to result primarily from increased domestic utilization of the groundfish resources in the Western Gulf of Alaska. Improved salmon management, enhancement, and rehabilitation programs, sustained large crab harvests, and increased halibut landings are expected to assure continued development of the traditional fisheries as a whole, but such development is expected to be a more modest source of industry growth. Between 1980 and 2000, total catch is expected to increase by 260 percent by weight and by 113 percent in real value. The more rapid increase in weight is explained from the change in harvest mix that is expected; the relatively low valued groundfish species will account for an increasing proportion of total catch. Processing activity is also expected to increase from current levels, however, due to increases in processing
TABLE 3.5
NUMBER OF EMPLOYEES BY INDUSTRY
(AVERAGE FOR ENTIRE YEAR FROM MONTHLY DATA)

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<th></th>
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<td>Mining</td>
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<td>I/D*</td>
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<td>-o-</td>
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<tr>
<td>Construction</td>
<td>61</td>
<td>131</td>
<td>269</td>
<td>212</td>
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<tr>
<td>Manufacturing (food and kindred products)</td>
<td>768</td>
<td>1,421</td>
<td>1,175</td>
<td>1,627</td>
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<tr>
<td>Transportation, Communications, and Utilities</td>
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<td>223</td>
<td>219</td>
<td>203</td>
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<td>Wholesale and Retail Trade</td>
<td>343</td>
<td>394</td>
<td>483</td>
<td>563</td>
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<tr>
<td>Finance, Insurance, and Real Estate Services</td>
<td>64</td>
<td>I/D*</td>
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<td>99</td>
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<tr>
<td>Federal Government</td>
<td>241</td>
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<td>366</td>
<td>395</td>
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<tr>
<td>State and Local Government</td>
<td>351</td>
<td>263</td>
<td>269</td>
<td>250</td>
</tr>
<tr>
<td>Agriculture, Forestry, and Fisheries (fishing, hunting, and trapping)</td>
<td>I/D*</td>
<td>252</td>
<td>307</td>
<td>I/D*</td>
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<tr>
<td>(fisheries)</td>
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<td>.</td>
<td>287</td>
<td>.</td>
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<tr>
<td></td>
<td>17</td>
<td>I/D*</td>
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</tr>
</tbody>
</table>

**TOTAL:** 2,595 3,260 3,472 3,986

*Incomplete data due to confidentiality regulations

**Excluding Mining and Agriculture, Forestry and Fisheries in all years, and Finance, Insurance, and Real Estate in 1973.

Source: Alaska Department of Labor, Statistical quarterly, 1971-1977
### TABLE 3.6
YEARLY PAYROLL BY INDUSTRY

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
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<td>I/D*</td>
<td>-o-</td>
<td>-o-</td>
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<tr>
<td>Construction</td>
<td>0.962</td>
<td>2.457</td>
<td>6.936</td>
<td>5.778</td>
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<tr>
<td>Manufacturing</td>
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<td>11.733</td>
<td>11.836</td>
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<tr>
<td>(food and kindred products)</td>
<td>5.747</td>
<td>11.405</td>
<td>12.568</td>
<td>19.337</td>
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<tr>
<td>Transportation, Communications, and Utilities</td>
<td>2.17</td>
<td>2.549</td>
<td>3.022</td>
<td>4.216</td>
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<td>Wholesale and Retail Trade</td>
<td>2.456</td>
<td>3.208</td>
<td>4.995</td>
<td>6.907</td>
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<tr>
<td>Finance, Insurance, and Real Estate</td>
<td>0.496</td>
<td>I/D*</td>
<td>1.026</td>
<td>1.301</td>
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<tr>
<td>Services</td>
<td>1.420</td>
<td>1.843</td>
<td>2.937</td>
<td>3.914</td>
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<tr>
<td>Federal Government</td>
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<td>3.804</td>
<td>4.897</td>
<td>5.672</td>
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<tr>
<td>State and Local Government</td>
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<td>8.773</td>
<td>11.307</td>
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<tr>
<td>Agriculture, Forestry, and Fisheries (fishing, Hunting, and Trapping)</td>
<td>I/D*</td>
<td>6.875</td>
<td>5.426</td>
<td>I/D*</td>
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<tr>
<td>(fisheries)</td>
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<td>--</td>
<td>5.414</td>
<td>I/D*</td>
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<tr>
<td></td>
<td>0.406</td>
<td>I/D*</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

*Incomplete data due to confidentiality regulations

Source: Alaska Department of Labor, Statistical Quarterly, 1971-1977
efficiency, processing employment and real income are expected to increase less rapidly. It is projected that processing employment and income will exceed current levels by 10 percent and 35 percent, respectively. Without allowing for increased efficiency, the increases would be approximately 50 percent and 80 percent.

Although the development of a domestic groundfish industry in Alaska is expected to be the principal source of growth for the Kodiak commercial fishing industry, it is not expected to result in as dramatic growth as it may elsewhere in the state. There are two reasons for this: (1) the Kodiak commercial fishing industry is one of the largest in the country, therefore a reactive large increase in catch in absolute terms is required to produce a given percentage increase, and (2) the groundfish resources are principally located in the Bering Sea, so the groundfish industry is not expected to be predominantly centered in Kodiak. The projections of harvesting activity by fishery on which the preceding summary is based and the projections of processing activity are presented in the following sections.

HARVESTING

Projections of harvesting activity and limited historical data are presented by species or species group in this section. The detailed historical data, which are referred to in this section and which serve as a basis for the projections, are presented in tabular form in Appendix C. The models used in making these projections are discussed in Chapter II.
Salmon

In Kodiak there are three distinct salmon fisheries, defined by gear type; they are the purse seine, beach seine, and set gill net fisheries. The purse seine fishery is, however, the dominant fishery; it accounts for approximately 75 percent of the red salmon harvest, 90 percent of the pink harvest, 95 percent of the chum harvest, and over 90 percent of the relatively minor king and coho harvests. Other pertinent differences among the salmon fisheries are summarized in Table 3.7.

| TABLE 3.7 |
| CHARACTERISTICS OF THE KODIAK SALMON FISHERIES |
| Pursue Seine | Beach Seine | Set Gill Net |
| Season | June-Sept. | July-August | July-August |
| Typical Boat Size | 26-55 feet | under 25 feet | under 25 feet |
| Crew Size | 5 | 2 | 2 |
| Fishing Grounds | near shore | very near shore | very near shore |

1 A foot equals 0.305 meters,

In recent years, there have been pink and chum catches that rival or surpass the record catches of the last 45 years. These recent successes, together with continually improving management, enhancement, and rehabilitation programs, suggest that the Kodiak salmon resources and harvesting activity will tend to increase. Catch is projected to increase from 12,000 metric tons (26.3 million pounds) in 1980 to 20,000 metric tons (44.7 million pounds) in 2000. This 70 percent increase in catch by weight is expected to result in a 273 percent increase in catch by value.
since real ex-vessel salmon prices are projected to increase by 120 percent. Increases in the numbers of boats and fishermen participating in the Kodiak salmon fisheries are not necessary since the salmon boats and crews are currently underutilized, and increases are not expected due to the limited entry program which exists in the salmon fisheries. The projections of harvesting activity and the resulting percentage increases during the forecast period are presented in Tables 3.8 and 3.9. Table 3.10 includes projections of catch by species.

Herring

There are potentially four distinct herring fisheries in Kodiak; they are the roe herring, bait fish, food fish, and industrial fish fisheries. The industrial fish fishery was dominant during the first half of the 1900s, the roe herring fishery has been dominant since the late 1960s, and a bait fishery existed in the intervening years and survives today. The leading role currently being played by the roe herring fishery is explained by market conditions, not resources abundance. The ex-vessel price for roe herring has been significantly higher than those in other herring fisheries, therefore, activity is centered in the roe fishery even though the harvest guidelines are 2,177 metric tons (2,400 short tons) for roe herring and 11,430 metric tons (12,600 short tons) for other herring. Market conditions are expected to favor the roe fishery and discourage fuller utilization of the other herring resources. For this reason, the projections are keyed on the roe fishery.

The pertinent characteristics of the Kodiak roe fishery include the following:
TABLE 3.8
PROJECTED HARVESTING ACTIVITY
KODIAK SALMON FISHERY 1980-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>POUNDS (1,000)</th>
<th>METRIC TONS</th>
<th>VALUE $1,000</th>
<th>EX-VESSEL PRICE ($/Pound)</th>
<th>NUMBER OF VESSELS</th>
<th>NUMBER OF LANDINGS</th>
<th>NUMBER OF FISHERMEN</th>
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<td>26307</td>
<td>11933</td>
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<td>7817</td>
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<td>1984</td>
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<tr>
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<td>39367</td>
<td>27063</td>
<td>535</td>
<td>8423</td>
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<td>44021</td>
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<td>17918</td>
<td>60208</td>
<td>33410</td>
<td>535</td>
<td>8614</td>
<td>2156</td>
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<td>66675</td>
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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
TABLE 3.9

PROJECTED PERCENTAGE CHANGE FROM 1980,
KODIAK SALMON FISHERY

<table>
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<td>119.964</td>
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</table>

Source: Alaska Sea Grant Program
### TABLE 3.10

**PROJECTED KODIAK SALMON CATCH BY SPECIES, 1980-2000**

(1,000 Pounds)

<table>
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<tr>
<th>Year</th>
<th>Kna</th>
<th>Red</th>
<th>Pink</th>
<th>Chum</th>
<th>Silver</th>
<th>Total</th>
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</table>

**Source:** Alaska Sea Grant Program
Salmon purse seine boats and fishermen dominate the fishery.

The herring seiners are typically 7.9 to 16.8 meters (26 to 55 feet) in length and have a crew of five.

Due to the need to harvest the herring when the roe is at the correct stage of development, the season occurs during a brief period in May and/or June.

The seiners operate in near-shore areas.

Due in part to the difficulty associated with harvesting when the roe is of a marketable quality, the harvests have been well below the harvest guideline of 2,177 metric tons (2,400 short tons); the 1979 harvest, however, is expected to approach the guideline. The improved harvest in 1979 is explained by the increased fishing effort which is, in turn, explained by favorable ex-vessel prices. Despite what may continue to be acceptable prices, the difficulty of harvesting herring at the right time is expected to, on average, hold the catch at 1,814 metric tons (2,000 short tons) or about 362 metric tons (400 short tons) below the guideline harvest. Although the harvest is not projected to increase between 1980 and 2000, the real value of the harvest is expected to increase by 21 percent. The projection of fishing activity and the resulting percentage increases in activity are presented in Tables 3.11 and 3.12.

**Halibut**

The Kodiak halibut fishery consists of two distinct fleets: a large boat
# TABLE 3.11

**PROJECTED HARVESTING ACTIVITY**

**KODIAK HERRING FISHERY 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>WEIGHT (1,000)</th>
<th>VALUE $1,000</th>
<th>EX-VEssel PRICE ($/Pound)</th>
<th>NUMBER OF BOATS</th>
<th>LANDINGS</th>
<th>FISHERMEN</th>
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<tbody>
<tr>
<td></td>
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<td>Nominal</td>
<td>Real</td>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### TABLE 3.12

**PROJECTED PERCENTAGE CHANGE FROM 1980, KODIAK HERRING FISHERY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch Weight</th>
<th>Catch Real Value</th>
<th>Ex-Vessel Price Nominal</th>
<th>Ex-Vessel Price Real</th>
<th>Number of Boats</th>
<th>Number of Landings</th>
<th>Number of Fishermen</th>
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</table>

Source: *Alaska Sea Grant Program*.
fleet which is capable of fishing far offshore areas and lands the majority of the catch, and a small boat fleet which fishes inshore areas and includes many boats that are principally participants in the salmon or other fisheries. The boats of the large boat fleet are usually over 15.2 meters (50 feet) in length and would include a large number of non-Kodiak boats since this fleet is very mobile and fishes throughout the Gulf of Alaska and/or the Bering Sea. In the small boat fleet, boat lengths range from under 7.6 meters to 21.3 meters (25 feet to 70 feet), but are predominantly less than 10.7 meters (35 feet). The casual or supplemental nature of the participation of the small boat fleet is indicated by the fact that the average number of landings per year per boat has been less than four. Four both fleets, the season is during three to four separate fishing periods between May and September.

A characteristic of the halibut fisheries that is of particular importance with respect to conflicts with other vessels is the type of gear used. Halibut fishermen use long line gear which can exceed three miles in length. The long line with hooks set at fixed intervals has an anchored buoy at each end and is left unattended for several hours. Despite the expansive area covered by this gear, only the buoyed ends are exposed to normal marine traffic since the remainder of the gear is deep enough that a vessel can usually pass over it safely. The exception would be vessels that are pulling trawls or seismographic equipment and other vessels with lines or equipment which extends well below the surface.

Although Kodiak is among the top two ports in terms of landings, the halibut fishery is by no means the dominant fishery in Kodiak. This
situation is expected to continue. Kodiak halibut landings are expected to be held below current levels through the mid-1980s as the International Pacific Halibut Commission (IPHC) maintains relatively low quotas in the Gulf of Alaska in an attempt to rebuild the halibut resources in that area. The management efforts are expected to be successful and the landings are projected to increase during the forecast period by 83 percent and 130 percent in terms of weight and real value, respectively. The high ex-vessel price for halibut and the excess harvesting and processing capacity that exist will tend to maintain resource abundance and the resulting quotas as the binding constraint on the fishery.

The projected levels of harvesting activity and the resulting percentage increases during the forecast period are summarized in Tables 3.13 and 3.14. The projections of catch are for both the small and large boat fleets; but since the boats and fishermen of the small boat fleet are primarily participants in other fisheries, the projected numbers of landings, boats, and fishermen, are for the large boat fleet alone.

Two additional comments are warranted by recent or possible changes in the halibut fishery. The first, the gradual phasing out of Canadian boats in the Gulf of Alaska, will tend to have only a minor effect on the distribution of Area 3 halibut landings since the presence of Canadian boats does not appear to have affected the historical ratio of landings in a community to Area 3 catch. The second change is more critical and cannot be readily incorporated in the projections. The incidental catch of halibut by trawlers has long been an unresolved problem. Foreign trawlers have caught large quantities of halibut as incidental catch
### TABLE 3.13

**PROJECTED HARVESTING ACTIVITY**

**KODIAK HALIBUT FISHERY 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>WEIGHT</th>
<th>VALUE</th>
<th>EX-VEssel PRICE</th>
</tr>
</thead>
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**Source:** Alaska Sea Grant Program.

1. The real values and prices are in terms of 1978 dollars.
TABLE 3.14

PROJECTED PERCENTAGE CHANGE FROM 1980, KODIAK HALIBUT FISHERY

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH</th>
<th>EX-VESSEL PRICE</th>
<th>NUMBER OF</th>
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</table>

Source: Alaska Sea Grant Program.
while targeting on groundfish and have been required to throw the halibut back into the water. This is not an ideal solution since much of the incidental catch does not survive, but it decreases the incentive for foreign trawlers to accidently catch halibut. As the domestic groundfish industry develops and the incidental catch becomes predominantly domestic, the IPHC and NPFMC will no doubt be forced to find a better solution to the problem of incidental halibut catch. One possibility is that the costs associated with limiting the incidental catch will be found to exceed the benefits, and it will be decided that the long line halibut fishery is not viable in light of multi-fishery management objectives. The management entities have not really confronted these issues, and it is therefore not known how the problem will be resolved. In the absence of such knowledge, the issue is noted but not incorporated in the halibut fishery projections.

Groundfish

The Kodiak groundfish fishery is similar to the halibut fishery in that it consists of two distinct fleets. They are a small boat long line fleet, and a large boat trawl fleet. The small boat fleet fishes inshore areas and is comprised of boats from under 7.6 meters to 16.8 meters (25 feet to 55 feet) in length which primarily participate in other fisheries. The large boat or trawl fleet consists of boats predominately over 19.8 meters (65 feet) in length that are capable of fishing more distant offshore areas. The majority of the catch of both fleets is used as bait by king and Tanner crab fishermen. As the domestic groundfish
industry develops, the catch will increasingly be marketed as a food fish, the number and size of the boats in the trawl fleet will increase, and the catch of the small boat fleet will be relatively insignificant.

Kodiak is identified in the "State of Alaska Program for Development of the Bottomfish Industry" as one of five ideal communities for bottomfish development in Alaska. The projections of Kodiak groundfish harvesting activity summarized in Tables 3.15 through 3.18 reflect the important role Kodiak is expected to have in the groundfish industry of the Gulf of Alaska. By the year 2000, groundfish fleets are projected to account for 63 percent of the Kodiak catch by all fisheries in terms of weight and 9 percent of the total catch in terms of value. The extreme difference in importance in terms of weight and value occurs because groundfish are a very low-valued fish while the traditional fisheries in Kodiak are dominated by higher valued species such as king crab, salmon, and Tanner crab. The projections of the numbers of boats, landings, and fishermen are for the large boat trawl fleet and the projections for boats and fishermen are based on estimates of how many full-time groundfish boats and therefore fishermen would be required to harvest a projected quantity of fish. If the groundfish fleet which develops does not consist primarily of such boats, the number of boats and fishermen who will participate in the fishery is understated. But to the extent that the part-time groundfish boats and fishermen participate in other fisheries, they are accounted for elsewhere.
TABLE 3.15

PROJECTED HARVESTING ACTIVITY
KODIAK GROUNDFISH FISHERY 1970-2000

| CATCH | VALUE | EX-VEssel PRICE | NUMBER OF
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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
### Table 3.16

**PROJECTED PERCENTAGE CHANGE FROM 1980, KODIAK GROUNDFISH FISHERY**

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Source: Alaska Sea Grant Program
## TABLE 3.17

KODIAK GROUNDFISH PROJECTED CATCH BY SPECIES 1980-2000

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Source: Alas a Sea Grant Program.
King Crab

The Kodiak king crab fishery is a relatively mature fishery with fairly well-defined resources that are expected to allow an average annual harvest of 13,600 metric tons (30 million pounds). The king crab fleet consists of boats from under 7.6 meters (25 feet) to over 38.1 meters (125 feet) in length, but the majority of the harvest is landed by the larger boats. Recently, the king crab season has been from September through January. During the remainder of the year, king crab boats and fishermen participate in king crab fisheries in other areas, in other crab fisheries, or to a lesser extent in non-crab fisheries.

The king crab harvest is expected to equal the sustainable yield by 1980 and on average be maintained at that level throughout the forecast period. The favorable market conditions that are expected to continue are projected to increase the real value of the king crab catch by over 30 percent between 1980 and 2000, and should result in stock abundance and the associated quotas determining annual catch. The projections are summarized in Tables 3.19 and 3.20.

The pot gear used in the king crab and other crab fisheries is fixed gear that is left unattended; therefore, it is subject to losses to marine traffic including trawlers. The gear consists of a pot that is placed on the ocean floor and connected to a buoy which marks its location. The pots are placed at varying intervals along a course that may be determined by the contour of the sea floor. If a buoy is ripped from a pot, the pot is very difficult to locate and recover. The exposed part
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Source: Alaska Sea Grant Program

*The real values and prices are in terms of 1978 dollars.*
TABLE 3.20

PROJECTED PERCENTAGE CHANGE FROM 1980,
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Source: Alaska Sea Grant Program.
of the gear, the buoy, provides a very small target for marine traffic, but since the buoys are often difficult to spot visually or with radar and the pots often are placed in heavy concentrations, gear losses to marine traffic are not infrequent. A typical crab fisherman loses several pots per year, but often the cause of each loss is not known.

**Tanner Crab**

The history of the Kodiak Tanner crab fishery indicates how rapidly a fishery can develop and, therefore, how hazardous it can be to make long-term fishery forecasts. The fishery began in 1967 with a meager catch of 50.1 metric tons (111,000 pounds) but by 1973, the catch had grown to 14,444 metric tons (31.8 million pounds). This explosive growth was stimulated by changing market conditions that made fuller utilization of the Tanner crab resources profitable. The decline in the abundance of king crab resulted in a shorter king crab season which provided an incentive to king crab fishermen and boats to also participate in the Tanner crab fishery; and the decrease in supply of king crab helped to increase the price of Tanner crab and make participation in the fishery more attractive.

In recent years, the Kodiak Tanner crab season has begun in January as the king crab fishery is ending and has extended into April or May. Many crab fishermen and boats participate in both fisheries; the characteristics of the fleets are therefore similar. The Tanner crab boats range in size from less than 10.7 meters (35 feet) to over 38.1 meters (125 feet), but are typically between 15.2 and 35.1 meters (50 and 115
feet) in length, have a crew of three, and are capable of fishing far offshore.

Although the Tanner crab fishery is younger than the king crab fishery, it is also a relatively mature fishery with resources and markets that are well developed and defined and which, in the absence of unforeseen major changes in the biological or market environments, are expected to result in an average annual harvest of 12,700 metric tons (28 million pounds) during the forecast period. The market conditions are expected to be sufficiently favorable to maintain resource abundance as the binding constraint on fishery activity, despite the projected "3 percent decline in the real ex-vessel price. The projections are summarized in Tables 3.21 and 3.22.

Dungeness Crab

The Kodiak Dungeness crab fishery is principally participated in by boats and fishermen that are primarily participants in other fisheries; and although the Dungeness crab fleet has included large king crab and shrimp boats, it has tended to have a larger concentration of boats under 16.8 meters (55 feet) than have the other shellfish fleets. The average crew size is two and one half and the season extends from May through December.

Typically, the development of the Kodiak Dungeness crab fishery has been constrained by market conditions, not resource abundance. The principal
### TABLE 3.21

**PROJECTED HARVESTING ACTIVITY**

**KODIAK TANNER CRAB FISHERY 1980-2000**

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Source: Alaska Sea Grant Program.

1 The real values and prices are in terms of 1978 dollars.
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Source: Alaska Sea Grant Program
barriers to a recovery of the Kodiak Dungeness crab fishery have been the relative strengths of other fisheries. There are two principal factors which determine the desirability of operating a vessel in this fishery. One is the ex-vessel price of Dungeness crab; this has historically been determined by Oregon, Washington, and California Dungeness crab harvest levels since that area is the main source of supply. The other factor is the strength of the other Kodiak fisheries; king crab vessels tend to enter the Dungeness crab fishery during lulls in the king crab season, and similarly, shrimp vessels enter the Dungeness crab fishery when area closures prevent them from fishing for shrimp.

Based on the expectations that the competing shellfish fisheries will not exhibit growth during the forecast period and that the demand for crab will continue to increase, the market conditions that have constrained the Dungeness crab fishery are expected to be gradually eliminated; catch is projected to approach the allowable biological catch of 908 metric tons (2 million pounds). The projections are presented in Tables 3.23 and 3.24.

**Shrimp**

The Kodiak shrimp fishery has declined rapidly in the past few years, and it is not known when or if a recovery will occur. Based on information provided by Martin Eaton, the ADF&G Westward Region Shellfish Biologist, it is assumed that catch will average 4,535 metric tons (10 million pounds) during the first 10 years of the forecast period and average 9,072 metric tons (20 million pounds) for the remainder of the period.
### TABLE 3.23

**PROJECTED HARVESTING ACTIVITY**

**KODIAK DUNGENESS CRAB FISHERY 1980-2000**

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<tr>
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<th>Real</th>
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Source: Alaska Sea Grant Program.

1. The real values and prices are in terms of 1978 dollars.
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Source: Alaska Sea Grant Program
(see Tables 3.25 and 3.26). Favorable market conditions and the depressed stock are expected to assure that the latter remains the binding constraint on catch.

The three distinct shrimp fleets include otter trawlers, beam trawlers, and pot boats. The otter trawlers which dominate the fishery have an average crew size of three and are typically 19.8 to 25.9 meters (65 to 85 feet) in length. Only a few beam trawlers or pot boats participate in the Kodiak shrimp fishery. The average crew size for either type vessel is two and the typical boat is less than 16.8 meters (55 feet) in length. The decline in resource abundance and the resulting area and seasonal closures have turned what was a year-round fishery in the early 1970s into a June through February fishery in 1978. As a result of the dramatic decline in this fishery, many of the shrimp trawlers have prepared to enter the Kodiak groundfish fishery.

**Razor Clam**

Market conditions have resulted in the Kodiak razor clam resources being underutilized in recent years; however, improved market conditions combined with a recovery of the razor clam resources are expected to result in substantial growth in the fishery by the year 2000. The weight and real value of the average annual harvest are projected to increase by over 500 percent during the forecast period. Despite this dramatic growth, the razor clam fishery will remain almost insignificant in comparison to the other Kodiak fisheries. The razor clam fishery projections are presented in Tables 3.27 and 3.28.
### TABLE 3.25

**PROJECTED HARVESTING ACTIVITY**

**KODIAK SHRIMP FISHERY 1980-2000**

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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
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Source: Alaska Sea Grant Program.
## TABLE 3.27

**PROJECTED HARVESTING ACTIVITY**

**KODIAK RAZOR CLAM FISHERY 1980-2000**

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Source: [Alaska Sea Grant Program](https://www.alaskaseagrant.org)

1. The real values and prices are in terms of 1978 dollars.
### Table 3.28

**Projected Percentage Change from 1980, Kodiak Razor Clam Fishery**

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Source: Alaska Sea Grant Program.
**Summation of Harvesting Activity Projections**

This section consists of the presentation and analysis of the projections of harvesting activity of the Kodiak commercial fishing industry as a whole. The tables presented in this section include summations of projected harvesting activity and projections of the relative importance of each fishery.

Total catch is projected to increase from 47,000 metric tons (103.7 million pounds) in 1980 to 169,000 metric tons (373 million pounds) in 2000, and its real value is projected to increase from $72.6 million to $155 million (see Table 3.29). The resulting percentage increases by weight and real value respectively are 260 and 130 percent (see Table 3.30). The weight is projected to increase more rapidly than the value due to a decrease in the industry-wide real ex-vessel price that is expected to occur as lower-valued groundfish become a larger proportion of the total harvest, and the higher valued traditional species become a smaller proportion of catch (see Table 3.33).

If the groundfish fisheries are excluded, total catch is expected to increase from 46,960 metric tons (103.5 million pounds) to 62,300 metric tons (137.4 million pounds) or in terms of real value from $72.6 million to $140 million (see Table 3.31). The corresponding percentage increases are 32.7 percent by weight and 92.9 percent by real value (see Table 3.32). For the traditional fisheries, the value of the annual catch is projected to increase more rapidly than its weight because the real ex-vessel prices of the dominant traditional species are projected to increase.
### TABLE 3.29

**PROJECTED HARVESTING ACTIVITY**

**KODIAK ALL FISHERIES 1980-2000**

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*Source: Alaska Sea Grant Program.*

*The real values and prices are in terms of 1978 dollars.*
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Source: Alaska Sea Grant Program
TABLE 3.31
PROJECTED HARVESTING ACTIVITY
KODIAK TRADITIONAL FISHERIES 1980-2000

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<th>YEAR</th>
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<th>NUMBER OF LANDINGS</th>
<th>NUMBER OF FISHERMEN</th>
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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
TABLE 3.32
PROJECTED PERCENTAGE CHANGE FROM 1980,
KODIAK TRADITIONAL FISHERIES

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Source: Alaska Sea Grant Program.
TABLE 3.33
PERCENTAGE OF CATCH BY WEIGHT BY KODIAK FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
In addition to the large projected changes in absolute levels of harvesting activity, there are some significant projected changes in relative levels of activity among the fisheries. The most notable is the previously mentioned change in the harvest mix between traditional species and the groundfish species. In terms of weight, the groundfish species are expected to account for less than one percent of the catch in 1980 but over 63 percent by 2000 (see Table 3.33); however, in terms of value, the groundfish species are expected to account for just over 9 percent of the Kodiak harvest (see Table 3.34). And as Tables 3.35 through 3.37 indicate, the groundfish fishery is expected to be relatively minor with respect to the number of boats, landings, or fishermen.

Within the traditional fisheries, less significant changes in relative importance are projected. By weight, the salmon fisheries are expected to become relatively more important as the king and Tanner crab fisheries become less important (see Table 3.38). The changes in terms of value are in the same directions but they are more dramatic (see Table 3.39).

The projected changes in the relative number of boats, landings, or fishermen among the traditional fisheries are minor (see Tables 3.40 through 3.42).

As is mentioned in Chapter II, the summation of the number of fishermen or boats over all fisheries results in double counting since a fisherman or boat is counted once for each fishery which is participated in. The method used to reduce this problem is discussed in Chapter II; the
### TABLE 3.34

PERCENTAGE OF VALUE BY KODIAK FISHERY INCLUDING GROUNDISH, 1980-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>Salmon</th>
<th>Halibut</th>
<th>Herring</th>
<th>King Crab</th>
<th>Tanner Crab</th>
<th>Dungeness</th>
<th>Shrimp</th>
<th>Razor Clams</th>
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Source: Alaska Sea Grant Program.
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<th>Razor Clams</th>
<th>Groundfish</th>
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Source: Alaska Sea Grant Program
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<th>Herring</th>
<th>King Crab</th>
<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program.
TABLE 3.37

PERCENTAGE OF NUMBER OF LANDINGS BY KODIAK FISHERY INCLUDING GROUND FISH, 1980-2000

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<th>Year</th>
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<th>Herring (%)</th>
<th>King Crab (%)</th>
<th>Tanner Crab (%)</th>
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Source: Alaska Sea Grant Program
### TABLE 3.40

**PERCENTAGE OF FISHERMEN BY KODIAK FISHERY EXCLUDING GROUNDFISH, 1980-2000**

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Source: Alaska Sea Grant Program
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<th>Herring</th>
<th>King Crab</th>
<th>Tanner Crab</th>
<th>Dungeness Crab</th>
<th>Shrimp</th>
<th>Razor Clams</th>
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Source: Alaska Sea Grant Program
results of this adjustment to reduce double counting are presented in Table 3.43 which includes adjusted and unadjusted projections of the numbers of boats and fishermen participating in the harvesting sector of the Kodiak commercial fishing industry.

Local Harvesting Effort

The difficulties associated with defining and measuring local fishing effort are discussed in Chapter II. The results of the method used to measure local effort are presented in this section. As the values of the local harvesting factors summarized in Table 3.44 indicate, the degree to which a fishery can be considered local varies greatly. For example, the halibut fisheries appear to be principally non-local while the Dungeness and Tanner crab fisheries appear to be principally local, and the salmon fisheries are close to being half local. In addition to the differences in local participation among fisheries, there is also a difference within some fisheries between smaller and larger boats.

There is a tendency for the participation factor to be higher for the small boats within a fishery; see for example the Tanner and king crab fisheries.

PROCESSING

The projections of processing plant activity presented in this section are based on the projections of industry-wide catch discussed in a preceding section. The measures of activity are in terms of processing
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Source: Alaska Sea Grant Program
### TABLE 3.43 Continued

**ADJUSTED PROJECTIONS OF THE NUMBER OF FISHERMEN FOR THE KODIAK COMMERCIAL FISHING INDUSTRY 1980-2000**

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Source: Alaska Sea Grant Program.
### TABLE 3.44
LOCAL HARVESTING FACTOR FOR KODIAK, 1976

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\[ P = \left( \frac{PF}{TP} \right) \times LPO/B \]

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<th>B</th>
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<tr>
<td>Shrimp, large boat pots</td>
<td>4</td>
<td>30</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Razor clams, shovel</td>
<td>8</td>
<td>174</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Razor clams, dredge</td>
<td>NA</td>
<td>5</td>
<td>-o-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Razor clams, other</td>
<td></td>
<td></td>
<td>-o-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon, hand troll</td>
<td>1,239</td>
<td>2,746</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon, power troll</td>
<td>742</td>
<td>999</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanner crab, small boat pots</td>
<td>166</td>
<td>295</td>
<td>62</td>
<td>32</td>
<td>1.0*</td>
</tr>
<tr>
<td>Tanner crab, large boat pots</td>
<td>224</td>
<td>341</td>
<td>92</td>
<td>75</td>
<td>.806</td>
</tr>
<tr>
<td>Scallops, dredge</td>
<td>NA</td>
<td>NA</td>
<td>-o-</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*P = 1 when calculated value exceeds 1
P = Estimate of the proportion of fishing effort that is local
LPO = Number of local permit owners
TP = Total number of permits
PF = Number of permits fished
B = Number of boats participating in the fishery

Source: ADF&G and CFEC data files
plant input requirements and processing plant payrolls or income. Four
sets of projections are presented for each measure of processing activity;
the four sets are the traditional fisheries with and without increased
efficiency and all fisheries with and without increased efficiency. The
four sets of projections are presented due to the speculative nature of
both the rate of development of the groundfish industry and the rate of
increase in processing efficiency.

**Water**

In 1976 and 1977, the peak water usage by Kodiak processing plants was
approximately 30 million liters (8 million gallons) per day. Using this
as the base peak load, the peak load is projected to be between 21 and 36
million liters (5.6 and 9.4 million gallons) per day by 2000 (see Table 3.45).

**Electricity**

Based on a base peak load requirement of 2 million kilowatt hours of
electricity per month, the projected peak use of electricity by processing
plants in the year 2000 is projected to range from 1.4 to 6.7 million
kilowatt hours per month (see Table 3.46).

**Employment**

Using the Alaska Department of Labor estimates of average monthly employment
in the manufacturing of food and kindred products in Kodiak as the base,
<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries 1</th>
<th>Traditional Fisheries 2</th>
<th>All Fisheries 1</th>
<th>All Fisheries 2</th>
<th>Percentage Increase*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>6584</td>
<td>6323</td>
<td>6584</td>
<td>6323</td>
<td>-17.7%</td>
</tr>
<tr>
<td>1981</td>
<td>6714</td>
<td>6319</td>
<td>6714</td>
<td>6320</td>
<td>-16.08%</td>
</tr>
<tr>
<td>1982</td>
<td>6854</td>
<td>6322</td>
<td>6855</td>
<td>6323</td>
<td>-14.33%</td>
</tr>
<tr>
<td>1983</td>
<td>7004</td>
<td>6331</td>
<td>7005</td>
<td>6332</td>
<td>-12.45%</td>
</tr>
<tr>
<td>1984</td>
<td>7166</td>
<td>6349</td>
<td>7168</td>
<td>6349</td>
<td>-10.43%</td>
</tr>
<tr>
<td>1985</td>
<td>7350</td>
<td>6381</td>
<td>7353</td>
<td>6383</td>
<td>-8.12%</td>
</tr>
<tr>
<td>1986</td>
<td>7392</td>
<td>6289</td>
<td>7396</td>
<td>6292</td>
<td>-7.60%</td>
</tr>
<tr>
<td>1987</td>
<td>7435</td>
<td>6199</td>
<td>7440</td>
<td>6203</td>
<td>-7.07%</td>
</tr>
<tr>
<td>1988</td>
<td>7478</td>
<td>6110</td>
<td>7486</td>
<td>6117</td>
<td>-6.52%</td>
</tr>
<tr>
<td>1989</td>
<td>7523</td>
<td>6024</td>
<td>7535</td>
<td>6033</td>
<td>-5.96%</td>
</tr>
<tr>
<td>1990</td>
<td>8205</td>
<td>6439</td>
<td>8222</td>
<td>6452</td>
<td>-2.57%</td>
</tr>
<tr>
<td>1991</td>
<td>8252</td>
<td>6346</td>
<td>8276</td>
<td>6365</td>
<td>3.16%</td>
</tr>
<tr>
<td>1992</td>
<td>8301</td>
<td>6256</td>
<td>8335</td>
<td>6282</td>
<td>3.76%</td>
</tr>
<tr>
<td>1993</td>
<td>8351</td>
<td>6168</td>
<td>8400</td>
<td>6204</td>
<td>4.3%</td>
</tr>
<tr>
<td>1994</td>
<td>8402</td>
<td>6081</td>
<td>8474</td>
<td>6133</td>
<td>5.0%</td>
</tr>
<tr>
<td>1995</td>
<td>8454</td>
<td>5997</td>
<td>8559</td>
<td>6071</td>
<td>5.67%</td>
</tr>
<tr>
<td>1996</td>
<td>8508</td>
<td>5414</td>
<td>8661</td>
<td>6021</td>
<td>6.35%</td>
</tr>
<tr>
<td>1997</td>
<td>8563</td>
<td>5833</td>
<td>8787</td>
<td>5986</td>
<td>7.34%</td>
</tr>
<tr>
<td>1998</td>
<td>8620</td>
<td>5755</td>
<td>8948</td>
<td>5974</td>
<td>7.75%</td>
</tr>
<tr>
<td>1999</td>
<td>8678</td>
<td>5678</td>
<td>9159</td>
<td>5992</td>
<td>8.47%</td>
</tr>
<tr>
<td>2000</td>
<td>8738</td>
<td>5602</td>
<td>Y444</td>
<td>6055</td>
<td>9.22%</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1 Requirement without increased efficiency.
2 Requirement with a 2 percent annual decrease in input requirements per unit produced.
*Projected percentage increase since the late 1970s.
## Table 3.46

**Projected Peak Kodiak Processing Requirements for Electricity**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
<th>Percentage Increase*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000 KWh/Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional Fisheries</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1980</td>
<td>1646</td>
<td>1581</td>
<td>1649</td>
</tr>
<tr>
<td>1981</td>
<td>1678</td>
<td>1580</td>
<td>1683</td>
</tr>
<tr>
<td>1982</td>
<td>1713</td>
<td>1580</td>
<td>1719</td>
</tr>
<tr>
<td>1983</td>
<td>1751</td>
<td>1583</td>
<td>1759</td>
</tr>
<tr>
<td>1987</td>
<td>1859</td>
<td>1550</td>
<td>1894</td>
</tr>
<tr>
<td>1988</td>
<td>1870</td>
<td>1529</td>
<td>1920</td>
</tr>
<tr>
<td>1989</td>
<td>1881</td>
<td>1506</td>
<td>1953</td>
</tr>
<tr>
<td>1990</td>
<td>2051</td>
<td>1610</td>
<td>2156</td>
</tr>
<tr>
<td>1993</td>
<td>2082</td>
<td>1542</td>
<td>2405</td>
</tr>
<tr>
<td>1995</td>
<td>2133</td>
<td>1499</td>
<td>2784</td>
</tr>
<tr>
<td>1996</td>
<td>2127</td>
<td>1479</td>
<td>3105</td>
</tr>
<tr>
<td>1997</td>
<td>2141</td>
<td>1459</td>
<td>3570</td>
</tr>
<tr>
<td>1998</td>
<td>2155</td>
<td>1439</td>
<td>4246</td>
</tr>
<tr>
<td>1999</td>
<td>2169</td>
<td>1419</td>
<td>5234</td>
</tr>
<tr>
<td>2000</td>
<td>2184</td>
<td>1401</td>
<td>6683</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1 Requirement without increased efficiency.

2 Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
the projections of average monthly employment for the year 2000 range from 1,698 to 2,312 (see Table 3.47).

Income

Using corresponding data of the annual payroll of processing plants, the annual real income for the year 2000 is projected to range from $26 million to $35.4 million (see Table 3.47). The projected percentage increases are summarized in Table 3.48.

Number of Plants

The number of plants can vary greatly due to changes in average plant size, and is therefore not a significant measure of processing activity. Since many Kodiak plants have either excess capacity or the capability of increasing their capacity, the number of plants is expected to remain relatively constant and perhaps range from 15 to 20, with most plants processing a combination of species. Since the projected development of the groundfish industry is more speculative and more significant than that of the traditional fisheries, a summary of projected groundfish processing activity, including the number of plants, is presented in Table 3.49.

Local Processing Effort

Industry sources have indicated that, during the summer months, less than half of the fish processing plant employees are full-time residents but
### TABLE 3.47

**PROJECTED KODIAK PROCESSING EMPLOYMENT AND INCOME, 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>WITHOUT</th>
<th>WITH</th>
<th>WITHOUT</th>
<th>WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I NCREASED EFFICIENCY</td>
<td>I NCREASED EFFICIENCY</td>
<td>I NCREASED EFFICIENCY</td>
<td>I NCREASED EFFICIENCY</td>
</tr>
<tr>
<td></td>
<td>Nominal</td>
<td>Real</td>
<td>Nominal</td>
<td>Real</td>
</tr>
<tr>
<td>1980</td>
<td>1280</td>
<td>18040</td>
<td>16208</td>
<td>1229</td>
</tr>
<tr>
<td>1981</td>
<td>1305</td>
<td>19593</td>
<td>16685</td>
<td>1273</td>
</tr>
<tr>
<td>1982</td>
<td>1332</td>
<td>21301</td>
<td>17195</td>
<td>1229</td>
</tr>
<tr>
<td>1983</td>
<td>1361</td>
<td>23183</td>
<td>17738</td>
<td>1231</td>
</tr>
<tr>
<td>1984</td>
<td>1393</td>
<td>25260</td>
<td>18319</td>
<td>1234</td>
</tr>
<tr>
<td>1985</td>
<td>1429</td>
<td>27594</td>
<td>18969</td>
<td>1240</td>
</tr>
<tr>
<td>1986</td>
<td>1437</td>
<td>29555</td>
<td>19258</td>
<td>1222</td>
</tr>
<tr>
<td>1987</td>
<td>1445</td>
<td>31658</td>
<td>19553</td>
<td>1205</td>
</tr>
<tr>
<td>1988</td>
<td>1454</td>
<td>33914</td>
<td>19854</td>
<td>1188</td>
</tr>
<tr>
<td>1989</td>
<td>1462</td>
<td>36335</td>
<td>20163</td>
<td>1171</td>
</tr>
<tr>
<td>1990</td>
<td>1595</td>
<td>42205</td>
<td>22199</td>
<td>1252</td>
</tr>
<tr>
<td>1991</td>
<td>1604</td>
<td>45207</td>
<td>22538</td>
<td>1234</td>
</tr>
<tr>
<td>1992</td>
<td>1613</td>
<td>48428</td>
<td>22846</td>
<td>1216</td>
</tr>
<tr>
<td>1993</td>
<td>1623</td>
<td>51885</td>
<td>23241</td>
<td>1199</td>
</tr>
<tr>
<td>1994</td>
<td>1633</td>
<td>55595</td>
<td>23604</td>
<td>1182</td>
</tr>
<tr>
<td>1995</td>
<td>1643</td>
<td>59377</td>
<td>23977</td>
<td>1166</td>
</tr>
<tr>
<td>1996</td>
<td>1654</td>
<td>63853</td>
<td>24358</td>
<td>1150</td>
</tr>
<tr>
<td>1997</td>
<td>1664</td>
<td>68445</td>
<td>24748</td>
<td>1134</td>
</tr>
<tr>
<td>1998</td>
<td>1675</td>
<td>73377</td>
<td>25148</td>
<td>1119</td>
</tr>
<tr>
<td>1999</td>
<td>1687</td>
<td>78675</td>
<td>25558</td>
<td>1104</td>
</tr>
<tr>
<td>2000</td>
<td>1698</td>
<td>84367</td>
<td>25979</td>
<td>1089</td>
</tr>
</tbody>
</table>

**Source:** Alaska Sea Grant Program

1. Average monthly employment.
2. Annual payroll in $1,000.
3. Income in 1978 dollars ($1,000).
## Table 3.48

**Projected Percentage Change* in Kodiak Processing Employment and Income 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries Without Increased Efficiency</th>
<th>Traditional Fisheries With Increased Efficiency</th>
<th>All Fisheries Without Increased Efficiency</th>
<th>All Fisheries With Increased Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment</td>
<td>Nominal</td>
<td>Real</td>
<td>Employment</td>
</tr>
<tr>
<td>1982</td>
<td>-14.33</td>
<td>10.21</td>
<td>-11.03</td>
<td>-20.98</td>
</tr>
<tr>
<td>1984</td>
<td>-10.43</td>
<td>3(-).70</td>
<td>-5.21</td>
<td>-20.65</td>
</tr>
<tr>
<td>1985</td>
<td>-8.12</td>
<td>42.78</td>
<td>-1.85</td>
<td>-20.24</td>
</tr>
<tr>
<td>1986</td>
<td>-7.60</td>
<td>52.92</td>
<td>-0.36</td>
<td>-21.39</td>
</tr>
<tr>
<td>1987</td>
<td>-7.07</td>
<td>63.80</td>
<td>1.17</td>
<td>-22.52</td>
</tr>
<tr>
<td>1988</td>
<td>-6.52</td>
<td>75.47</td>
<td>2.73</td>
<td>-23.62</td>
</tr>
<tr>
<td>1989</td>
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<td>88.00</td>
<td>4.32</td>
<td>-24.70</td>
</tr>
<tr>
<td>1990</td>
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<td>118.37</td>
<td>1.48</td>
<td>-19.91</td>
</tr>
<tr>
<td>1994</td>
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<td>187.65</td>
<td>22.13</td>
<td>-23.99</td>
</tr>
<tr>
<td>1995</td>
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<td>200.26</td>
<td>24.06</td>
<td>-25.04</td>
</tr>
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<td>26.03</td>
<td>-26.07</td>
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<td>336.52</td>
<td>34.42</td>
<td>-30.07</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

*1977 is the base period.

1 Average monthly employment.

2 Annual payroll in $1,000.

3 Income in 1978 dollars in ($1,000).
### TABLE 3.49

**PROJECTED KODIAK GROUNDFISH PROCESSING ACTIVITY, 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH (MT)</th>
<th>NUMBER OF PLANTS</th>
<th>EMPLOYMENT (man years)</th>
<th>LAND (hectares)</th>
<th>ELECTRICITY (million KWH/year)</th>
<th>WATER (million gallons/year)</th>
</tr>
</thead>
<tbody>
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<td>1980</td>
<td>70</td>
<td>0</td>
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<td>99</td>
<td>0</td>
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<td>0</td>
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</tr>
<tr>
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<td>0</td>
<td>0</td>
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</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1984</td>
<td>285</td>
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<td>0</td>
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</tr>
<tr>
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<td>0</td>
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</tr>
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</tr>
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<td>53</td>
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<td>213</td>
<td>1</td>
<td>1</td>
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</tr>
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<td>303</td>
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</tr>
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<td>4</td>
<td>96</td>
</tr>
<tr>
<td>2000</td>
<td>107026</td>
<td>2</td>
<td>614</td>
<td>3</td>
<td>5</td>
<td>141</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1. The number of full-time groundfish plants.

NOTE: The values are rounded to the nearest whole number, therefore a "0" indicates a value of less than 0.5.
that, during the remainder of the year, the employees are predominantly local residents.

THE FEASIBILITY OF THE PROJECTED GROWTH

In this section, the feasibility of the projected growth of the Kodiak commercial fishing industry is evaluated in terms of the projected input requirements and projected input availability. The inputs that are considered include small boat harbor facilities, port facilities, labor, land, electric power, water, and processing plant facilities. Projections of the availability of port facilities, labor, land, electric power, and water are drawn from the following SESP reports:

- Technical Report Number 37, Western Gulf of Alaska Petroleum Development Scenarios Transportation Systems Impacts
- Technical Report Number 40, Western Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts

Projections of input requirements are based on forecasts of harvesting and processing activity presented in previous sections, and the projections of input availability that are not available from other SESP reports are developed in this section.

Small Boat Harbor

The Kodiak small boat harbor has been used well beyond its design capacity for a number of years. The inadequacy of this facility is demonstrated
by the long waiting lists for permanent slips, the rafting of vessels that is often required, and the inability of very large fishing vessels to use the small boat harbor. The City of Kodiak is pursuing development programs for two additional small boat harbor facilities. The projected increases in the harvesting activity of the traditional fisheries can occur without a significant increase in the number of boats using the Kodiak small boat harbor; therefore, it is believed that the projected growth of the traditional fisheries can occur given the existing facility. However, the development of the groundfish fishery would be constrained by the existing facility since the groundfish fleet is expected to consist primarily of vessels that are too large to be adequately served by the existing small boat harbor. The facilities that are being planned would be adequate for the projected groundfish fleet and the projected fleets of the traditional fisheries.

Port Facility

Technical Report Number 37 indicates that the Kodiak port facilities are operating near capacity and that the capacity of the existing facilities will be inadequate by the early 1980s. The report does not indicate how or if port capacity will be increased. Inadequate port facilities could adversely affect the growth of the traditional fisheries and the development of the groundfish fishery. However, since the commercial fishing industry is the mainstay of the Kodiak economy, and since Kodiak has been identified as an area for the State of Alaska to concentrate groundfish development efforts, it is believed that eventually adequate port facilities will be available.
The projected growth of the commercial fishing industry is feasible only if the corresponding rates of increase in input requirements can be met or surpassed by the rates of increase in input availability. The rates of increase of input requirements can be derived from the projections of input requirements developed in the previous section and the rates of increase in input availability can be inferred from information included in Technical Report Number 40. The report presents projections of community requirements for labor, electric power, and water for each of the OCS petroleum scenarios and indicates that the requirements can be met. The rates of increase in community-wide input requirements corresponding to the projections of community-wide input requirements are, therefore, considered to only include rates of increase that do not exceed feasible rates of increase in input availability. The highest rates of increase are associated with the high find case, therefore, the rates of increase in input requirements for the commercial fishing industry are compared to the rates of increase in community-wide input requirements/availability of the high find case to determine if the former are feasible. The projected rates of increase in input availability and requirements are presented in Table 3.50.

With the exception of the 1990 fishing industry cases which do not allow for increased efficiency, the projected rate of growth of water usage by the fishing industry is below the record rate of growth of water availability projected for the early to mid-1980s. With the same exceptions and that of case 3 in the late 1990s, the annual projected rate of
## TABLE 3.50

COMPARATIVE RATES OF GROWTH, HIGH FIND CASE AND THE KODIAK FISHING INDUSTRY

<table>
<thead>
<tr>
<th>Year</th>
<th>WATER</th>
<th>ELECTRIC POWER</th>
<th>POPULATION</th>
<th>EMPLOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ocs</td>
<td>Fishing Industry Case</td>
<td>Ocs</td>
<td>Fishing Industry Case</td>
</tr>
<tr>
<td></td>
<td>Case</td>
<td>I</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1981</td>
<td>7.7</td>
<td>2.0</td>
<td>-0.1</td>
<td>2.0</td>
</tr>
<tr>
<td>1982</td>
<td>7.0</td>
<td>2.1</td>
<td>0.0</td>
<td>2.1</td>
</tr>
<tr>
<td>1983</td>
<td>7.4</td>
<td>2.2</td>
<td>0.1</td>
<td>2.2</td>
</tr>
<tr>
<td>1984</td>
<td>8.0</td>
<td>2.3</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>1985</td>
<td>5.8</td>
<td>2.6</td>
<td>O*5</td>
<td>2.6</td>
</tr>
<tr>
<td>1986</td>
<td>3.9</td>
<td>O*6</td>
<td>-1.4</td>
<td>0.6</td>
</tr>
<tr>
<td>1987</td>
<td>3.9</td>
<td>0.6</td>
<td>-1.4</td>
<td>0.6</td>
</tr>
<tr>
<td>1988</td>
<td>3.4</td>
<td>0.6</td>
<td>-1.4</td>
<td>0.6</td>
</tr>
<tr>
<td>1989</td>
<td>2.4</td>
<td>0.6</td>
<td>-1.4</td>
<td>0.6</td>
</tr>
<tr>
<td>1990</td>
<td>2.6</td>
<td>9.1</td>
<td>6.9</td>
<td>9.1</td>
</tr>
<tr>
<td>1991</td>
<td>2.8</td>
<td>9.1</td>
<td>6.9</td>
<td>9.1</td>
</tr>
<tr>
<td>1992</td>
<td>4.4</td>
<td>0.6</td>
<td>-1.4</td>
<td>O*7</td>
</tr>
<tr>
<td>1993</td>
<td>3.1</td>
<td>0.6</td>
<td>-1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>1994</td>
<td>2.8</td>
<td>0.6</td>
<td>-1.4</td>
<td>0.9</td>
</tr>
<tr>
<td>1995</td>
<td>2.8</td>
<td>0.6</td>
<td>-1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>1996</td>
<td>1.9</td>
<td>0.6</td>
<td>-1.4</td>
<td>10.2</td>
</tr>
<tr>
<td>1997</td>
<td>2.1</td>
<td>0.6</td>
<td>-1.4</td>
<td>1.5</td>
</tr>
<tr>
<td>1998</td>
<td>1.5</td>
<td>0.7</td>
<td>-1.4</td>
<td>1.8</td>
</tr>
<tr>
<td>1999</td>
<td>2.6</td>
<td>0.7</td>
<td>-1.3</td>
<td>2.4</td>
</tr>
<tr>
<td>2000</td>
<td>2.0</td>
<td>0.7</td>
<td>-1.3</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1) Traditional fisheries without increased efficiency.  
2) Traditional fisheries with increased efficiency.  
3) All fisheries without increased efficiency.  
4) All fisheries with increased efficiency.
increase in water availability exceeds the projected rate of increase in fishing industry requirements. The largest percentage growth in the availability of electric power is projected to occur in 1983, and it exceeds the projected rates of increase in fishing industry use of electric power until 2000; and until the early 1990s, the projected annual increase in electric power capacity exceeds the projected increase in fishing industry requirements. With few exceptions, the projected rates of increase in fishing industry labor requirements are also below the record projected rates of growth of the Kodiak labor force. It therefore appears that the projected rates of growth of fishing industry requirements for water, electric power, and labor can be met. It should be noted that the high rates of increase in input requirements for 1990 are due to the projected doubling of the shrimp catch in 1990. Refer to the section on shrimp for an explanation of this increase.

Processing Facilities

Within a year, processing capacity can change significantly as the capacity of existing plants changes, as new plants are built, or as old plants become unusable. The ability to rapidly increase processing capacity, when the long-run prognosis indicates that it is profitable to do so, suggests that processing plant capacity will not be a constraint on the growth that is projected for the processing sector of the commercial fishing industry. The comparison of current processing capacity and the projected harvests for 2000, which is summarized in Table 3.51, also indicated that physical processing capacity is not expected to constrain the projected growth.
### TABLE 3.51
CURRENT PROCESSING CAPACITY AND FORECASTED HARVEST

<table>
<thead>
<tr>
<th>Species</th>
<th>Current Daily Processing Capacity (pounds/day)</th>
<th>Forecasted Harvest for 2000</th>
<th>Days Required to Process the Year 2000 Harvest with Current Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>1,890,000</td>
<td>44,667,000</td>
<td>23.6</td>
</tr>
<tr>
<td>King Crab</td>
<td>1,390,000</td>
<td>30,000,000</td>
<td>21.6</td>
</tr>
<tr>
<td>Tanner Crab</td>
<td>1,490,000</td>
<td>28,000,000</td>
<td>18.8</td>
</tr>
<tr>
<td>Shrimp</td>
<td>1,010,000</td>
<td>20,000,000</td>
<td>19.8</td>
</tr>
<tr>
<td>Halibut</td>
<td>500,000</td>
<td>8,050,000</td>
<td>16.1</td>
</tr>
</tbody>
</table>

**Land**

The requirements for additional land for processing plants are expected to be minimal since many plants currently have excess capacity.

**Conclusion**

The conclusion is that the long-term growth that is projected for the Kodiak commercial fishing industry appears to be feasible in terms of the long-term availability of inputs. This does not mean that during the next twenty years, temporary shortages of labor or water or other inputs will not prevent the level of activity of the fishing industry from being as high as it might otherwise be. What it means is that the long-term growth projected for the industry appears to be feasible despite the occasional shortages that will occur.
Seward is located adjacent to Resurrection Bay at the eastern extremity of the Cook Inlet management area. Although it can readily be demonstrated that the Seward economy is heavily dependent on the commercial fishing industry, it is very difficult to define the harvesting sector of the Seward commercial fishing industry. Seward is not the center of harvesting activity in any one management area; rather it is associated with the harvesting activity of several areas including Cook Inlet, Prince William Sound, and Kodiak. However, since it is most closely associated with the Cook Inlet fisheries, and since the data required to more narrowly define Seward harvesting activity are not available, the harvesting activity of the Cook Inlet management area will be used as a proxy for Seward harvesting activity. The exceptions are that the halibut and groundfish projections are in fact for Seward and not the entire Cook Inlet area. The usefulness of this definition of Seward harvesting activity will be discussed by fishery in subsequent sections. These fisheries include salmon, halibut, herring, groundfish, king crab, Tanner crab, Dungeness crab, and shrimp. The absolute and relative magnitudes of each fishery by weight are summarized in Table 3.52.

The importance of the Seward commercial fishing industry to the local community can be measured in a number of ways. It can be measured in absolute terms, such as, by the income of Seward fishermen or the number of commercial fishermen who reside in Seward (see Tables 3.53 and 3.54), or it can be measured in relative terms; for example, in 1976, approximately
### TABLE 3.52
#### COOK INLET FISHERIES
1973-1977

**Catch in 1000 pounds**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HERRING</th>
<th>HALIBUT</th>
<th>KING CRAB</th>
<th>TANNER CRAB</th>
<th>DUNGENESS CRAB</th>
<th>SHRIMP</th>
<th>ALL SHELLFISH</th>
<th>TOTAL OF FISHERIES INCLUDED IN THIS STUDY</th>
<th>TOTAL ALL FISHERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>14,418</td>
<td>3,184</td>
<td>3,972</td>
<td>4,349</td>
<td>8,509</td>
<td>330</td>
<td>4,897</td>
<td>18,085</td>
<td>39,659</td>
<td>39,808</td>
</tr>
<tr>
<td>1974</td>
<td>10,341</td>
<td>5,389</td>
<td>1,930</td>
<td>4,602</td>
<td>7,661</td>
<td>721</td>
<td>5,749</td>
<td>18,733</td>
<td>36,393</td>
<td>36,535</td>
</tr>
<tr>
<td>1975</td>
<td>18,045</td>
<td>8,298</td>
<td>3,935</td>
<td>2,886</td>
<td>4,952</td>
<td>363</td>
<td>4,752</td>
<td>12,953</td>
<td>43,231</td>
<td>43,248</td>
</tr>
<tr>
<td>1976</td>
<td>23,298</td>
<td>9,696</td>
<td>3,418</td>
<td>4,954</td>
<td>5,935</td>
<td>119</td>
<td>6,208</td>
<td>17,216</td>
<td>53,628</td>
<td>53,639</td>
</tr>
<tr>
<td>1977</td>
<td>36,012</td>
<td>6,436</td>
<td>3,249</td>
<td>2,027</td>
<td>5,650</td>
<td>76</td>
<td>5,144</td>
<td>12,897</td>
<td>58,594</td>
<td>58,607</td>
</tr>
<tr>
<td>Mean</td>
<td>20,443</td>
<td>6,600</td>
<td>3,300</td>
<td>3,764</td>
<td>6,541</td>
<td>322</td>
<td>5,350</td>
<td>15,976</td>
<td>46,301</td>
<td>46,367</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PERCENTAGE OF SHELLFISH INCLUDED</th>
<th>PERCENTAGE OF MISCELLANEOUS FISH INCLUDED</th>
<th>PERCENTAGE OF ALL FISH INCLUDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>99.55</td>
<td>97.87</td>
<td>99.62</td>
</tr>
<tr>
<td>1974</td>
<td>100.00</td>
<td>97.43</td>
<td>99.61</td>
</tr>
<tr>
<td>1975</td>
<td>99.91</td>
<td>99.92</td>
<td>99.96</td>
</tr>
<tr>
<td>1976</td>
<td>99.99</td>
<td>99.89</td>
<td>99.97</td>
</tr>
<tr>
<td>1977</td>
<td>99.98</td>
<td>99.82</td>
<td>99.97</td>
</tr>
</tbody>
</table>

**Percentage of All Included Fisheries**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HERRING</th>
<th>HALIBUT</th>
<th>KING CRAB</th>
<th>TANNER CRAB</th>
<th>DUNGENESS CRAB</th>
<th>SHRIMP</th>
<th>ALL SHELLFISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>36.35</td>
<td>8.02</td>
<td>10.01</td>
<td>10.96</td>
<td>21.45</td>
<td>0.83</td>
<td>12.34</td>
<td>45.60</td>
</tr>
<tr>
<td>1974</td>
<td>28.41</td>
<td>14.80</td>
<td>5.30</td>
<td>12.64</td>
<td>21.05</td>
<td>1.98</td>
<td>15.79</td>
<td>51.47</td>
</tr>
<tr>
<td>1975</td>
<td>41.74</td>
<td>19.19</td>
<td>9.10</td>
<td>6.67</td>
<td>11.45</td>
<td>0.83</td>
<td>10.99</td>
<td>29.96</td>
</tr>
<tr>
<td>1976</td>
<td>43.44</td>
<td>18.98</td>
<td>6.37</td>
<td>9.23</td>
<td>11.06</td>
<td>0.22</td>
<td>11.57</td>
<td>32.10</td>
</tr>
<tr>
<td>1977</td>
<td>61.46</td>
<td>10.98</td>
<td>5.54</td>
<td>3.45</td>
<td>9.64</td>
<td>0.13</td>
<td>8.77</td>
<td>22.01</td>
</tr>
</tbody>
</table>

Sources: ADF&G Annual Catch and Production Reports and Salmon and Shellfish Catch Reports, IPHC Annual Reports.
12 percent of the residents of Seward had commercial fishing licenses. Data available from the Kenai Borough Management Data Base Study indicate that in 1976, approximately 50 percent of Seward's basic sector

### TABLE 3.53
ESTIMATED GROSS EARNINGS OF SEWARD FISHERMEN 1969 - 1976

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF GEAR OPERATORS</th>
<th>ESTIMATED GROSS EARNINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>49</td>
<td>1,163,000</td>
</tr>
<tr>
<td>1970</td>
<td>72</td>
<td>1,612,000</td>
</tr>
<tr>
<td>1971</td>
<td>60</td>
<td>1,618,000</td>
</tr>
<tr>
<td>1972</td>
<td>64</td>
<td>2,011,000</td>
</tr>
<tr>
<td>1973</td>
<td>60</td>
<td>2,833,000</td>
</tr>
<tr>
<td>1974</td>
<td>62</td>
<td>2,978,000</td>
</tr>
<tr>
<td>1975</td>
<td>48</td>
<td>1,298,000</td>
</tr>
<tr>
<td>1976</td>
<td>52</td>
<td>3,153,000</td>
</tr>
</tbody>
</table>

Source: Alaska Commercial Fisheries Entry Commission, Distribution of Income from Alaska Fisheries, July, 1978

### TABLE 3.54
NUMBER OF SEWARD RESIDENTS HOLDING A COMMERCIAL FISHERMAN'S LICENSE 1969 - 1976

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>178</td>
<td>190</td>
<td>207</td>
<td>197</td>
<td>199</td>
<td>186</td>
<td></td>
</tr>
</tbody>
</table>

*A Seward resident is anyone who uses a Seward address when applying for a license.

Source: Commercial Fisheries Entry Commission, Commercial License File.
employment was in the industries dominated almost exclusively by commercial fishing and fish processing. The implication is that roughly one-half of the total employment in Seward is directly or indirectly generated by the Seward commercial fishing industry. Although more precise measures of the importance of the commercial fishing industry can be developed, the measurements used here are sufficient to demonstrate that the commercial fishing industry is a principle source of employment and income in Seward. The following brief summary of the projected growth of this industry indicates that the Seward commercial fishing industry will be a continuing source of economic growth in Seward.

During the next twenty years, the growth of the industry is expected to be primarily the result of increased domestic utilization of the groundfish resource of the Gulf of Alaska. Resource management, enhancement, and/or rehabilitation programs, which are expected to allow further expansion of the salmon and halibut fisheries and stability in the shellfish fisheries, are expected to result in the traditional fisheries being a continuing but moderate source of growth. Between 1980 and 2000, catch is projected to increase by over 375 percent by weight and by 149 percent by value. The corresponding rates of growth for the traditional fisheries alone are 24.5 percent and 121 percent. Processing employment and real income are expected to increase less rapidly than catch due to increased processing efficiency. It is projected that processing employment and real income will exceed current levels by 109 percent and 156 percent, respectively. If increases in processing efficiency are not allowed for the projected increases in processing employment and real income.
will exceed current levels by 152 percent and 210 percent respectively. The projections of harvesting activity by fishery on which this brief summary is based and the projections of processing activity are presented in the following sections.

HARVESTING

Projections of harvesting activity and limited historical data are presented by species or species group in this section. The detailed historical data which are referred to in this section and which serve as a basis for the projections are presented in tabular form in Appendix C. The models used in making the projections are discussed in Chapter II.

Salmon

Three distinct Cook Inlet salmon fisheries can be defined by gear type; they are the purse seine, drift gill net, and set gill net fisheries. The Upper Cook Inlet areas are primarily gill net areas, and the Lower and Outer Cook Inlet areas are primarily purse seine areas. Some of the pertinent differences between these fisheries are summarized in Table 3.55.

TABLE 3.55
CHARACTERISTICS OF THE COOK INLET SALMON FISHERIES

<table>
<thead>
<tr>
<th></th>
<th>Purse Seine</th>
<th>Drift Gill Net</th>
<th>Set Gill Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season</td>
<td>July-August</td>
<td>June-August</td>
<td>June-September</td>
</tr>
<tr>
<td>Typical Boat Size</td>
<td>26-35 feet</td>
<td>26-35 feet</td>
<td>(under 25 feet)</td>
</tr>
<tr>
<td>Crew Size</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

1 To convert to meters multiply by 0.305

*In some areas, set gill net gear can be used without a boat.*
In recent years there have been red and chum salmon harvests that approach or surpass record harvests of the last twenty-five years. These recent successes, together with continually improving management: enhancement, and rehabilitation programs, suggest that the Cook Inlet salmon resources will tend to increase. Catch is projected to increase from 9,224 metric tons (20.4 million pounds) in 1980 to 12,778 metric tons (28.2 million pounds) in the year 2000, and the real value of the catch is projected to increase from $20.8 million to $56.6 million (see Table 3.56). The corresponding percentage increases in the weight and value of the harvest are 38.5 percent and 172.4 percent (see Table 3.57). The more rapid increase in value is the result of the projected increase in the real ex-vessel price of salmon. Due to the excess harvesting capacity that exists today, an increase in the number of boats and/or fishermen is not necessary to harvest the catch projected for 2000, and due to the existence of the limited entry program such increases are not expected to occur. Projections of catch by species are presented in Table 3.58.

An issue which has become critical in Cook Inlet is the allocation of harvestable salmon between commercial and recreational fishermen. Cook Inlet salmon fishermen appear to be more concerned with this issue than any other. The proximity and accessibility of the Cook Inlet salmon resources to Anchorage has resulted in increased political pressure to increase the allocation to recreational fishermen. There is no simple solution to this problem since the resource base is not sufficient to fully satisfy the demands of both user groups. If there are dramatic reductions in the allocation to commercial fishermen, the projections
<table>
<thead>
<tr>
<th>Year</th>
<th>Pounds (1,000)</th>
<th>Metric Tons</th>
<th>Noni ريال</th>
<th>Real</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>20335</td>
<td>9224</td>
<td>23141</td>
<td>20791</td>
</tr>
<tr>
<td>1981</td>
<td>20860</td>
<td>9462</td>
<td>27089</td>
<td>23069</td>
</tr>
<tr>
<td>1982</td>
<td>21413</td>
<td>9713</td>
<td>30966</td>
<td>24996</td>
</tr>
<tr>
<td>1983</td>
<td>21996</td>
<td>9977</td>
<td>35787</td>
<td>27382</td>
</tr>
<tr>
<td>1984</td>
<td>22611</td>
<td>10256</td>
<td>40622</td>
<td>29461</td>
</tr>
<tr>
<td>1985</td>
<td>23259</td>
<td>10550</td>
<td>46126</td>
<td>31709</td>
</tr>
<tr>
<td>1986</td>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
## TABLE 3.57

**PROJECTIONS OF PERCENTAGE CHANGE FROM 1980,**

**COOK INLET SALMON FISHERY**

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<th>Catch Value ( $ thousands )</th>
<th>Ex-Vessel Price Nominal ( $ thousands )</th>
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Source: Alaska Sea Grant Program
### TABLE 3.58

**PROJECTED COOK INLET SALMON CATCH BY SPECIES, 1980-2000**

(1,000 Pounds)

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Source: Alaska Sea Grant Program
will tend to overstate the level of harvesting activity that will occur. Since much of the salmon that is landed in Seward is delivered by tenders, the projections of the number of landings grossly overstate the amounts of vessel traffic and harbor space use that are expected to occur in Seward. The projected percentage increases in the number of landings should however be meaningful.

Herring

The Cook Inlet herring fishery is primarily a roe herring fishery. The market conditions which result in the roe herring both being fully utilized and being "the principal herring fishery are expected to exist throughout the forecast period. The average annual catch is projected at 2,919 metric tons (6.4 million pounds) (see Table 3.59). The real value of the harvest is expected to increase by 21 percent by the year 2000 (see Table 3.60).

Halibut

The Cook Inlet halibut fishery is similar to other Alaskan halibut fisheries in that it consists of a large boat fleet which fishes the Gulf of Alaska and/or the Bering Sea, and a small boat fleet which consists of boats that are usually primarily participants in other fisheries and which fish in protected waters. The boats in the former fleet are typically over 15.2 meters (50 feet) in length while those in the latter fleet are typically less than 10.7 meters (35 feet) in length. The catch is projected to increase by 76 percent in terms of weight and by 121 percent in terms
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Source: Alaska Sea Grant Program

*The real values and prices are in terms of 1978 dollars.*
### TABLE 3.6

**PROJECTED PERCENTAGE CHANGE FROM 1980, COOK INLET HERRING FISHERY**

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<th>Catch Weight</th>
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<th>Ex-Vessel Price Real</th>
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Source: Alaska Sea Grant Program.
of value resulting in a harvest of 2,638 metric tons (5.8 million pounds) and $12.6 million (real dollars) in the year 2000 (see Tables 3.61 and 3.62).

The projections of the number of landings are indicative of the vessel traffic and harbor usage that are expected in Seward since the projections are based on Seward and not Cook Inlet landings. It should also be noted that since the small boat fleet consists of boats and fishermen that are primarily associated with other fisheries, the projections of the numbers of boats and fishermen are for the large boat fleet that delivers halibut to Seward.

**Groundfish**

In recent years there have been two distinct groundfish fleets in the Cook Inlet management area, a small boat long line fleet and a large boat trawl fleet. The long line boats are typically less than 13.7 meters (45 feet) in length, have a crew of one, and are active in this fishery during May and September. The average number of landings per boat per year has been less than three; this indicates that the boats and fishermen of the long line fleet are only casual participants and are primarily associated with other fisheries. The trawl fleet has included no more than two or three boats in the last nine years. These boats have typically been shrimp trawlers which ranged in length from under 13.7 meters (45 feet) to over 25.9 meters (85 feet),

As the domestic groundfish industry develops, there are expected to continue to be distinct small and large boat fleets; both fleets may,
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<th>Nominal</th>
<th>Real</th>
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<th>Real</th>
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Source: Alaska Sea Grant Program.

1 The real values and prices are in terms of 1978 dollars.
### Table 3.62

**Projected Percentage Change from 1980, Cook Inlet Halibut Fishery**

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Source: Alaska Sea Grant Program
however, include a variety of gear types. The small boat fishery is expected to remain a casual or supplemental fishery with its participants being principally associated with other fisheries. The groundfish projections that are presented below exclude harvesting activity in the Cook Inlet management area that does not result in fish being landed in Seward; the projections of the numbers of boats, fishermen, and landings exclude the small boat fleet since they are accounted for elsewhere.

The annual groundfish harvest is projected to increase from 52 metric tons (114,000 pounds) in 1980 to 72,000 metric tons (159 million pounds) in the year 2000 and to increase in real value from $14,000 to $11.4 million (see Table 3.63). The associated percentage increases are staggering (see Table 3.64). In terms of its relative importance, the Seward groundfish catch is expected to increase from 0.3 percent of total Cook Inlet catch in 1980 to 74 percent of the catch by the year 2000. The relative importance in terms of value is projected to increase from 0.03 percent to 11.4 percent (see Table 3.65). The significant difference between the projected relative importance of the fishery measured by weight and by value is explained by the large ex-vessel price differential that is expected to exist between the relatively low-valued groundfish and the high-valued traditional species. The relative importance of the groundfish fisheries is also expected to be relatively low in terms of the number of boats, fishermen, or landings. Projections of groundfish catch by species are presented in Table 3.66.
### Table 3.63

**PROJECTED HARVESTING ACTIVITY**

=OK INLET GROUNDFISH FISHERY 1980-2000

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Source: Alaska Sea Grant Program.

1 The real values and prices are in terms of 1978 dollars.
## TABLE 3.64

**PROJECTED PERCENTAGE CHANGE FROM 1980, COOK INLET GROUNDFISH FISHERY**

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Source: Alaska Sea Grant Program.
**TABLE 3.65**

**SEWARD GROUNDFISH PROJECTED CATCH BY SPECIES 1980-2000**

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<th>TOTAL</th>
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1 Value in terms of 1978 dollars.

Source: Alaska Sea Grant Program
TABLE 3.66
PROJECTIONS OF COOK INLET GROUNDFISH HARVESTING ACTIVITY
AS A PERCENTAGE OF TOTAL COOK INLET HARVESTING ACTIVITY

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Source: Alaska Sea Grant Program.
King Crab

The Cook Inlet king crab fishery provides an excellent example of the over capitalization that often occurs in an open entry fishery. In an attempt to reduce this problem, the ADF&G prohibits boats that participate in other Alaska king crab fisheries from participating in the Cook Inlet fishery. One result has been that the Cook Inlet king crab fleet consists of smaller boats than does the Kodiak fleet. The typical Cook Inlet boats are between 7.6 and 13.7 meters (25 and 45 feet) in length, have a crew of three to four, and participate in the fishery from August through March.

Despite the recent declines in annual harvest, the sustainable yield is thought to be approximately 1,900 metric tons (4.2 million pounds). The annual catch is expected to increase to this level by 1985 and to be maintained at this level through the year 2000, at which time the real value of the harvest is expected to equal $10.9 million (see Table 3.67). The projected increases in the harvest by weight and real value are 14.6 percent and 52 percent respectively (see Table 3.68).

Although Seward boats and fishermen participate in the Cook Inlet shellfish fisheries, they do not dominate them and the harvesting activity is concentrated in the Lower Cook Inlet, not in the areas around Seward. For these reasons, the projections of the number of landings grossly overstate the harbor use and vessel traffic that are expected to occur in Seward. The projected percentage increases are, however, indicative of the expected rates of growth in traffic and harbor use.
## TABLE 3.67

**Projected Harvesting Activity**

**Cook Inlet King Crab Fishery 1980-2000**

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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
### TABLE 3.68

**PROJECTED PERCENTAGE CHANGE FROM 1990, COOK INLET KING CRAB FISHERY**

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**Source:** Alaska Sea Grant Program.
Tanner Crab

The Cook Inlet Tanner crab fishery is similar to the Kodiak fishery in that its development was promoted by a decline in the local king crab resources. The Tanner crab season is from December through May; there are therefore several months when the same boats are participating in both the king and Tanner crab fisheries. Since many boats participate in both fisheries, it is not surprising that the characteristics of the two fleets are similar. They both have boats that are typically between 7.6 and 13.7 meters (25 and 45 feet) in length and a crew of three to four.

The Cook Inlet Tanner crab resources appear to be fully utilized. Successful management of these resources is expected to allow modest increase in harvest between 1980 and 1985 and an average annual harvest of 2,410 metric tons (5.3 million pounds) during the remainder of the forecast period (see Table 3.69). The real value of the average annual harvest is projected to increase to approximately $2.5 million by the year 2000. The small (2.6 percent) increase in harvest and favorable market conditions are expected to assure that resource abundance will remain as the binding constraint (see Table 3.70).

Dungeness Crab

The Cook Inlet Dungeness crab fleet consists of boats that typically are 7.9 to 10.7 meters (26 to 35 feet) in length, have a crew of two, and participate in the Dungeness crab fishery from May through December. The annual harvest has fluctuated significantly in recent years; for example, the catch
TABLE 3.69
PROJECTED HARVESTING ACTIVITY
E50K INLET TANNER CRAB FISHERY 1980-2000

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Source: Alaska Sea Grant Program.

1The real values and prices are in terms of 1978 dollars.
### Table 3.70

**Projected Percentage Change from 1980.**

**Cook Inlet Tanner Crab Fishery**

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Source: Alaska Sea Grant Program
in 1978 exceeded that of 1977 by a factor of 15. Market conditions have
been a principal determinant of the fluctuation in harvest. The favor-
able markets that resulted in a near-record harvest in 1978 are expected
to continue, and it is projected that during the forecast period the
average annual harvest will equal the allowable biological catch of 204
metric tons (450,000 pounds). By the year 2000, the real value of the
annual harvest is expected to approach $400,000 (see Table 3.71).
This represents a 22 percent increase in real value during the forecast
period (see Table 3.72).

**Shrimp**

There are two shrimp fisheries in Cook Inlet, a trawl fishery and a pot
fishery. The trawlers range in length from under 7.6 meters (25 feet) to
over 24.4 meters (80 feet), have a crew of three, and participate in the
fishery from June through March. Although several times as many boats parti-
cipate in the pot fishery as in the trawl fishery, the trawl fleet harvests the
majority of the annual catch. The pot boats range in length from under 7.6
meters to 13.7 meters (25 feet to 45 feet) but are predominately under 10.7
meters (35 feet). They have a crew of two, and are active throughout the year.

The shrimp fisheries are well developed and have well defined resources
that are expected to result in a sustainable annual harvest of 2,540
metric tons (5.6 million pounds). The market conditions that have
resulted in resource abundance being a binding constraint are expected
to exist throughout the forecast period and result in an annual harvest
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<th>Year</th>
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<th>REAL EX-VESSEL PRICE ($/Pound)</th>
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Source: Alaska Sea Grant Program.

'The real values and prices are in terms of 1978 dollars.'
### Table 3.72

**Projected Percentage Change from 1980, Cook Inlet Dungeness Crab Fishery**

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Source: Alaska Sea Grant Program.
value in real dollars of over $4 million by the year 2000 (see Table 3.73); this represents a 165 percent increase in real value during the forecast period (see Table 3.74).

Razor Clams

The razor clam fishery is located in the Upper Cook Inlet and is not considered part of the Seward commercial fishing industry.

Summation of Harvesting Activity Projections

This section consists of the presentation and analysis of the projections of harvesting activity of the Seward commercial fishing industry as a whole. The tables presented in this section include summations of projected harvesting activity and projections of the relative importance of each fishery.

Total catch is projected to increase from 20,452 metric tons (45.1 million pounds) in 1980 to 97,500 metric tons (214.9 million pounds) in 2000 and its real value is projected to increase from $39.8 million to 99.4 million (see Table 3.75). The corresponding percentage increases by weight and real value are 377 percent and 149 percent respectively (see Table 3.76). Less significant increases in the number of boats, fishermen, and landings are expected. Excluding groundfish, catch is expected to increase from 20,400 metric tons (45 million pounds) to 25,400 metric tons (56.0 million pounds); or in terms of real value, it
### Table 3.73

**Projected Harvesting Activity**  
**Cook Inlet Shrimp Fisheries 1980-2000**

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<th>Year</th>
<th>Catch</th>
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**Source:** Alaska Sea Grant Program.

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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
**TABLE 3.76**

**PROJECTED PERCENTAGE CHANGE FROM 1980, COOK INLET ALL FISHERIES**

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**Source:** Alaska Sea Grant Program
is expected to increase from $39.8 million to over $88 million (see Table 3.77). The corresponding percentage increases are 24.5 percent by weight and 120.9 percent by real value (see Table 3.78). The more rapid increase in real value is explained by the 73 percent projected increase in the average ex-vessel price.

In addition to the significant changes in absolute harvesting activity, there are expected to be notable changes in the relative importance of individual fisheries. For example, in 1980, groundfish is projected to account for less than one percent of total catch by weight or value but by the year 2000, it is expected to equal 73.9 percent of total catch by weight and 11.4 percent by value (see Table 3.79 and 3.80). The large difference in the importance of groundfish as measured by weight or value is due to the large ex-vessel price differential between groundfish and the traditional high-valued species such as crab and salmon. As is indicated by the projections in Tables 3.81 through 3.83, the changes in the relative number of boats, fishermen, or landings are not expected to be significant. Within the traditional fisheries the changes in relative importance are expected to be less dramatic. In terms of pounds harvested, the salmon and halibut fisheries are expected to make minor gains at the expense of the shellfish fisheries (see Table 3.84). In terms of relative value, the salmon and shrimp fisheries have minor gains and the other fisheries have minor losses or are little changed (see Table 3.85). The changes in the relative importance of individual traditional fisheries as measured by the number of boats, fishermen, or landings are insignificant except for the gains by the halibut fishery at the expense of the salmon fishery (see Tables 3.86 through 3.88).
**TABLE 3.77**

**PROJECTED HARVESTING ACTIVITY**

**COOK INLET TRADITIONAL FISHERIES 1980-2000**

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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### Table 3.78

**PROJECTED PERCENTAGE CHANGE FROM 1980, COOK INLET TRADITIONAL FISHERIES**

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Source: Alaska Sea Grant Program.
TABLE 3.79

PERCENTAGE OF CATCH BY WEIGHT BY COOK INLET FISHERY INCLUDING GROUNDFISH, 1980-2000

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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program
## TABLE 3.

PERCENTAGE OF VALUE BY COCK INLET FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
## TABLE 3.84

**PERCENTAGE OF CATCH BY WEIGHT BY COOK INLET FISHERY EXCLUDING GROUNDFISH, 1980-2000**

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<th>Herring</th>
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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program
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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program
### TABLE 3.88

PERCENTAGE OF THE NUMBER OF LANDINGS BY COOK INLET FISHERY EXCLUDING GROUNDFISH, 1980-2000

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<th>Year</th>
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<th>Tanner Crab</th>
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<th>Shrimp</th>
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<td>5.709</td>
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<td>2.095</td>
<td>2.514</td>
<td>5.805</td>
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<td>4.784</td>
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Source: Alaska Sea Grant Program
As is mentioned in Chapter II, the summation of the number of landings of fishermen or boats over all fisheries results in double counting since a fisherman or boat is counted once for each fishery which is participated in. The method used to reduce this problem is also discussed in Chapter II; the results of this method are presented in Tables 3.89 and 3.90 which include adjusted and unadjusted projections of the numbers of fishermen and boats that will participate in the harvesting sector of the Seward commercial fishing industry. Again it should be noted that since, with the exception of the groundfish and halibut fisheries, Cook Inlet harvesting activity is used as a proxy for Seward harvesting activity and since the harvesting activity is not concentrated in the waters adjacent to Seward, the projections of the number of boats greatly overstates the vessel traffic and harbor usage that is expected to occur. However, the projected percentage increases are expected to be applicable to Seward as well as the entire Cook Inlet area, such projections are presented in Table 3.76.

**Local Harvesting Effort**

The difficulties associated with defining and measuring local harvesting effort are discussed in Chapter II. The results of the method developed to measure local effort in that chapter are presented in this section. As the values of the local harvesting factors of Table 3.91 indicate, the degree to which a fishery can be considered local varies greatly. For example, although 19 percent of the purse seine salmon harvesting activity is local (i.e., carried on by residents of Seward), less than 3 percent of the drift gill net fishery and almost none of the set gill
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<td>Unadjusted</td>
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Source: Alaska Sea Grant Program
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**Adjusted Projections of the Number of Boats for the Seward Commercial Fishing Industry 1980-2000**

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</tr>
<tr>
<td>Bottomfish large boat long line</td>
<td>8</td>
<td>59</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Bottomfish small boat pots</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bottomfish otter trawl</td>
<td>12</td>
<td>40</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bottomfish beam trawl</td>
<td>NA</td>
<td>6</td>
<td>-0-</td>
<td></td>
</tr>
<tr>
<td>Shrimp otter trawl</td>
<td>129</td>
<td>218</td>
<td>-0-</td>
<td>8</td>
</tr>
<tr>
<td>Shrimp beam trawl</td>
<td>22</td>
<td>69</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shrimp large boat pots</td>
<td>4</td>
<td>30</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Shrimp small boat pots</td>
<td>33</td>
<td>281</td>
<td>12</td>
<td>.041</td>
</tr>
<tr>
<td>Razor clams shove</td>
<td>8</td>
<td>174</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Razor clams dredge</td>
<td>NA</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon hand troll</td>
<td>1,239</td>
<td>2,747</td>
<td>-0-</td>
<td>2</td>
</tr>
<tr>
<td>Salmon power troll</td>
<td>742</td>
<td>999</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Tanner crab small boat pots</td>
<td>166</td>
<td>295</td>
<td>5</td>
<td>.47</td>
</tr>
<tr>
<td>Tanner crab large boat pots</td>
<td>224</td>
<td>341</td>
<td>10</td>
<td>.263</td>
</tr>
<tr>
<td>Tanner crab other</td>
<td>NA</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Scallops dredge</td>
<td>NA</td>
<td>NA</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

**P** = Estimate of the proportion of fishing effort that is local

**LPO** = Number of local permit owners

**TP** = Total number of permits

**PF** = Number of permits fished

**B** = Number of boats participating in the fishery

Source: ADF&G and CFEC data files.
net salmon harvesting activity are local. For each fishery in which separate data are available by boat size, the local participation factor is significantly higher for large boats than for small boats. This can in part be explained by the fact that Seward is some distance from the major fishing grounds; therefore, for Seward residents to participate in the fisheries, larger and more seaworthy boats are required.

PROCESSING

The projections of processing plant activity presented in this section are based on the projections of industry-wide catch discussed in a preceding section. The measures of activity are in terms of processing plant input requirements and processing plant payrolls or income. Four sets of projections are presented for each measure of processing activity; the four sets are the traditional fisheries with and without increased efficiency and all fisheries with and without increased efficiency.

Water

In 1976 and 1977, the peak water usage by Seward processing plants was approximately 3.4 million liters (0.9 million gallons) per day. Using this as the base peak load, the peak load is projected to be between 2.6 and 5.9 million liters (0.7 and 1.56 million gallons) per day by 2000 (see Table 3.92).
### Table 3.92

**Projected Peak Seward Processing Requirements for Water**

<table>
<thead>
<tr>
<th>Year</th>
<th>1000 Gallons/Day</th>
<th>Percentage Increase*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional Fisheries</td>
<td>All Fisheries</td>
</tr>
<tr>
<td>1980</td>
<td>873</td>
<td>838</td>
</tr>
<tr>
<td>1981</td>
<td>886</td>
<td>834</td>
</tr>
<tr>
<td>1982</td>
<td>899</td>
<td>829</td>
</tr>
<tr>
<td>1983</td>
<td>913</td>
<td>825</td>
</tr>
<tr>
<td>1984</td>
<td>927</td>
<td>822</td>
</tr>
<tr>
<td>1985</td>
<td>943</td>
<td>818</td>
</tr>
<tr>
<td>1986</td>
<td>950</td>
<td>808</td>
</tr>
<tr>
<td>1987</td>
<td>957</td>
<td>798</td>
</tr>
<tr>
<td>1988</td>
<td>964</td>
<td>788</td>
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<td>1989</td>
<td>972</td>
<td>778</td>
</tr>
<tr>
<td>1990</td>
<td>980</td>
<td>769</td>
</tr>
<tr>
<td>1993</td>
<td>1006</td>
<td>743</td>
</tr>
<tr>
<td>1994</td>
<td>1016</td>
<td>735</td>
</tr>
<tr>
<td>1997</td>
<td>1048</td>
<td>714</td>
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<td>1998</td>
<td>1060</td>
<td>708</td>
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<td>1999</td>
<td>1073</td>
<td>702</td>
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<tr>
<td>2000</td>
<td>1087</td>
<td>697</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

*Requirement without increase efficiency.

*Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
Electricity

Based on a base peak load requirement of 0.3 million kilowatt hours of electricity per month, the projected peak use of electricity by processing plants in the year 2000 is projected to range from 0.4 to 3.4 million kilowatt hours per month (see Table 3.93).

Employment

Using 1976-1977 Alaska Department of Labor estimates of average monthly employment in Seward processing plants as the base, the projections of average monthly employment for the year 2000 range from 244 to 794 (see Table 3.94).

Income

Using corresponding data of the annual payroll of processing plants, the annual real income for the year 2000 is projected to range from $2.5 million to 8.2 million (see Table 3.94). The projected percentage changes in income and employment are presented in Table 3.95.

Number of Plants

By the end of the forecast period there are expected to be two large multi-species processing plants in addition to two to three smaller, more specialized plants. Since the projected development of the ground-
### Table 3.93

**PROJECTED PEAK SEWARD PROCESSING REQUIREMENTS FOR ELECTRICITY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
<th>PERCENTAGE INCREASE*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000 KWH/MONTH</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Traditional Fisheries</td>
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<td>Traditional Fisheries</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1980</td>
<td>320</td>
<td>307</td>
<td>322</td>
</tr>
<tr>
<td>1981</td>
<td>325</td>
<td>306</td>
<td>328</td>
</tr>
<tr>
<td>1982</td>
<td>330</td>
<td>304</td>
<td>334</td>
</tr>
<tr>
<td>1983</td>
<td>335</td>
<td>303</td>
<td>341</td>
</tr>
<tr>
<td>1984</td>
<td>340</td>
<td>301</td>
<td>349</td>
</tr>
<tr>
<td>1985</td>
<td>346</td>
<td>300</td>
<td>358</td>
</tr>
<tr>
<td>1986</td>
<td>348</td>
<td>296</td>
<td>366</td>
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<tr>
<td>1987</td>
<td>351</td>
<td>292</td>
<td>376</td>
</tr>
<tr>
<td>1988</td>
<td>353</td>
<td>289</td>
<td>390</td>
</tr>
<tr>
<td>1989</td>
<td>356</td>
<td>285</td>
<td>408</td>
</tr>
<tr>
<td>1990</td>
<td>359</td>
<td>282</td>
<td>434</td>
</tr>
<tr>
<td>1991</td>
<td>362</td>
<td>279</td>
<td>470</td>
</tr>
<tr>
<td>1992</td>
<td>366</td>
<td>275</td>
<td>520</td>
</tr>
<tr>
<td>1993</td>
<td>369</td>
<td>271</td>
<td>592</td>
</tr>
<tr>
<td>1994</td>
<td>372</td>
<td>272</td>
<td>695</td>
</tr>
<tr>
<td>1995</td>
<td>376</td>
<td>267</td>
<td>842</td>
</tr>
<tr>
<td>1996</td>
<td>380</td>
<td>264</td>
<td>1056</td>
</tr>
<tr>
<td>1997</td>
<td>384</td>
<td>262</td>
<td>1365</td>
</tr>
<tr>
<td>1998</td>
<td>389</td>
<td>260</td>
<td>1815</td>
</tr>
<tr>
<td>1999</td>
<td>394</td>
<td>257</td>
<td>2470</td>
</tr>
<tr>
<td>2000</td>
<td>399</td>
<td>256</td>
<td>3428</td>
</tr>
</tbody>
</table>

**Source:** Alaska Sea Grant Program

'Requirement without increased efficiency.

'Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
### Table 3.94

**Projected Seward Processing Employment and Income, 1980-2000**

| Year | Traditional Fisheries Without Increased Efficiency | | | Traditional Fisheries With Increased Efficiency | | | All Fisheries Without Increased Efficiency | | | All Fisheries With Increased Efficiency |
|------|---------------------------------------------------|---|---|---------------------------------------------------|---|---|---------------------------------------------------|---|---|
| 1980 | 306 | 2923 | 2626 | 293 | 2807 | 2522 | 306 | 2928 | 2631 | 294 | 2813 | 2527 |
| 1981 | 310 | 3158 | 2690 | 292 | 2973 | 2532 | 311 | 3166 | 2696 | 292 | 2980 | 2538 |
| 1982 | 315 | 3414 | 2756 | 290 | 3149 | 2542 | 316 | 3425 | 2765 | 291 | 3160 | 2551 |
| 1983 | 319 | 3692 | 2825 | 289 | 3337 | 2554 | 321 | 3708 | 2837 | 290 | 3354 | 2566 |
| 1984 | 325 | 3995 | 2897 | 288 | 3539 | 2567 | 327 | 4019 | 2915 | 289 | 3563 | 2584 |
| 1985 | 330 | 4325 | 2973 | 286 | 3754 | 2581 | 333 | 4359 | 2997 | 289 | 3789 | 2605 |
| 1986 | 332 | 4639 | 3023 | 283 | 3947 | 2592 | 336 | 4691 | 3056 | 286 | 3998 | 2605 |
| 1987 | 335 | 4978 | 3074 | 279 | 4150 | 2603 | 340 | 5054 | 3121 | 284 | 4226 | 2610 |
| 1988 | 337 | 5342 | 3127 | 276 | 4365 | 2621 | 344 | 5454 | 3193 | 293 | 4477 | 2621 |
| 1989 | 340 | 5735 | 3182 | 272 | 4592 | 2641 | 350 | 5901 | 3274 | 282 | 4758 | 2641 |
| 1990 | 343 | 6158 | 3239 | 269 | 4832 | 2652 | 357 | 6404 | 3368 | 283 | 5078 | 2671 |
| 1991 | 346 | 6614 | 3298 | 266 | 5086 | 2682 | 365 | 6980 | 3480 | 285 | 5452 | 2718 |
| 1992 | 349 | 7107 | 3358 | 263 | 5356 | 2751 | 376 | 7652 | 3616 | 290 | 5901 | 2789 |
| 1993 | 352 | 7639 | 3422 | 260 | 5642 | 2826 | 390 | 8451 | 3786 | 298 | 6454 | 2891 |
| 1994 | 356 | 8214 | 3487 | 257 | 5945 | 2923 | 408 | 9427 | 4003 | 310 | 7158 | 3039 |
| 1995 | 359 | 8836 | 3556 | 255 | 6268 | 2954 | 433 | 10651 | 4286 | 328 | 8082 | 3253 |
| 1996 | 363 | 9509 | 3627 | 252 | 6610 | 2984 | 467 | 12228 | 4665 | 356 | 9329 | 3559 |
| 1997 | 367 | 10239 | 3702 | 250 | 6975 | 3015 | 513 | 14320 | 5178 | 396 | 11056 | 3998 |
| 1998 | 371 | 11030 | 3780 | 248 | 7364 | 3046 | 578 | 17166 | 5883 | 454 | 13499 | 4627 |
| 1999 | 376 | 11890 | 3863 | 246 | 7779 | 3076 | 667 | 21129 | 6864 | 538 | 17018 | 5528 |
| 2000 | 380 | 12824 | 3949 | 244 | 8223 | 3107 | 794 | 26758 | 8239 | 657 | 22156 | 6822 |

Source: Alaska Sea Grant Program

1. Average monthly employment.
2. Annual payroll in $1,000.
3. Income in 1978 dollars in ($1,000).
TABLE 3.95
PROJECTED PERCENTAGE CHANGE* IN SEWARD
PROCESSING EMPLOYMENT AND INCOME 1980-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>TRADITIONAL FISHERIES</th>
<th>ALL FISHERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WITHOUT WITH INCREASED EFFICIENCY</td>
<td>WITHOUT WITH INCREASED EFFICIENCY</td>
</tr>
<tr>
<td></td>
<td>Employment Nominal Income Real Income</td>
<td>Employment Nominal Income Real Income</td>
</tr>
<tr>
<td></td>
<td>Nominal Income Real Income</td>
<td>Nominal Income Real Income</td>
</tr>
<tr>
<td>1980</td>
<td>-3.00 10.02 -1.15 10.21 -5.07</td>
<td>-2.83 10.21 10.21 10.21 -5.07</td>
</tr>
<tr>
<td>1981</td>
<td>1.59 18.87 1023 -7.038 12.88 -4.72</td>
<td>1.36 19015 19015 19015 -4.98</td>
</tr>
<tr>
<td>1982</td>
<td>-0.12 28.49 3.72 -7.087 18.52 -4.33</td>
<td>0.02 28.49 28.49 28.49 -4.00</td>
</tr>
<tr>
<td>1983</td>
<td>1<em>43 38</em>96 6.32 -8.322 25.61 -3.89</td>
<td>1.87 39<em>57 39</em>57 39<em>57 -3</em>43</td>
</tr>
<tr>
<td>1984</td>
<td>3<em>05 50</em>36 9.05 -8.723 33*19 -3.40</td>
<td>3.66 51.25 51.25 51.25 -3.40</td>
</tr>
<tr>
<td>1985</td>
<td>4<em>74 62</em>76 11.89 -9.074 41030 -2.97</td>
<td>5.58 64.07 64.07 64.07 -2*76</td>
</tr>
<tr>
<td>1986</td>
<td>5.51 74.61 13.78 -10.24 48.55 -3.20</td>
<td>6.67 76.54 76.54 76.54 -3.20</td>
</tr>
<tr>
<td>1987</td>
<td>6.29 87.35 15.71 -11.385 56.20 -3.53</td>
<td>7*91 90.20 90.20 90.20 -3.53</td>
</tr>
<tr>
<td>1988</td>
<td>7*11 101.06 17071 -12.48 64.28 -3.83</td>
<td>9036 105.27 105.27 105.27 -3.83</td>
</tr>
<tr>
<td>1989</td>
<td>7.96 115.83 19.77 -13.555 72.82 -4*10</td>
<td>11.08 122.08 122.08 122.08 -4*10</td>
</tr>
<tr>
<td>1990</td>
<td>8<em>85 131</em>76 21.90 -14<em>58 81.87 -4</em>34</td>
<td>13.21 141.03 141.03 141.03 -4*34</td>
</tr>
<tr>
<td>1991</td>
<td>9*78 148.94 24.11 -15.57 91.44 -4.56</td>
<td>15.86 162.71 162.71 162.71 -4.56</td>
</tr>
<tr>
<td>1993</td>
<td>11.79 187.50 28.78 -17.44 112.34 -4.89</td>
<td>23.67 218<em>07 218</em>07 218*07 -4.89</td>
</tr>
<tr>
<td>1994</td>
<td>12<em>87 209</em>14 31.26 -18.31 123.76 -5.00</td>
<td>29.53 254.80 254.80 254.80 -5.00</td>
</tr>
<tr>
<td>1995</td>
<td>14.00 232.55 33.84 -19.13 135.89 -5.07</td>
<td>37.42 300.85 300.85 300.85 -5.07</td>
</tr>
<tr>
<td>1996</td>
<td>15.20 257.89 36.52 -19.92 148.79 -5.10</td>
<td>48.15 360.24 360.24 360.24 -5.10</td>
</tr>
<tr>
<td>1997</td>
<td>16.47 285*35 39.34 -20.66 162.52 -5.08</td>
<td>58.90 438.96 438.96 438.96 -5.08</td>
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</tr>
<tr>
<td>2000</td>
<td>20.77 382.66 48.62 -22.57 209.47 -4.71</td>
<td>151.98 907.07 907.07 907.07 -4.71</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

*1977 is the base period.

1 Average monthly employment.
2 Annual payroll in $1,000.
3 Income in 1978 dollars in ($1,000).
fish industry is more speculative and more significant than that of the traditional fisheries, a summary of projected groundfish processing activity including the number of processing plants is presented in Table 3.96.

**Local Processing Effort**

On the basis of information provided by the processing sector of the industry, it is estimated that full-time residents account for between 20 and 25 percent of the processing plant employment.

**The Feasibility of the Projected Growth**

In this section, the feasibility of the projected growth of the Seward commercial fishing industry is evaluated in terms of the projected input requirements and projected input availability. The inputs that are considered include small boat harbor facilities, port facilities, labor, land, electric power, water, and processing plant facilities. Projections of the availability of port facilities, labor, land, electric power, and water are drawn from the following Studies Program reports:

- Technical Report Number 33, Northern Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts
### TABLE 3.96

**PROJECTED SEWARD GROUNDFISH PROCESSING ACTIVITY, 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH (MT)</th>
<th>NUMBER OF PLANTS</th>
<th>EMPLOYMENT (man years)</th>
<th>LAND (hectares)</th>
<th>ELECTRICITY (million KWH/year)</th>
<th>WATER (million gallons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>70</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>1981</td>
<td>99</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1982</td>
<td>141</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
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<td>200</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1984</td>
<td>285</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1985</td>
<td>407</td>
<td>0</td>
<td>4</td>
<td>0</td>
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</tr>
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<td>5</td>
<td>0</td>
<td>0</td>
<td>3</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>6</td>
</tr>
<tr>
<td>1989</td>
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<td>0</td>
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<td>38</td>
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<td>1994</td>
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<td>75</td>
<td>0</td>
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<td>55</td>
</tr>
<tr>
<td>1995</td>
<td>15961</td>
<td>0</td>
<td>106</td>
<td>0</td>
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<td>1</td>
<td>1</td>
<td>116</td>
</tr>
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<td>1997</td>
<td>33994</td>
<td>1</td>
<td>213</td>
<td>1</td>
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<td>170</td>
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<td>2</td>
<td>614</td>
<td>3</td>
<td>5</td>
<td>535</td>
</tr>
</tbody>
</table>

Source: *Alaska Sea Grant Program*

1. The number of full-time groundfish plants.

**NOTE:** The values are rounded to the nearest whole number, therefore a "0" indicates a value of less than 0.5.
Projections of input requirements are based on forecasts of harvesting and processing activity presented in previous sections, and the projections of input availability that are not available from other SESP reports are developed in this section.

**Small Boat Harbor**

The Seward small boat harbor has been used well beyond its design capacity for a number of years. The inadequacy of this facility is demonstrated by the long waiting lists for permanent slips, the rafting of vessels that is often required, and the lack of permanent slips for fishing vessels over 33.5 meters (110 feet). The City of Seward is planning to develop additional small boat harbor facilities. The projected increases in the harvesting activity of the traditional fisheries can no doubt occur in the absence of significant improvements to the existing small boat harbor, however, the development of the groundfish fishery will be constrained if adequate facilities are not available for large fishing vessels. There are two reasons for expecting that such facilities will be available; the City of Seward is actively promoting the development of the groundfish industry, and Seward has been identified in the state groundfish development program as one of five communities in which the state should concentrate its development efforts.

**Port Facilities**

Technical Report Number 31 indicates that the Seward port facilities are currently underutilized, and that a 278 percent to 442 percent increase
in usage could occur before capacity is reached. The projected port usage through 2000 does not approach the facilities' current capacity, therefore, adequate port facilities are expected to exist throughout the forecast period.

Labor, Electric Power, and Water

The projected growth of the commercial fishing industry is feasible only if the corresponding rates of increase in input requirements can be met or surpassed by the rates of increase in input availability. The rates of increase of input requirements can be derived from the projections of input requirements developed in the previous section and the rates of increase in input availability can be inferred from information included in Technical Report Number 40. The report presents projections of community requirements for labor, electric power, and water for each of the OCS petroleum scenarios and indicates that the requirements can be met. The rates of increase in community-wide input requirements corresponding to the projections of community-wide input requirements are, therefore, considered to only include rates of increase that do not exceed feasible rates of increase in input availability. The highest rates of increase are associated with the high find case, therefore, the rates of increase in input requirements for the commercial fishing industry are compared to the rates of increase in community-wide input requirements/availability of the high find case to determine if the former are feasible. The projected rates of increase in input availability and requirements are presented in Table 3.97.
**TABLE 3.97**

COMPARATIVE RATES OF GROWTH, HIGH FIND CASE AND THE SEWARD (NORTHERN GULF) FISHING INDUSTRY

<table>
<thead>
<tr>
<th>Year</th>
<th>OCS Case</th>
<th>Fishing Industry Case</th>
<th>ELECTRIC POWER Case</th>
<th>POPULATION Case</th>
<th>EMPLOYMENT Case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>1981</td>
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<td>1.5</td>
<td>-0.6</td>
<td>1.5</td>
<td>-0.6</td>
</tr>
<tr>
<td>1982</td>
<td>1.5</td>
<td>1.5</td>
<td>-0.5</td>
<td>1.5</td>
<td>-0.5</td>
</tr>
<tr>
<td>1983</td>
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<td>1.5</td>
<td>-0.5</td>
<td>1.6</td>
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</tr>
<tr>
<td>1984</td>
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<td>1.6</td>
<td>-0.4</td>
<td>1.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>1985</td>
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<td>1.7</td>
<td>-0.3</td>
</tr>
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<td>1.3</td>
<td>-0.8</td>
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<tr>
<td>1987</td>
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<td>0.9</td>
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<td>0.9</td>
<td>-1.1</td>
</tr>
<tr>
<td>1989</td>
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<tr>
<td>1991</td>
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<td>0.8</td>
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<td>1.2</td>
<td>-1.3</td>
</tr>
<tr>
<td>1992</td>
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</tr>
<tr>
<td>1993</td>
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<td>0.9</td>
<td>-1.1</td>
<td>2.1</td>
<td>-1.0</td>
</tr>
<tr>
<td>1994</td>
<td>2.4</td>
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<td>1.4</td>
<td>-1.3</td>
</tr>
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<td>1995</td>
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<td>-1.0</td>
<td>3.1</td>
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<tr>
<td>1996</td>
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<td>-1.0</td>
<td>4.0</td>
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</tr>
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<td>1997</td>
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<td>1.1</td>
<td>-0.9</td>
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<tr>
<td>1998</td>
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<td>-0.9</td>
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<td>4.7</td>
</tr>
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<tr>
<td>2000</td>
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<td>1.3</td>
<td>-0.7</td>
<td>11.7</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1) Traditional fisheries without increased efficiency.
2) Traditional fisheries with increased efficiency.
3) All fisheries without increased efficiency.
4) All fisheries with increased efficiency.
### TABLE 3.97 Continued

**COMPARATIVE RATES OF GROWTH, HIGH FIND CASE AND THE SEWARD (WESTERN GULF) FISHING INDUSTRY**

<table>
<thead>
<tr>
<th>Year</th>
<th>WATER</th>
<th>ELECTRIC POWER</th>
<th>POPULATION</th>
<th>EMPLOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCS Case</td>
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<td>OCS Case</td>
<td>Fishing Industry Case</td>
</tr>
<tr>
<td>1981</td>
<td>8.4</td>
<td>1.5</td>
<td>-0.6</td>
<td>1.5</td>
</tr>
<tr>
<td>1982</td>
<td>8.5</td>
<td>1.5</td>
<td>-0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>1983</td>
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<td>1.5</td>
<td>-0.5</td>
<td>2.1</td>
</tr>
<tr>
<td>1984</td>
<td>28.2</td>
<td>1.5</td>
<td>-0.4</td>
<td>2.7</td>
</tr>
<tr>
<td>1985</td>
<td>-6.9</td>
<td>0.7</td>
<td>-1.3</td>
<td>0.8</td>
</tr>
<tr>
<td>1986</td>
<td>0.6</td>
<td>0.7</td>
<td>-1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>1987</td>
<td>0.6</td>
<td>0.7</td>
<td>-1.3</td>
<td>0.9</td>
</tr>
<tr>
<td>1988</td>
<td>-0.1</td>
<td>1.0</td>
<td>-1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>1989</td>
<td>-0.1</td>
<td>1.0</td>
<td>-1.0</td>
<td>3.1</td>
</tr>
<tr>
<td>1990</td>
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<td>1.0</td>
<td>-1.0</td>
<td>4.0</td>
</tr>
<tr>
<td>1991</td>
<td>2.9</td>
<td>1.1</td>
<td>-0.9</td>
<td>5.2</td>
</tr>
<tr>
<td>1992</td>
<td>3.1</td>
<td>1.2</td>
<td>-0.9</td>
<td>6.8</td>
</tr>
<tr>
<td>1993</td>
<td>3.0</td>
<td>1.2</td>
<td>-0.8</td>
<td>9.0</td>
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<tr>
<td>1994</td>
<td>2.9</td>
<td>1.3</td>
<td>-0.7</td>
<td>11.7</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1) Traditional fisheries without increased efficiency.
2) Traditional fisheries with increased efficiency.
3) All fisheries without increased efficiency.
4) All fisheries with increased efficiency.
Through the mid 1990s, the projected annual rate of increase in the availability of water exceeds the projected rate of growth of water usage by the Seward commercial fishing industry; however, in the late 1990s, the fishing industry's demand for water is projected to be growing at record levels that exceed the projected growth of the supply of water. The development of the fishing industry will be constrained if the supply of water is not increased more rapidly in the late 1990s. The projected rates of growth in the fishing industry demand for electric power exceed the record rates of increase in capacity by the late 1980s or early 1990s. However, due to the importance of the commercial fishing industry to Seward, due to the important role Seward is expected to have in the development of the Alaska groundfish industry, and due to the long planning horizon that exists, it is believed that adequate steps will be taken to assure that the continued development of the Seward commercial fishing industry is not constrained by an inadequate supply of water and/or electric power during the 1990s.

The projected rate of increase in processing plant employment in the late 1990s also exceeds the record projected increases in population and total employment. However, it is significantly higher in only 1999 and 2000, therefore, the development of the Seward commercial fishing industry through 2000 is not expected to be substantially constrained by the availability of labor and the required housing.
Processing Facilities

Within a year, processing capacity can change significantly as the capacity of existing plants changes, as new plants are built, or as old plants become unusable. The ability to rapidly increase processing capacity, when the long-run prognosis indicates that it is profitable to do so, suggests that processing plant capacity will not be a constraint on the growth that is projected for the processing sector of the commercial fishing industry.

The comparison of current Seward processing capacity and the projected Cook Inlet harvests for 2000, which is summarized in Table 3.98, also indicates that physical processing capacity is not expected to constrain the projected growth.

**TABLE 3.98**

Seward Processing Capacity

<table>
<thead>
<tr>
<th></th>
<th>Current Capacity (1,000 pounds per day)</th>
<th>Catch Forecast for 2000</th>
<th>Days Required to Process the Catch Projected for 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>510,000&quot;</td>
<td>28,170</td>
<td>55.2</td>
</tr>
<tr>
<td>Halibut</td>
<td>310</td>
<td>5,816</td>
<td>18.8</td>
</tr>
<tr>
<td>Herring</td>
<td>430</td>
<td>6,436</td>
<td>15.0</td>
</tr>
</tbody>
</table>

The other species that are harvested in Cook Inlet are primarily processed in communities other than Seward.

Land

The number of processing plants is not expected to increase substantially during the forecast period, therefore, the availability of land is not
expected to constrain the growth projected for the commercial fishing industry.

**Conclusion**

The conclusion is that the long-term growth that is projected for the Seward commercial fishing industry appears to be feasible in terms of the long-term availability of inputs. This does not mean that, during the next twenty years, temporary shortages of labor or water or other inputs will not prevent the level of activity of the fishing industry from being as high as it might otherwise be. What it means is that the long-term growth projected for the industry appears to be feasible despite the occasional shortages that will occur.

**The Cordova Commercial Fishing Industry**

Cordova is located at the eastern end of Prince William Sound. Its economic base is dominated by the commercial fisheries of Prince William Sound of which Cordova is the center of both harvesting and processing activity. The salmon fishery is by far the most important fishery in the Prince William Sound management area which also includes herring, halibut, king crab, Tanner crab, Dungeness crab, shrimp, and razor clam fisheries. The absolute and relative magnitudes of the fisheries in terms of pounds harvested are presented in Table 3.99.
### Table 3.99
**Prince William Sound Fishery**
1973-1977

**Catch in 1000 pounds**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HERRING</th>
<th>HALIBUT</th>
<th>KING TANNER</th>
<th>DUNGENESS</th>
<th>RAZOR CRAB</th>
<th>ALL CLAMS</th>
<th>TOTAL OF FISHERIES INCLUDED IN THIS STUDY</th>
<th>TOTAL ALL FISHERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>21,340</td>
<td>14,290</td>
<td>317</td>
<td>208</td>
<td>12,697</td>
<td>7</td>
<td>32</td>
<td>13,750</td>
<td>49,697</td>
</tr>
<tr>
<td>1974</td>
<td>9,468</td>
<td>13,322</td>
<td>320</td>
<td>85</td>
<td>9,598</td>
<td>14</td>
<td>30</td>
<td>10,286</td>
<td>33,202</td>
</tr>
<tr>
<td>1975</td>
<td>22,178</td>
<td>13,078</td>
<td>320</td>
<td>53</td>
<td>5,017</td>
<td>15</td>
<td>30</td>
<td>5,932</td>
<td>41,488</td>
</tr>
<tr>
<td>1976</td>
<td>25,701</td>
<td>5,653</td>
<td>330</td>
<td>275</td>
<td>6,000</td>
<td>29</td>
<td>15</td>
<td>6,445</td>
<td>38,129</td>
</tr>
<tr>
<td>1977</td>
<td>35,429</td>
<td>5,019</td>
<td>330</td>
<td>18</td>
<td>2,895</td>
<td>135</td>
<td>2</td>
<td>3,897</td>
<td>44,429</td>
</tr>
<tr>
<td>mean</td>
<td>22,823</td>
<td>10,272</td>
<td>210</td>
<td>90</td>
<td>7,241</td>
<td>72</td>
<td>16</td>
<td>8,062</td>
<td>41,367</td>
</tr>
</tbody>
</table>

**Percentage of All Included Fisheries**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HERRING</th>
<th>HALIBUT</th>
<th>KING TANNER</th>
<th>DUNGENESS</th>
<th>RAZOR CRAB</th>
<th>ALL CLAMS</th>
<th>PERCENTAGE OF MISCELLANEOUS FISH INCLUDED</th>
<th>PERCENTAGE OF ALL FISH INCLUDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>42.94</td>
<td>28.75</td>
<td>0.637</td>
<td>0.41s</td>
<td>25.54</td>
<td>1.62</td>
<td>0.014</td>
<td>99.9491</td>
<td>99.7751</td>
</tr>
<tr>
<td>1974</td>
<td>28.51</td>
<td>40.12</td>
<td>0.379</td>
<td>0.256</td>
<td>28.90</td>
<td>1.68</td>
<td>0.069</td>
<td>99.9358</td>
<td>99.7716</td>
</tr>
<tr>
<td>1975</td>
<td>53.48</td>
<td>31.54</td>
<td>0.663</td>
<td>0.127</td>
<td>12.09</td>
<td>1.97</td>
<td>0.036</td>
<td>99.9831</td>
<td>99.9397</td>
</tr>
<tr>
<td>1976</td>
<td>67.40</td>
<td>14.82</td>
<td>0.865</td>
<td>0.047</td>
<td>15.73</td>
<td>0.76</td>
<td>0.054</td>
<td>99.9845</td>
<td>99.7802</td>
</tr>
<tr>
<td>1977</td>
<td>79.89</td>
<td>11.31</td>
<td>-o-</td>
<td>0.200</td>
<td>6.52</td>
<td>1.65</td>
<td>0.039</td>
<td>100.0000</td>
<td>99.8109</td>
</tr>
</tbody>
</table>

Source: ADFG Annual Catch and Production Reports and Salmon and Shellfish Catch Reports, IPHC Annual Reports.
The importance of the Cordova commercial fishing industry to the local community can be measured in a number of ways. It can be measured in absolute terms such as the income of Cordova fishermen or the number of commercial fishermen who reside in Cordova (see Tables 3.100 and 3.101), or it can be measured in relative terms; for example, in 1976, over 27 percent of the residents of Cordova had commercial fishing licenses, and in 1974, over 75 percent of the base sector employment was in agriculture and manufacturing, the two segments of the base sector that are dominated by commercial fishing and fish processing, respectively. The implication is that in 1974, approximately 75 percent of the total employment in Cordova was generated either directly or indirectly by the Cordova commercial fishing industry. The employment projections for 1978 that are presented in "Northern Gulf of Alaska Local Socioeconomic and Physical Systems Impact Analysis" indicate that the contribution of the commercial fishing industry to the economic base is as great as or greater than it was in 1974. Despite their lack of precision, these measures are sufficient to demonstrate that the commercial fishing industry is the principal component of the Cordova economy; and as the following brief summary of the projected growth of the industry indicates, the Cordova commercial fishing industry is expected to be the source of increasing levels of economic activity.

During the next twenty years, the development of domestic groundfish fisheries and continued growth of the traditional fisheries will contribute to the growth of the industry and the community. Total catch is projected to increase from 17,846 metric tons (39.3 million pounds) in 1980 to 55,425 metric tons (122.2 million pounds) in 2000, and the
### TABLE 3.100

**ESTIMATED GROSS EARNINGS OF CORDOVA FISHERMEN 1969 - 1976**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>GEAR OPERATORS</th>
<th>GROSS EARNINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>330</td>
<td>3,219</td>
</tr>
<tr>
<td>1970</td>
<td>391</td>
<td>3,918,000</td>
</tr>
<tr>
<td>1971</td>
<td>361</td>
<td>4,225,000</td>
</tr>
<tr>
<td>1972</td>
<td>357</td>
<td>2,927,000</td>
</tr>
<tr>
<td>1973</td>
<td>429</td>
<td>7,869,000</td>
</tr>
<tr>
<td>1974</td>
<td>378</td>
<td>6,163,000</td>
</tr>
<tr>
<td>1975</td>
<td>354</td>
<td>6,629,000</td>
</tr>
<tr>
<td>1976</td>
<td>377</td>
<td>11,677,000</td>
</tr>
</tbody>
</table>

---

1 Cordova - McCarthy

Source: Alaska Commercial Fisheries Entry Commission, Distribution of Income from Alaska Fisheries, July, 1978

### TABLE 3.101

**NUMBER OF CORDOVA RESIDENTS HOLDING A COMMERCIAL FISHERMAN’S LICENSE 1969 - 1976**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>186</td>
<td>205</td>
<td>216</td>
<td>211</td>
<td>286</td>
<td>264</td>
<td>467</td>
<td>572</td>
</tr>
</tbody>
</table>

*A Cordova resident is anyone who uses a Cordova address when applying for a license.*

Source: Commercial Fisheries Entry Commission, Commercial License File.
real value of catch is projected to increase from $27.3 million to $65.2 million. The corresponding percentage increases are 211 percent by weight and 139 percent by value. Processing activity is also expected to increase, but due to increases in processing efficiency, processing employment and real income are not projected to increase as rapidly as catch. A 52.6 percent increase in employment and a 87.8 percent increase in real income are expected between 1980 and 2000.

If the increases in processing efficiency were not allowed for, 98.9 percent and 144.9 percent increases in employment and real income would be projected. The projections of harvesting activity by fishery, on which the preceding summary is based, and more detailed projections of processing activity are presented in the following sections.

**Harvesting**

Projections of harvesting activity and limited historical data are presented by species or species group in this section. The detailed historical data which are referred to in this section and which serve as a basis for the projections are presented in tabular form in Appendix C. The models used in making the projections are discussed in Chapter II.

**Salmon**

Two major Prince William Sound salmon fisheries can be defined by gear type; they are the purse seine and drift gill net fisheries. The drift gill net fleet consists of boats which are typically 6 to 10.7
meters (20 to 35 feet) in length, have a crew of one, and are active during specified periods which occur between May and September. The purse seiners are typically 7.9 to 16.8 meters (26 to 55 feet) in length, have a crew of four, and fish during open periods which occur between June and August.

Recent record salmon harvests and continuously improving resource management, enhancement, and rehabilitation programs suggest that the Prince William Sound salmon resources will increase during the forecast period. Catch is projected to increase from 9,835 metric tons (21.7 million pounds) in 1980 to 15,773 metric tons (34.8 million pounds) in 2000, and its real value is expected to increase from $15.0 million to $44.2 million (see Table 3.102). The resulting percentage increases are 60 percent by weight and 195 percent by real value (see Table 3.103). The Prince William Sound salmon fisheries are similar to many other Alaskan salmon fisheries both in that increases in the number of boats or fishermen participating in the fishery are not necessary to substantially increase the annual harvest because there is currently excess harvesting capacity, and in that increases are not expected to occur because they are limited entry fisheries. Projections of catch by species are presented in Table 3.104.

Herring

There are two major roe fisheries and a relatively minor bait herring fishery in Prince William Sound. The roe herring fleet consists of purse seiners, many of which participate in the salmon fishery after
### TABLE 3.102

**PROJECTED HARVESTING ACTIVITY**  
**PRINCE WILLIAM SOUND SALMON FISHERY 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH</th>
<th>VALUE</th>
<th>EX-VESEL PRICE</th>
<th>NUMBER OF BOATS</th>
<th>LANDINGS</th>
<th>FISHERMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POUNDS ($/Pound)</td>
<td>METRIC TONS</td>
<td>($/1,000)</td>
<td>($)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>21683</td>
<td>9835</td>
<td>16683</td>
<td>14989</td>
<td>0.77</td>
<td>0.69</td>
</tr>
<tr>
<td>1981</td>
<td>21953</td>
<td>9958</td>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
TABLE 3. 103

PROJECTED PERCENTAGE CHANGE FROM 1980
PRINCE WILLIAM SOUND SALMON FISHERY

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Source: Alaska Sea Grant Program
the brief and intensive roe herring fishery which occurs during April and May. The seiners are typically between 7.9 to 13.7 meters (26 and 45 feet) in length and have a crew of four. The herring roe on kelp season is also during April and May. The boats in this fishery are typically under 10.7 meters (35 feet) in length and many are under 7.6 meters (25 feet).

Favorable market conditions have resulted in the roe fishery resources being fully utilized; catch is therefore not expected to increase during the forecast period. Average annual catch is projected at 4,725 metric tons (10.4 million pounds) and its real value is expected to increase from $7.9 million in 1980 to $9.6 million in 2000 (see Table 3.105). This represents a 21 percent increase in real value (see Table 3.106).

**Halibut**

In recent years, Cordova has had a relatively minor role in the halibut fishery of the Gulf of Alaska and this situation is not expected to change. The small boat fleet is more active locally than the large boat fleet which fishes throughout the Gulf. The small boat fleet consists of boats and fishermen that are typically only casual participants in the halibut fishery and are more closely associated with other fisheries such as salmon. The casual nature of their participation in the halibut fishery is reflected in the number of landings per boat per year which has not reached four in recent years. The boats of this fleet are typically between 6 and 16.8 meters (20 feet and 55 feet) in
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Source: Alaska Sea Grant Program.

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Source: Alaska Sea Grant Program.
length, have a crew of one, and participate in the fishery during May through August or September.

Since these boats and fishermen are primarily associated with other fisheries and therefore accounted for elsewhere, the projections of the numbers of boats and fishermen are for the large boat fleet. The projections of catch are, however, for the entire fishery. Catch is projected to increase from 100 metric tons (220,000 pounds) in 1980 to 176 metric tons (388,000 pounds) in the year 2000, and its real value is expected to increase from $380,000 to $842,000 (see Table 3.107). This amounts to a 76 percent increase by weight and a 121 percent increase by value (see Table 3.108).

Groundfish

In the past several years there have been two distinct groundfish fleets in the Prince William Sound management area, a small boat long line fleet and a trawl fleet. The long line fleets have included up to 51 boats; the boats are typically under 10.7 meters (35 feet) in length, have a crew of one, and participate in the fishery on an occasional or casual basis between May and August or September. The average number of landings per boat per year has not exceeded three in recent years. This suggests that the small boat long line groundfish fishery is a supplemental fishery for boats and fishermen more closely associated with other fisheries. The trawl fleet has included between one and five boats in the last few years. The boats have ranged in size from under 7.6 meters (25 feet) to over 22.9 meters (75 feet) in length but boats under 10.7 meters (35 feet)
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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
### TABLE 3.108

**PROJECTED PERCENTAGE CHANGE FROM 1980, PRINCE WILLIAM SOUND HALIBUT FISHERY**

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Source: Alaska Sea Grant Program
have been most common. The average crew size is three and the season has extended from December through April.

As the domestic groundfish fishery develops there are expected to continue to be distinct small and large boat fleets, however, both fleets may include several gear types. A number of gear types will be experimental, with attempts to find gear types that will allow salmon and shellfish boats to profitably participate in the groundfish fishery when they are not participating in the traditional fisheries. Since the small boat fleet is expected to consist of vessels that will be more closely associated with other fisheries and, therefore, accounted for elsewhere, the following projection of the numbers of boats and fishermen exclude the small boat fleet.

The annual groundfish harvest is projected to increase from 24 metric tons (53,000 pounds) in 1980 to 31,136 metric tons (68.6 million pounds) in 2000 and its real value is expected to increase from $6,500 to $5.5 million (Table 3.109). The resulting percentage increases are reported in Table 3.110. In considering the projection of the number of boats or fishermen, it should be remembered that they are projections of full-time equivalents; that is, they indicate the number of full-time boats and fishermen it would take to harvest the projected catch.

The relative importance of the groundfish fishery in terms of all Prince William Sound fisheries is projected to increase dramatically during the forecast period and to vary greatly depending on whether the relative importance is measured in terms of pounds, value, or the number of landings.
### TABLE 3.109

**PROJECTED HARVESTING ACTIVITY**  
**PRINCE WILLIAM SOUND GROUNDFISH FISHERY 1980-2000**

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<th>EX-VESSEL PRICE ($/Pound)</th>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### TABLE 3.110
**Projected Percentage Change from 1980, Prince William Sound Groundfish Fishery**

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<th>Catch Value</th>
<th>Ex-Vessel Price Nominal</th>
<th>Ex-Vessel Price Real</th>
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<th>Fishermen</th>
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</table>

Source: Alaska Sea Grant Program.
or boats, or fishermen. For example, the groundfish catch as a percentage of total catch is expected to increase from 0.13 percent in 1980 to 56.2 percent in 2000; whereas the value of the groundfish catch as a percent of the value of the total catch is expected to increase from 0.02 percent in 1980 to 8.4 percent in 2000 (Table 3.111). The significant difference between the relative importance of the groundfish fishery measured by weight and value is due to the large ex-vessel price differential between groundfish and other finfish or shellfish. Projections of catch by species are provided in Table 3.112.

**King Crab**

In recent years, the Prince William Sound king crab fleet has ranged in size from 10 to 21 boats. The boats are typically 10.7 to 13.7 meters (35 to 45 feet) in length and have a crew of four. The season has extended from August through March, but in the two most recent years, 1977 and 1978, the season was from October through March. Although the annual harvest has been as high as 134 metric tons (296,000 pounds), the sustainable yield is not thought to exceed 45 metric tons (100,000 pounds). Recent harvests have approached this figure and favorable market conditions are expected to maintain harvests at this level throughout the forecast period. The real value of the projected harvest is expected to increase from $98,000 in 1980 to $130,000 in 2000 (Table 3.113). This is a 32 percent increase in real value (Table 3.114).
TABLE 3.111
PROJECTIONS OF PRINCE WILLIAM SOUND GROUNDFISH HARVESTING ACT
AS A PERCENTAGE OF TOTAL PRINCE WILLIAM SOUND HARVESTING ACTIVITY

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<th>Number of Landings</th>
<th>Number of Fishermen</th>
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Source: Alaska Sea Grant Program.
**TABLE 3.112**

CORDOVA GROUNDFISH PROJECTED CATCH BY SPECIES 1980-2000

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\(^1\)Value in terms of 1978 dollars.
## TABLE 3.113
PROJECTED HARVESTING ACTIVITY
PRINCE WILLIAM SOUND KING CRAB FISHERY 1980-2000

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<th>EX-VEssel PRICE ($/Pound) Nominal</th>
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Source: Alaska Sea Grant Program.

1The real values and prices are in terms of 1978 dollars.
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Source: Alaska Sea Grant Program
Tanner Crab

The Prince William Sound Tanner crab fishery has included up to 54 boats in the last several years. Although a vessel over 35 meters (115 feet) in length has participated in this fishery, the typical boat is 10.7 to 19.8 meters (35 to 65 feet) in length and has a crew of four. In 1977 and 1978 the season was from November through May. The Tanner crab fishery is like many other fisheries, in that the record catch far exceeds what is thought to be the sustainable yield. The sustainable yield is not expected to exceed 2,268 metric tons (5 million pounds), but favorable market conditions are expected to result in the resources being harvested at that level throughout the forecast period. The real value of the annual harvest is projected to decrease from $2.7 million in 1980 to $2.4 million in 2000; this is a 13 percent decrease in real value (Tables 3.115 and 3.116).

Dungeness Crab

The Prince William Sound Dungeness crab fleet has ranged in size from less than nine boats to more than 49 boats. The typical boat is between 7.6 and 19.8 meters (25 feet and 65 feet) in length and has a crew of two. In 1978 the fishery was active from January through December. The harvest, however, was concentrated from May through December.

In 1978 the fishery was more than fully utilized, that is, the catch of 931 metric tons (2.1 million pounds) exceeded what is thought to be the sustainable yield. The favorable market conditions that resulted in the record catch are expected to exist during the forecast period and the
TABLE 3.115
PROJECTED HARVESTING ACTIVITY
PRINCE WILLIAM SOUND TANNER CRAB FISHERY 1980-2000

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<th>EX-VESSEL PRICE</th>
<th>NUMBER OF BOATS</th>
<th>LANDINGS</th>
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Source: Alaska Sea Grant Program

The real values and prices are in terms of 1978 dollars.
### TABLE 3.16
PROJECTED PERCENTAGE CHANGE FROM 1980,
PRINCE WILLIAM SOUND TANNER CRAB FISHERY

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Source: Alaska Sea Grant Program.
average annual harvest is projected to equal the sustainable harvest of 567 metric tons (1.25 million pounds). The real value of the harvest is expected to increase from just over $0.9 million in 1980 to over $1.1 million in the year 2000 (Table 3.117). This represents a 22 percent increase in real value (Table 3.118).

Shrimp

The shrimp resources of Prince William Sound have historically been under-utilized. The pot and trawl fisheries have been sporadic, and prior to the 1978 harvest of 203 metric tons (448,000 pounds), the annual harvests had been well below the sustainable yield of approximately 227 metric tons (500,000 pounds). Favorable market conditions, including the decline in the Kodiak shrimp fishery and an increasing real ex-vessel price, are expected to result in the resources being fully utilized during the forecast period. The average annual harvest is thus projected at the sustainable yield of 227 metric tons (500,000 pounds) and its real value is expected to increase from $112,000 in 1980 to $297,000 in 2000 (Table 3.119). This is a 165 percent increase in real value (Table 3.120).

The small number of trawlers that participate in this fishery are expected to have a crew of three and exceed 19.8 meters (65 feet) in length. The pot boats are expected to have a crew of two and typically be under 13.7 meters (45 feet) in length. During the record catch year of 1978, the shrimp fishery was active all twelve months, but over 95 percent of the catch was taken in September and October. This indicates that if the maximum sustainable

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### Table 3.117

**Projected Harvesting Activity**

**Prince William Sound Dungeness Crab Fishery 1980-2000**

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<th>Real</th>
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Source: Alaska Sea Grant Program

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Source: Alaska Sea Grant Program
### Table 3.119

**Projected Harvesting Activity**

*Prince William Sound Shrimp Fishery 1980-2000*

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<th>Ex-Vessel Price ($/Pound)</th>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### Table 3.120

**Projected Percentage Change from 1980.**

**Prince William Sound Shrimp Fishery - Ex-Vessel**

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Source: Alaska Sea Grant Program
yield is approximately 500,000 pounds, the fishery can be fully utilized by a small number of trawlers in a short period of time.

It should be noted that, although there are indications that the sustainable yield does not exceed 227 metric tons (500,000 pounds), the shrimp resources of Prince William Sound have not been explored and/or surveyed sufficiently to know with a high degree of confidence what level of catch can be sustained. It would, therefore, not be surprising if the harvest forecasts prove to be off by a factor of three or more.

**Razor Clams**

Adverse market and/or environmental conditions have held the Prince William Sound razor clam fishery well below the record levels of activity which occurred between 1900 and 1950. In recent years activity has been minimal, with boats and fishermen from other fisheries participating in the razor clam fishery on a casual and supplemental basis. The predominant gear type is still a clam shovel, since mechanized harvesting methods have not yet proven to be feasible. The feasibility of both mechanical harvesting and an expansion of the fishery are limited by a low level of state funding for Paralytic Shellfish Poisoning (PSP) monitoring and beach certification, and limited markets for razor clams.

The market conditions that have limited interest in this fishery during the past 15 years have permitted increases in the resource that will increase the profitability of the fishery. This, together with improving market conditions including decreases in the clam resources on the East
Coast, and the prospect of sustained high levels of activity in the Dungeness crab fishery, is expected to result in a continued recovery of the razor clam fishery. The level of activity of the Dungeness crab fishery is of importance because razor clams are used as bait in that fishery.

The razor clam season is expected to be from April through August and participation in the fishery is expected to be supplemented with very few fishermen or boats participating solely in the razor clam fishery. The optimistic projections are that the annual catch will increase from 54 metric tons (120,000 pounds) in 1980 to 508 metric tons (1.1 million pounds) in 2000, and that the real value of the harvest will increase from $129,000 to $1.1 million (see Table 3.121). This would be a 833 percent increase in catch or real value during the forecast period (see Table 3.122) and a significantly larger increase over the catches that occurred in the late 1970s. Even if this rapid recovery of the razor clam fishery does occur, the razor clam fishery will remain a relatively unimportant fishery, and to the extent it remains a supplemental fishery, it will not result in more fishermen or boats participating in the Prince William Sound fisheries as a whole.

**Summation of Harvesting Activity Projections**

This section consists of the presentation and analysis of the projections of harvesting activity of the Cordova commercial fishing industry as a whole. The tables presented in this section include summations of pro-
### TABLE 3.121

**PROJECTED HARVESTING ACTIVITY**

**PRINCE WILLIAM SOUND RAZOR CLAM FISHERY 1980-2000**

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**Source:** Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### TABLE 3.122

**PROJECTED PERCENTAGE CHANGE FROM 1980, PRINCE WILLIAM SOUND RAZOR CLAM FISHERY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch Weight</th>
<th>Catch Real Value</th>
<th>EX-VESSEL PRICE Nominal</th>
<th>EX-VESSEL PRICE Real</th>
<th>Number of Boats</th>
<th>Number of Landings</th>
<th>Number of Fishermen</th>
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<td>750.000</td>
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<td>256.716</td>
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<td>791.667</td>
<td>176.565</td>
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<td>71.429</td>
<td>256.716</td>
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<td>833.333</td>
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<td>71.429</td>
<td>256.716</td>
<td>71.429</td>
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</table>

Source: Alaska Sea Grant Program
jetted harvesting activity and projections of the relative importance of each fishery.

Total catch is projected to increase from 17,846 metric tons (39.3 million pounds) in 1980 to 55,425 metric tons (122.2 million pounds) in 2000, and its real value is expected to increase from $27.3 million to $65.2 million (Table 3.123). The associated percentage increases are 211 percent and 139 percent respectively (Table 3.124). Excluding groundfish, catch is expected to increase from 17,822 metric tons (39.3 million pounds) in 1980 to 24,289 metric tons (53.5 million pounds) in 2000 and its real value is expected to increase from $27.3 million to $59.7 million (Table 3.125). This amounts to a 36.3 percent increase in weight and a 119 percent increase in real value (Table 3.126). Due to both the excess harvesting capacity that exists in many fisheries and the large catches projected per boat and fisherman in the groundfish fishery, the numbers of boats and fishermen are not expected to increase significantly in the fisheries as a whole or in the traditional fisheries (Tables 3.123 through 3.126).

In addition to significant changes in harvesting activity, there are expected to be notable changes in the relative importance of individual fisheries. The largest change is, of course, expected in the relative importance of the groundfish fishery which is just beginning to develop.

As a percentage of total catch, the groundfish catch is expected to increase from less than one percent in 1980 to over 56 percent in 2000 (Table 3.127). The value of the groundfish catch is expected to in-
### TABLE 3.123

**PROJECTED HARVESTING ACTIVITY**

**PRINCE WILLIAM SOUND ALL FISHERIES 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>POUNDS (1,000)</th>
<th>METRIC TONS</th>
<th>VALUE ($1',000)</th>
<th>EX-VESSEL PRICE ($/Pound)</th>
<th>NUMBER OF Boats</th>
<th>Landings</th>
<th>Fishermen</th>
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<td>Real</td>
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</tr>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
TABLE 3.124

PROJECTED PERCENTAGE CHANGE FROM 1980,
PRINCE WILLIAM SOUND ALL FISHERIES

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<td>Real</td>
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<td>Fishermen</td>
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Source: Alaska Sea Grant Program.
TABLE 3.125
PROJECTED HARVESTING ACTIVITY
PRINCE WILLIAM SOUND TRADITIONAL FISHERIES 1980-2000

<table>
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<tr>
<th>Year</th>
<th>CATCH</th>
<th>VALUE</th>
<th>EX-VESSEL PRICE</th>
<th>NUMBER OF BOATS</th>
<th>LANDINGS</th>
<th>FISHERIES</th>
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<tbody>
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<td>POUNDS (1,000)</td>
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<td>($1,000)</td>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program
crease from 0.02 percent to 8.4 percent of the value of the total catch (Table 3.128),

The large difference between the importance of groundfish as measured by weight and value is due to the significant ex-vessel price differentials between groundfish and the traditional species. The relative importance of each fishery with respect to the number of boats, fishermen, or landings is expected to remain relatively constant (Tables 3.129 through 3.131); the one exception is the groundfish fishery.

Within the traditional fisheries, the projected changes in relative importance are more modest. The salmon fishery, which has been the leading traditional fishery in terms of harvest weight or value, is projected to increase its dominance (Tables 3.132 and 3.133). In terms of the number of boats, fishermen, or landings, the relative importance of individual fisheries among the traditional fisheries is expected to be quite stable (Tables 3.134 through 3.136).

As is mentioned in Chapter II, the summation of the number of boats or fishermen over all fisheries results in double counting since a fisherman or boat is counted once for each fishery participated in. The method used to reduce this problem is also discussed in Chapter II and the results of that adjustment method are presented in Table 3.137, which includes adjusted and unadjusted projections of the number of boats and fishermen for the Cordova commercial fishing industry as a whole.
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Source: Alaska Sea Grant Program.
### TABLE 3.129

**PERCENTAGE OF BOATS BY PRINCE WILLIAM SOUND FISHERY INCLUDING GROUNDFISH, 1980-2000**

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<th>Crab</th>
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<th>Dungeness</th>
<th>Shrimp</th>
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**Source:** Alaska Sea Grant Program
### TABLE 3.130

PERCENTAGE OF FISHERMEN BY PRINCE WILLIAM SOUND FISHERY INCLUDING GROUNDISH, 1980-2000

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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program.
### TABLE 3.131

**PERCENTAGE OF THE NUMBER OF LANDINGS BY PRINCE WILLIAM SOUND FISHERY INCLUDING GROUND FISH, 1980-2000**

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<th>Tanner Crab</th>
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Source: Alaska Sea Grant Program.
### TABLE 3.133

PERCENTAGE OF VALUE BY PRINCE WILLIAM SOUND FISHERY EXCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
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PERCENTAGE OF FISHERMEN BY PRINCE WILLIAM SOUND FISHERY EXCLUDING GROUNDFISH, 1980-2000

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Source: 'Alaska Sea Grant Program
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Source: Alaska Sea Grant Program
Local Harvesting Effort

The difficulties of defining and measuring local harvesting effort are addressed in Chapter II and a method of approximating local effort is developed. The results of that method of approximation are presented in this section. As the values of the local harvesting factors indicate, the degree to which a Prince William Sound fishery can be considered a local Cordova fishery varies greatly among fisheries (Table 3.138). For example, the salmon fisheries are principally local and the halibut fisheries are not.

PROCESSING

The projections of processing plant activity presented in this section are based on the projections of industry-wide catch discussed in a preceding section. The measures of activity are in terms of processing plant input requirements and processing plant payrolls or income. Four sets of projections are presented for each measure of processing activity; the four sets are the traditional fisheries with and without increased efficiency and all fisheries with and without increased efficiency.

Water

In 1976 and 1977, the peak water usage by Cordova processing plants was approximately 5.7 million liters (1.5 million gallons) per day. Using this as the base peak load, peak load is projected to be between 4.5 to 7.9 million liters (1.2 and 2.1 million gallons) per day by 2000 (Table 3.139).
### Table 3.138
**Local Harvesting Factor for Cordova, 1976**

#### Prince William Sound:

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\[
P = \frac{(PF/TP) \cdot LPO}{B}
\]

#### Statewide:

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</table>

\[
P = \text{Estimated proportion of fishing effort that is local}
\]

LPO = Number of local permit owners

TP = Total number of permits

PF = Number of permits fished

B = Number of boats participating in the fishery

*P=1 when calculated value exceeds 1 -

Source: ADF&G and CFEC data files.

282
## TABLE 3.139

**PROJECTED PEAK CORDOVA PROCESSING REQUIREMENTS FOR WATER**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000 GALLONS/DAY</td>
<td>PERCENTAGE INCREASE*</td>
<td></td>
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<tr>
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<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<td>1938</td>
<td>1243</td>
<td>2144</td>
<td>1374</td>
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</table>

Source: Alaska Sea Grant Program

*Requirement without increased efficiency.

**Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
Electricity

Based on a base peak load requirement of 0.624 million kilowatt hours of electricity per month, the projected peak use of electricity by processing plants in the year 2000 is projected to range from 0.517 to 2.1 million kilowatt hours per month (Table 3.140).

Employment

Using the Alaska Department of Labor estimate of average monthly employment in Cordova processing plants in 1977 as the base, the projections of average monthly employment for the year 2000 range from 212 to 509 (Table 3.141).

Income

Using corresponding data of the annual payroll of processing plants, the annual real income for the year 2000 is projected to range from $3.7 million to $8.9 million (Table 3.141). The corresponding projected percentage increases since the base period are presented in Table 3.142.

Number of Plants

The number of plants can vary greatly due to changes in average plant size and is, therefore, not a significant measure of processing activity. Since many Cordova plants have either excess capacity or the capability of increasing their capacity, the number of plants is expected to remain...
### TABLE 3.140

**PROJECTED PEAK CORDOVA PROCESSING REQUIREMENTS FOR ELECTRICITY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
</tr>
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<tbody>
<tr>
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<td>1000 KWH/MONTH</td>
<td></td>
<td>PERCENTAGE INCREASE*</td>
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<td></td>
<td></td>
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<td>2</td>
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<td></td>
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<td>1</td>
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<tr>
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<td>596</td>
<td>561</td>
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</tr>
<tr>
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<td>601</td>
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<td>-14.26</td>
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<td>520</td>
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<td>517</td>
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<td>-17.16</td>
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</table>

Source: Alaska Sea Grant Program

1 Requirement without increased efficiency.

2 Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
<table>
<thead>
<tr>
<th>Year</th>
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<th>WITH</th>
<th>WITHOUT</th>
<th>WITH</th>
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<td>3587</td>
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<td>3650</td>
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<td>3849</td>
<td>219</td>
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<td>214</td>
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<tr>
<td>2000</td>
<td>331</td>
<td>18838</td>
<td>5901</td>
<td>212</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1. Average monthly employment.

2. Annual payroll in $1,000.

3. Income in 1978 dollars in ($1,000).
## Table 3.142

**Projected Percentage Change* in Cordova Processing Employment and Income 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries Without Increased Efficiency</th>
<th>All Fisheries Without Increased Efficiency</th>
<th>Traditional Fisheries With Increased Efficiency</th>
<th>All Fisheries With Increased Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment</td>
<td>Nominal Income</td>
<td>Real Income</td>
<td>Employment</td>
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<td>15*45</td>
<td>-1.64</td>
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<td>1982</td>
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<td>23*96</td>
<td>0.06</td>
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</tr>
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<td>1983</td>
<td>-2.85</td>
<td>33*18</td>
<td>1.84</td>
<td>-12.18</td>
</tr>
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<td>42*93</td>
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<td>-13.23</td>
</tr>
<tr>
<td>1985</td>
<td>-1.23</td>
<td>53*94</td>
<td>5.51</td>
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<td>66*23</td>
<td>8.32</td>
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<td>20.38</td>
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<td>-16.46</td>
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<td>38.00</td>
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<td>19.75</td>
<td>277*01</td>
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<td>29.21</td>
<td>416*39</td>
<td>59.01</td>
<td>-17.16</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

*1977 is the base period.
1. Average monthly employment.
2. Annual payroll “in $1,000.
3. Income in 1978 dollars “in ($1,000).
relatively constant and perhaps include four or five large plants and a few small plants. The plants will typically process a variety of species. Since the projected development of the groundfish industry is more speculative and more significant than that of the traditional fisheries, a summary of projected groundfish processing activity, including the number of plants, is presented in Table 3.143.

Local Processing Effort

On the basis of information provided by the industry, it is estimated that 40 percent of the summer employment and almost 100 percent of the winter employment in Cordova fish processing plants utilize full-time residents.

THE FEASIBILITY OF THE PROJECTED GROWTH

In this section, the feasibility of the projected growth of the Cordova commercial fishing industry is evaluated in terms of the projected input requirements and projected input availability. The inputs that are considered include small boat harbor facilities, port facilities, labor, land, electric power, water, and processing plant facilities. Projections of the availability of port facilities, labor, land, electric power, and water are drawn from the following Studies Program reports.

- Technical Report Number 33, Northern Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts
## TABLE 3.143

PROJECTED CORDOVA GROUNDFISH PROCESSING ACTIVITY, 1980-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH (MT)</th>
<th>NUMBER OF PLANTS(^1)</th>
<th>EMPLOYMENT (man years)</th>
<th>LAND (hectares)</th>
<th>ELECTRICITY (million KWH/year)</th>
<th>WATER (million gallons/year)</th>
</tr>
</thead>
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<tr>
<td>1980</td>
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</table>

Source: Alaska Sea Grant Program

1 The number of full-time groundfish plants.

NOTE: The values are rounded to the nearest whole number, therefore a "( )" indicates a value of less than 0.5.
These reports were prepared by Alaska Consultants, Inc., and Peter Eakland and Associates, respectively. Projections of input requirements are based on forecasts of harvesting and processing activity presented in previous sections, and the projections of input availability that are not available from other Studies Program reports are developed in this section.

**Small Boat Harbor**

The Cordova small boat harbor has been used well beyond its design capacity for a number of years. The inadequacy of this facility is demonstrated by the long waiting lists for permanent slips, the rafting of vessels that is often required, and the inability of very large fishing vessels to use the small boat harbor. An enlargement of the existing facility is being planned. The projected increases in the harvesting activity of the traditional fisheries can probably occur without major improvements to the small boat harbor; however, to the extent that the development of the groundfish industry is dependent on harbor facilities for large fishing vessels, the existing facility will be a constraint.

**Port Facilities**

Technical Report Number 31 indicates that a 245 percent increase in usage could occur before the current capacity of the Cordova port facilities is fully utilized. Since total harvest is projected to increase by just over 200 percent by 2000 and since the volume of fish products shipped from Cordova will increase less rapidly due to the relatively low recovery
factor for groundfish, the projected growth of the Cordova commercial fishing industry is not expected to be hampered by the port facilities.

Labor, Electric Power, and Water

The projected growth of the commercial fishing industry is feasible only if the corresponding rates of increase in input requirements can be met or surpassed by the rates of increase in input availability. The rates of increase of input requirements can be derived from the projections of input requirements developed in the previous section and the rates of increase in input availability can be inferred from information included in Technical Report Number 40. The report presents projections of community requirements for labor, electric power, and water for each of the OCS petroleum scenarios and indicates that the requirements can be met. The rates of increase in community-wide input requirements corresponding to the projections of community-wide input requirements are, therefore, considered to only include rates of increase that do not exceed feasible rates of increase in input availability. The highest rates of increase are associated with the high find case, therefore, the rates of increase in input requirements for the commercial fishing industry are compared to the rates of increase in community-wide input requirements/availability of the high find case to determine if the former are feasible. The projected rates of increase in input availability and requirements are presented in Table 3.144.

The record projected rate of growth of the water supply greatly exceeds the largest percentage increase in water usage projected for the fishing industry; and with the exception of the case which includes groundfish but
### TABLE 3.144

**COMPARATIVE RATES OF GROWTH; HIGH FIND CASE AND THE CORDOVA FISHING INDUSTRY**

<table>
<thead>
<tr>
<th>Year</th>
<th>OCS Fishing Industry Case</th>
<th>ELECTRIC POWER OCS Fishing Industry Case</th>
<th>POPULATION OCS Fishing Industry Case</th>
<th>EMPLOYMENT OCS Fishing Industry Case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Case</td>
<td></td>
<td>Case</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>1981</td>
<td>4.6 0.8 -1.2</td>
<td>0.8</td>
<td>-1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>1982</td>
<td>1.7 0.8 -1.2</td>
<td>0.8</td>
<td>-1.2</td>
<td>4.0</td>
</tr>
<tr>
<td>1983</td>
<td>1.6 0.8 -1.2</td>
<td>0.8</td>
<td>-1.2</td>
<td>3.8</td>
</tr>
<tr>
<td>1984</td>
<td>1.6 0.8 -1.2</td>
<td>0.8</td>
<td>-1.2</td>
<td>3.9</td>
</tr>
<tr>
<td>1985</td>
<td>1.6 0.8 -1.2</td>
<td>0.8</td>
<td>-1.2</td>
<td>3.4</td>
</tr>
<tr>
<td>1986</td>
<td>1.7 1.7 -0.3</td>
<td>1.7</td>
<td>-0.3</td>
<td>3.3</td>
</tr>
<tr>
<td>1987</td>
<td>2.3 1.7 -0.4</td>
<td>1.7</td>
<td>-0.4</td>
<td>5.9</td>
</tr>
<tr>
<td>1988</td>
<td>2.4 1.7 -0.3</td>
<td>1.7</td>
<td>-0.3</td>
<td>6.4</td>
</tr>
<tr>
<td>1989</td>
<td>4.2 1.7 -0.3</td>
<td>1.8</td>
<td>-0.2</td>
<td>12.2</td>
</tr>
<tr>
<td>1990</td>
<td>6.2 1.7 -0.3</td>
<td>1.8</td>
<td>-0.2</td>
<td>19.9</td>
</tr>
<tr>
<td>1991</td>
<td>1.8 1.8 -0.3</td>
<td>1.9</td>
<td>-0.1</td>
<td>1.4</td>
</tr>
<tr>
<td>1992</td>
<td>1.6 1.7 -0.3</td>
<td>1.9</td>
<td>-0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>1993</td>
<td>1.8 1.9 -0.2</td>
<td>2.1</td>
<td>0.1</td>
<td>1.5</td>
</tr>
<tr>
<td>1994</td>
<td>2.2 1.8 -0.2</td>
<td>2.2</td>
<td>0.2</td>
<td>2.5</td>
</tr>
<tr>
<td>1995</td>
<td>2.1 1.8 -0.2</td>
<td>2.3</td>
<td>0.3</td>
<td>2.1</td>
</tr>
<tr>
<td>1996</td>
<td>2.0 1.9 -0.2</td>
<td>2.6</td>
<td>0.6</td>
<td>1.8</td>
</tr>
<tr>
<td>1997</td>
<td>2.1 1.9 -0.2</td>
<td>3.0</td>
<td>0.9</td>
<td>1.7</td>
</tr>
<tr>
<td>1998</td>
<td>2.0 1.9 -0.1</td>
<td>3.4</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>1999</td>
<td>2.0 1.9 -0.1</td>
<td>4.1</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>2000</td>
<td>2.1 1.9 -0.1</td>
<td>4.9</td>
<td>2.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1) Traditional fisheries without increased efficiency.
2) Traditional fisheries with increased efficiency.
3) All fisheries without increased efficiency.
4) All fisheries with increased efficiency.
does not allow for increased processing efficiency, the annual projected rate of increase in supply exceeds the projected increase in fishing industry usage. The projected rate of increase in the use of electric power is below the record rate of increase in electric power capacity prior to 1999, and until the 1990s the annual rate of growth in fishing industry demand is less than the rate of growth in supply. The record projected rates of increase in population and employment exceed the largest projected increase in fishing industry employment and the annual rates of increase in population and employment are typically greater than the projected increases in fishing industry employment; this suggests that the labor force and the required housing facilities can increase rapidly enough to meet the projected growth of the fishing industry.

It, therefore, appears that the projected rates of growth of the fishing industry requirements for water, electric power, and labor, can be met.

**Processing Facilities**

Within a year, processing capacity can change significantly as the capacity of existing plants changes, as new plants are built, or as old plants become unusable. The ability to rapidly increase processing capacity, when the long-run prognosis indicates that it is profitable to do so, suggests that processing plant capacity will not be a constraint on the growth that is projected for the processing sector of the commercial fishing industry. The comparison of current processing capacity and the projected harvests for 2000, which is summarized in Table 3.145, also indicates that physical processing capacity is not expected to constrain the project growth.
### TABLE 3.145
CORDOVA PROCESSING CAPACITY

<table>
<thead>
<tr>
<th>Species</th>
<th>Current Daily Processing Capacity</th>
<th>Harvest by 2000</th>
<th>Days Required to Produce 2000 Harvest with Current Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>655,000 lbs</td>
<td>34,500,000 lbs</td>
<td>52.7 days</td>
</tr>
<tr>
<td>Crab</td>
<td>575,000 lbs</td>
<td>6,728,000 lbs</td>
<td>11.7 days</td>
</tr>
<tr>
<td>Herring</td>
<td>320,000 lbs</td>
<td>6,173,000 lbs</td>
<td>19.3 days</td>
</tr>
</tbody>
</table>

**Land**

Due to the existence of excess capacity in several processing plants, the requirements for additional land are not expected to be sufficient to constrain the projected growth.

**Conclusion**

The conclusion is that the long-term growth which is projected for the Cordova commercial fishing industry appears to be feasible in terms of the long-term availability of inputs. This does not mean that, during the next 20 years, temporary shortages of labor or water or other inputs will not prevent the level of activity of the fishing industry from being as high as it might otherwise be. What it means is that the long-term growth projected for the industry appears to be feasible despite the occasional shortages that will occur.
Yakutat is located on the eastern shore of the Gulf of Alaska approximately halfway between Cape Suckling to the north and Cape Fairweather to the south; as such, it is at the geographic center of commercially important fisheries. This area will be referred to as the Yakutat management area. The commercial fisheries in this area are the salmon, halibut, groundfish, king crab, Dungeness crab, Tanner crab, shrimp, and scallop fisheries. The absolute and relative importance of each of these fisheries in terms of pounds harvested are summarized in Table 3.146. Although much of the harvesting activity and subsequent processing activity is not associated with Yakutat, enough of it is that the Yakutat commercial fishing industry is the dominant element of the local economy.

The local importance of the Yakutat commercial fishing industry can be measured in a number of ways. It can be measured in absolute terms such as the income of Yakutat fishermen or the number of fishermen who reside in Yakutat (see Tables 3.147 and 3.148), or it can be measured in relative terms. For example, in 1976, out of a population of 550, there were 49 residents with commercial fishing licenses; that is, about nine percent of the local residents were commercial fishermen. Perhaps a more significant measure of the local importance of the Yakutat commercial fishing industry is provided by an estimate of the proportion of the economic base that is attributable to the industry. The Yakutat Comprehensive Development Plan indicates that out of 137 full-time equivalent base sector employees in 1976, 70 were employed in the two basic sectors that consist almost exclusively of harvesting and processing of seafood products. The
### TABLE 3.146
**YAKUTAT FISHERIES**
**1973-1977**

**Catch in 1000 pounds**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HALI BUT</th>
<th>KING CRAB</th>
<th>TANNER CRAB</th>
<th>DUNGENESS CRAB</th>
<th>SCALLOPS</th>
<th>SHELLFISH I INCLUDED IN THIS STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>1,473</td>
<td>228</td>
<td>0</td>
<td>207</td>
<td>2,347</td>
<td>174</td>
<td>2,728</td>
</tr>
<tr>
<td>1974</td>
<td>1,481</td>
<td>155</td>
<td>0</td>
<td>1,872</td>
<td>1,632</td>
<td>357</td>
<td>3,861</td>
</tr>
<tr>
<td>1975</td>
<td>1,253</td>
<td>128</td>
<td>7</td>
<td>2,021</td>
<td>541</td>
<td>139</td>
<td>2,708</td>
</tr>
<tr>
<td>1976</td>
<td>1,577</td>
<td>221</td>
<td>0</td>
<td>1,714</td>
<td>529</td>
<td>190</td>
<td>2,433</td>
</tr>
<tr>
<td>1977</td>
<td>2,740</td>
<td>128</td>
<td>3</td>
<td>1,016</td>
<td>124</td>
<td>22</td>
<td>1,165</td>
</tr>
<tr>
<td>Mean</td>
<td>1,705</td>
<td>172</td>
<td>2</td>
<td>1,366</td>
<td>1,035</td>
<td>176</td>
<td>2,579</td>
</tr>
</tbody>
</table>

**PERCENTAGE OF TOTAL CATCH**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SALMON</th>
<th>HALI BUT</th>
<th>KING CRAB</th>
<th>TANNER CRAB</th>
<th>DUNGENESS CRAB</th>
<th>SCALLOPS</th>
<th>SHELLFISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>33.2581</td>
<td>5.1478</td>
<td>0</td>
<td>4.673</td>
<td>52.9916</td>
<td>3.928</td>
<td>61.5</td>
</tr>
<tr>
<td>1974</td>
<td>26.9420</td>
<td>2.8197</td>
<td>0</td>
<td>34.054</td>
<td>29.6889</td>
<td>6.494</td>
<td>70.2</td>
</tr>
<tr>
<td>1975</td>
<td>30.6432</td>
<td>3.1303</td>
<td>0.171</td>
<td>49.425</td>
<td>13.2306</td>
<td>3.399</td>
<td>66.2</td>
</tr>
<tr>
<td>1976</td>
<td>37.2725</td>
<td>5.2233</td>
<td>0</td>
<td>40.5105</td>
<td>12.5030</td>
<td>4.490</td>
<td>57.5</td>
</tr>
<tr>
<td>1977</td>
<td>67.9395</td>
<td>3.1738</td>
<td>0.074</td>
<td>25.1922</td>
<td>3.074</td>
<td>0.545</td>
<td>28.8</td>
</tr>
</tbody>
</table>

Source: ADF&G Annual Catch and Production Reports and Salmon and Shellfish Catch Reports, IPHC Annual Reports.
### TABLE 3.147
ESTIMATED GROSS EARNINGS OF YAKUTAT FISHERMEN 1969 - 1976

<table>
<thead>
<tr>
<th>YEAR</th>
<th>GEAR OPERATORS</th>
<th>GROSS EARNINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>20</td>
<td>222,000</td>
</tr>
<tr>
<td>1970</td>
<td>23</td>
<td>283,000</td>
</tr>
<tr>
<td>1971</td>
<td>02</td>
<td>262,000</td>
</tr>
<tr>
<td>1972</td>
<td>21</td>
<td>351,000</td>
</tr>
<tr>
<td>1973</td>
<td>58</td>
<td>834,000</td>
</tr>
<tr>
<td>1974</td>
<td>53</td>
<td>965,000</td>
</tr>
<tr>
<td>1975</td>
<td>05</td>
<td>544,000</td>
</tr>
<tr>
<td>1976</td>
<td>24</td>
<td>978,000</td>
</tr>
</tbody>
</table>

\(^1\)Yakutat - Skagway

Source: Alaska Commercial Fisheries Entry Commission, Distribution of Income from Alaska Fisheries, July, 1978

### TABLE 3.148
NUMBER OF YAKUTAT* RESIDENTS HOLDING A COMMERCIAL FISHERMAN'S LICENSE 1969 - 1976

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21</td>
<td>11</td>
<td>19</td>
<td>31</td>
<td>29</td>
<td>26</td>
<td>25</td>
<td>49</td>
</tr>
</tbody>
</table>

\*A Yakutat resident is anyone who uses a Yakutat address when applying for a license.

Source: Commercial Fisheries Entry Commission, Commercial License File.
The implication is that approximately one-half of the economic activity in Yakutat is generated directly or indirectly by the commercial fishing industry. The following brief description of the projected growth of this industry indicates that the Yakutat commercial fishing industry will be a source of increasing economic activity in Yakutat.

During the next 20 years, the development of a domestic groundfish fishery and the expansion of the traditional fisheries are expected to result in significant growth in the Yakutat commercial fishing industry. Total catch is expected to increase from 2,086 metric tons (4.6 million pounds) in 1980 to 62,280 metric tons (137 million pounds) in 2000, and its real value is projected to increase from $4.0 million to $22.5 million. The traditional fisheries are expected to exhibit less dramatic yet substantial growth; catch is expected to increase from 2,046 metric tons (4.5 million pounds) to 3,922 metric tons (8.6 million pounds) and its real value is projected to increase from $4.0 million to $12.0 million. Processing activity is also expected to increase from current levels; however, due to the increases in processing efficiency that will be possible, processing activity is expected to increase less rapidly than catch. It is projected that processing employment and real income will exceed current levels by 7,070 percent and 1,340 percent respectively. Without allowing for increased processing efficiency, the corresponding projected percentage increases in employment and real income would be 1,140 percent and 1,425 percent respectively. The projections on which this summary is based are presented in the following sections.
Projections of harvesting activity and limited historical data are presented by species or species group in this section. The detailed historical data which are referred to in this section, and which serve as a basis for the projections, are presented in tabular form in Appendix C. The models used in making the projections are discussed in Chapter II.

Salmon

There are two distinct salmon fleets in the Yakutat management area, a set gillnet fleet and a troll fleet. The set gillnet fleet consists primarily of Yakutat boats that are less than 7.6 meters (25 feet) in length, have a crew of one, and participate in the fishery from June through September. Prior to 1975, the troll fleet consisted principally of hand trollers; it is now almost exclusively a power troll fleet. Power trollers are typically 10.7 to 13.7 meters (35 to 45 feet) in length, have a crew of two or three, are much less likely to be Yakutat boats than are the set gillnet boats, and participate in the fishery from May through September.

Recent record salmon harvests, together with continually improving resource management, enhancement, and rehabilitation programs, suggest that the Yakutat salmon resources will tend to increase during the forecast period. Catch is projected to increase from 774 metric tons (1.7 million pounds) in 1980 to 1,679 metric tons (3.7 million pounds) in 2000, and its real value is expected to increase from less than $2.2 million to over
$8.6 million (Table 3.149). The corresponding percentage increases are 117 percent by weight and 298 percent by real value (Table 3.150). Due to the excess harvesting capacity that exists and/or changing gear restrictions, an increase in the number of boats and/or fishermen will not be necessary to allow the projected harvests. Projections of catch by species are reported in Table 3.151.

Halibut

The growth of the Yakutat halibut fishery is expected to parallel that of the halibut fisheries of other Gulf of Alaska communities. Growth is expected to occur after the first quarter of the forecast period. During the period as a whole, catch is expected to increase from 50 metric tons (1 10,000 pounds) to 88 metric tons (194,000 pounds) and its real value is expected to increase from $190,000 to $421,000 (Table 3.152). These are increases of 76 percent by weight and 121 percent by value (Table 3.153). The small boat fleet is included in the catch and value projections but not the other projections, since this fleet is accounted for elsewhere.

Groundfish

Due to its proximity to known groundfish resources, Yakutat has been identified in the State of Alaska Program for the Development of the Bottomfish Industry as one of five communities in which to concentrate development efforts. The fishery that develops is expected to include both large and small boat fleets, each of which will include a variety of gear types. The small boat fleet would allow local entry into the fishery with a more modest investment than large boats would require.
## TABLE 3.119

**PROJECTED HARVESTING ACTIVITY**

**YAKUTAT SALMON FISHERY 1980-2000**

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch (1,000)</th>
<th>Pounds</th>
<th>Metric Tons</th>
<th>Nominal</th>
<th>Rea 1</th>
<th>Ex-Vessel Price ($/Pound)</th>
<th>Nominal</th>
<th>Rea 1</th>
<th>Number of Boats</th>
<th>Number of Landings</th>
<th>Number of Fishermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>1.707</td>
<td>774</td>
<td>2403</td>
<td>2163</td>
<td></td>
<td>1.41</td>
<td>1.27</td>
<td></td>
<td>164</td>
<td>3034</td>
<td>328</td>
</tr>
<tr>
<td>1981</td>
<td>1.427</td>
<td>829</td>
<td>2956</td>
<td>2432</td>
<td></td>
<td>1.56</td>
<td>1.33</td>
<td></td>
<td>164</td>
<td>3130</td>
<td>328</td>
</tr>
<tr>
<td>1982</td>
<td>1.659</td>
<td>889</td>
<td>3311</td>
<td>2673</td>
<td></td>
<td>1.69</td>
<td>1.36</td>
<td></td>
<td>164</td>
<td>3235</td>
<td>328</td>
</tr>
<tr>
<td>1983</td>
<td>2.105</td>
<td>955</td>
<td>3010</td>
<td>2992</td>
<td></td>
<td>1.86</td>
<td>1.42</td>
<td></td>
<td>164</td>
<td>3351</td>
<td>328</td>
</tr>
<tr>
<td>1984</td>
<td>2.267</td>
<td>1028</td>
<td>4532</td>
<td>3287</td>
<td></td>
<td>2.00</td>
<td>1.45</td>
<td></td>
<td>164</td>
<td>3481</td>
<td>328</td>
</tr>
<tr>
<td>1985</td>
<td>2.447</td>
<td>1110</td>
<td>5327</td>
<td>3662</td>
<td></td>
<td>2.18</td>
<td>1.50</td>
<td></td>
<td>164</td>
<td>3625</td>
<td>328</td>
</tr>
<tr>
<td>1986</td>
<td>2.514</td>
<td>1181</td>
<td>6007</td>
<td>3914</td>
<td></td>
<td>2.39</td>
<td>1.56</td>
<td></td>
<td>164</td>
<td>3678</td>
<td>328</td>
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<tr>
<td>1987</td>
<td>2.583</td>
<td>1172</td>
<td>6777</td>
<td>4186</td>
<td></td>
<td>2.62</td>
<td>1.62</td>
<td></td>
<td>164</td>
<td>3733</td>
<td>328</td>
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<tr>
<td>1988</td>
<td>2.654</td>
<td>1204</td>
<td>7591</td>
<td>4444</td>
<td></td>
<td>2.86</td>
<td>1.67</td>
<td></td>
<td>164</td>
<td>3789</td>
<td>328</td>
</tr>
<tr>
<td>1989</td>
<td>2.777</td>
<td>1237</td>
<td>8509</td>
<td>6721</td>
<td></td>
<td>3.12</td>
<td>1.73</td>
<td></td>
<td>164</td>
<td>3847</td>
<td>328</td>
</tr>
<tr>
<td>1990</td>
<td>2.802</td>
<td>1271</td>
<td>9540</td>
<td>7018</td>
<td></td>
<td>3.40</td>
<td>1.79</td>
<td></td>
<td>164</td>
<td>3907</td>
<td>328</td>
</tr>
<tr>
<td>1991</td>
<td>2.880</td>
<td>1306</td>
<td>10692</td>
<td>5331</td>
<td></td>
<td>3.71</td>
<td>1.85</td>
<td></td>
<td>164</td>
<td>3969</td>
<td>328</td>
</tr>
<tr>
<td>1992</td>
<td>2.960</td>
<td>1343</td>
<td>11007</td>
<td>5627</td>
<td></td>
<td>4.02</td>
<td>1.92</td>
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Source: Alaska Sea Grant Program

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Source: Alaska Sea Grant Program
### TABLE 3.151

**PROJECTED YAKUTAT SALMON CATCH BY SPECIES, 1980-2000**

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Source: Alaska Sea Grant Program.

1. The real values and prices are in terms of 1978 dollars.
### TABLE 3.153

PROJECTED PERCENTAGE CHANGE FROM 1980,
YAKUTAT HALIBUT FISHERY

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Source: Alaska Sea Grant Program
Catch is projected to increase from 41 metric tons (90,000 pounds) in 1980 to 58,358 metric tons (129 million pounds) in 2000, and its real value is expected to increase from $11,000 to $10.5 million (see Table 3.154). The associated percentage increases are presented in Table 3.155 and the projections of catch by species are reported in Table 3.156. As the Yakutat groundfish fishery develops, its relative importance is expected to increase dramatically. For example, the groundfish catch is expected to account for under 2 percent of the total Yakutat management area catch in 1980—but almost 94 percent of the catch by 2000 (see Table 3.157). The projected change in the relative importance of groundfish in terms of value is less significant; the value of the groundfish catch as a percentage of the value of total catch is projected to increase from 0.3 percent in 1980 to over 46 percent in 2000.

King Crab

The harvesting of king crab in the Yakutat management area has been very sporadic; during the past 10 years, the fishery has been inactive in more years than it has been active. It appears that the king crab resources are not sufficient to maintain an active fishery. This fishery is expected to remain, at most, marginally active. The average annual catch is projected to increase from less than a metric ton in 1980 to approximately three metric tons by 2000, and the real value of the catch is expected to increase from under $2,000 in 1980 to $8,550 in 2000 (see Table 3.158). The resulting percentage increase exceeds 200 percent (see Table 3.159). This level of activity is not sufficient to support one boat on more than a part-time basis.
### TABLE 3.154

**PROJECTED HARVESTING ACTIVITY**

**YAKUTAT GROUNDFISH FISHERY 1980-2000**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>WEIGHT (1,000)</th>
<th>METRIC TONS</th>
<th>VALUE $1,000</th>
<th>EX-VESSEL PRICE ($/Pound)</th>
<th>NUMBER OF BOATS</th>
<th>LANDINGS</th>
<th>FISHERMEN</th>
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Source: Alaska Sea Grant Program.

1. The real values and prices are in terms of 1978 dollars.
TABLE 3.155

PROJECTED PERCENTAGE CHANGE FROM 1980, YAKUTAT GROUNDFISH FISHERY

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<th>Real</th>
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Source: Alaska Sea Grant Program
### TABLE 3.156

**YAKUTAT GROUNDFISH PROJECTED CATCH BY SPECIES 1980-2000**

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<th>YEAR</th>
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$^1$Value in terms of 1978 dollars.
### TABLE 3.157

PROJECTIONS OF YAKUTAT GROUNDFISH HARVESTING ACTIVITY AS A PERCENTAGE OF TOTAL YAKUTAT HARVESTING ACTIVITY

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<th>Year</th>
<th>Weight</th>
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Source: Alaska Sea Grant Program.
## TABLE 3.158

**PROJECTED HARVESTING ACTIVITY**

**YAKUTAT KING CRAB FISHERY 1980-2000**

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**EX-VEssel Price ($/Pound)**

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Source: Alaska Sea Grant Program

1 The real values and prices are in terms of 1978 dollars.
### Table 3.159

**Projected Percentage Change from 1980, Yakutat King Crab Fishery**

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**Source:** Alaska Sea Grant Program
Tanner Crab

The Yakutat Tanner crab fishery has become an active fishery in the last few years. However, the fishery has not been in existence long enough, nor have the resources been sufficiently explored and/or surveyed, to adequately determine the maximum sustainable yield of the fishery. The limited stock assessment data that are available indicate that a sustainable yield of 1,361 metric tons (3 million pounds) is possible. Favorable market conditions are expected to increase harvest to this level by 1985 and resource abundance is expected to hold catch at that level through the remainder of the forecast period. The real value of the catch is projected to increase from $0.9 million in 1980 to $1.4 million in 2000 (see Table 3.160). The projected percentage increases in catch by weight and real value are 81 percent and 57 percent respectively (see Table 3.161).

Dungeness Crab

The Yakutat Dungeness crab fishery has been active and relatively stable since 1960, with the exception of abnormally low harvests in 1975 through 1977. The favorable market conditions that are expected to buoy the Dungeness crab fisheries elsewhere in the Gulf of Alaska are expected to provide growth in the Yakutat fishery until catch is constrained by resource abundance. Catch is, therefore, projected to increase from 470 metric tons (1.0 million pounds) in 1980 to 792 metric tons (1.7 million pounds) in 2000, and its real value is projected to increase from $0.8 million to $1.5 million (Table 3.162). The associated percentage changes are 69 percent by weight and 106 percent by real value (Table 3.163). The
TABLE 3.160

PROJECTED HARVESTING ACTIVITY
YAKUTAT TANNER CRAB FISHERY 1980-2000

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<th>EX-VESSEL PRICE ($/Pound)</th>
<th>NUMBER OF</th>
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Source: Alaska Sea Grant Program.

1The real values and prices are in terms of 1978 dollars.
### TABLE 3.16

**Projected Percentage Change from 1980,**
**Yakutat Tanner Crab Fishery**

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<th>Ex-Vessel Price Real</th>
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Source: 'Alaska Sea Grant Program.'
TABLE 3.162
PROJECTED HARVESTING ACTIVITY
YAKUTAT DUNGENESS CRAB FISHERY 1980-2000

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<th>Real Catch Value</th>
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Source: Alaska Sea Grant Program

1. The real values and prices are in terms of 1978 dollars.
### TABLE 3.163

**PROJECTED PERCENTAGE CHANGE FROM 1980, YAKUTAT DUNGENESS CRAB FISHERY**

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Source: Alaska Sea Grant Program.
record catch exceeds the projection for the year 2000; harvesting capacity is, therefore, not expected to be a binding constraint.

**Shrimp**

Since 1960 the Yakutat shrimp fishery has been active fewer years than the king crab fishery. The lack of activity, even when efforts are being increased to find shrimp resources to offset dramatic declines in resource abundance in traditionally heavily fished areas of the Gulf of Alaska, suggests that the shrimp resources in the Yakutat area cannot support a commercial fishery on a sustained basis. For this reason, no projections have been made for the Yakutat shrimp fishery.

**Scallops**

The Yakutat scallop fishery had a burst of activity between 1968 and 1977. During this period, the harvesting of a virgin resource resulted in a profitable fishery. The resulting decline in resource abundance and adverse market conditions have rendered this fishery inactive in the past two years. It is not known when, or if, the fishery will become active again. If it does, it is not expected to be capable of supporting more than one or two boats. Due to both the uncertainty as to when the fishery will again be active and the minimal fishery that is expected to be feasible, no projections have been made for the Yakutat scallop fishery.
Summation of Harvesting Activity Projections

This section consists of the presentation and analysis of the projections of harvesting activity of the Yakutat commercial fishing industry as a whole. The tables presented in this section include summations of projected harvesting activity and projections of the relative importance of individual fisheries.

Total catch is projected to increase from 2,086 metric tons (4.6 million pounds) in 1980 to 62,280 metric tons (137 million pounds) in 2000, and its real value is expected to increase from $4.0 million to $22.5 million (Table 3.164). The corresponding percentage increases are 2,885 percent by weight and 461 percent by real value (see Table 3.165). Excluding groundfish, catch is projected to increase from 2,046 metric tons (4.5 million pounds) to 3,923 metric tons (8.6 million pounds), and its real value is expected to increase from $4.0 million to $12.0 million (Table 3.166). This amounts to a 92 percent increase by weight and a 200 percent increase by real value for the traditional fisheries (see Table 3.167). As is indicated by the projections presented in Tables 3.165 and 3.167, the growth of the fisheries in terms of the number of boats or fishermen is expected to be much more modest than the growth in catch.

The significant projected changes in the level of harvesting activity are matched by changes in the relative importance of individual fisheries. For example, while in terms of harvest weight the groundfish fishery is expected to account for less than two percent of the total catch in 1980,
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Source: Alaska Sea Grant Program

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Source: Alaska Sea Grant Program

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Source: Alaska Sea Grant Program.
by 2000 it is expected to account for over 93 percent of the total catch (see Table 3.168), and its share of total value is projected to increase from 0.3 percent to 46.7 percent (Table 3.169). As indicated by Tables 3.170 through 3.172, the changes in relative importance measured in terms of the number of boats, fishermen, or landings are much less substantial.

The changes in the relative importance of individual fisheries among the traditional fisheries are not expected to be dramatic. In terms of harvest weight, the salmon and Tanner crab fisheries are expected to vie for dominance until the salmon fishery pulls ahead in the mid-1990s (Table 3.173). In terms of value, the salmon fishery is projected to maintain its dominance, and the Dungeness crab fishery is expected to replace the Tanner crab fishery as the premier crab fishery in the early 1990s (Table 3.174). Tables 3.175 through 3.177 contain projections of the relative importance of individual traditional fisheries in terms of the number of boats, fishermen, and landings respectively.

In the Yakutat management area, a minimal amount of double counting occurs. When boats are summed over all fisheries to calculate the number of boats in the Yakutat commercial fishery industry as a whole it is not necessary to adjust the projections of the number of boats.

Local Harvesting "Effort"

The difficulties associated with defining and measuring local fishing effort are discussed and a method of approximating local effort is developed in Chapter II. The results of that method of measuring
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Source: Alaska Sea Grant Program
TABLE 3.169

PERCENTAGE OF VALUE BY YAKUTAT FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
## TABLE 3.170

PERCENTAGE OF BOATS BY YAKUTAT FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
**TABLE 3.171**

PERCENTAGE OF FISHERMEN BY YAKUTAT FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
TABLE 3.172

PERCENTAGE OF NUMBER OF LANDINGS BY YAKUTAT FISHERY INCLUDING GROUNDFISH, 1980-2000

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Source: Alaska Sea Grant Program
Table 3.175

Percentage of Boats by Yakutat Fishery Excluding Groundfish, 1980-2000

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Source: Alaska Sea Grant Program
local effort are presented in this section. As the values of the local harvesting factors reported in Table 3.178 indicate, the degree to which a Yakutat fishery can be considered a local fishery varies greatly. For example, the salmon set gillnet fishery is primarily a local fishery and the salmon power troll fishery is primarily a non-local fishery.

PROCESSING

The projections of Yakutat processing plant activity presented in this section are based on the projections of industry-wide catch discussed in a preceding section. The measures of activity are in terms of processing plant input requirements and processing plant payrolls or income. Four sets of projections are presented for each measure of processing activity; the four sets are the traditional fisheries with and without increased efficiency and all fisheries with and without increased efficiency.

Water

In 1976 and 1977, the peak water usage in Yakutat processing plants was approximately 413,000 liters (125,000 gallons) per day. Using this as the base peak load, the peak load is projected to be between 590,000 and 2,377,000 liters (156,000 and 628,000 gallons) per day by 2000 (Table 3.179).
TABLE 3.178  
LOCAL HARVESTING FACTOR FOR YAKUTAT, 1976

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<tr>
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<td>P</td>
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<tr>
<td></td>
<td>PF</td>
<td>TP</td>
<td>LPO</td>
<td>B</td>
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<td>Tanner crab, large boat pots</td>
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P = Estimate of the proportion of fishing effort that is local  
LPO = Number of local permit owners  
TP = Total number of permits  
PF = Number of permits fished  
B = Number of boats participating in the fishery  
P = 1 when calculated value exceeds 1

Source: ADF&G and CFEC data files
TABLE 3.179

PROJECTED PEAK YAKUTAT PROCESSING REQUIREMENTS FOR WATER

<table>
<thead>
<tr>
<th>Year</th>
<th>1000 GALLONS/DAY</th>
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<th></th>
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<td></td>
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<tr>
<td></td>
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<td>127</td>
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<td>38.82</td>
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<td>165</td>
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<td>208</td>
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<td>1993</td>
<td>215</td>
<td>158</td>
<td>243</td>
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<td>1994</td>
<td>218</td>
<td>158</td>
<td>260</td>
<td>188</td>
<td>74.60</td>
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<tr>
<td>1995</td>
<td>222</td>
<td>157</td>
<td>282</td>
<td>200</td>
<td>77.58</td>
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<tr>
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<td>?26</td>
<td>157</td>
<td>313</td>
<td>217</td>
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<td>1997</td>
<td>230</td>
<td>157</td>
<td>356</td>
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<td>83.89</td>
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<td>1998</td>
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<td>?43</td>
<td>156</td>
<td>628</td>
<td>402</td>
<td>94.05</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1 Requirement without increased efficiency.

*Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
Electricity

Based on a base peak load requirement of 50,000 kilowatt hours of electricity per month, the projected peak use of electricity by processing plants in the year 2000 is projected to range from 62,000 to 2,255,000 million kilowatt hours per month (Table 3.180).

Employment

Using 32 as the base level of average monthly employment in Yakutat processing plants, the projections of average monthly employment for the year 2000 range from 40 to almost 400 (see Table 3.181).

Income

Using $384,000 (i.e., 32 x $12,000) as the base period annual payroll of processing plants, the annual real income for the year 2000 is projected to range from $0.6 million to $5.9 million (see Table 3.181). The associated projected percentage increases in processing plant employment and income are reported in Table 3.182.

Number of Plants

The number of processing plants is not a good measure of processing activity because production per plant can vary greatly. There is expected to be sufficient processing activity to support no more than one large processing
<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
<th>Traditional Fisheries</th>
<th>All Fisheries</th>
</tr>
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<td>3 4</td>
<td>5 6 5 6</td>
<td>7 8</td>
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<td>51 49 52 50</td>
<td>1.21 -2.80 4.63 0.49</td>
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<tr>
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<td>55 51 57 54</td>
<td>9.16 2.74 14.03 7.32</td>
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<td>59 54 62 58</td>
<td>18.02 8.86 24.96 15.26</td>
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<tr>
<td>1983</td>
<td>64 58 69 62</td>
<td>27.85 15.57 37.75 24.52</td>
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<tr>
<td>1984</td>
<td>69 61 76 68</td>
<td>38.82 22.98 52.97 35.50</td>
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<td>77 65 91 78</td>
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<td>55.90 29.98 97.35 64.54</td>
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<td>80 64 123 99</td>
<td>60.84 28.79 146.17 97.12</td>
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<tr>
<td>1990</td>
<td>82 64 143 112</td>
<td>63.44 28.26 186.08 124.49</td>
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<tr>
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<td>66.09 27.73 242.53 163.41</td>
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<tr>
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<td>68.85 27.25 322.97 218.77</td>
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<tr>
<td>1993</td>
<td>86 63 269 199</td>
<td>71.68 26.80 438.11 297.43</td>
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<tr>
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<td>77.58 25.96 842.06 568.22</td>
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<tr>
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<td>94.05 24.42 4999.87 3169.89</td>
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<td></td>
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</tbody>
</table>

Source: Alaska Sea Grant Program

1 Requirement without increased efficiency.

2 Requirement with a 2 percent annual decrease in input requirements per unit produced.

*Projected percentage increase since the late 1970s.
### TABLE 3.181

**PROJECTED YAKUTAT PROCESSING EMPLOYMENT AND INCOME, 1980-2000**

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<thead>
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<th>Year</th>
<th><strong>TRADITIONAL FISHERIES</strong></th>
<th><strong>ALL FISHERIES</strong></th>
</tr>
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<tbody>
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<td><strong>WITH INCREASED EFFICIENCY</strong></td>
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<td>1986</td>
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</tr>
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<td>2000</td>
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Source: Alaska Sea Grant Program

1. Average monthly employment.
2. Annual payroll in $1,000.
3. Income in 1978 dollars in ($1,000).
### Projected Percentage Change* in Yakutat Processing Employment and Income 1980-2000

**Traditional Fisheries**

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**All Fisheries**

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<td>1035.69</td>
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Source: Alaska Sea Grant Program

*1977 is the base period.

1 Average monthly employment.

2 Annual payroll in $1,000.

3 Income in 1978 dollars in ($1,000).
plant from 1980 through 1995 and perhaps two for the remainder of the period. If smaller plants are used, perhaps three times as many plants will be in operation. In either case there is not expected to be a large number of processing plants. Since the development of the groundfish fishery is more speculative and more significant than that of the traditional fisheries, a summary of projected groundfish processing activity, including the number of plants, is presented in Table 3.183.

Local Processing Effort

Industry sources have indicated that the fish processing plants in Yakutat rely almost exclusively on the local labor force.

THE FEASIBILITY OF THE PROJECTED GROWTH

In this section, the feasibility of the projected growth of the Yakutat commercial fishing industry is evaluated in terms of the projected input requirements and projected input availability. The inputs that are considered include small boat harbor facilities, port facilities, labor, land, electric power, water and processing plant facilities. Projections of the availability of port facilities, labor, land, electric power, and water are drawn from the following Studies Program reports:

- Technical Report Number 33, Northern Gulf of Alaska Petroleum Development Scenarios Local Socioeconomic Impacts
TABLE 3.183

PROJECTED YAKUTAT GROUNDFISH PROCESSING ACTIVITY, 1980-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>CATCH (MT)</th>
<th>NUMBER OF PLANTS</th>
<th>EMPLOYMENT (man years)</th>
<th>LAND (hectares)</th>
<th>ELECTRICITY (million KWH/year)</th>
<th>WATER (million gallons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>41</td>
<td>0</td>
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<td>0</td>
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</tr>
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<td>0</td>
</tr>
<tr>
<td>1984</td>
<td>168</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>1985</td>
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<td>0</td>
<td>2</td>
<td>0</td>
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</tr>
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<td>1986</td>
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<td>0</td>
<td>3</td>
<td>0</td>
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</tr>
<tr>
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</tr>
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<tr>
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<td>0</td>
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<td>0</td>
</tr>
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<td>1994</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>1995</td>
<td>9094</td>
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<td>60</td>
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</tr>
<tr>
<td>1996</td>
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<td>85</td>
<td>0</td>
<td>1</td>
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</tr>
<tr>
<td>1997</td>
<td>19061</td>
<td>0</td>
<td>119</td>
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<td>1</td>
<td>25</td>
</tr>
<tr>
<td>1998</td>
<td>27645</td>
<td>1</td>
<td>168</td>
<td>1</td>
<td>1</td>
<td>36</td>
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<tr>
<td>1999</td>
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<td>237</td>
<td>1</td>
<td>2</td>
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<td>2000</td>
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<td>1</td>
<td>335</td>
<td>2</td>
<td>3</td>
<td>77</td>
</tr>
</tbody>
</table>

Source: Alaska Sea Grant Program

1 The number of full-time groundfish plants.

NOTE: The values are rounded to the nearest whole number. therefore a "O" indicates a value of less than 0.5.
Projections of input requirements are based on forecasts of harvesting and processing activity presented in previous sections, and the projections of input availability that are not available from other Studies Program reports are developed in this section.

**Small Boat Harbor**

The Yakutat small boat harbor facilities are not large enough to provide slips for all of the small salmon set gillnet boats that are active in the area during the summer or to provide moorage space of any kind to transient fishing vessels. Although the harbor is deep enough for very large vessels, the moorage structures were not designed for vessels in excess of 27.4 meters (90 feet). The physical characteristics of the harbor area will, however, permit the harbor to be significantly increased without extensive dredging or breakwater projects.

The projected growth of the traditional fisheries can probably occur without major improvements in the small boat harbor. The development of a local groundfish industry would, however, be hampered if more adequate facilities are not available for larger boats. Since Yakutat has been identified in the state bottomfish development program as one of five communities in which to concentrate its groundfish development efforts, and since the natural features of the existing harbor will facilitate its expansion, it is expected that more adequate large boat facilities will become available.
Port Facilities

Technical Report Number 31 indicates that the use of the Yakutat port facilities could increase by a factor of from 8 to 19 before they were fully utilized. The projected increase in the volume of fish products that will use the port facilities approaches, but does not surpass, current capacity. Therefore, the port facilities are not expected to constrain the growth projected for the commercial fishing industry.

Labor, Electric Power, and Water

The projected growth of the commercial fishing industry is feasible only if the corresponding rates of increase in input requirements can be met or surpassed by the rates of increase in input availability. The rates of increase of input requirements can be derived from the projections of input requirements developed in the previous section and the rates of increase in input availability can be inferred from information included in Technical Report Number 40. The report presents projections of community requirements for labor, electric power, and water for each of the OCS petroleum scenarios and indicates that the requirements can be met. The rates of increase in community-wide input requirements corresponding to the projections of community-wide input requirements are, therefore, considered to only include rates of increase that do not exceed feasible rates of increase in input availability. The highest rates of increase are associated with the high find case, therefore, the rates of increase in input requirements for the commercial fishing industry are compared to the rates of increase in community-wide input requirements/availability of the high find case...
to determine if the former are feasible. The projected rates of increase in input availability and requirements are presented in Table 3.184.

The record projected rate of increase in the supply of water exceeds the highest growth rate projected for water usage by the fishing industry and, through 1991, the annual projected increases in water availability exceed the projected increase in demand by the fishing industry. The fishing industry demand for electric power is expected to increase very rapidly during the 1990s; however, it is not projected to exceed the record rate of increase in electric power capacity projected for 1989. The fishing industry demand for electric power is, however, expected to increase more rapidly than the commercial supply; but since the fish processing plants are expected to generate their own electric power in the absence of a lower price source of electric power, the slower rate of growth of commercially available electric power is not expected to constrain the projected growth of the Yakutat commercial fishing industry. The record rates of growth of population and employment projected for 1989 through 1990 greatly exceed the expected rate of increase in fish processing employment; this suggests that the labor force and the resulting land and housing requirements can increase at the rates required by the projections for the fishing industry.

It, therefore, appears that the supplies of water, electric power, and labor can increase rapidly enough to meet the projected input requirements of the fishing industry.
TABLE 3.184

COMPARATIVE RATES OF GROWTH, HIGH FIND CASE AND THE YAKUTAT FISHING INDUSTRY

<table>
<thead>
<tr>
<th>Year</th>
<th>Water</th>
<th>Fishing Industry Case</th>
<th>OCS</th>
<th>Fishing Industry Case</th>
<th>OCS</th>
<th>Fishing Industry Case</th>
<th>OCS</th>
<th>Fishing Industry Case</th>
<th>OCS</th>
<th>Fishing Industry Case</th>
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</tr>
<tr>
<td>1981</td>
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<td>7.9</td>
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<td>8.8</td>
<td>6.6</td>
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<td>5.2</td>
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<tr>
<td>1993</td>
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<td>3.2</td>
<td>2.3</td>
<td>1.7</td>
<td>0.4</td>
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<td>1.2</td>
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<td>33.1</td>
<td>35.2</td>
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</table>

Source: Alaska Sea Grant Program

1) Traditional fisheries without increased efficiency.
2) Traditional fisheries with increased efficiency.
3) All fisheries without increased efficiency.
4) All fisheries with increased efficiency.
Processing Facilities

Within a year, processing capacity can change significantly as the capacity of existing plants changes, as new plants are built, or as old plants become unusable. The ability to rapidly increase processing capacity, when the long-run prognosis indicates that it is profitable to do so, suggests that processing plant capacity will not be a constraint on the growth that is projected for the processing sector of the commercial fishing industry. The comparison of current processing capacity and the projected harvests for 2000, which is summarized in Table 3.185, also indicates that physical processing capacity is not expected to be a constraint upon the projected growth.

| TABLE 3.185 |
| YKUTAT HARVESTING CAPACITY |

<table>
<thead>
<tr>
<th>Current Capacity (1,000 pounds per day)</th>
<th>Catch Forcasts for 2000</th>
<th>Days Required to Process the Catch Projected for 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon† 20</td>
<td>3,875</td>
<td>194</td>
</tr>
<tr>
<td>Tanner Crab 45</td>
<td>3,000</td>
<td>67</td>
</tr>
<tr>
<td>Scallops 22</td>
<td>106</td>
<td>5</td>
</tr>
</tbody>
</table>

†Set gillnet salmon catch.

The cold storage facility is scheduled to be rebuilt during 1979. Once it is in operation Yakutat salmon processing capacity will increase by approximately 80,000 pounds per day. With this additional capacity the salmon catch projected for the year 2000 could be processed in approximately forty days.
Land

The land required for the replacement of the cold storage facility and the addition of one large processing plant appears to be available and adequate for the projected growth.

Conclusion

The conclusion is that the long-term growth which is projected for the Yakutat commercial fishing industry appears to be feasible in terms of the long-term availability of inputs. This does not mean that, during the next 20 years, temporary shortages of labor or water or other inputs will not prevent the level of activity of the fishing industry from being as high as it might otherwise be. What it means is that the long-term growth projected for the industry appears to be feasible despite the occasional shortages that will occur.
IV. POTENTIAL IMPACTS OF ALTERNATIVE LEVELS OF OCS DEVELOPMENT

Competition between the commercial fishing and OCS petroleum industries for labor, ocean space use, and the services provided by the infrastructures of coastal communities can impact the development of a commercial fishing industry. The objective of this chapter is to analyze the potential impacts on the commercial fishing industries of Kodiak, Seward, Cordova, and Yakutat that may result from alternative hypothesized levels of OCS activity pursuant to lease sale No. 46 and/or lease sale No. 55. The method used to meet this objective is as follows:

- The characteristics of the hypothesized OCS activity and the projected impacts on the population, employment, and infrastructure of the coastal communities as presented in other studies program reports are summarized.

- Past experiences of interactions between the offshore oil and commercial fishing industries and economic analysis are used to identify potential impacts.

- The hypothesized characteristics of the development of the commercial fishing and OCS industries are compared in light of past experiences to determine the types of impacts that may occur.
The impacts that are considered are those on:

- Catch by species by weight and value.

- Level of fishing effort (number of vessels by type, employment, and income).

- Level of processing effort (number of plants by type, employment and income).

- Local participation in harvesting and processing.

- Fish markets.

- Capacity, suitability and location of local ports, harbors, processing plants, fleets, and public services.

- Siting and public service requirements of commercial harbors and onshore processing plants.

- Areas of conflict in ocean and harbor space use.

- Frequency and seasonality of ocean space and harbor use.

- Conflicts between recreational and commercial fishing activities.
Organization of the commercial fishing industry and current economic and political trends of significance to the industry.

As is noted in Chapter I, there are serious limitations on the degree to which quantitative projections of impact can be made. For this reason, the discussion of potential impacts is typically discussed in qualitative rather than quantitative terms.

The Hypothesized Characteristics of OCS Development

In order to analyze the potential impact of OCS development, it is necessary to know what the characteristics of the OCS and commercial fishing industries and coastal communities are expected to be. The projected characteristics of the commercial fishing industries of the study area are presented in Chapter III. The projected characteristics of OCS development and of the coastal communities as described in other SESP reports are summarized in this section and subsequent sections by OCS development scenario. The reports from which the summaries are drawn were written in preparation of the following SESP reports:
- Technical Report Number 29
  Northern Gulf of Alaska
  Petroleum Development Scenarios

- Technical Report Number 31
  Northern Gulf of Alaska
  Petroleum Development Scenarios
  Transportation Systems Impacts

- Technical Report Number 32
  Northern and Western Gulf of Alaska
  Petroleum Development Scenarios
  Local Socioeconomic Baseline

- Technical Report Number 33
  Northern Gulf of Alaska
  Petroleum Development Scenarios
  Local Socioeconomic Impacts

- Technical Report Number 34
  Northern Gulf of Alaska
  Petroleum Development Scenarios
  Economic and Demographic Impacts
These reports describe the hypothesized OCS activity and project the potential impacts that alternative levels of OCS development may have on the environments in which the commercial fisheries operate. These reports, therefore, provide information which serves as a basis for the analysis of the potential impacts on the fishing industries.

The three alternative levels of OCS development to be considered will be referred to as the low, mean, and high find cases. They are generated
from the 95 percent, mean, and 5 percent probability resource level scenarios, respectively. The low find case encompasses the OCS development that is expected to occur if the actual level of the recoverable resources is found to be no greater than that which is thought to have a 95 percent probability of existing. Similarly, the high find case encompasses the OCS development that is expected to occur if the actual level of the recoverable resources if found to equal that which is thought to have at most a 5 percent probability of existing. The mean find case is associated with a statistical mean level of recoverable resources.

LEASE SALE NO. 55

Low Find Case, 95 Percent Probability Resource Scenario

The low find case is also the exploration only case, since the level of recoverable resources that has at least a 95 percent probability of existing is not expected to be sufficient to warrant field development. Under the 95 percent scenario, exploration begins in the Northern Gulf in the year after lease sale No. 55 and ends after four years of effort. Technical Report Number 33 indicates that the resulting impacts on Yakutat will be short-term and modest and that the impacts on Cordova and Seward will be fleeting and negligible. The hypothesized exploration activities are outlined in Table 4.1.

The peak year employment impact in Yakutat is in 1981 and totals 52 jobs (see Table 4.2). This 15 percent increase in employment is matched by a
### Table 4.1

#### Assumptions for the Distribution of Employment Among the Coastal Areas of Seward, Cordova and Yakutat

**95 Percent Probability Resource Level Scenario - Exploration Only**

**Northern Gulf of Alaska**

<table>
<thead>
<tr>
<th>Phase, Task and Area of Operations</th>
<th>Seward</th>
<th>Cordova</th>
<th>Yakutat</th>
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</thead>
<tbody>
<tr>
<td><strong>EXPLORATION</strong></td>
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</tr>
<tr>
<td><strong>Survey</strong></td>
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</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geophysical and Geological Surveying</td>
<td>N/A</td>
<td>Survey vessels conducting geophysical and geological surveys on the Middleton and Yakataga Shelves outside the Cordova coastal area.</td>
<td>Survey vessels conducting geophysical and geological surveys on the Yakutat Shelf outside the Yakutat coastal area.</td>
</tr>
<tr>
<td>[area of operation]</td>
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<tr>
<td>Service Base</td>
<td>Temporary service base providing resupply, communications and a point for crew rotation for vessels surveying the Middleton, Yakataga and Yakutat Shelves.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Rigs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploration Well Drilling</td>
<td>N/A</td>
<td>Rigs drilling exploration wells on Middleton and Yakataga Shelves outside the Cordova coastal area.</td>
<td>Rigs drilling exploration wells on the Yakutat Shelf outside the Yakutat coastal area.</td>
</tr>
<tr>
<td>[area of operation]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Transportation [port area]</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Middleton and Yakataga Shelves.</td>
<td>N/A</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Yakutat Shelf.</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>-----</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Onshore Service Base</td>
<td>Shore base supplying rigs and boats on Middleton and Yakataga Shelves with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>N/A</td>
<td>Shore base supplying rigs and boats on the Yakutat Shelf with tubular materials, fuel, water, mud, cement, and other cargo.</td>
</tr>
<tr>
<td>Air Transportation</td>
<td>N/A</td>
<td>Helicopter service from Cordova Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Middleton and Yakataga Shelves.</td>
<td>Helicopter service from Yakutat Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Yakutat Shelf.</td>
</tr>
</tbody>
</table>

**TABLE 4.2**

**YAKUTAT POPULATION AND EMPLOYMENT PROJECTIONS,**  
A COMPARISON OF THE BASE CASE AND THE LOW FUND CASE

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population Low Case</th>
<th>Employment Base Case</th>
<th>Employment Low Case</th>
<th>Change from the Base Case Absolute Change</th>
<th>Population Percentage in Employment</th>
<th>Employment Percentage in Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>604</td>
<td>708</td>
<td>302</td>
<td>354</td>
<td>104</td>
<td>52</td>
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<tr>
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<td>622</td>
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<td>311</td>
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<tr>
<td>1983</td>
<td>634</td>
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<td>361</td>
<td>36</td>
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<td>1986</td>
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<td>1987</td>
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<td>519</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The projections of employment and population were prepared by Alaska Consultants, Inc.
15 percent increase in population, suggesting that the OCS generated employment does not compete with other local employment but rather attracts the required additions to the labor force to Yakutat. The projected impact on Cordova is negligible since, with the exception of the helicopter service from the Cordova airport, the exploration activity is expected to occur some distance from Cordova. A one percent increase in employment and population is projected for the peak impact years of 1982 and 1983. Again the implication is that the employment generated by the OCS activity is matched by an increase in the labor force (see Table 4.3). The peak year impact in Seward is expected to increase employment and population by less than 3 percent (see Table 4.4).

The impacts on the transportation systems are also expected to be minor. There is expected to be one helicopter flight per day from both Yakutat and Cordova. The number of barge and small tanker trips necessary to transport the industrial freight associated with exploration is not expected to exceed seven in any one year at either Seward or Yakutat. The number of supply boat arrivals per day is expected to be one or two in Yakutat, zero in Cordova, and one in Seward.

**Mean Find Case, Mean Probability Resource Scenario**

The mean find case is hypothesized to consist of exploration activity that results in the discovery of nine economically viable oil and gas fields on the Middleton and Yakutat shelves. The development of these fields will include the use of offshore production platforms, submarine pipelines, and onshore oil storage terminals and trans-shipment facilities.
<table>
<thead>
<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population Low Case</th>
<th>Employment Base Case</th>
<th>Employment Low Case</th>
<th>Absolute Change</th>
<th>Change Percentage in Population</th>
<th>Change Percentage in Employment</th>
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</thead>
<tbody>
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</table>

The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.4

SEWARD (NORTHERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE LOW FUND CASE

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Employment</th>
<th>Change from the Base Case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Case</td>
<td>Low Case</td>
<td>Base Case</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Population</td>
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<tr>
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<td>2696</td>
<td>2734</td>
<td>1172</td>
</tr>
<tr>
<td>1982</td>
<td>2732</td>
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</tr>
<tr>
<td>1987</td>
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<td>3064</td>
<td>1454</td>
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<td>1988</td>
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<td>4393</td>
<td>2293</td>
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</tbody>
</table>

The projections of employment and population were prepared by Alaska Consultants, Inc.
required for production. Yakutat, Cordova, and Seward are expected to provide support for exploration, field development, and production. Major onshore construction projects are expected to include marine terminals for oil and gas and natural gas liquification plants in the Yakutat and Cordova areas and a permanent service base both in Seward and Yakutat.

The OCS exploration, field development, and production activities that are expected for the mean find case are summarized in Table 4.5. The population and employment impacts in Yakutat are expected to occur in three distinct stages corresponding to the exploration, field development, and production phases of OCS activity (see Table 4.6). First there will be a period of steady but moderate expansion as Yakutat serves as a principal support base during the exploration phase. Second, there will be a construction boom in Yakutat during the field development stage. The construction projects, which include a marine oil terminal and a liquid natural gas (LNG) plant, are expected to employ over 1,000 transient construction workers, who are expected to be housed in a construction camp at the construction site. This second phase of impact is expected to occur between 1986 and 1989, with the peak employment occurring in 1987 and 1988. The third impact phase is expected to begin in 1990 with the onset of terminal operations and to continue throughout the production phase of OCS activity, which will extend beyond 2000. During this phase, OCS activity will generate over 650 new jobs.
### Table 4.5

**Assumptions for the Distribution of Employment Among the Coastal Areas of Seward, Cordova and Yakutat**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Northern Gulf of Alaska &amp;&lt;sup&gt;a&lt;/sup&gt;</th>
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</thead>
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<tr>
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<td>Phase, Task and Area of Operations</td>
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<tr>
<td><strong>Exploration</strong></td>
<td></td>
</tr>
<tr>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
</tr>
<tr>
<td>Geophysical and Geophysical and geological surveys on the Middleton (and Yakataga) Shelf outside the Cordova coastal area.</td>
<td>N/A</td>
</tr>
<tr>
<td>Onshore</td>
<td></td>
</tr>
<tr>
<td>Service Base</td>
<td>Temporary and later service base providing resupply, communications and a point for crew rotation for vessels surveying the Middleton, (Yakataga) and Yakutat Shelves.</td>
</tr>
<tr>
<td><strong>Rigs</strong></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
</tr>
<tr>
<td>Exploration Well</td>
<td>Rigs drilling exploration wells on Middleton (and Yakataga) Shelf outside the Cordova coastal area.</td>
</tr>
<tr>
<td>Drilling</td>
<td></td>
</tr>
</tbody>
</table>

&<sup>a</sup> See note in the text.
### TABLE 4.5 (continued)

<table>
<thead>
<tr>
<th>Marine Transportation [port area]</th>
<th>Supply/anchor/tug boats transporting materials to rigs, moving rig on the Middleton (and Yakataga) Shelf.</th>
<th>ii/A</th>
<th>Supply/anchor/tug boats transporting materials to rigs, moving rigs on the Yakutat Shelf.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore Service Base</td>
<td>Shore-base supplying rigs and boats on Middleton (and Yakataga) Shelf with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>N/A</td>
<td>Shore bases supplying rigs and boats on the Yakutat Shelf with tubular materials, fuel, water, mud, cement, and other cargo.</td>
</tr>
<tr>
<td>Air Transportation</td>
<td>N/A</td>
<td>Helicopter service from Cordova Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Middleton (and Yakataga) Shelf.</td>
<td>Helicopter service from Yakutat Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Yakutat Shelf.</td>
</tr>
<tr>
<td>Construction</td>
<td>Constructing a permanent service base on Resurrection Bay.</td>
<td>N/A</td>
<td>Constructing a permanent service base on Monti Bay.</td>
</tr>
</tbody>
</table>

### DEVELOPMENT

<table>
<thead>
<tr>
<th>Platform Installation and Offshore Pipeline Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offshore Platform Installation [area of operation]</td>
</tr>
<tr>
<td>N/A</td>
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<tr>
<td>Activity</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Pipeline Construction</td>
</tr>
<tr>
<td>Marine Transportation</td>
</tr>
<tr>
<td>Onshore Service Base</td>
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<tr>
<td>Air Transportation</td>
</tr>
<tr>
<td>Construction</td>
</tr>
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</table>
### TABLE 4.5 (continued)

#### Platforms

<table>
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<tr>
<th>Offshore</th>
<th>Development Drilling [area of operation]</th>
<th>Marine Transportation</th>
<th>Onshore Service Base</th>
<th>Air transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Supply boats transporting materials to platforms on the Middleton (and Yakataga) Shelf</td>
<td>N/A</td>
<td>Shore base supplying boats and platforms on Middleton (and Yakataga) Shelf with tubular materials, fuel, water, mud, cement, food and other cargo</td>
<td>N/A</td>
</tr>
<tr>
<td>Development drilling on platforms on the Middleton (and Yakataga) Shelf outside the Cordova coastal area.</td>
<td>N/A</td>
<td>Supply boats transporting materials to platforms on Yakutat Shelf.</td>
<td>Shore base supplying boats and platforms on the Yakutat Shelf with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>Helicopter service at Cordova Airport transporting offshore personnel and small volume, light weight freight to platforms on Middleton (and Yakataga) Shelf.</td>
</tr>
<tr>
<td>Operating platforms with periodic workovers and well stimulation on Middleton (and Yakataga) Shelf.</td>
<td>Operating platforms with workovers and well stimulation on Yakutat Shelf.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Production

<p>| Offshore Platform Operations [area of operation] | N/A | Operating platforms with workovers and well stimulation on Yakutat Shelf. | |
| Operating platforms with periodic workovers and well stimulation on Middleton (and Yakataga) Shelf. | | | |</p>
<table>
<thead>
<tr>
<th>Marine Transportation [port area]</th>
<th>Supply boats transporting materials to platforms on Middleton and Yakataga Shelves. Half of the Middleton (and Yakataga) Shelf effort will be provided from Seward.</th>
<th>Supply boats transporting materials to platforms on Middleton (and Yakataga) Shelf. Half of the Middleton (and Yakataga) Shelf effort will be provided from Seward.</th>
<th>Supply boats transporting materials to platforms on the Yakutat Shelf.</th>
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<td>Shore base providing half the effort in supplying boats and platforms on the Middleton (and Yakataga) Shelf with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>Shore base providing half the effort in supplying boats and platforms on the Middleton (and Yakataga) Shelf with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>Shore base supplying boats and platforms on the Yakutat Shelf with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
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<td>Operating oil terminal and LNG plant processing oil and gas from the Yakutat Shelf. Forty percent of the total NGA oil terminal/LNG plant employment will be provided at Cordova.</td>
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The 5 percent probability resource level includes exploration, development and offshore production on the Yakataga Shelf enclosed in (). The Yakataga Shelf is not included in the mean case.

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The projections of employment and population were prepared by Alaska Consultants, Inc.
The population and employment impacts in Cordova are expected to be minimal during the exploration and field development stages of the mean find case (see Table 4.7). The expectation of minimal impacts is the result of Hinchinbrook Island being identified as the probable site of the marine oil terminal and LNG plant associated with the hypothesized oil and gas discoveries on the Middleton shelf. However, Cordova is expected to be the home base for the operational work force for the OCS facilities on Hinchinbrook Island; therefore, during the production phase of OCS activity, significant population and employment impacts are expected in Cordova. Equal percentage increases in population and employment over the base case are projected, indicating that the employment generated by OCS activity will attract additional workers to Cordova rather than compete with other employment opportunities.

The population and employment impacts in Seward in the mean find case are projected to occur in three distinct phases corresponding to the three stages of OCS activity (see Table 4.8). During the exploration phase, Seward is expected to be the site of a service base and the resulting impacts are minimal. During the field development phase the construction and operation of a permanent service base and a pipe coating yard are projected to result in more significant increases in population and employment. These two construction projects are expected to employ a large number of transient workers who will be housed in temporary construction camps. In the early 1990s, the pipe yard is expected to close down and the service base is expected to become less active and the employment and population impacts are once again projected to be minimal.
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The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.8

SEWARD (NORTHERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS,
A COMPARISON OF THE BASE CASE AND THE MEAN FIND CASE

<table>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
The projections of vessel traffic resulting from OCS activity are summarized in Table 4.9.

**TABLE 4.9**

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<th>Service Boat Arrivals Per Day</th>
<th>Dry Goods Barge Annual Per Year</th>
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<th>Oil Tanker and LNG Ships Per Week</th>
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**High Find Case, 5 Percent Probability Resource Scenario**

This case consists of exploration activities that result in 18 commercial oil and gas discoveries. The development phase includes the installation of 32 production platforms and 145 miles of submarine pipelines and the construction of service bases in Yakutat and Seward, and marine terminals and LNG plants in Yakutat and on Hinchinbrook Island. Although the magnitudes of the levels of activity are much greater in the high find case than in the mean find case the types of activities are similar. These activities are outlined in Table 4.5.

The employment and population impacts in Yakutat, Cordova, and Seward are expected to be similar in character but larger in magnitude than the projected percentage increases in population and employment as compared to the base case are typically equal (see Table 4.10 through 4.12). This indicates that the employment generated by the OCS activity is expected to attract individuals to the coastal communities. The projections of OCS related vessel traffic are presented in Table 4.13.
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The projections of employment and population were prepared by Alaska Consultants, Inc.
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The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.12

SEWARD (NORTHERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS,
A COMPARISON OF THE BASE CASE AND THE HIGH FIND CASE

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<th>Year</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.13

**OCS Vessel Traffic, High Find Case**

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<tr>
<th></th>
<th>Service Boat Arrivals per Day</th>
<th>Dry Goods Barge Arrivals per Year</th>
<th>Five Tanker Arrivals per Year</th>
<th>LNG Ships per Year</th>
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**Source:** Peter Eakland and Associates.
**Low Find Case, 95 Percent Probability Resource Scenario**

The low find case and the exploration only case are the same, since the level of recoverable resources that is thought to have a 95 percent probability of existing is not expected to be sufficient to warrant field development. The exploration activity is expected to last from 1981 through 1983 and result in 17 exploration wells, 11 in the Middle Albatross Basin and six in the Tugidak Basin.

The OCS activities associated with the low find case are summarized in Table 4.14. The transitory and minimal population and employment impacts that are projected for Kodiak and Seward are presented in Tables 4.15 and 4.16.

Vessel traffic is expected to be minimal in Kodiak since the service base in Seward is assumed to support exploration activities. The vessel traffic out of Seward is expected to consist primarily of up to 36 supply boat arrivals per month.

**Mean Find Case, Mean Probability Resource Scenario**

The exploration phase of the mean find case is expected to last for three years and result in the discovery of one commercial oil field in the Middle Albatross Basin and no gas resources of commercial value. The field development phase is assumed to commence in 1985 with the
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<td>Survey vessels conducting geophysical and geological surveys on Albatross and Tugidak Basins outside the Kodiak coastal area.</td>
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<tr>
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<tr>
<td>Service Base</td>
<td>Temporary service base providing resupply, communications and a point for crew rotation for vessels surveying Albatross and Tugidak Basins.</td>
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<td>Exploration Well Drilling</td>
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<td>Rigs drilling exploration wells on Albatross and Tugidak Basins outside the Kodiak coastal area.</td>
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<td>Marine Transportation</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Albatross and Tugidak Basins.</td>
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<tr>
<td>Onshore Service Base</td>
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<tr>
<td>Air Transportation</td>
<td>N/A Helicopter service from Kodiak Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Albatross and Tugidak Basins.</td>
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Source: 'Alaska Consultants, Inc. April 1979.'
**TABLE 4.15**

KODIAK POPULATION AND EMPLOYMENT PROJECTIONS,
A COMPARISON OF THE BASE CASE AND THE LOW FIND CASE

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The projections of employment and population were prepared by Alaska Consultants, Inc.
The projections of employment and population were prepared by Alaska Consultants, Inc.
installation of a production platform and an offshore loading system. Support for field development is expected to come primarily from Kodiak. The production phase is assumed to last from 1987 through 1999. The OCS activities associated with the mean find case are summarized in Table 4.17.

The population and employment impacts in Kodiak are expected to be minor with the exception of the employment impact resulting from the construction of a permanent service base at Womens Bay in 1983. It is assumed that the labor force used to construct the service base will consist primarily of transient construction workers who will live in a temporary construction camp. The projected employment and population impacts are presented in Table 4.18.

The population and employment impacts in Seward in the mean find case are similar to those in the low find case since the Seward service base is expected to be active during the exploration phase, but to provide very limited support services once a permanent base is established in Kodiak. The projected impacts are presented in Table 4.19. The projections of OCS related vessel traffic for the mean find case are summarized in Table 4.20.
### TABLE 4.17  
**Assumptions for the Distribution of Employment among the Coastal Areas of Seward and Kodiak**  
**Mean Probability Resource Level Scenario**  
**Western Gulf of Alaska**

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</tr>
<tr>
<td>Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geophysical and Geological Surveying</td>
<td>N/A</td>
<td>Survey vessels conducting geophysical and geological surveys on Albatross Basin outside the Kodiak coastal area.</td>
</tr>
<tr>
<td>[area of operation]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Base</td>
<td>Temporary and later permanent service base providing resupply, communications and a point for crew rotation for vessels surveying Albatross Basin.</td>
<td>N/A</td>
</tr>
<tr>
<td>Rigs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploration Well Drilling</td>
<td>N/A</td>
<td>Rigs drilling exploration wells on the Albatross Basin outside the Kodiak coastal area.</td>
</tr>
<tr>
<td>[area of operation]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Transportation</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Albatross Basin.</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Albatross Basin.</td>
</tr>
<tr>
<td>[port area]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4.17 (continued)

<table>
<thead>
<tr>
<th>Onshore Service Base</th>
<th>Shore base supplying rigs and boats on Albatross Basin with tubular materials, fuel, water, mud, cement, food and other cargo.</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Transportation</td>
<td>N/A</td>
<td>Helicopter service from Kodiak Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Albatross Basin.</td>
</tr>
<tr>
<td>Construction</td>
<td>N/A</td>
<td>Constructing a permanent service base.</td>
</tr>
</tbody>
</table>

DEVELOPMENT

Platform Installation

<table>
<thead>
<tr>
<th>Offshore Platform Installation [area of operation]</th>
<th>N/A</th>
<th>Locating, installing and commissioning platforms on the Albatross Basin outside the Kodiak coastal area.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Transportation [port area]</td>
<td>Supply/anchor/tug boats transporting materials to platforms, lay barges and bury barges. Half of the vessels for the total WGA platform installation will be provided from Seward.</td>
<td>Supply/anchor/tug boats transporting materials to platforms, lay barges and bury barges. Half of the vessels for the total WGA platform installation will be provided from Kodiak.</td>
</tr>
</tbody>
</table>

| Onshore Service Base | Shore base supplying boats and platforms with tubular materials, fuel, water, food and other cargo. Half of the total effort for platform installation in the WGA will be provided from Seward. | Shore base supply boats and platforms with tubular materials, fuel water, food and other cargo. Half of the total effort for platform installation in the WGA will be provided from Kodiak. |
### Platforms

<table>
<thead>
<tr>
<th>Offshore</th>
<th>Marine Transportation</th>
<th>Onshore</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Production

<table>
<thead>
<tr>
<th>Offshore</th>
<th>Marine Transportation</th>
<th>Onshore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform Operations [area of operation]</td>
<td></td>
<td>Operating platforms with workovers and well stimulation on Albatross Basin.</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>Supply boats transporting materials to platforms on the Albatross Basin.</td>
</tr>
</tbody>
</table>

Helicopter service at Kodiak Airport transporting offshore personnel and small volume, lightweight freight to platforms, lay barges and bury barges on the Albatross Basin.

Development drilling on platforms on the Albatross Basin outside the Kodiak coastal area.

Supply boats transporting materials to platforms on the Albatross Basin.

Shore base supply boats and platforms on Albatross Basin with tubular materials, fuel, water, mud, cement, food and other cargo.

Helicopter service at Kodiak Airport transporting offshore personnel and small volume, lightweight freight to platforms on Albatross Basin.
TABLE 4.17 (continued)

<table>
<thead>
<tr>
<th>Onshore</th>
<th>Service Base</th>
<th>N/A</th>
<th>Shore base supplying boats and platforms on the Albatross Basin with tubular materials, fuel, water, mud, cement, food and other cargo.</th>
</tr>
</thead>
</table>

### TABLE 4.18

**Kodiak Population and Employment Projections, A Comparison of the Base Case and the Mean Find Case**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population Mean Case</th>
<th>Employment Base Case</th>
<th>Employment Mean Case</th>
<th>Absolute Change Population</th>
<th>Percentage Change Population</th>
<th>Absolute Change Employment</th>
<th>Percentage Change Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>7782</td>
<td>7804</td>
<td>6694</td>
<td>6705</td>
<td>22</td>
<td>0.28</td>
<td>11</td>
<td>0.16</td>
</tr>
<tr>
<td>1982</td>
<td>8317</td>
<td>8339</td>
<td>7028</td>
<td>7039</td>
<td>72</td>
<td>0.26</td>
<td>11</td>
<td>0.16</td>
</tr>
<tr>
<td>1983</td>
<td>8876</td>
<td>8888</td>
<td>7377</td>
<td>7383</td>
<td>12</td>
<td>0.14</td>
<td>6</td>
<td>0.08</td>
</tr>
<tr>
<td>1984</td>
<td>9500</td>
<td>10063</td>
<td>7765</td>
<td>7812</td>
<td>563</td>
<td>5.93</td>
<td>47</td>
<td>0.61</td>
</tr>
<tr>
<td>1985</td>
<td>10046</td>
<td>10112</td>
<td>8100</td>
<td>8133</td>
<td>66</td>
<td>0.66</td>
<td>33</td>
<td>0.41</td>
</tr>
<tr>
<td>1986</td>
<td>10498</td>
<td>10596</td>
<td>8373</td>
<td>8422</td>
<td>98</td>
<td>0.93</td>
<td>49</td>
<td>0.59</td>
</tr>
<tr>
<td>1987</td>
<td>10887</td>
<td>10967</td>
<td>8609</td>
<td>8649</td>
<td>80</td>
<td>0.73</td>
<td>40</td>
<td>0.46</td>
</tr>
<tr>
<td>1988</td>
<td>11268</td>
<td>11378</td>
<td>8840</td>
<td>8895</td>
<td>110</td>
<td>0.98</td>
<td>55</td>
<td>0.62</td>
</tr>
<tr>
<td>1989</td>
<td>11496</td>
<td>11558</td>
<td>8982</td>
<td>9013</td>
<td>62</td>
<td>0.54</td>
<td>31</td>
<td>0.35</td>
</tr>
<tr>
<td>1990</td>
<td>11791</td>
<td>11853</td>
<td>9163</td>
<td>9194</td>
<td>62</td>
<td>0.53</td>
<td>31</td>
<td>0.34</td>
</tr>
<tr>
<td>1991</td>
<td>12170</td>
<td>12232</td>
<td>9331</td>
<td>9362</td>
<td>62</td>
<td>0.51</td>
<td>31</td>
<td>0.33</td>
</tr>
<tr>
<td>1992</td>
<td>12743</td>
<td>12810</td>
<td>9610</td>
<td>9648</td>
<td>67</td>
<td>0.53</td>
<td>38</td>
<td>0.40</td>
</tr>
<tr>
<td>1993</td>
<td>13149</td>
<td>13225</td>
<td>9759</td>
<td>9827</td>
<td>76</td>
<td>0.58</td>
<td>38</td>
<td>0.39</td>
</tr>
<tr>
<td>1994</td>
<td>13517</td>
<td>13593</td>
<td>9944</td>
<td>9982</td>
<td>76</td>
<td>0.56</td>
<td>38</td>
<td>0.38</td>
</tr>
<tr>
<td>1995</td>
<td>13879</td>
<td>13955</td>
<td>10094</td>
<td>10132</td>
<td>76</td>
<td>0.55</td>
<td>38</td>
<td>0.38</td>
</tr>
<tr>
<td>1996</td>
<td>14159</td>
<td>14235</td>
<td>10196</td>
<td>10234</td>
<td>76</td>
<td>0.54</td>
<td>38</td>
<td>0.37</td>
</tr>
<tr>
<td>1997</td>
<td>14449</td>
<td>14525</td>
<td>10302</td>
<td>10340</td>
<td>76</td>
<td>0.53</td>
<td>38</td>
<td>0.37</td>
</tr>
<tr>
<td>1998</td>
<td>14660</td>
<td>14736</td>
<td>10363</td>
<td>10401</td>
<td>76</td>
<td>0.52</td>
<td>38</td>
<td>0.37</td>
</tr>
<tr>
<td>1999</td>
<td>15052</td>
<td>15122</td>
<td>10524</td>
<td>10559</td>
<td>70</td>
<td>0.47</td>
<td>35</td>
<td>0.33</td>
</tr>
<tr>
<td>2000</td>
<td>15344</td>
<td>15344</td>
<td>10628</td>
<td>10628</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.19

**SEWARD (WESTERN GULF) population and EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE MEAN FIND CASE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Employment</th>
<th>Change from the Base Case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Case</td>
<td>Mean Case</td>
<td>Base Case</td>
</tr>
<tr>
<td>1981</td>
<td>2720</td>
<td>2772</td>
<td>1184</td>
</tr>
<tr>
<td>1982</td>
<td>2764</td>
<td>2816</td>
<td>1204</td>
</tr>
<tr>
<td>1983</td>
<td>2846</td>
<td>2872</td>
<td>1262</td>
</tr>
<tr>
<td>1984</td>
<td>2964</td>
<td>2964</td>
<td>1337</td>
</tr>
<tr>
<td>1985</td>
<td>3645</td>
<td>3699</td>
<td>1476</td>
</tr>
<tr>
<td>1986</td>
<td>3235</td>
<td>3293</td>
<td>1489</td>
</tr>
<tr>
<td>1987</td>
<td>3202</td>
<td>3270</td>
<td>1523</td>
</tr>
<tr>
<td>1988</td>
<td>3320</td>
<td>3332</td>
<td>1594</td>
</tr>
<tr>
<td>1989</td>
<td>3686</td>
<td>3686</td>
<td>1789</td>
</tr>
<tr>
<td>1990</td>
<td>3744</td>
<td>3744</td>
<td>1878</td>
</tr>
<tr>
<td>1991</td>
<td>3626</td>
<td>3626</td>
<td>1853</td>
</tr>
<tr>
<td>1992</td>
<td>3539</td>
<td>3539</td>
<td>1845</td>
</tr>
<tr>
<td>1993</td>
<td>3607</td>
<td>3607</td>
<td>1881</td>
</tr>
<tr>
<td>1994</td>
<td>3696</td>
<td>3696</td>
<td>1928</td>
</tr>
<tr>
<td>1995</td>
<td>3907</td>
<td>3907</td>
<td>1986</td>
</tr>
<tr>
<td>1996</td>
<td>3923</td>
<td>3923</td>
<td>2046</td>
</tr>
<tr>
<td>1997</td>
<td>4044</td>
<td>4044</td>
<td>2109</td>
</tr>
<tr>
<td>1998</td>
<td>4166</td>
<td>4166</td>
<td>2173</td>
</tr>
<tr>
<td>1999</td>
<td>4294</td>
<td>4294</td>
<td>2240</td>
</tr>
<tr>
<td>2000</td>
<td>4429</td>
<td>4429</td>
<td>2311</td>
</tr>
</tbody>
</table>

The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.20

Projected OCS Vessel Traffic, Mean Find Case
Western Gulf

Arrivals Per Month

<table>
<thead>
<tr>
<th>Supply Boats</th>
<th>Dry Goods Barges</th>
<th>Fuel Tankers</th>
<th>Oil Tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kodiak</td>
<td>0-25</td>
<td>1-2</td>
<td>1-2</td>
</tr>
<tr>
<td>Seward(^1)</td>
<td>11-62</td>
<td>1-2</td>
<td>1-2</td>
</tr>
<tr>
<td>Albatross Basin</td>
<td>--</td>
<td>--</td>
<td>.</td>
</tr>
</tbody>
</table>

\(^1\) The vessel traffic into Seward supports OCS activity in both the Northern and Western Gulf.


High Find Case, 5 Percent Probability Resource Scenario.

In the high find case, exploration is assumed to begin in 1981 and continue through 1988. The activity, which is first centered in the Middle Albatross Basin and later in the Tugidak Basin, is expected to result in 78 wells and the discovery of four oil fields and three gas fields of commercial value. The exploration activity is at first supported by temporary supply bases in Kodiak and Seward, but later it is supported primarily from a permanent base in Kodiak.

Field development, which is expected to begin in 1984, includes the installation of production platforms and submarine pipelines and the construction of an LNG plant and marine oil terminal at Ugak Bay. The production phase is expected to begin in 1986 and continue beyond 2000. The OCS activities
associated with each phase of the hypothesized OCS operations are summarized in Table 4.21.

The projected employment and population impacts in Kodiak are significant in the high find case, once a permanent supply base is established in 1983 (see Table 4.22). The population and employment projections do not include the transient construction workers, who will be housed in temporary onsite construction camps during the construction of the service base, the LNG plant and the marine oil terminal, and during the expansion of the service base.

The projected population and employment impacts in Seward, which are summarized in Table 4.23, indicate that the magnitudes of the impacts will vary during the three phases of OCS activity. The employment impact fluctuates from 22 to 52 new jobs during the early stages of exploration, when the Seward service base is the principal support facility in the Western Gulf, to over 143 new jobs, when the Seward pipe coating yard supports pipe laying operations off Kodiak Island, and back to under 50 new jobs during the later development and the production phases, when the pipe coating yard is inactive and the Seward service base has a supplemental role as a support facility.

The projections of OCS related vessel traffic are summarized in Table 4.24,
TABLE 4.21
ASSUMPTIONS FOR THE DISTRIBUTION OF EMPLOYMENT AMONG THE COASTAL AREAS OF SEWARD AND KODIAK
5 PERCENT PROBABILITY RESOURCE LEVEL SCENARIO - OIL AND GAS WESTERN GULF OF ALASKA

<table>
<thead>
<tr>
<th>Phase, Task and Area of Operations</th>
<th>Seward</th>
<th>Kodiak</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXPLORATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geophysical and Geological Surveying</td>
<td>N/A</td>
<td>Survey vessels conducting geophysical and geological surveys on Albatross and Tugidak Basins outside the Kodiak coastal area.</td>
</tr>
<tr>
<td>Onshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Base</td>
<td>Temporary and later permanent service base providing resupply, communications and a point for crew rotation for vessels surveying Albatross and Tugidak Basins.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Rigs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploration Well Drilling</td>
<td>N/A</td>
<td>Rigs drilling exploration wells on the Albatross and Tugidak Basins outside the Kodiak coastal area.</td>
</tr>
<tr>
<td>Marine Transportation [port area]</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Albatross and Tugidak Basins.</td>
<td>Supply/anchor/tug boats transporting materials to rigs, moving rig anchors and towing rigs on the Albatross and Tugidak Basins.</td>
</tr>
<tr>
<td>Onshore Service Base</td>
<td>Shore base supplying rigs and boats on Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>Shore base supplying rigs and boats on Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Air Transportation</td>
<td>N/A</td>
<td>Helicopter service from Kodiak Airport transporting offshore personnel and small volume, light weight freight to and from rigs on the Albatross and Tugidak Basins.</td>
</tr>
<tr>
<td>Construction</td>
<td>N/A</td>
<td>Constructing a permanent service base.</td>
</tr>
</tbody>
</table>

**DEVELOPMENT**

**Platform Installation**

<table>
<thead>
<tr>
<th>Offshore Platform Installation [area of operation]</th>
<th>N/A</th>
<th>Locating, installing and commissioning platforms on the Albatross and Tugidak Basins outside the Kodiak coastal area.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline Construction</td>
<td>N/A</td>
<td>Laying and burying subsea gathering lines and a trunk line from Albatross Basin to the north shore of Ugak Bay.</td>
</tr>
<tr>
<td>Marine Transportation [port area]</td>
<td>Supply/anchor/tug boats transporting materials to platforms, lay barges and bury barges. Half of the vessels for the total WGA platform installation will be provided from Seward.</td>
<td>Supply/anchor/tug boats transporting materials to platforms, lay barges and bury barges. Half of the vessels for the total WGA platform installation will be provided from Kodiak.</td>
</tr>
<tr>
<td>Onshore Service Base</td>
<td>Shore base supplying boats and platforms with tubular materials, fuel, water, food and other cargo. Half of the total effort for platform installation in the WGA will be provided from Seward.</td>
<td>Shore base supply boats and platforms with tubular materials, fuel, water, food and other cargo. Half of the total effort for platform installation in the WGA will be provided from Kodiak.</td>
</tr>
</tbody>
</table>
### Air Transportation

<table>
<thead>
<tr>
<th>Construction</th>
<th>Coating of all pipe used in subsea gathering and trunk pipelines at Sews rd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopter service at Kodiak Airport transporting offshore personnel and small volume, light weight freight to platforms, lay barges and bury barges on the Albatross Basin.</td>
<td></td>
</tr>
<tr>
<td>Marine Transportation</td>
<td>Supply boats transporting materials to platforms on the Albatross and Tugidak Basins.</td>
</tr>
<tr>
<td>Offshore</td>
<td>Development drilling on platforms the Albatross Basin outside the Kodiak coastal area.</td>
</tr>
<tr>
<td>Onshore</td>
<td>Shore base supplying boats and platforms on Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
</tr>
<tr>
<td>Air Transportation</td>
<td>N/A</td>
</tr>
<tr>
<td>Helicopter service at Kodiak Airport transporting offshore personnel and small volume, light weight freight to platforms, lay barges and bury barges on the Albatross Basin.</td>
<td></td>
</tr>
</tbody>
</table>

### Platforms

| Offshore
Development Drilling [area of operation] | N/A |
| Marine Transportation [port area] | Supply boats transporting materials to platforms on the Albatross and Tugidak Basins. |
| Onshore Service Base | Shore base supplying boats and platforms on Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo. |
| Air Transportation | N/A |
| Helicopter service at Kodiak Airport transporting offshore personnel and small volume, light weight freight to platforms on Albatross and Tugidak Basins. |

### PRODUCTI ON

| Offshore
Platform Operations [area of operation] | N/A |
| Operating platforms with workovers and well stimulation on Albatross and Tugidak Basins. |
### TABLE 4.21 (continued)

<table>
<thead>
<tr>
<th>Marine Transportation [port area]</th>
<th>Supply boats transporting materials to platforms on the Albatross and Tugidak Basins. One third of the Albatross and Tugidak Basins effort will be provided from Seward.</th>
<th>Supply boats transporting materials to platforms on the Albatross and Tugidak Basins. Two thirds of the effort on the Albatross and Tugidak Basins will be provided from Kodiak.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onshore Service Base</strong></td>
<td>Shore base providing one third the effort in supplying boats and platforms on the Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
<td>Shore base providing two thirds the effort in supplying boats and platforms on the Albatross and Tugidak Basins with tubular materials, fuel, water, mud, cement, food and other cargo.</td>
</tr>
<tr>
<td>Oil Terminal and LNG Plant Operations</td>
<td>N/A</td>
<td>Operating oil terminal and LNG plant on the north side of Ugak Bay processing oil and gas from Albatross Basin.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population High Case</th>
<th>Employment Base Case</th>
<th>Employment High Case</th>
<th>Change from the Base Case</th>
<th>Absolute Change</th>
<th>Percentage in Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>7782</td>
<td>7802</td>
<td>6694</td>
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TABLE 4.22  
KODIAK POPULATION AND EMPLOYMENT PROJECTIONS,  
A COMPARISON OF THE BASE CASE AND THE HIGH FIND CASE  

The projections of employment and population were prepared by Alaska Consultants, Inc.
### Table 4.23

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population High Case</th>
<th>Employment Base Case</th>
<th>Employment High Case</th>
<th>Change from the Base Case Absolute Change</th>
<th>Percentage in Population</th>
<th>Percentage in Employment</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.24
Projected OCS Vessel Traffic,
High Find Case, Western Gulf
Arrivals Per Month

<table>
<thead>
<tr>
<th>Location</th>
<th>Supply Boats</th>
<th>Dry Goods Barges</th>
<th>Fuel Tankers</th>
<th>Oil Tankers and LNG Ships</th>
</tr>
</thead>
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<tr>
<td>Kodiak</td>
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<td>1-5</td>
<td>1-7</td>
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<tr>
<td>Seward¹</td>
<td>7-144</td>
<td>1-7</td>
<td>1-10</td>
<td>---</td>
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<tr>
<td>Ugak Bay</td>
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<td></td>
<td></td>
<td>0-12</td>
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<tr>
<td>Tugidak Basin</td>
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<td></td>
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¹ Vessel traffic into Seward supports OCS activity in both the Northern Gulf and Western Gulf.


Using Past Interactions Between the Offshore Petroleum and Commercial Fishing Industries and Economic Analyses to Identify Potential Impacts

In the following sections, past experiences of interactions between the offshore petroleum and commercial fishing industries and economic analyses are used to identify the impacts that may result as these two industries compete for labor, ocean space use, and the services of the infrastructure of the coastal communities.

COMPETITION FOR LABOR

The commercial fishing industry is the largest employer in Kodiak, Seward, Cordova, and Yakutat, and its labor requirements are projected to increase in each of these communities as the traditional fisheries
continue to expand and as a domestic groundfish industry develops. The question to be addressed in this section is, can the labor requirements of the commercial fishing industry be met as the OCS industry develops and becomes a major employer? The answer to this question will be determined by a number of factors including:

- the skill requirements of both industries
- wage differentials between the industries
- the hiring practices of both industries
- the sources of labor that are available to each industry
- the effect of OCS activity on the supply of labor in each community.

Skill Requirements

Differences in skill requirements tend to limit the competition for labor between two industries; an analysis of the skill requirements of the two industries can, therefore, be used to begin to determine for which types of labor the industries will compete. Typically, the skill requirements are sufficiently different to limit competition. For example, the offshore OCS operations require highly specialized labor, and the OCS supply boats are manned by licensed officers and crews with seaman's papers. Conversely, the seafood processing requires a large number of unskilled workers, and fishing boats are typically manned by individuals who are not licensed officers or do not have seaman's papers. Therefore, the offshore labor requirements of the OCS industry tend not to compete with either the harvesting or processing labor requirements of the fishing industry.
The OCS requirements for onshore labor, particularly for construction projects, can, however, compete directly with the labor requirements of the fishing industry since the skill requirements for many onshore jobs are minimal and can be met by many of those who are employed in the fishing industry. In terms of skill requirements, the OCS industry can also compete with the fishing industry for more skilled workers such as foremen and mechanics.

Wage Differentials

For the types of labor for which there is direct competition between the two industries, the effect of the competition on the fishing industry's ability to meet its labor requirements will be affected by the wage differential between the two industries. For example, the hourly wage in seafood processing is expected to be substantially below the hourly wage in construction; therefore, to the extent that both can utilize unskilled labor, the onshore construction projects can provide effective and, therefore, potentially adverse competition. Conversely, the equivalent of an hourly wage in the harvesting sector is expected to exceed the hourly construction wage; therefore, the OCS construction labor requirements are expected to effectively compete with harvesting labor requirements although many fishermen are aptly qualified to work in construction.

Hiring Practices

The hiring practices of an industry also influence the degree to which it provides effective competition for particular types of labor. The
hiring practices of the OCS industry will tend to limit the competition for labor. The industry consists of oil companies and service companies that participate in petroleum development on a global scale. As the activity of the industry begins in a new area, petroleum industry workers from other areas are brought in; therefore, the points of entry into the industry are typically not a new area of industry activity. A major exception to this hiring practice would include hiring for large onshore construction projects. For such projects, a large number of workers who are new to the industry are employed. This does not, however, mean that such workers will be hired locally. If local hiring halls of the construction unions do not exist or are not used, the large construction labor requirements may less effectively compete with the labor requirements of the fishing industry. The use of non-local hiring halls limits, but does not eliminate, access to local residents.

The hiring practices in the fishing industry will also tend to reduce the effective competition for labor between the two industries. For example, crews are typically hired in the home port of a fishing boat or its skipper; therefore, non-local boats do not draw heavily on the local labor force. The hiring of some processing plant employees also occurs in part at distant locations. For example, processing plants recruit students on college campuses in Alaska and in the Pacific Northwest and recruit nonstudents from the Seattle and Anchorage areas. Effective competition will also be reduced by the use of family members to crew fishing boats. Family crew members have close ties to a fishery and in many cases are too young to be employed elsewhere or have little interest in alternative employment opportunities.
Source of Labor

The source of labor and hiring practices are closely related; they both affect the effectiveness of the competition for labor generated by the OCS industry by differentiating between the labor pools from which each industry hires. The analysis presented under hiring practices is, therefore, applicable to this section. A factor which is more appropriately discussed in this section is the nature of employment in the two industries and, thus, the type of worker each attracts.

Many individuals are attracted to the fishing industry because being a fisherman results in a lifestyle that could not otherwise be enjoyed. To the extent that fishermen are tied to the non-monetary rewards of that lifestyle, they are not part of the labor pool in which other industries readily compete.

A less romantic distinction can be drawn between part of the unskilled labor force available to fish processing plants and OCS onshore construction projects. Seafood processing plants have had a much higher propensity to hire women, students, minorities, and transients that have construction contractors; therefore, the major source of labor in seafood processing has not been considered part of the labor pool for construction. This is no doubt explained by the preferences of these employees as well as those of prospective employers; that is, those who work in processing plants may do so in part because they prefer such employment to construction employment and in part because the employment opportunities in
construction may be limited due to the desire of contractors to hire from their traditional labor pools. To the degree that some processing plant workers remain in a distinct labor pool, the labor competition of the OCS industry will be less effective in attracting the labor which has traditionally been available to processing plants.

An additional aspect of the source of labor that determines the impact of labor competition is the size of the labor pool the fishing industry can utilize. If an almost inexhaustible source of labor is available, the labor requirements of the fishing industry can be met despite large OCS labor requirements. For the traditional summer fisheries, the seafood processing sector of the industry has had access to such a labor pool. The large differential between the minimum and Alaska seafood processing wage and the high seasonal unemployment rates in the United States have resulted in an almost unlimited supply of seasonal workers in Alaska processing plants.

The harvesting sector of the industry also has access to a very large labor pool of prospective fishermen who are attracted to Alaska fisheries. This is demonstrated by the large number of letters fishing boat owners receive from such individuals and the ability of a competent skipper to turn such individuals into productive fishermen during one season.

Effects of OCS Activity on the Supply of Labor

The OCS labor requirements can adversely or beneficially impact the fishing industry. If the increase in labor demand due to OCS activity
is greater than the increase in labor supply due to OCS activity, less labor is available for the fishing industry and the impact is detrimental. However, if the OCS activity results in the labor supply increasing more rapidly than demand, more labor is available for the fishing industry and the impact is beneficial.

In the preceding sections, economic analysis is used to delineate factors that will tend to determine the impact of competition for labor. The proceeding sections provide additional insight into the nature of potential impacts by reviewing the impacts that have occurred in the past.

Cook Inlet 1961-1968

The petroleum development which occurred in the Upper Cook Inlet between 1961 and 1968 provides an opportunity to measure the extent to which such competition existed and affected the processing sector of the commercial fishing industry. The experience in Cook Inlet is particularly useful in measuring the potential impact of high levels of OCS onshore employment because the development there was at first exclusively onshore and included the construction of several oil and gas processing plants.

The Cook Inlet and Alaska oil boom began with the Swanson River strike of 1957. Onshore production began in 1959; offshore production did not, however, begin until 1965. Between 1961 and 1968 the petroleum development activities included: (1) the exploration for and/or development of six.
oil fields and 15 natural gas fields; (2) the construction of an 82-mile gas pipeline to connect the Kenai field with the Anchorage area; construction began in 1969; (3) the construction of marine terminal facilities at Port Nikiski, completed in 1961; (4) the construction of the Standard Oil Company’s refinery in 1962 and 1963; (5) the construction of offshore platforms, the first being completed in 1964; (6) the construction of pipelines connecting the offshore fields with on-shore facilities; (7) the construction of the Collier Carbon and Chemical Corp. ammonia plant, and the Collier Carbon and Chemical Corp. and Japan Gas-Chemical Co. urea plant; (8) the initiation of construction of the Phillips Petroleum Co. and Marathon Oil Co. liquified natural gas plant and the Alaskan Oil and Refining Co. refinery; and (9) the construction in 1961 of a 42 mile pipeline from Granite Point to the Drift River marine terminal and storage facilities which were completed the same year.

This brief overview of the development which occurred between 1961 and 1968 is based on material in A Social and Economic Impact Study of Off-Shore Petroleum and Natural Gas in Alaska.

Employment data are not available for fish processing or the petroleum industry, but are available for groupings of industries which are dominated by one or the other. Employment related to the petroleum industry dominated mining and construction employment during the 1960s and fish processing was the principal source of employment in manufacturing. The employment in the former two sectors is, therefore, used as a proxy for employment in the petroleum industry, including petroleum-related construction. And manufacturing employment, minus an estimate of employment
in the manufacturing of petroleum products, is used to represent fish processing employment.

A quick review of the employment, work force, and salmon harvest statistics presented in Table 4.25 indicates that the rate of increase in the labor force was sufficient to meet the growing employment requirements of the petroleum industry without adversely affecting employment in manufacturing. A more rigorous demonstration of the lack of an adverse effect is provided by the results of the following regression equations:

4.1 \[ EM = 91.45 - 0.00156 \text{CIS} + 0.00312 \text{RCS} + 0.159 \text{EC} \]
\[ t\text{-statistics (-0.34) (2.00) (3.07)} \]
\[ R^2 = 0.829 \quad D-W = 1.51 \]

4.2 \[ EM = 65.60 - 0.00242 \text{CIS} + 0.00348 \text{RCS} + 0.102 \text{EMC} \]
\[ t\text{-statistics (-0.56) (2.36) (3.48)} \]
\[ R^2 = 0.858 \quad D-W = 1.09 \]

4.3 \[ EM = -95.61 - 0.00355 \text{CIS} + 0.00342 \text{RCS} + 0.0612 \text{WF} \]
\[ t\text{-statistics (-0.95) (2.84) (4.32)} \]
\[ R^2 = 0.899 \quad D-W = 2.37 \]

where

\( EM = \) third quarter employment in manufacturing, excluding petroleum products; this is predominantly fish processing;

\( \text{CIS} = \) Cook Inlet salmon harvest in 1,000 pounds;

\( \text{RCS} = \) rest of Central Alaska salmon harvest;

\( \text{EC} = \) third quarter construction employment;

\( \text{EMC} = \) third quarter mining and construction employment;

\( \text{WF} = \) third quarter total civilian work force; the employment and work force statistics are for the Kenai - Cook Inlet labor market.

Equations 4.1 and 4.2 are used to test the hypothesis that increases in construction employment or increases in construction and mining employment, respectively, were at the expense of fish processing employment. The coefficients of EC and EMC are not, however, negative; they are significant.
## Table 4.25


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<th>Year</th>
<th>Mining</th>
<th>Construction</th>
<th>Mining &amp; Construction</th>
<th>Excluding Petroleum Products</th>
<th>Total Employment</th>
<th>Working Force</th>
<th>Cook Inlet</th>
<th>Remainder of Central Alaska</th>
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</table>

1. Third quarter employment July - August.

2. Manufacturing employment minus the employment at the Standard Oil Company refinery, the later was provided by a representative of the Standard Oil Company.

**Sources:**
- Catch and Production, ADF&G 1961-1968
and positive which indicates that the hypothesis can be rejected with a high degree of confidence. The results of equation 4.3 provide an explanation of why the increased petroleum employment was not detrimental to fish processing. The coefficient of $WF$ is positive and highly significant indicating that manufacturing (fish processing) employment increased as the workforce increased. The increases in workforce were primarily due to increased petroleum industry employment.

Commercial fishing industry sources associated with fish processing on the Kenai Peninsula during the period under investigation have also indicated that the supply of labor for processing plants was not adversely affected by the petroleum industry. Fred McGill of Kenai Packers and Vance Sutter of Whitney-Fidalgo, who held management positions in Kenai fish processing plants during the period of the Kenai oil boom, provided the following assessment of the impacts of the labor requirements of the petroleum industry. Petroleum industry activity did not adversely affect the supply of labor for fish processing because the fish processing labor force was dominated by students and women, for whom the petroleum industry offered limited employment opportunities, and because many of the petroleum-related jobs were taken by people who were attracted to the area by the petroleum industry. Skilled workers in the fish processing plants were not hired away by the petroleum industry; this may in part be due to the petroleum industry's desire to be a good neighbor and cause as little conflict with existing industries as possible. Fish processing wages did not increase significantly as a result of the petroleum industry's demand for labor. This is no doubt due to the fact that these two industries drew from distinct labor pools.
The petroleum development activities associated with Prudhoe Bay provide another opportunity to determine whether the labor force can increase rapidly enough to meet the volatile labor requirements of the petroleum industry, without decreasing the quantity of labor available to other industries. As the data in Table 4.26 indicate, there was a dramatic increase in construction and total employment in 1974. Much of this was due to the large construction projects associated with the development of the Prudhoe Bay oil field.

TABLE 4.26
ALASKA EMPLOYMENT AND WORK FORCE STATISTICS 1970 - 1977

<table>
<thead>
<tr>
<th>Year</th>
<th>Contract Employment</th>
<th>Total Civilian Employment</th>
<th>Total Work Force</th>
<th>Unemployment</th>
<th>Unemployment Rate Alaska</th>
<th>Unemployment Rate Us.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>6,893</td>
<td>99,000</td>
<td>109,000</td>
<td>10,000</td>
<td>9.1</td>
<td>4.9</td>
</tr>
<tr>
<td>1971</td>
<td>7,443</td>
<td>104,000</td>
<td>116,000</td>
<td>12,000</td>
<td>10.6</td>
<td>5.9</td>
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<tr>
<td>1972</td>
<td>7,893</td>
<td>110,000</td>
<td>123,000</td>
<td>13,000</td>
<td>10.6</td>
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</tr>
<tr>
<td>1973</td>
<td>7,838</td>
<td>116,000</td>
<td>130,000</td>
<td>14,000</td>
<td>10.8</td>
<td>4.9</td>
</tr>
<tr>
<td>1974</td>
<td>14,066</td>
<td>134,000</td>
<td>149,000</td>
<td>15,000</td>
<td>10.2</td>
<td>5.6</td>
</tr>
<tr>
<td>1975</td>
<td>25,876</td>
<td>165,000</td>
<td>180,000</td>
<td>15,000</td>
<td>8.2</td>
<td>8.5</td>
</tr>
<tr>
<td>1976</td>
<td>30,233</td>
<td>176,000</td>
<td>195,000</td>
<td>19,000</td>
<td>9.7</td>
<td>7.7</td>
</tr>
<tr>
<td>1977</td>
<td>19,546</td>
<td>132,000</td>
<td>150,000</td>
<td>18,000</td>
<td>12.2</td>
<td>7.0</td>
</tr>
</tbody>
</table>


Although the construction of the Trans Alaska Pipeline, the production facilities at Prudhoe Bay, and the marine terminal and storage facilities at Valdez directly and indirectly generated phenomenal increases in employment, the increases in employment were more than matched by increases in the size of the work force. The unemployment rate was lower during
the peak years of construction (1975 and 1976) than it had been in the
previous four years, but it remained high by U.S. standards and the
number of unemployed actually increased.

The data for both Cook Inlet and the North Slope suggest that large
increases in the demand for labor due to petroleum development activity
can be more than met by increases in the work force. This does not
imply that increased employment opportunities in the petroleum industry
have not caused shortages in the supply of specific types of labor, but
it does suggest that the total supply of labor tends to increase more
rapidly than the total demand. There will, therefore, tend to be an
excess supply of workers who are, at least temporarily, part of the pool
of unskilled labor, and this is the major source of labor for fish
processing.

North Sea

The experience of Scotland's commercial fishing industry, relative to
petroleum development in the North Sea, can be used to determine the
extent to which the large labor requirements of the petroleum industry
can adversely affect the fishing industry. In this section, the Scottish
experience, as outlined by John Sevy in Technical Report Number 28, is
so used.

The Scottish experience reaffirms the belief stated previously that, to
the extent that labor requirements of the petroleum industry adversely
affect the commercial fishing industry, it is the processing sector, not the harvesting sector, that is affected.

Sevy cites several references to the impact of petroleum development on fish processing employment. A brief summary of these citations and their applicability to the Gulf of Alaska is as follows. George Hunter has noted a decline in fish processing employment on the Shetland Islands, which he attributes to the higher job security offered by oil-related firms. Whether fish processing workers are paid an hourly wage, as they are in Alaska, or on a piece rate basis as Sevy indicates they are in Shetland, the irregularity of landings and resulting irregularity in hours worked per week or month does decrease income and job security. However, in Alaska the peak season for fish processing, and the period in which income and job security are the highest for fish processing workers are during the summer; so when the OCS demand for construction workers is at its height, there will typically be high job security in fish processing. The lack of job security in fish processing may, therefore, be less important in Alaska than Hunter suggests it was in Shetland. The seasonality of fish processing employment in Alaska and the degree of job security can be measured by dividing monthly employment by the average monthly employment for a year as a whole. When this is done using 1978 food processing employment data, the quotient for October through May ranges from 0.58 to 0.91 and the quotient for June through September ranges from 1.23 to 1.89. The implication is that fish processing employment is highly, although not exclusively, concentrated in the summer months. Hunter does not qualify the reduction in fish
processing employment due to petroleum development, and Sevy provides a possible explanation why he does not; British employment statistics do not distinguish between fish processing and meat processing and the harvesting sector of the commercial fishing industry had been declining. It is, therefore, difficult to measure the decline in fish processing employment and even more difficult to determine what part of the decline was due to petroleum development.

Mackay agrees with Hunter that any adverse affects of the increased competition for labor have been concentrated on fish processing, not harvesting; he notes that less than 0.3 percent of the Shetland fishermen have taken employment directly related to the petroleum industry. Mackay indicates that the competition for labor is not only concentrated in fish processing, but within fish processing it has been focused on the skilled workers such as machine maintenance personnel. The competition for unskilled workers has had less effect because the unskilled employment in fish processing is female-intensive. The unskilled labor in Alaskan fish processing can be characterized as highly transient and female-intensive; therefore, skilled fish processing workers are perhaps also more likely to be poached in Alaska, as Mackay suggests they are in the Shetlands. However, the access that most Alaskan processors have to pools of skilled labor in the Pacific Northwest and the rest of the country should reduce the adverse affects of competition for skilled labor. It should be noted that Scottish fish processing plants had access to skilled labor in that there was high unemployment of both skilled and unskilled labor throughout much of Scotland; however, Scottish
plants were apparently much less accustomed to accessing distant pools of labor than are Alaskan plants which are often managed from the Seattle area.

Mackay and Marr report that competition for labor was also concentrated on skilled labor in the Peterhead area. Steel indicates that, excluding fishermen, commercial fishing industry employment decreased by 20 percent in the Peterhead area between 1972 and 1976, but that only a negligible change occurred in Shetland. He does not, however, allocate the change to particular causes.

Perhaps what is best documented about impacts on the commercial fishing industry of the competition for labor generated by petroleum industry activity, as well as the other interactions between the petroleum and commercial fishing industries, is that the impacts and/or interactions “are not well documented.

COMPETITION FOR OCEAN SPACE

The use of ocean space by the OCS industry will prevent fishing in some areas and will make fishing more costly in others. The objective of this section is to discuss the characteristics of the OCS industry use of ocean space that lead to this conclusion, the nature of these costs, and how these costs may potentially impact a fishery.

Offshore structures such as drilling and production platforms will prevent fishing in some areas, however, unless the number of such struc-
tures is extremely large, the proportion of a fishing ground that is lost due to such structures will be insignificant. And unless the target species is sedentary or attracted to such structures, the decrease in catch will be less than proportionate with the loss in fishing areas. The species under consideration are not sedentary. There is not sufficient biological information to determine the extent to which various species will be attracted to each structure.

In addition to preempting an area within a fishing ground, an offshore structure can also increase the cost of fishing in the remaining areas. The increased costs can occur because the structure prevents the most efficient use of the remainder of the fishing ground or because of navigational hazards posed by the structure. The former can occur in a fishery which utilizes non-fixed gear such as trawls or long-lines. The latter can occur despite the fact that the positions of such structures are reported in Notices to Mariners and despite the fact that their presence is discernible from some distance by day or night. The cost associated with the navigational hazards such structures pose appears to be quite low since Coast Guard accident data indicate that collisions with such structures are infrequent, even in areas where there are a large number of such structures. This cost may, in fact, be offset by the navigational aid that such structures provide.

Submarine pipelines will preempt fishing grounds if fishing is prohibited in sections of the pipeline corridor. They will tend to make fishing more costly in the portion of the corridor in which fishing is permitted unless the pipe is buried and remains buried and no debris is left on
the seafloor after the pipe laying and burying operations. Past experiences indicate that neither condition will be met; therefore, submarine pipelines are expected to increase the cost of harvesting activities.

Additional fishing costs would include gear losses due to undersea obstacles associated with the pipeline, the cost associated with less efficient fishing patterns in non-fixed gear fisheries resulting from the position of the pipeline, and other costs incurred in avoiding pipeline-related gear losses. The avoidance costs could include the cost of additional onboard electronics that will allow a vessel to more readily avoid gear losses along the pipeline corridor, or the additional cost of fishing in a "less productive area if the pipeline corridor is through a highly productive fishing area and, to avoid gear losses, less productive areas must be fished.

It is not known how a submarine pipeline will affect biological relationships in each fishery; therefore, any discussion of a pipeline attracting fish and thus concentrating them in an area in which they can easily be caught, or not caught at all, is highly speculative. The same is true for other offshore structures.

Vessel traffic generated by OCS activity will also use areas of ocean space within fishing grounds. These vessels include supply boats, exploration rigs, survey vessels, barges used in the construction of submarine pipelines, barges and tankers used to deliver the materials needed for OCS operations, production platforms prior to installation, the tankers and LNG ships that will deliver the Gulf of Alaska oil and
gas to markets elsewhere in the United States, and additional commercial traffic resulting from the population impacts of OCS activities. This additional vessel traffic will increase the cost of fishing. These costs will include the costs of gear losses and collisions that occur because of OCS generated marine traffic, and the costs incurred by fishermen in attempting to reduce the probability of such gear losses and collisions. The latter can include the cost of additional navigation equipment and the cost associated with having such marine traffic determine the areas fished.

Coast Guard marine accident data indicate that the number of collisions between fishing boats and the OCS generated marine traffic will probably be very small. Fishing vessels have been fairly successful in avoiding each other and other marine traffic in Alaska, and also in areas where the volume of traffic is much greater and more concentrated than it is expected to be in the Gulf of Alaska during this century. The sophisticated navigation equipment on many fishing boats and vessels associated with OCS activity, good seamanship, and good fortune greatly reduce, but do not eliminate; the probability of collisions.

East Coast fishermen report that they bear the cost of collision and gear loss avoidance; they indicate that supply boats, which comprise the bulk of the OCS marine traffic, often ignore the right-of-way of fishing boats, run through fishing grounds on automatic pilot, and consider it the fishermen's fault when fishermen do not do what the supply boat tells them to do (National Fisherman, October, 1975, p. B.3). Even
under more ideal conditions, gear losses are expected to occur. The potential for gear loss is greater for fixed gear fisheries than for non-fixed gear fisheries, since fixed gear such as crab pots and long lines are left unattended.

There are two gear loss problems associated with fixed and unattended gear; its presence is marked by a buoy that is much more difficult to observe visually or on radar than a fishing boat and, when it is lost, the cause of the loss is not known. Therefore, it is difficult for a fisherman to gain compensation for his gear losses. The crab and shrimp pot fishermen are more susceptible to gear losses than are halibut long-liners because the concentration of pot gear in some areas greatly increases the probability of gear losses when any OCS marine traffic enters the area. The necessity to completely avoid an area of pot gear to avoid gear losses is evidenced by the successful efforts of West Coast crab fishermen and tug boat operators to all but eliminate what were once substantial gear losses. This was accomplished by identifying routes that the tugs and barges could use to avoid areas of heavy pot concentrations. Halibut longline gear, which can extend for several miles and is marked only at the buoyed ends, is more vulnerable to vessels that have an exceptional draft or are dragging gear. Survey vessels are among those for which such gear provides a large but unobservable target.

Non-fixed gear such as trawls, purse seines, and dredges is continuously monitored by and is in the relative proximity of the fishing boat; therefore, gear losses to marine traffic are more readily avoided than
for fixed gear. However, the size of the gear and the lack of maneuverability of a vessel using such gear can result in gear losses to marine traffic under adverse conditions. The greatest source of gear losses to non-fixed gear is, however, expected to result not from marine traffic but from debris that results from marine traffic and other submarine obstacles that result from OCS activity.

Debris on the seafloor has been a problem in areas of offshore petroleum development despite prohibitions on intentional dumping and despite regulations requiring that the location of unintentional dumpings be reported. Evidence from the North Sea, Upper Cook Inlet, and the Gulf of Mexico suggests that the OCS debris problem can be reduced but not eliminated. Therefore, gear losses will occur because of debris that results from OCS operations and the cost of such losses in many cases will be borne by the fishermen since it is in many instances difficult to determine whether it was, in fact, OCS debris that caused the loss.

The ability of a single undersea obstacle to continuously result in gear losses is demonstrated by a well-head in the Santa Barbara Channel which claimed the gear of five or more vessels over a period of several years before it was removed (National Fisherman, January, 1979, p. 38). There are several factors which make even known undersea obstacles hazardous. Fishermen may consider information on undersea obstacles to be proprietary, once they have found it at their own expense (in terms of gear loss and lost fishing time). Also, the exact location of such an obstacle may be difficult to determine, even after gear is lost, and information that
the Coast Guard provides on the location of known obstacles is not in a form most readily usable by fishermen. The last problem existed in the Santa Barbara Channel because fishermen used loran A or C for navigation, but the location of obstacles as provided by the Coast Guard was in terms of latitude and longitude. An additional problem was that oil companies used the Lambert Grid system, which is different from the systems used by either the fishermen or the Coast Guard (National Fisherman, January, 1979).

If OCS uses of ocean space increase the cost of fishing, and if the fishermen cannot typically be compensated by the OCS industry because of the physical, legal, and theoretical difficulties associated with identifying the party responsible or the magnitude of the increased costs, the relevant question is, how will the increased costs affect harvesting activity? The answer to this question is less obvious than it is relevant.

If the binding constraint on harvesting activity is resource abundance and the subsequent quota, there is a margin within which costs can increase without causing harvesting activity to decline. In such a fishery, the sole effect of a cost increase within that margin would be a decrease in net income to the fishermen and/or boat owner. If entry into such a fishery is limited, the additional fishing costs would tend to reduce the value of the limited entry permit; in this case the burden of increased fishing costs is borne by those who own permits at the time when it is generally recognized that the cost of fishing will be higher due to OCS operations. New entrants into the fishery would not bear the higher costs if the price of the entry permit accurately reflects the increases
in fishing cost that will result from such operations. It should also be noted that the margin within which costs can increase without reducing harvesting activity will tend to be larger for the limited entry fisheries, since much of the adjustment can occur through a decrease in the price of the limited entry permit.

Since costs and productivity vary among boats in any one fishery, the margins within which costs can increase without affecting harvesting varies. The least efficient boats will be the first to decrease harvesting effort, and as they do so, the harvesting activity of the more efficient boats will tend to increase as long as resource abundance 'remains the binding constraint for the fishery as a whole. In this case, the number of boats and fishermen participating in a fishery will be reduced but catch will not change, and the net income of fishermen and/or boat owners may increase. If the increase in costs due to OCS operation is less than the decrease in cost that occurs as fishing effort becomes concentrated among the more efficient boats and fishermen, net income will increase.

If market conditions impose the binding constraint, an increase in fishing costs will result in a decrease in harvesting effort unless ex-vessel prices are increased to compensate fishermen for the additional costs. However, since seafood products are quite mobile between areas and, therefore, tend to compete interregionally prior to processing, and since processed forms from different regions compete in the same markets, large ex-vessel price differentials are not possible. Small ex-vessel
price differentials are possible and may be sufficient to compensate fishermen for increased costs.

If ex-vessel prices are not increased to compensate fishermen, harvesting activity will decrease. The least efficient boats would be the first to reduce their effort and, as they do so, the effort of the remaining boats may increase as the resources per boat increase. It is therefore possible, however unlikely, that the total harvest will not decrease.

It should be noted that replacing the activity of less efficient boats with increased activity among the more efficient boats is beneficial in that it tends to decrease the total cost of the harvest exclusive of gear loss costs; however, it reduces the number of fishermen who are employed in a specific fishery. The decrease in employment is an adverse effect to the extent that unemployed fishermen cannot readily find alternative employment.

If total harvest does decrease as a result of the increase in fishing cost caused by OCS operations, processing activity in the local community will also tend to decrease unless the decrease in harvest is matched by a decrease in sales to non-local processors, or unless the decrease in the harvest available to local processors can be offset by increased imports of fish from other areas.

The conclusions are as follows:

- OCS uses of ocean space will increase the cost of fishing in the areas of joint use.
The increase in fishing costs may be minimal and not decrease harvesting effort.

A decrease in harvesting effort may be possible without decreasing catch.

If catch decreases, local processing activity need not, but probably will, decrease.

COMPETITION FOR THE SERVICES OF THE INFRASTRUCTURE

The OCS industry requirements for the services of the infrastructure of the coastal communities will be substantial. If these requirements cannot be met without decreasing the services that would otherwise be available to, and would be required by, the commercial fishing industry, OCS operations will adversely affect the fishing industry. However, there are economies of scale associated with such services; if the OCS operations result in increases in the supply of these services that meet the OCS requirements, and also increase the supply and/or quality of the services available to the commercial fishing industry, the effect is beneficial. The services that are considered in this report are water, electric power, and port and harbor facilities.

Although the impact of competition for these services will depend upon the rates at which the supply of and demand for each service increase in each community, the general characteristics of the service requirements of the two industries, and past experiences of OCS and fishing industry competition for services, provide some general guidance in determining what the impacts may be. The remainder of this section summarizes information
from such experiences in the Upper Cook Inlet and the North Sea, and addresses the characteristics of the requirements. The summary of the Cook Inlet experience is based on information provided by Fred McGill of Kenai Packers and Vance Sutter of Whitney-Fidalgo, each of whom has held a management position in the Cook Inlet fish processing industry since the beginning of the Upper Cook Inlet oil boom. The summary of the North Sea experience is based on material presented by Sevy in Technical Report Number 28.

McGill and Sutter reported that Upper Cook Inlet petroleum development did not adversely affect the supply of public services to the commercial fishing industry. A beneficial impact on the infrastructure, although not on the supply of public services, was said to be the establishment of businesses which existed to provide specialized services to the petroleum industry but which were also used by the fishing industry. Examples of such businesses or services would include underwater welding and marine electronics repair.

For the services for which the two industries will tend to compete, the impact will be determined by the rates of increase in the supply of and demand for these services as a result of OCS operations, and by the ability of the fishing industry to find alternative inputs if the changes in supply and demand are adverse. For other services, the characteristics and/or practices of the two industries will reduce or eliminate competition. The ability of the fishing industry to adapt when confronted with a lack of services and the factors that reduce competition are discussed below.
The commercial fishing industry has demonstrated a remarkable ability to survive and make do when "required" services are not available. An example of this is the fishing industry that continues to expand in Dutch Harbor/Unalaska despite the fact that adequate water, electric power, and port or harbor facilities are not provided by the community. When such services were not provided, the fishing industry has been capable of providing its own sources of services. Processing plants use diesel generators to produce their own electric power; and since many communities also use this high-cost method, the cost differential of generating their own electric power is minimal. Wells can often be drilled when the municipal water system is inadequate, and freighters with self-contained cargo handling equipment can be used when only minimal port facilities are available. The height to which self-sufficiency can be taken is demonstrated by the completely self-contained processing barges which have recently been built. The barges can receive fish on the fishing grounds directly from fishing boats, process the fish using workers who are hired for the duration of the season and who live onboard, and load the processed fish directly onto ships or barges bound for markets in Seattle or Japan.

The characteristics of the water and electric power required by the two industries are quite similar; therefore, their requirements will tend to be competitive. However, their requirements for port and harbor facilities are sufficiently diverse to greatly reduce the effective competition of the OCS service requirements. The small boat harbors that provide moorage facilities for most commercial fishing boats in the Gulf of Alaska are not designed to accommodate vessels as large as the smallest
OCS vessels; these vessels will therefore not compete for moorage in the small boat harbors. However, there are two reasons why competition for moorage space will occur outside the small boat harbors until OCS vessels use only facilities that are built for their exclusive use. The reasons are that the small boat harbors are not large enough to provide moorage for all the fishing boats seeking it, nor are they large enough to service the larger fishing boats that are becoming more numerous. There vessels tie up wherever possible and, in many cases, temporarily use the facilities that will be used by OCS vessels before their own facilities are available.

The desire of the OCS industry to have facilities dedicated to OCS vessels in order to assure that the facilities are available when required, once it becomes apparent that a community will be the site of field development support activities, will climate the competition between fishing boast and OCS boats for moorage space. However, this may also preclude the benefit to be had from development of a harbor facility that could both serve the OCS industry and provide better service to the fishing industry than is currently available from the small boat harbors. The OCS harbor requirements could provide the impetus necessary for construction of a more adequate facility. It should be noted that the larger fishing boats are quite similar in dimension to OCS supply boats and, as is mentioned in Appendix B, the Alaska fishing fleet includes several vessels that were originally OCS supply boats or were built using the basic design of such boats.

This section has completed the review of past experiences of the interaction between the commercial fishing and OCS industries and the general analysis.
of the potential impacts OCS operations may have on a commercial fishing industry. In the following section, this information is used, together with the material presented in the first section of this chapter, to discuss the area- and scenario-specific impacts that may occur.

Potential Impacts

The nature of the potential impacts is sufficiently similar for each resource scenario and each commercial fishing industry that they can most efficiently be discussed together by source of impact. The discussion of the potential impacts due respectively to the competition for labor, ocean space use, and infrastructure services is followed by a summary of potential impacts by scenario by commercial fishing industry.

COMPETITION FOR LABOR

The analysis of potential impacts of the competition for labor included a discussion of a number of factors that will tend to moderate this competition and perhaps result in a beneficial impact. These factors, together with the projected magnitude of the OCS labor requirements excluding direct labor requirements for OCS onshore construction projects, and other salient local factors are combined in this section to determine the potential effects of this competition for each resource scenario and each community. The labor requirements for the onshore construction projects are expected to have a minor effect on the fishing industry because the construction work force is assumed to primarily consist of transient workers who will be housed in onsite construction camps, and
because the projects are sufficiently large to attract enough labor to an area so that the fishing industry employees which are lost can be replaced with new arrivals. The assumption that construction workers will primarily consist of transients is used in other SESP reports. It is a critical assumption because construction and fish processing use large amounts of relatively unskilled labor and because the wage in construction is expected to be significantly higher than that in fish processing. Therefore, if the construction workers are not primarily transients and if the construction projects do not attract enough labor to an area to meet the construction labor requirements, construction employment would be expected to occur at the expense of processing employment. The experiences of the oil boom in the Upper Cook Inlet and the Trans-Alaska Pipeline cited in an earlier section indicate that large construction projects tend to attract more labor than is required directly or indirectly by such projects.

Low Find Cases

The projected increases in employment in Seward and Cordova resulting from lease sale number 55 and in Kodiak and Seward resulting from lease sale number 46 are minimal; therefore, the impact on the fishing industry is expected to be negligible (see Tables 4.27 through 4.30). The significant employment requirements projected for Yakutat in 1981 and 1982 (see Table 4.31) are probably not sufficient to attract an adequate number of workers to Yakutat; therefore, some of the OCS employment is expected to be at the expense of the harvesting and processing sectors of the Yakutat commercial fishing industry.
### TABLE 4.27

**SEWARD (NORTHERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE LOW FIND CASE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population Absolute Change</th>
<th>Population Percentage Change</th>
<th>Employment Absolute Change</th>
<th>Employment Percentage Change</th>
</tr>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.28

**CORDOVA POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE LOW FIND CASE**

<table>
<thead>
<tr>
<th>Year</th>
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<th>Employment</th>
<th>Change from the Base Case</th>
</tr>
</thead>
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</tr>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
TABLE 4.29
KODIAK POPULATION AND EMPLOYMENT PROJECTIONS,
A COMPARISON OF THE BASE CASE AND THE LOW FIND CASE

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
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<th></th>
<th>Change from the Base Case</th>
<th></th>
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<td>Absolute Change</td>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### Table 4.30

**TABLE 4.30**

**SEWARD (JESTERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE LOW FIND CASE**

<table>
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<tr>
<th>Year</th>
<th>Population</th>
<th>Employment</th>
<th>Change from the Base Case</th>
<th>Absolute Change</th>
<th>Percentage in Population</th>
<th>Percentage in Employment</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.31

**Yakutat Population and Employment Projections.**

A comparison of the base case and the low find case.

<table>
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<tr>
<th>Year</th>
<th>Population</th>
<th>Employment</th>
<th>Change from the Base Case</th>
</tr>
</thead>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
The OCS labor requirements in Seward resulting from lease sale No. 55 and/or lease sale No. 46 are not expected to have a significant impact on the Seward commercial fishing industry. With the exception of a few years, the OCS labor requirements are not substantial and/or they are matched by projected increases in population, indicating that the supply of labor will increase to meet the OCS labor requirements (see Tables 4.32 and 4.33).

The OCS labor requirements in Kodiak resulting from lease sale No. 46 are minimal and are not expected to affect the Kodiak commercial fishing industry (see Table 4.34).

The mean case OCS labor requirements in Cordova resulting from lease sale No. 55 are expected to be too small to affect the Cordova commercial fishing industry prior to the production phase, during which the employees of the Hinchinbrook Island marine oil terminal and LNG plant are assumed to live in Cordova (see Table 4.35). The year in which these employees establish residence in Cordova, the population and employment growth is substantial enough to be disruptive of the local economy. Once this growth has been accommodated, the increased population will result in a larger labor force being available to the fishing industry. The availability of a larger year-round labor force will facilitate the development that is projected for the commercial fishing industry.

For Yakutat, the OCS employment requirements are substantial throughout the forecast period; therefore, beyond the first few years of OCS operations
### Table 4.32

**SEWARD (NORTHERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE MEAN FIND CASE**

<table>
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<tr>
<th>Year</th>
<th>Population Base Case</th>
<th>Population Mean Case</th>
<th>Employment Base Case</th>
<th>Employment Mean Case</th>
<th>Absolute Change Population</th>
<th>Percentage in Population</th>
<th>Absolute Change Employment</th>
<th>Percentage in Employment</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.33

SEWARD (WESTERN GULF) POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE MEAN FIND CASE

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<th>Employment Base Case</th>
<th>Employment Mean Case</th>
<th>Change from the Base Case Absolute Change</th>
<th>Change from the Base Case Percentage in Population</th>
<th>Change from the Base Case Percentage in Employment</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
### TABLE 4.34

**KODIAK POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE MEAN FIND CASE**

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The projections of employment and population were prepared by Alaska Consultants, Inc.
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The projections of employment and population were prepared by Alaska Consultants, Inc.
when the growth generated by OCS activity may be disruptive to the fishing industry, the increases in population are expected to increase the supply of seasonal and year-round labor available to the fishing industry and facilitate the expansion that is projected for the fishing industry. The larger population base and the resulting increase in the year-round labor force is of particular importance to the development of the groundfish industry (see Table 4.36).

The nature of the OCS labor force will tend to diminish any adverse impacts and increase the beneficial impacts. The OCS labor force is expected to consist primarily of head of households who are part of the primary labor force of an area, not part of the secondary labor force which consists of spouses and children who work to supplement the income generated by the head of the household. The latter section of the total labor force is a principal source of labor for fish processing plants. The importance of a large secondary labor force and the ability of fish processing plants to compete very successfully for such labor in an expanding economy is demonstrated by the recent growth in fish processing in the Anchorage area.

During the years in which the most rapid increases in employment and population occur, the growth will tend to disrupt the local economy; that is, local employers, including fish processing plants, may find it very difficult to meet their labor requirements. There are two reasons for this; the relatively high wage employment opportunities generated directly and indirectly by OCS activities will be available and attractive to local residents; and the rapidly increasing living costs that are expected during
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<th>Change from the Base Case</th>
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The projections of employment and population were prepared by Alaska Consultants, Inc.
such periods will make it difficult for local residents to maintain their current standard of living without accepting the new higher paying employment opportunities.

**High Find Cases**

With the exception of a six-year period beginning in 1988, the OCS labor requirements in Seward resulting from lease sale No. 55 are not substantial and are, therefore, not expected to affect the fishing industry (see Table 4.37). The increase in employment is so heavily concentrated in 1988 that the growth may prove disruptive to the community and the fishing industry. However, in subsequent years, increases in population that are projected to parallel the increases in employment may marginally increase the amount of labor that is available to the commercial fishing industry.

The OCS labor requirements in Kodiak and Seward for lease sale No. 46 are not expected to be substantial enough to affect the commercial fishing industry (see Tables 4.38 and 4.39).

The projected OCS labor requirements for Cordova in the high find case of lease sale No. 55 are minimal until the late 1980s, when the production employees at the Hinchinbrook Island oil terminal and LNP plant are expected to arrive and become permanent residents of Cordova (see Table 4.40). The large increases in employment and population projected to occur in 1989 and 1990 are expected to be somewhat disruptive and, perhaps, adversely affect the commercial fishing industry. However, once the increases in
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The projections of employment and population were prepared by Alaska Consultants, Inc.
population and employment have been absorbed, the larger population will result in more labor being available to the fishing industry. This will be particularly beneficial to the development of the groundfish industry.

For the high find case of lease sale No. 55, the OCS labor requirements in Yakutat are substantial throughout the forecast period (see Table 4.41) and the resulting rates of growth of Yakutat employment are staggering. For example, in 1989 employment, excluding OCS construction, is projected to increase by over 55 percent and, in several years, it is projected to increase at an annual rate in excess of 20 percent. Such rapid growth is expected to be disruptive to the local economy and the fishing industry; however, equally large increases in population are projected indicating that the employment requirements generated by OCS operations will be met by net migration to Yakutat, not by reducing the labor force available to other local employers such as the fishing industry. Therefore, once the disruptions have ended, the increased population is expected to provide a larger potential labor force for the fishing industry. Once again this will be of particular importance to the development of the groundfish industry.

COMPETITION FOR OCEAN SPACE USE

Area specific information about the nature and location of ocean space use by the commercial fishing and OCS industries is presented in this section and, together with the previously presented analysis of the competition for ocean space, is used to determine the potential impact of OCS use of ocean space.
### TABLE 4.41

YAKUTAT POPULATION AND EMPLOYMENT PROJECTIONS, A COMPARISON OF THE BASE CASE AND THE HIGH FIND CASE

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The projections of employment and population were prepared by Alaska Consultants, Inc.
The extent to which OCS uses of ocean space will increase fishing costs in a particular fishery will depend on the extent to which the fishing grounds of each fishery are used for OCS operations, and on the nature of the fishing and OCS operations in areas of joint use. There are a number of fisheries that will not compete with the OCS industry for ocean space because their principal fishing grounds are not included in areas identified for OCS use. These fisheries include:

- all the Cook Inlet fisheries with the exception of minor herring and trawl shrimp fisheries in Resurrection Bay and the groundfish fishery that is beginning to develop (see Figures 4.1 through 4.7),
- the salmon, herring, king crab, Dungeness crab, shrimp and razor clam fisheries of Prince William Sound (see Figures 4.8 through 4.11),
- the salmon, Dungeness crab, Tanner crab, and pot shrimp fisheries of Yakutat (see Figure 4.12 through 4.14),
- the shrimp and razor clam fisheries of Kodiak (see Figure 4.15).

The exception to the absence of OCS ocean space use on the fishing grounds of these fisheries includes the offshore pipeline corridor that crosses nearshore salmon and Dungeness crab fishing grounds near Yakutat and the shrimp fishery in Ugak Bay, which has been closed in recent years to allow the recovery of the resource. The OCS activity along the pipeline corridor is expected to minimally reduce the area available for fishing, but not to adversely affect the catch as a whole. However, those set gillnet salmon fishermen who have established property rights to the area of the
Figure 4.1  Major Salmon Fishing Areas, 'Cook Inlet.'
Figure 4.2 Major Halibut Fishing Areas, Cook Inlet.
Figure 4.3 Major King Crab Fishing Areas, Cook Inlet.
Figure 4.4 Major Tanner Crab Fishing Areas, Cook Inlet.
Figure 4.5  Major Dungeness Crab Fishing Areas, Cook Inlet.

Source: Alaska Department of Fish and Game, 
Figure 4.6 Major Shrimp Fishing Areas, Cook Inlet.

Figure 4.7 Major Herring Fishing and Razor Clamming Areas, Cook Inlet.
Figure 4.8 Major Salmon Fishing Areas, Prince William Sound.
Known herring spawning areas

Principal distribution of scallops


Figure 4.9 Known Distribution of Scallops and Razor Clams and Known Herring Spawning Areas, Prince William Sound.
Figure 4.10 Major Crab Fishing Areas, Prince William Sound.
Major shrimp fishing areas

- - - - - - - 7 Pots

- - - - - - - Otter Trawl

- Oil Fields
- Gas Fields
- Pipeline corridors


Figure 4.11 Major Shrimp Fishing Areas, Prince William Sound.
Major salmon fishing areas

Set Gill Net

Oil Fields
Gas Fields
Pipeline Corridors

Figure 4.12 Major Salmon Fishing Areas, Yakutat.
Figure 4.13 Major Crab Fishing Areas, Yakutat.
Figure 4.14 Major Shrimp Fishing Areas, Yakutat.

Figure 4.15 Major Shrimp Fishing and Razor Clamming Areas, Kodiak.
pipeline corridor will suffer a loss unless equally productive areas are available to them. Perhaps no more than one to two set gillnet sites will be preempted by each pipeline corridor, and if the pipeline is buried, the sites would only be affected during the year in which the pipeline is constructed. The real gross income per gillnet boat is not expected to exceed $53,000 by the year 2000.

The longline halibut fleet operates throughout the Gulf of Alaska and, as is indicated in Figures 4.16 through 4.18, the OCS operations off of Yakutat, Hinchinbrook Island, and Kodiak are on major halibut grounds. The longline gear is particularly susceptible to losses to OCS survey vessels and other OCS vessels that tow underwater gear or are of great draft. Gear losses are expected to occur and fishing costs are expected to increase. However, since the binding constraint in the halibut fishery is stock abundance, the increased fishing costs are not expected to adversely affect harvesting effort. The magnitude of the gear losses will to a great extent be determined by the actions taken by the fishing and OCS industries and others to reduce the probability of gear losses.

The crab fisheries use pot gear which is left unattended. The high concentration of the gear in some areas results in a very high probability that gear losses will occur if other vessels enter the areas. Figures 4.10, 4.13, and 4.19 through 4.21 indicate that OCS ocean space use will occur in the Yakutat Dungeness crab grounds, the Prince William Tanner crab grounds, and the Kodiak king, Tanner, and Dungeness crab grounds. Gear losses are, therefore, expected to occur in these areas. With the exception of the Dungeness crab fisheries, the binding constraint on these fisheries is resource abundance; therefore, the increases in fishing costs
Figure 4.16 Major Halibut Fishing Areas, Yakutat.
Figure 4.17 Major Halibut Fishing Areas, Prince William Sound.

Figure 4.19 Major King Crab Fishing Areas, Kodiak.

Source: Alaska Department of Fish and Game, Alaska's Fisheries Atlas, 1978
Figure 4.20  Major Tanner Crab Fishing Areas, Kodiak.

that result from OCS offshore operations may have a relatively minor impact on harvesting effort although they will adversely affect the income of fishermen and/or boat owners. The increased fishing costs are expected to decrease harvesting effort including catch in the crab fisheries in which market conditions are the binding constraints. As with other fisheries, the magnitude of the gear losses and increases in fishing costs will principally be determined by the efforts of the fishing and OCS industries and others to minimize the conflicts. In the absence of such efforts the losses may be substantial enough that the OCS activity effectively preempts other uses of ocean space in specific areas.

OCS offshore operation out of Womens Bay and Ugak Bay will compete with the Kodiak salmon fisheries for ocean space (see Figure 4.22). This competition will increase fishing costs; however, since the binding constraint in these fisheries is resource abundance, fishing effort may not be adversely affected. The net income of fishermen and/or boat owners is expected to decrease marginally for the fishery as a whole; the decrease in income may, however, be substantial for specific individuals.

The groundfish grounds in the Gulf of Alaska encompass the potential areas of OCS offshore operations, therefore, the cost of fishing will increase as a result of OCS operations. The increases are, however, with the possible exception of those due to gear losses to OCS debris, expected to be minimal since the groundfish grounds are so expansive, and by the time the domestic fishery has fully developed, OCS ocean space use will consist primarily of tanker traffic in well established lanes.
Figure 4.22 Major salmon fishing area. Kodiak.

Source: Alaska Department of Fish and Game, Alaska Fisheries Atlas, 1974.
Gear losses are expected to be a major part of the increase in fishing costs in areas in which the two industries will compete for ocean space. Although the magnitude of the gear losses resulting from OCS operations cannot be determined, current gear losses in absolute terms or in terms of total fishing costs are of interest. CFEC data indicate that in the mid-1970s, the average annual gear loss of vessels participating in Alaska shellfish fisheries was approximately $8,400. This was about 13 percent of the total value of the gear used by these vessels or about 17 percent of the fishing costs excluding labor costs. These gear loss estimates include the cost of gear itself and do not include the cost associated with lost fishing time. OCS operations are typically not expected to double gear losses.

Another aspect of the increased fishing cost is the cost associated with collisions between fishing vessels and OCS vessels or structures. It is not possible to determine the magnitude of these costs, but there are reasons for expecting them to be minor for the fishing industry as a whole. The probability of a collision increases as the volume of traffic increases, and OCS and fishing operations are expected to significantly increase the volume of marine traffic in the study area. However, as is indicated in the Technical Report Number 31, the volume of traffic is expected to be insignificant compared to the capacity of the system; therefore, the projected increase in traffic is not expected to measurably increase the probability of a collision.

Fishing vessel accident data indicate, for the United States as a whole, collisions account for approximately 18 percent of fishing boat accidents and 45 percent of the collisions result from neglecting the rules of the road.
The implication is that additional vessel traffic will not substantially increase the cost of vessel accidents, particularly if more attention is paid to the rules of the road (see Appendix B).

COMPETITION FOR THE SERVICES OF THE INFRASTRUCTURE

The OCS requirements for electric power and water are expected to be greatest for the high find cases; therefore, a comparison of the requirements of the OCS and commercial fishing industries in the high find case with the projections of the availability of electric power and water can be used to determine whether adequate supplies will be available for both industries. Such a comparison is presented below by community.

The water requirements of the Yakutat commercial fishing industry are expected to increase more rapidly than the area wide water requirements in the high find case. However, the abundant groundwater supply and the ability of seafood processing plants to use salt water to supplement the supply of fresh water should prevent the availability of water from constraining the projected growth of the fishing industry. The availability of commercially generated electric power is not expected to constrain the fishing industry because the seafood processing plants are expected to continue to generate their own electric power unless a lower cost source of power becomes available. The low cost electric power that may be available from the LNG plant would be particularly beneficial to the industry in that it would be available in the early 1990s, just when the industry's demand for electric power is projected to increase rapidly due to the development of the groundfish fishery.
The water requirements for the fishing industry are expected to increase less rapidly than the water requirements for Cordova as a whole; therefore, adequate water is expected to be available for the projected long-run development of the industry. The industry's requirement for electric power is not expected to increase substantially until the early 1990s; by that time the growth in demand for electric power due to OCS operations will have subsided, It is, therefore, believed that the ability of the commercial fishing industry to acquire adequate electric power will not be adversely affected by OCS activity.

The water and electric power requirements of the Seward commercial fishing industry are not expected to increase significantly until the early 1990s. By that time, the growth in demand generated by OCS operations is projected to be minor. It would, therefore, appear that the availability of water and electric power to the fishing industry will not be adversely affected by OCS activities subsequent to lease sale No. 55 and/or lease sale No. 46.

In Kodiak, the modest rate at which the fishing industry's demand for water is expected to increase and the moderate OCS requirements for water are expected to assure that the projected growth of the industry will not be adversely affected by OCS operations. There are two reasons why the community's ability to meet the fishing industry's demand for electric power projected for the 1990s is not expected to be adversely affected by the OCS requirements for electric power. The ability of a community to meet the demand for electric power is more dependent on the rate of growth in demand, and the OCS requirements for electric power are expected to be relatively
stable during the 1990s and will, therefore, not increase the rate of
growth in demand.

Due to the inability of existing small boat harbors to serve OCS vessels,
such vessels are not expected to compete with fishing boats for moorage
space in the small boat harbors; however, due to the overflow conditions
that currently exist in the small boat harbors of Alaska, fishing boats
are forced to use other moorage facilities including those which OCS
vessels will compete for prior to the construction of permanent service
bases. The OCS competition for moorage facilities is, therefore, expected to
adversely affect the fishing industries during the exploration phase.
The impact is expected to be greatest in those fisheries in which the
boats are most mobile in terms of where fish can be landed; however,
since the same adverse conditions are expected to occur at competing points
of landing in the Gulf of Alaska, the competitiveness of one community
relative to the others may not change sufficiently to affect its ability
to attract boats. The impact will then be that fishing boats will be
forced to use less convenient and, therefore, more costly moorage facilities
in each community.

The port facilities that are used by the freighters and barges servicing
the commercial fishing industries in Kodiak and Seward will also serve
the OCS industry prior to the completion of permanent OCS service bases.
The Studies Program Transportation reports indicate that the port facility
in Seward has sufficient capacity to serve both industries but that the Kodiak
facility is close to capacity. OCS use of the Kodiak port facility is,
therefore, expected to adversely affect the Kodiak fishing industry. The
existing service base facility in Yakutat and the limited OCS marine traffic projected for Cordova reduce the probability that similar impacts will occur in Yakutat or Cordova.

Summary of Potential Impacts

This section briefly summarizes the potential impacts of OCS operations by scenario and by community.

LEASE SALE NO. 55, LOW FIND CASE

Yakutat

- The competition for labor is expected to be substantial enough to adversely affect the amount of labor available to the fishing industry, particularly the processing sector.
- The competition for ocean space is expected to be minimal and, therefore, only marginally increase fishing costs.
- The OCS requirements for services are not expected to be large enough to adversely affect the fishing industry.

Cordova

- The labor requirements of the OCS activities are not expected to be large enough to affect the fishing industry.
- The OCS vessel traffic on the Prince William Sound fishing grounds is expected to be insignificant and not measurably
affect harvesting.

- The OCS requirements for services are not expected to be significant enough to affect the fishing industry.

**Seward**

- The projected OCS labor requirements are minimal and are not expected to affect the industry.
- With few exceptions, OCS offshore activity is not expected to occur in major fishing grounds; the impact of the competition for ocean space use is, therefore, expected to be minimal.
- The service requirements of the two industries are projected to increase at rates which can be met by increases in the availability of inputs. The one exception is moorage facilities outside the small boat harbor. The competition for such facilities is expected to be decremental to the fishing industry.

**LEASE SALE NO 55, MEAN FIND CASE**

**Yakutat**

- The substantial OCS labor requirements are expected to disrupt the supply of labor to the fishing industry during the years of the most rapid growth, but to benefit the industry in subsequent years by increasing the supply of
labor available to the fishing industry.

- The competition for ocean space use is expected to have a minor adverse impact on the industry.
- The competition for services will be limited by each industry's ability to provide their own.

Cordova

- Prior to the Hinchinbrook Island oil terminal and LNG plant labor force being housed in Cordova, the OCS labor impact is expected to be too small to affect the fishing industry. The disruptive growth that may occur the year these personnel become residents of Cordova will tend to temporarily disrupt the supply of labor to the fishing industry; however, in the long-run the larger population will increase the supply of labor to the industry.
- There are expected to be few areas of ocean space that will be used jointly by the two industries. The OCS uses of ocean space are, therefore, not expected to significantly affect the Cordova fishing industry.
- The OCS requirements for services are not expected to adversely affect the industry.

Seward

- The OCS labor requirements in Seward are not expected to significantly affect the fishing industry.
With few exceptions, the Cook Inlet fisheries and OCS offshore operations will not compete for ocean space; the Seward fishing industry is, therefore, not expected to be measurably affected by such operations.

With the exception of moorage facilities, the service or facilities requirements of the fishing and OCS industries are not expected to be competitive. The competition for moorage, which will be limited to the exploration phase, is expected to adversely affect the industry.

LEASE SALE NO 55, HIGH FIND CASE

Yakutat

The impact of the competition for labor is expected to be similar to that of the mean find case. It is expected to be adverse during the years of explosive growth but beneficial in the long-run.

The competition for ocean space is expected to adversely affect the groundfish, salmon, and crab fisheries by marginally increasing fishing costs.

The ability of each industry to provide its own services is expected to prevent the competition for services from adversely affecting the fishing industry.
Cordova

- The impacts of the competition for labor, ocean space, and services are expected to be similar in nature to those of the mean fish case.

Seward

- The concentration of the OCS labor requirements in 1988 may be sufficient to partially disrupt the supply of labor to the fishing industry. In the remainder of the period, the larger population is expected to marginally increase the supply of labor available to the fishing industry.
- The competition for ocean space is expected to be minimal in all but the halibut and groundfish fisheries. The impact on the halibut fishery is expected to be smaller than that on the groundfish fishery since the former is constrained by resource abundance while the latter is constrained by market conditions.
- The projected increases in OCS fishing industry service requirements are consistent with the projections of the availability of services; the OCS competition is, therefore, not expected to be decremental. The one exception is the adverse effect that is expected from the competition for moorage facilities prior to the completion of a permanent OCS service base.
The OCS labor requirements are not expected to be sufficient to affect the fishing industry.

Gear losses, particularly in the halibut and crab fisheries, are expected to occur. They are not, however, expected to significantly affect harvesting effort.

The availability of services is expected to keep pace with the modest increases in the requirements for services of the two industries.

The competition for labor is not expected to have a measurable impact on the fishing industry since the OCS labor requirements are not significant.

OCS offshore operations are expected to be minimal in the major fishing grounds of Cook Inlet; therefore, the adverse effects of the competition for ocean space will be minor for the fishing industry as a whole.

With one exception, the OCS service requirements are not expected to be large enough to affect the fishing industry. The exception is the competition for moorage which is expected to be marginally decremental to the fishing industry.
Kodiak

- The OCS labor requirements are minimal and are not expected to adversely affect the fishing industry.
- The OCS uses of ocean space are expected to increase the fishing costs in all but two of the Kodiak fisheries; however, since resource abundance is the binding constraint for most of these fisheries, the decreases in harvesting activity are not expected to be significant.
- It is believed that, with the exception of port facility services, the availability of services will increase sufficiently to meet the demands of both industries. The competition for port facility services during the exploration phase can adversely affect the fishing industry.

Seward

- The OCS labor requirements are not expected to be large enough to affect the fishing industry.
- There are expected to be few areas of joint ocean space use in the Cook Inlet management area. The increased fishing costs in the areas of joint use are not expected to have a measurable impact on the industry as a whole.
- With the exception of moorage facilities, the supply of
services is expected to be sufficient to meet the needs of both industries.

LEASE SALE NO. 46, High Find Case

Kodiak

- The OCS labor requirements are not expected to be sufficient to affect the fishing industry.
- OCS offshore operations will increase fishing costs in the major Kodiak fisheries, but this is not expected to result in a significant decrease in harvesting effort.
- With the possible exception of port facilities, the availability of services is expected to keep pace with the service requirements of the two industries.

Seward

- Since the OCS labor requirements are not substantial and since they are projected to be matched by increases in population, the competition for labor is not expected to significantly affect the fishing industry.
- The competition for ocean space is not expected to be sufficient to have more than a minor adverse effect on the industry as a whole.
- The service requirements are similar to those of the mean find use. Therefore, only the competition for moorage
during the exploration phase is expected to adversely effect the fishing industry.
APPENDIX 1

CONTENTS

Ex-vessel Price Models ......................................................... 486

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<table>
<thead>
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<tr>
<td><strong>SUMMARY OF EX-VESSEL PRICE MODELS</strong></td>
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</tbody>
</table>

**King Crab**

\[ P = -0.011 - 0.858E-6 \text{AKL} - 0.072 \text{RW} + 0.324E-3 \text{RY} + 0.621 \text{CPI} \]

$t$-statistics: -1.637, -1.158, 2.152, 1.455

$R^2 = 0.88$ Durbin-Watson statistic = 1.85 Number of observations = 75, 1961-1975

$P$ = ex-vessel price (statewide average)

$\text{AKL} = \text{Alaska landings of king crab in 1,000 lbs}$

$\text{RW} = \text{the real average hourly wage in Alaska food processing for July and August}$

$\text{RY} = \text{real national income in billions}$

$\text{CPI} = \text{Consumer Price Index (U.S., all goods, 1978 CPI = 1.0)}$

**Dungeness Crab**

\[ P = 0.065 - 0.622E-5 \text{AKL} - 0.547E-5 \text{OL} - 0.038 \text{RW} + 0.168E-3 \text{RY} + 0.846 \text{CPI} \]

$t$-statistics: 1.385, -6.171, -0.817, 1.910, 3.131

$R^2 = 0.97$ D-W = 1.60 $n = 15$, 1961-1975

$P$ = ex-vessel price (statewide average)

$\text{AKL} = \text{Alaska landings of Dungeness crab in 1,000 lbs.}$

$\text{OL} = \text{other landings, (Oregon, Washington and California) of Dungeness crab}$

$\text{RW} = \text{real average hourly wage in Alaska food processing}$

$\text{RY} = \text{real national income in billions}$

$\text{CPI} = \text{Consumer Price Index (U.S. all goods, 1978 CPI = 1.0)}$
### Table 1 (continued)

**Halibut**

1st stage:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>-0.778</td>
<td>0.559E-5</td>
<td>(-0.778)</td>
<td>(0.499)</td>
</tr>
<tr>
<td>HAKL</td>
<td>+0.673E-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HINV</td>
<td>-0.029</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SL</td>
<td>-0.293E-2</td>
<td></td>
<td>(-1.849)</td>
<td>(0.114E-3)</td>
</tr>
<tr>
<td>HCONS/N</td>
<td>+0.898E-06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIMP</td>
<td>-0.029</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RY</td>
<td>+0.979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPI</td>
<td>+3.151</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OLH</td>
<td>+0.180E-5</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

R² = 0.975
D-W = 2.475
n = 15

2nd stage:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-Statistic</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>+0.218-0.240E-5</td>
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<td>(1.867)</td>
<td>(-1.391)</td>
</tr>
<tr>
<td>HAKL</td>
<td>-0.387E-5</td>
<td></td>
<td>(-1.391)</td>
<td></td>
</tr>
<tr>
<td>HINV</td>
<td>+0.986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW</td>
<td>-0.652E-01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>= 0.993</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PW is the wholesale price ($/lb) for dressed frozen halibut, average of monthly observations over each year (nominal dollars)

HAKL denotes Alaska landings of halibut (dressed weight) x 10³ lbs;

W is average hourly wage in Alaska food processing for July and August (nominal dollars)

SL is length of fishing season in area 3A (Cape Spencer to Kupreanof Pt.) in days

HCONS is U.S. consumption of halibut in lbs

HIMP is halibut imports to the U.S. for consumption (product wt.) x 10³ lbs

OLH is other U.S. landings of halibut (dressed weight) x 10³ lbs

P is the Seattle ex-vessel price ($/lb) for No. 1 medium halibut, average of monthly observations over the year (nominal dollars)

N is U.S. total resident population x 10⁻³

HINV is the halibut inventory held in cold storage

RY is real national income in billions

CPI is the Consumer Price Index (U.S. all goods, 1978 CPI = 1.0)

The t-statistics are in parentheses.
<table>
<thead>
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<th>Table 1 (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tanner Crab</strong></td>
</tr>
<tr>
<td>$P = 0.018 + 0.156 \times 10^{-5} HAKL + 0.413 \times 10^{-7} \text{EXJ} + 0.011 RW + 0.450 \times 10^{-5} \text{RY'}$</td>
</tr>
<tr>
<td>t-statistics</td>
</tr>
<tr>
<td>(0.961)</td>
</tr>
<tr>
<td>(0.03)</td>
</tr>
<tr>
<td>(0.384)</td>
</tr>
<tr>
<td>(0.031)</td>
</tr>
<tr>
<td>$-0.026 \text{ CPI}$</td>
</tr>
<tr>
<td>(-0.123)</td>
</tr>
<tr>
<td>$R^2 = 0.88$</td>
</tr>
<tr>
<td>$D-W = 1.86$</td>
</tr>
<tr>
<td>$N = 10$ (1966-75)</td>
</tr>
</tbody>
</table>

Where:

- $P$ is the average Alaska ex-vessel price per pound of Tanner crab (nominal dollars)
- $HAKL$ denotes Alaska landings of Tanner crab (round wt.) x $10^{-3}$ lbs
- $\text{EXJ}$ Tanner crab exports to Japan
- $RW$ real average hourly wage in Alaska food processing for July and August (nominal dollars)
- $\text{RY'}$ is real national income
- $\text{CPI}$ is the Consumer Price Index (U.S. all goods, 1978 = 1.0)

**Salmon**

$PCH = -2.3073 + 0.5406 \times 10^{-3} \text{RPCYUS} + 0.2260 \times 10^{-2} \text{AKCHMLDG} + 0.6758 \times 10^{-4}$

$\text{FRCSTCHM} + 0.9672 \times 10^{-5} \text{WRLDMCHM} + 0.6887 \times 10^{-3} \text{PRSTEAK} + 0.1223 \times 10^{-1}$

$\text{ATSMLDGS} - 0.1558 \times 10^{-1} \text{PRTUNA} + 0.8774 \times 10^{-1} \text{WAGE} + 0.5489 \times 10^{-4}$

$\text{RPCYSWED} + 0.5062 \times 10^{-3} \text{RPCYUK} - 0.2798 \times 10^{-5} \text{RPCYJAPN}$

$\text{PP} = -1.3724 + 0.2220 \times 10^{-3} \text{RPCYUS} + 0.3448 \times 10^{-2} \text{PRSTEAK} + 0.1181 \times 10^{-1}$

$\text{ATSMLDGS} - 0.2404 \times 10^{-6} \text{FRCSTPNK} - 0.7529 \times 10^{-2} \text{PRTUNA} + 0.3882 \times 10^{-5}$

$\text{WRLDMPNK} + 0.5176 \times 10^{-3} \text{AKPNKLDG} + 0.9768 \times 10^{-1} \text{WAGE} - 0.1464 \times 10^{-4}$

$\text{RPCYUK} - 0.1367 \times 10^{-5} \text{RPCYJAPN} + 0.3268 \times 10^{-4} \text{RPCYFRAN}$

* Standard error.
TABLE 1 (continued)

\[
\begin{align*}
PR & \quad = \quad -0.8509 + 0.3212 \times 10^{-3} \text{RPCYUS} + 0.5306 \times 10^{-2} \text{PRSTEAK} + 0.1378 \times 10^{-1} \\
& \quad \quad (2.5423) (0.3325 \times 10^{-1}) (0.1236 \times 10^{-1}) (0.1623 \times 10^{-1})
\end{align*}
\]

\[
\begin{align*}
\text{ATSMLDGS} & \quad = \quad -0.4971 \times 10^{-1} \text{PRTUNA} + 0.1258 \times 10^{-5} \text{FRCSTSOX} + 0.5184 \times 10^{-4} \\
& \quad \quad (0.5855 \times 10^{-1}) (0.5284 \times 10^{-5}) (0.1076 \times 10^{-3})
\end{align*}
\]

\[
\begin{align*}
\text{WRLDMOK} & \quad = \quad -0.1374 \times 10^{-2} \text{AKSOKLDG} + 0.1397 \text{WAGE} + 0.1076 \times 10^{-2} \text{RPCYUK} \\
& \quad \quad (0.2694 \times 10^{-2}) (0.1638) (0.5288 \times 10^{-2})
\end{align*}
\]

\[
\begin{align*}
0.5291 \times 10^{-5} \text{RPCYJAPN} + 0.1708 \times 10^{-3} \text{RPCYFRAN} \\
& \quad \quad (0.8994 \times 10^{-5}) (0.6057 \times 10^{-2})
\end{align*}
\]

\[
PCH \quad = \quad \text{Ex-vessel price, chum, Alaska}
\]

\[
PP \quad = \quad \text{Ex-vessel price, pink, Alaska}
\]

\[
PR \quad = \quad \text{Ex-vessel price, sockeye, Alaska}
\]

\[
\text{RPCYUS} \quad = \quad \text{U.S. real per capita income}
\]

\[
\text{RPCYSWED} \quad = \quad \text{Swedish real per capita income}
\]

\[
\text{RPCYJAPN} \quad = \quad \text{Japanese real per capita income}
\]

\[
\text{RPCYUK} \quad = \quad \text{U.K. real per capita income}
\]

\[
\text{AKCHMLDG} \quad = \quad \text{Alaska chum landings}
\]

\[
\text{AKPNKLDG} \quad = \quad \text{Alaska pink landings}
\]

\[
\text{AKSOKLDG} \quad = \quad \text{Alaska sockeye landings}
\]

\[
\text{FRCSTCHM} \quad = \quad \text{Alaska chum run forecast}
\]

\[
\text{FRCSTPNK} \quad = \quad \text{Alaska pink run forecast}
\]

\[
\text{FRCSTSOX} \quad = \quad \text{Alaska sockeye run forecast}
\]

\[
\text{WRLDMCHM} \quad = \quad \text{Total world salmon landings, minus Alaska chum}
\]

\[
\text{WRLDMNPK} \quad = \quad \text{Total world salmon landings, minus Alaska pink}
\]

\[
\text{WRLDMSOX} \quad = \quad \text{Total world salmon landings, minus Alaska sockeye}
\]

\[
\text{ATSMLDGS} \quad = \quad \text{Total Atlantic salmon landings}
\]

\[
\text{PRTUNA} \quad = \quad \text{Price of tuna}
\]

\[
\text{PRSTEAK} \quad = \quad \text{Price of steak}
\]

\[
\text{WAGE} \quad = \quad \text{Average wage in food processing, Alaska}
\]

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TABLE 1 (continued)

Groundfish

\[
P = 0.001715 + 4.1892 \ WCP + 0.8944 \ WD
\]

\[
t-statistics = (0.046) \quad (1.550) \quad (2.365)
\]

\[
R^2 = 0.7919 \quad D-W = 2.77
\]

\[
WCP = 0.00248 - 0.45626E-5 \ WC + 0.019311 \ NW + 0.30845 \ WPGF
\]

\[
t-statistics = (2.223) \quad (-1.246) \quad (1.91) \quad (5.878)
\]

\[
R^2 = 0.954 \quad D-W = 1.432
\]

\[
P = \text{Ex-vessel price of Alaska groundfish}
\]

\[
WCP = \text{World ex-vessel price of cod}
\]

\[
WD = \text{Wage differential (Alaska food processing wage - national wage)}
\]

\[
WC = \text{World groundfish catch}
\]

\[
NW = \text{National wage}
\]

\[
WPGF = \text{World wholesale price of groundfish}
\]
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Source: Alaska Sea Grant Program

NOTE: The percentage changes in the ex-vessel prices of king and coho salmon are expected to equal those of red salmon.
### TABLE 3

**ACTUAL AND PROJECTED VALUES OF THE EX-VESSEL PRICE MODEL EXPLANATORY VARIABLE**

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**Projected Values**

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</table>
TABLE 4
MODELS USED TO PROJECT THE NUMBER OF BOATS AND/OR LANDINGS

Kodiak

SALMON

Purse Seine

\[ L = -2.262 + 0.090 c + 13.96 B \]

T-statistics \( (8.23) \) \( (3.46) \) \[ R^2 = 0.953 \]

Beach Seine

\[ L = -14.28 + 0.027 C + 0.00029 C^2 + 4.49 B \]

\( (0.21) \) \( (1.74) \) \( (3.82) \) \[ R^2 = 0.965 \]

Set Gill Net

\[ L = -588 + 1.37 c + 0.000147 C^2 \]

\( (3.79) \) \( (-2.85) \) \[ R^2 = 0.842 \]

HALIBUT

\[ c = 0.40 C_3 \]

\[ B = C/37 \] (where 37 is catch per vessel in 1977)

\[ L = 4 B \]

HERRING

\[ L = 3B \]

3 = mean number of landings per boat 1974-1976
### TABLE 4 (continued)

**KING CRAB**

\[
\begin{align*}
B &= 222 - 4 \times 10^{6} C^{-2} - 14,948 \times 10^{6} CL^{-2} \\
&= (-1.00) \\
L &= 2,696 + 0.0331 C + 6.97 B + 820 \times 10^{6} Y^{-3} \\
&= (7.67) (15.1) (10.6) R^2 = 0.991
\end{align*}
\]

**TANNER CRAB**

\[
\begin{align*}
B &= 40.9 + 0.00225 C + 0.000791 CL \\
&= (3.83) (1.40) R^2 = 0.892 \\
L &= -2,296 + 0.0382 C + 5.00 B + 784 \times 10^{6} Y^{-3} \\
&= (6.51) (3.51) (4.72) R^2 = 0.981
\end{align*}
\]

**DUNGENESS CRAB**

\[
\begin{align*}
B &= 1.71 + 0.00375 C - 10.57 R P^{-1} + 668,000 KC^{-1} \\
&= (3.29) (-4.58) (3.44) R^2 = 0.917 \\
L &= -68 + 0.010 C + 10.93 B \\
&= (1.11) (7.02) R^2 = 0.958
\end{align*}
\]
TABLE 4 (continued)

SHRIMP

\[ B = \frac{\text{mean } C/B}{C} \]

\[ L = \frac{\text{mean } C/L}{C} \]

<table>
<thead>
<tr>
<th></th>
<th>Otter Trawl</th>
<th>Beam Trawl</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969-1976 mean C/B</td>
<td>41,255</td>
<td>127.5</td>
</tr>
<tr>
<td>1969-1976 mean C/L</td>
<td>60</td>
<td>13.76</td>
</tr>
</tbody>
</table>

SALMON

**Purse seine**

\[ L = -1.51 + 0.126 C + 6.256 B \]

\[ \text{t-statistics} \quad (3.08) \quad (1.41) \]

\[ R^2 = .80 \]

**Drift gillnet**

\[ L = -1.858 + 0.167 C + 9.346 B \]

\[ \text{t-statistics} \quad (1.56) \quad (1.87) \]

\[ R^2 = .71 \]

**Set gillnet**

\[ L = 4.068 + 0.418 C - 2.225 B \]

\[ \text{t-statistics} \quad (1.98) \quad (0.46) \]

\[ R^2 = .52 \]

HALIBUT

\[ c = 0.30 C3 \]

\[ B = \frac{C}{37} \quad (\text{where } 37 \text{ is catch in } 1,000 \text{ lbs. per vessel in 1977}) \]

\[ L = 48 \]
TABLE 4 (continued)

**HERRING**

\[ L = 6.3B \]

6.3 = Mean number of landings per boat 1974-1976

**KING CRAB**

\[
B = 66.177 + 0.0015C - 29.794 (1/T) \\
\text{t-statistics} \quad (0.232) - (-1.72) \quad R^2 = 0.52
\]

\[
L = 49.883 + 0.253C \\
\text{t-statistics} \quad (3.61) \quad R^2 = 0.68
\]

**TANNER CRAB**

\[
B = 6.781 + 0.0108C - 9.475 (1/Y) \\
\text{t-statistics} \quad (0.62) - (3.61) \quad R^2 = 0.64
\]

\[
L + 228.720 + 0.128C \\
\text{t-statistics} \quad (4.35) \quad R^2 = 0.76
\]

**DUNGENESS CRAB**

\[
B = 39.224 + 0.021C - 0.806 (1/RP) \\
\text{t-statistics} \quad (1.21) - (-2.53) \quad R^2 = 0.71
\]

\[
L = -111.996 + 0.401C + 10.951B \\
\text{t-statistics} \quad (4.63) + (8.45) \quad R^2 = 0.98
\]
TABLE 4 (continued)

POT SHRIMP

\[ B = 10.422 + 0.0615C \]
\[ t\text{-statistics} \quad (4.01) \quad R^* = 0.73 \]

\[ L = 52.919 + 1.732C \]
\[ t\text{-statistics} \quad (14.00) \quad R^* = 0.97 \]

TRAWL SHRIMP

\[ L = -141.730 + 0.101C + 231.364 (l/T) \]
\[ t\text{-statistics} \quad (4.38) \quad (2.25) \quad R^* = 0.81 \]

No regression equation has been found that adequately explains the variance in the number of boats in the fishery. The variance was relatively small.

The following equation was used to forecast the number of boats:

\[ B = C \left( \frac{\text{meanB}}{\text{meanC}} \right) \]

Prince William Sound

SALMON

Purse seine

\[ L = -151 + 0.099C + 6.87B \]
\[ t\text{-statistics} \quad (6.16) \quad (3.80) \quad R^2 = .97 \]

Drift gillnet

\[ L = 4215 + 0.853C \]
\[ t\text{-statistics} \quad (3.47) \quad R^2 = .67 \]
TABLE 4 (continued)

<table>
<thead>
<tr>
<th></th>
<th>Simulation</th>
<th>c= 0.03 C3</th>
<th>B = C/37 (where 37 is catch in 1,000 lbs. per vessel in 1977)</th>
<th>L = 4B</th>
</tr>
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</table>

**HALIBUT**

**HERRING**

**Purse Seine**

L = 2.4B

2.4 = Mean number of landings per boat 1974-1976

**Roe on Kelp**

L = 5.5B

5.5 = Mean number of landings per boat 1974-1976

**KING CRAB**

\[
B = 12.627 + 0.0433C \\
\text{t-statistics} = (2.79) \\
R^2 = 0.56
\]

\[
L = 37.802 + 0.407C + 0.433B \\
\text{t-statistics} = (2.39) (0.14) \\
R^2 = 0.74
\]

**TANNER CRAB**

\[
B = 18.443 + 0.00315C - 5.009 (1/Y) \\
\text{t-statistics} = (5.44) (-0.56) \\
R^2 = 0.92
\]

\[
L = 129.913 + 0.0658C \\
\text{t-statistics} = (3.21) \\
R^2 = 0.32
\]
TABLE 4 (continued)

DUNGENESS CRAB

\[ B = 2.83 + 0.0506C \quad T\text{-statistics} \quad R^2 = 0.54 \]
\[ L = -71.56 + 0.0506C \quad t\text{-statistics} \quad R^2 = 0.73 \]

Yakutat

SALMON

Set Gill Net

\[ L = -161.97 + 0.797C + 11.376B \quad t\text{-statistics} \quad R^2 = 0.80 \]

HALIBUT

\[ c = 0.015C^3 \]
\[ B = C/37 \text{ (where 37 is 'catch in 1,000 lbs. per vessel in 1977)} \]
\[ L = 4B \]

TANNER CRAB

\[ B = C/340 \]
\[ 340 = 1977 \text{ catch per boat in 1,000 pounds} \]
\[ L = C/43 \]
\[ 43 = 1977 \text{ catch per landing in 1,000 pounds} \]
### TABLE 4 (continued)

**DUNGENESS CRAB**

\[ B = \frac{C}{165} \]

165 = 1977 catch per boat in 1,000 pounds

\[ L = \frac{C}{18} \]

18 = 1977 catch per landing in 1,000 pounds

**KING CRAB**

The king crab catch is expected to be primarily incidental catch in other crab fisheries, therefore, the king crab fishery is not expected to contribute to the number of boats or landings in the Yakutat fisheries.

The meanings of the previous symbols are as follow:

- \( L \) = number of landings
- \( c \) = catch in 1,000 pounds
- \( B \) = number of boats
- \( LC \) = last year's catch in 1,000 pounds
- \( Y \) = the year, 1969 = 1
- \( RP \) = real ex-vessel price (dollars/pound)
- \( KC \) = Kodiak king crab catch in 1,000 pounds
- \( C3 \) = area 3 halibut catch in 1,000 pounds
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Technical Report
Number 26

Alaska OCS Socioeconomic Studies Program

Sponsor: Bureau of Land Management

Alaska Outer Continental Shelf Office

Developing Predictive Indicators of Community and Population Change
The United States Department of the Interior was designated by the Outer Continental Shelf (OCS Lands Act of 1953) to carry out the majority of the Act's provisions for administering the mineral leasing and development of off-shore areas of the United States under federal jurisdiction. Within the Department, the Bureau of Land Management (BLM) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of off-shore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socio-economic and environmental information to improve OCS decision making at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, the BLM has initiated several investigative programs, one of which is the Alaska OCS Socioeconomic Studies Program.

The Alaska OCS Socioeconomic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS Petroleum Development upon the physical, social, and economic environments within the state. The analysis addresses the differing effects among various geographic units: the State of Alaska as a whole, the several regions within which oil and gas development is likely to take place, and within these regions, the various communities.

The overall research method is multidisciplinary in nature and is based on the preparation of three research components. In the first research component, the internal nature, structure, and essential processes of these various geographic units and interactions among them are documented. In the second research component, alternative sets of assumptions regarding the location, nature, and timing of future OCS petroleum development events and related activities are prepared. In the third research component, future oil and gas development events are translated into quantities and forces acting on the various geographic units. The predicted consequences of these events are evaluated in relation to present goals, values, and expectations.

In general, program products are sequentially arranged in accordance with BLM's proposed OCS lease sale schedule, so that information is timely to decision making. In addition to making reports available through the National Technical Information Service, the BLM is providing an information service through the Alaska OCS Office. Inquiries for information should be directed to: Program Director (COAR), Socioeconomic Studies Program, Alaska OCS Office, P.O. Box 1159, Anchorage, Alaska 99510.