COMMERCIAL FISHING INDUSTRY OF THE BERING SEA

OCS Study
MMS 90-0026

Social and Economic Studies

U.S. Department of the Interior
MMS Minerals Management Service
Alaska Outer Continental Shelf Region

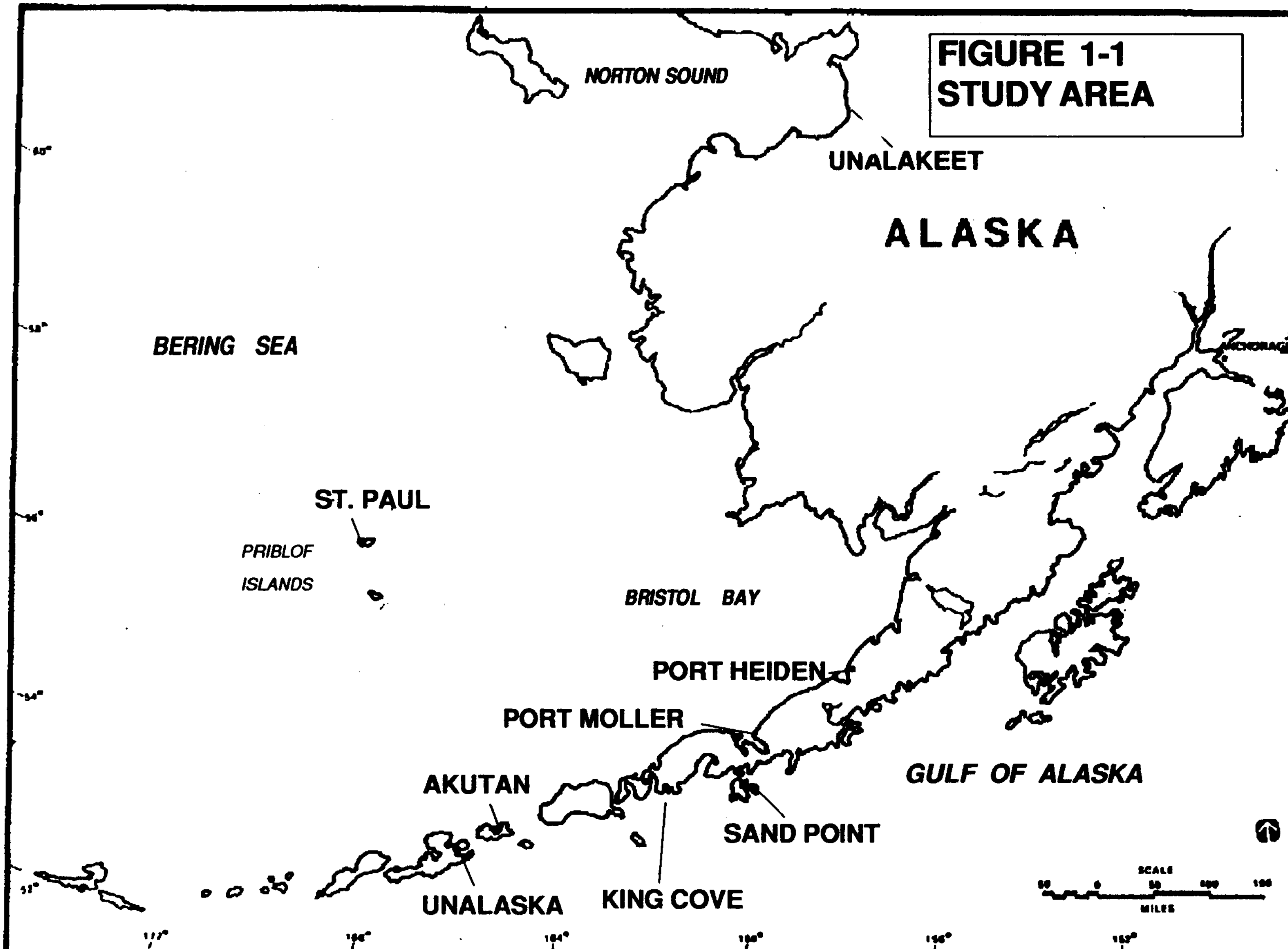


FIGURE 1-1
STUDY AREA
NORTON SOUND
UNALAKEET
ALASKA
BERING SEA
ST. PAUL
PRIBLOF
ISLANDS
BRISTOL BAY
PORT HEIDEN
PORT MOLLER
AKUTAN
SAND POINT
GULF OF ALASKA
UNALASKA
KING COVE
SCALE
MILES

Technical Report No. 138

OCS Study
MMS 90-0026
Contract No. 14-12-0001-30406

Final Technical Report

COMMERCIAL FISHING INDUSTRY OF THE BERING SEA

Prepared for

Minerals Management Service
Alaska Outer Continental Shelf Region
Leasing and Environment Office
Social and Economic Studies Unit

by:

Northern Economics

with

Jon Isaacs and Associates

ResourcEcon

Resource Valuations, Inc.

June, 1990

NOTICE

ACKNOWLEDGEMENTS

The study team wishes to gratefully acknowledge the support and cooperation of the residents, fishermen, and processing plant personnel in the study communities, and staff of numerous agencies and organizations supplying secondary data.

This report was prepared under the helpful guidance of Mr. Kevin Banks, Minerals Management Service. Principal authors were Patrick Burden of Northern Economics, James Richardson of ResourcEcon, Jon Isaacs of Jon Isaacs and Associates, with assistance from William Jensen and Hans Radtke of Resource Valuations, Inc.

Document is available to the public through the
National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

ABSTRACT

The Bering Sea is a frontier area for Outer Continental Shelf (OCS) petroleum exploration and an area of bountiful fisheries harvests in the North Pacific. In addition to a number of investigations about the physical environment of the Bering Sea, the Minerals Management Service (MMS) has conducted four studies since 1980 to predict and analyze potential impacts and changes in commercial fishing due to oil and gas activities. MMS also conducts economic and demographic forecasts for the regions and communities that may host onshore OCS activities. The commercial fishing industry is the most important and most volatile economic sector in the region. Any assessment of prospects for economic growth among the communities is dependent upon an accurate understanding of the importance of the fishing industry.

The purpose of this study is to provide MMS with an update of the earlier commercial fishing studies with the focus on contribution of the industry at the community level. The study examines the overall status of the commercial fishing industry in the Bering Sea, identifies the share of the industry captured by the several principal ports, and develops a forecast of the commercial harvest and fishing related employment.

The objectives of the study are to: (1) Describe the current status of the Bering Sea fishing industry and the nature of the involvement of the principal Alaska communities that participate in it, and (2) provide a forecast of future harvest levels and employment for both the industry and the principal fishing communities.

The Bering Sea study area defined by MMS includes the geographic region bound to the south by the Alaska Peninsula and the Aleutian Islands, bound to the north by the Bering Straits, and encompassing state and federal waters within the 200-mile fishery conservation zone. The communities investigated are Akutan, King Cove, Port Heiden, Port Moller, Sand Point, Unalakleet, and Unalaska/Dutch Harbor. The project entailed a literature review, field work in the study communities, and extensive use of unpublished computer data base files obtained by MMS from the Alaska Commercial Fisheries Entry Commission and National Marine Fisheries Service. This information was used to describe the Bering Sea fishing industry, and the relationship of the industry to the study communities.

Based on review of the literature, discussions with industry and agency personnel, and development of a simulation model of the Bering Sea fishing industry, researchers concluded that the Bering Sea groundfish and crab fleets are near the point where the resources cannot financially support additional vessels in the fisheries. Ongoing expansion and construction of shoreside processing plants and at-sea processors and catcher/processors will result in excess processing capacity by 1991.

Much of the harvesting sector is dependent upon a single species for a majority of its revenues. The groundfish industry trawl fleet is dependent upon walleye pollock for its financial health, and the crab fleet is supported mainly by C. opilio crab. The traditional coastal small boat fleet relies upon salmon for most of its revenues.

The economic base of Bering Sea communities is dependent on the local fishing fleets and processing plants. The present high utilization levels for major fishery stocks will exacerbate any decline in resource levels because, with the exception of very low-value species, there are no new fisheries left to exploit. In addition, competition for remaining stocks is increasing. As a result, fisheries management agencies are facing difficult allocation issues with decisions that require extended amounts of time which strain resources of the agencies..

Incidental catch of non-target species, declining marine mammal populations, limited funds for research, and high seas interception of salmon stocks are other issues facing management agencies and the fishing industry which require time and resources to overcome.

Many species of groundfish are near their historic peaks of abundance, although stocks of walleye pollock, which is the most important species, are declining. C. opilio crab stocks have maintained record catch levels for several years, but other crab stocks are well below their peak harvest of the late 1970's and early 1980's. Record salmon harvests occurred in the Bering Sea during the past decade.

Study area residents are primarily salmon fishermen. Local residents use their salmon vessels to pursue herring, halibut, sablefish, and Pacific cod to a lesser degree. The trawl fleet and the pollock fishery primarily involve vessels from Puget Sound ports.

There are distinct regional differences between the Alaska Peninsula/Aleutian Islands, Norton Sound, and the Pribilof Islands in the nature of the fisheries and the resulting effects on the communities. In the Alaska Peninsula/Aleutian Islands, fishery resources are generally more diverse, more abundant, have higher value, and have been exploited for a longer period of time than in the other two regions. This has led to a wider range of participation in commercial fishing activities, and a higher level of individual, commercial, and industrial benefits. In the remaining two regions, commercial fishing still plays a significant role as a source of cash income (Norton Sound) or represents future economic development (Pribilof Islands).

Processing plants in Akutan, Saint Paul, and Unalaska/Dutch Harbor primarily handle crab and groundfish. Other plants in the study area focus on salmon although other species may be processed. Few local residents are employed in processing plants, and non-resident processing employees increase community population on a seasonal basis. Increasing numbers of factory trawlers and floating processors have accounted for the majority of the increase in processing capacity in the Bering Sea.

Local communities have an interest in maintenance of the fisheries resource base and the health of the fishing fleets because commercial fishing and processing are major sources of employment and wage and non-wage income. In rural Native communities, the lack of other employment opportunities makes fishing income and employment even more important. In addition, in many communities fish processing companies develop their own dock, electric, fuel, and water infrastructure which are often used directly by a community, or are available as a backup.

Local taxation of processed and landed products, processing plants and fishing vessels, and the raw fish tax which the state shares with communities are major sources of government income. These revenues fund local government jobs, services, and public works improvements, and also contribute to municipal permanent funds in some communities. Such revenues also allow communities more flexibility in developing, operating, and maintaining infrastructure. They are less dependent on user charges to cover costs, and less dependent on state revenue sharing.

The presence of a significant fishing industry improves the quality of life in local communities by 1) providing employment and income, 2) creating municipal revenues, 3) providing demand-based justification for state funding of capital projects, 4) providing a user base (fleet and processors) which generates service charge revenues to cover or assist with operations and maintenance costs and amortization of infrastructure, and 5) reducing costs to local residents by requiring additional transportation and other business services.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 Purpose and Scope of the Study

The Bering Sea is a frontier area for Outer Continental Shelf (OCS) petroleum exploration and an area of bountiful fisheries harvests in the North Pacific. The fisheries that occur in the Bering Sea are some of the largest in biomass and value in the world. The Minerals Management Service (MMS) has recognized that damage to the resource or conflict with human activity may occur as a result of OCS exploration. .

MMS and other federal and state agencies are charged with protecting the human and natural environments in addition to permitting development of the resources of the Outer Continental Shelf. The Outer Continental Shelf Lands Act, as amended Section 20, mandates MMS to study the environment to obtain data pertinent to sound leasing decisions. These environmental studies are conducted to assist in prediction, assessment, and management of effects of proposed oil and gas leasing and development on the human, marine, and nearshore waters.

The MMS has supported a number of studies related to fisheries research and community socioeconomic and sociocultural systems in the Bering Sea. Studies of the physical environment have encompassed literature reviews, distribution and abundance studies, ecosystem studies, and modeling studies to describe regional oceanographic circulation patterns. In addition, MMS has conducted 4 studies since 1980 through its Social and Economic Studies Program (SESP) to predict and analyze potential impacts and changes in commercial fishing industries due to OCS oil and gas activities. Topics covered in these studies have included the fisheries data bases, competition for labor, ocean space use, collisions, gear loss, and competition for onshore infrastructure and harbor facilities. Because of the nature of the available secondary source data, there was limited discussion of the contribution of the industry to the economies of local communities in these reports.

The SESP has also conducted economic and demographic forecasts for the State of Alaska, and the various regions and communities that may be sites of onshore OCS activities. This work has been conducted by the Institute of Social and Economic Research of the University of Alaska and has resulted in a set of three related models:

1. Man-in-the Arctic Program Model (MAP);
2. Small Community Impact Model (SCIMP); and
3. Rural Alaska Model (RAM).

All three of these models were developed to analyze the impact of OCS or other developments. MAP is a statewide and regional model, and SCIMP was developed in order to model OCS impacts on the census division level. Over time, SCIMP has been adopted to model impacts on individual communities, and RAM was designed to examine project impacts on population and resident employment on rural Alaska communities. All of the models depend on an economic base model, and employment and other parameters for exogenous industries (such as fishing and fish processing) are estimated outside of the models. The outcome of projections is affected by these estimates and "uncertainty about the level of future employment opportunities (particularly in the bottomfish industry) contributes to uncertainty in our ... projections" (Knapp and MarkAnthony, 1984).

Other important assumptions to these models include labor force participation rates, and estimates of the proportion of migrants who become residents. These "local hire" related assumptions are critical since the share of employment that goes to Alaska residents, and local (community or regional specific) residents define a majority of the initial effects of economic activity on a community.

The MMS relies upon the information developed in these fishing industry studies, and the forecasts developed through the various models to develop an environmental impact statement (EIS) which assesses the impacts associated with the proposed action and results in development stipulations. The information available to MMS from these reports and models is significant since the fishing industry is the most important economic sector in the Bering Sea region, and expansion of the groundfish industry is expected to be the driving force for growth in the region. The rapidly changing conditions in the Bering Sea fishing industry also make it difficult for MMS staff to employ the findings and forecasts of previous reports to estimate future levels of activity.

Projections of future activity in the Bering Sea fishing industry are a primary influence on the base case (without OCS activity) economic and population projections in forthcoming EISs. Potential impacts from growth associated with OCS activity will vary according to possible stresses placed on a community or region from the level of fishing industry activity. OCS activities could exacerbate difficult situations during fishing "boom" times, or they could provide jobs and income during times of low fishing harvests. Methods that can be used by MMS staff to estimate the level of future activity in the fishing industry, and define the relationship of the industry to the local economic structure of the communities in the region are needed to improve the accuracy of OCS impact assessments.

MMS contracted with Northern Economics, in association with ResourcEcon and Jon Isaacs and Associates, to obtain more current information on the Bering Sea commercial fishing industry and to acquire a model that can be used to estimate fisheries resources harvest levels and fishing industry employment in local communities. The emphasis of the study is on the contribution of the fishing industry to local community economies.

1.2 General Methodology

The Bering Sea study area is defined as the geographic region bound to the south by the Alaska Peninsula and the Aleutian Islands, bound to the north by the Bering Straits, and encompassing state and federal waters within the 200-mile fishery conservation zone. The communities investigated in this study are Akutan, King Cove, Port Heiden, Port Moller, Sand Point, St. Paul, Unalakleet, and Unalaska/Dutch Harbor (See Figure 1.2-1). These communities were recognized by MMS as fishing communities which may be affected by OCS activities.

King Cove and Sand Point are located on the south side of the Aleutian Peninsula on the Gulf of Alaska and are not within the boundaries of the study area. They are included in this study since fishermen from these communities operate in the Bering Sea, and local processors obtain fish from within the region.

The major effort for this study was conducted from July, 1987 through November, 1987. As described below, information was obtained from published documents, unpublished computer files and other materials, and interviews with industry and community representatives. Field verification was not included but will be partially achieved through public and industry review of the draft final report.

In the initial phase of the study, the project team assembled and reviewed available published documents for pertinent data. The primary sources were previous MMS reports related to fisheries, fishing industry publications, National Marine Fishery Service (NMFS) files and reports, North Pacific Fisheries Management Council reports and newsletters, regional newspapers, local government plans and related documents, and publications from various state agencies.

The extracted data were reviewed for timeliness and adequacy for the project, and data gaps were identified. The necessary additional data were obtained by further research of documents or file data, and through interviews with (1) fishermen operating from each port, (2) processors or buyers in each community, (3) local government representatives, and (4) staff members of state and federal public agencies.

Contacts were made with fishermen representing each major gear type, representatives of firms providing services or equipment to the fishing fleets, managers of local processing plants, and local government officials. Because of the different types of data required from each industry or community segment, different sets of questions were asked of each major group. This arrangement assured full coverage and comparability in the quality of data collected from the respondents.

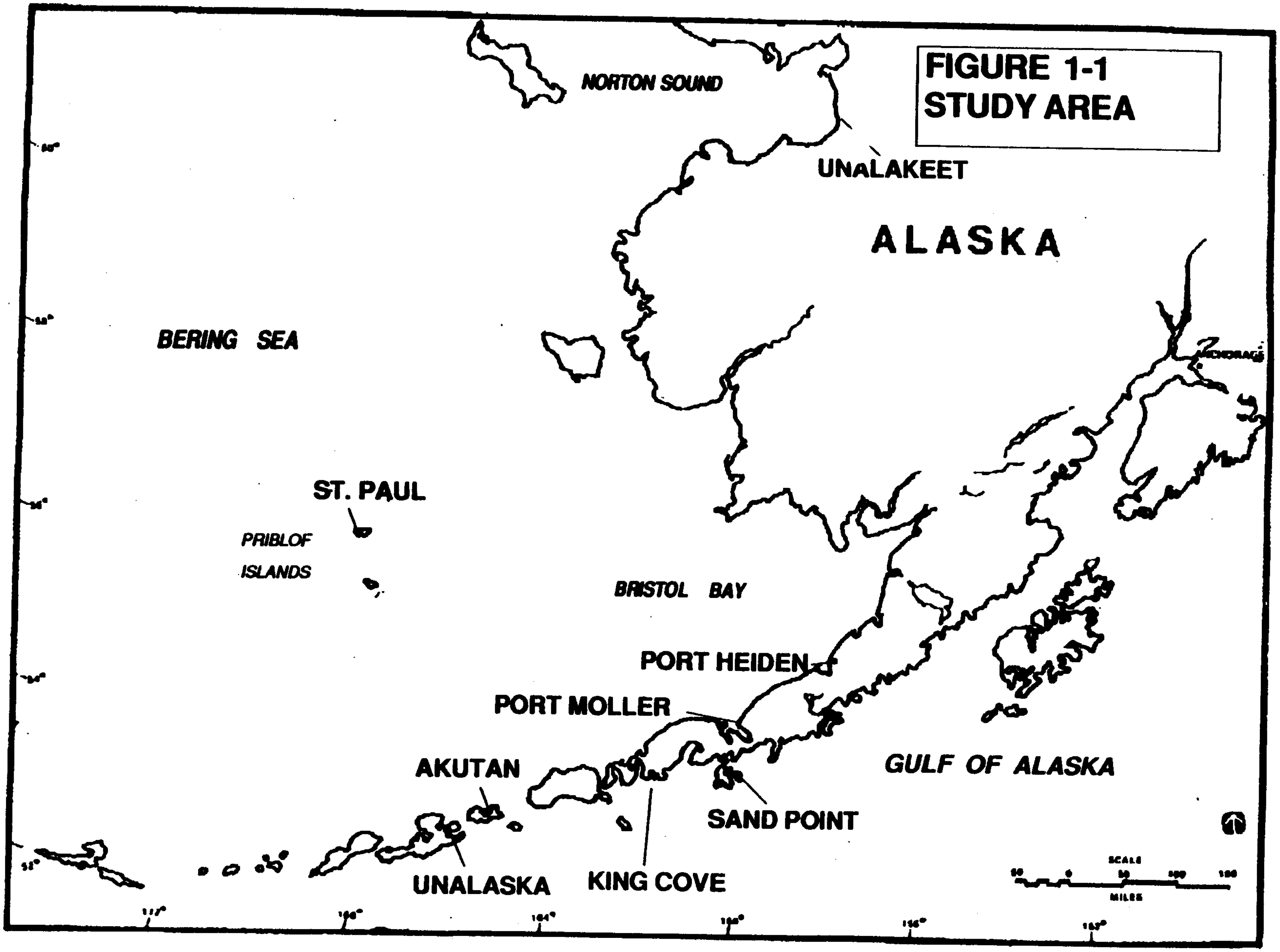


FIGURE 1-1
STUDY AREA
NORTON SOUND
UNALAKEET
ALASKA
BERING SEA
ST. PAUL
PRIBLOF
ISLANDS
BRISTOL BAY
PORT HEIDEN
PORT MOLLER
AKUTAN
UNALASKA
KING COVE
SAND POINT
GULF OF ALASKA
SCALE
MILES

An important aspect of contacts with industry representatives was the verification of operational data. Verification was necessary since published data sources were often out-of-date or were sometimes in disagreement. In addition, the fishermen and processors represent an extensive source of detailed information whereas information presented in general interest publications or even trade journals often did not meet the level of detail and specificity required for this study.

Prior to proceeding with this project MMS recognized that comprehending the relationships between local communities and the domestic and foreign fishing fleets would require specific information that is not generally available. As a result, MMS entered into interagency agreements with the Northwest and Alaska Fisheries Center (NWAFC) of NMFS and with the Alaska Commercial Fisheries Entry Commission to obtain detailed harvest and resource data. They also entered into agreement with the Alaska Department of Labor (DOL) to acquire employment data disaggregated to the community level where possible.

Certain information was not received until mid-1989 due to differences between current and prior contracts, priorities for agency staff, and timing of the federal fiscal year. To a large extent, tables which present the data received from these agencies have been updated to include 1987 and 1988 data. However, much of the analysis is based upon the 1986 and 1987 data which were available at the time of the field work, and preparation of the earlier technical memoranda.

1.3 Study Area

For purposes of this report the study area is defined as the geographic region bound to the south by the Alaska Peninsula and the Aleutian Islands, bound to the north by the Bering Straits, and encompassing State waters and Federal waters within the 200-mile Fishery Conservation Zone. This region includes a number of different State and Federal management areas and parts of others. Some areas are salmon or herring only, and others are for groundfish and crab. The management areas (as defined by the Alaska Commercial Fisheries Entry Commission and National Marine Fisheries Service) included in this discussion of Bering Sea fisheries are:

Peninsula/Aleutians;
Nelson/Nunivak;
Dutch Harbor;
Bering Sea;
Adak;
Security Cove;
Bristol Bay;
Kotzebue;
Norton Sound; and
Aleutian Islands.

Selection of these areas is not totally consistent with the Bering Sea definition proposed by MMS. For example, the Peninsula/Aleutians and Aleutian Islands areas includes part of the Gulf of Alaska, but eliminating these areas requires an order of magnitude increase in the level of detail required for analysis. Parts of the Lower Yukon and Kuskokwim/Goodnews Bay management areas are in the Bering Sea, but are excluded from this definition since the majority of fishing effort occurs upriver from the Bering Sea coast.

Much of the computer data base information available for this study is at a community level. Selecting which communities comprise the set of Bering Sea communities can be the subject of extensive discussions, since even Yukon River fishermen in Canada can be considered dependent on salmon from the Bering Sea. Conversely, Anchorage residents possess a significant number of the limited entry salmon permits in western Alaska, and the majority of the groundfish fleet hails from Puget Sound ports. The basis for selecting the following communities was location on, or in very close proximity to the Bering Sea. Inclusion or omission of several communities could be argued but the set of communities listed in Table 1.3-1 is thought to provide a representative data base for this analysis.

This report is divided into three major sections: Descriptive material on Bering Sea fisheries (Section 2.0), a discussion of the interaction between the industry and eight local communities (Section 3.0), and the harvest and employment forecast model (Appendix A).

Table 1.3-1: Bering Sea Communities

Adak	Kongiganak	Saint George Island
Akutan	Kotzebue	Saint Michael
Alakanuk	Koyuk	Saint Paul Island
Aleknagik	Kwigillingok	Sand Point
Alitak	Mekoryuk	Scammon Bay
Atka	Naknek	Selawik
Clarks Point	Kotlik	Shaktoolik
Deering	Nelson Island	Sheldon Point
Dillingham	Nelson Lagoon	Shishmaref
Dutch Harbor	Newtok	South Naknek
Egegik	Nightmute	Stebbins
Elim	Nome	Teller
False Pass	Pilot Point	Togiak
Golovin	Platinum	Toksook Bay
Goodnews Bay	Point Hope	Tununak
Hooper Bay	Port Heiden	Ugashik
King Cove	Port Moller	Unalakleet
Kivalina	Quinhagak	Unalaska

2. CHARACTERISTICS OF THE BERING SEA FISHERIES

2.1 Introduction

The waters of the eastern Bering Sea and Aleutian Islands area contain some of the richest fisheries in the world. Large quantities of groundfish, herring, salmon, crab and other species are harvested from the study area each year. This report presents the harvest of salmon, groundfish, herring and crab through 1989 and projections of future harvests through 2010.

The communities included in this study are located within the Alaska Peninsula/Aleutian Islands and the Norton Sound management areas. Fishermen from these communities may fish in other areas but the major effort occurs in local areas. The salmon fishery in Bristol Bay and the herring fishery in Togiak are also included since they contribute to income and fisheries employment for some fishermen living in the target communities.

The information presented and referenced in this section provides the base for the Bering Sea Fishing Industry Model (FIM) discussed in the Appendix A. The projections and forecasts shown in this section are taken from other sources and are not a function of the FIM output.

2.2 Regulatory and Management Structure

General resource abundance and structure of the fisheries for the various species are an important consideration in estimating future harvest levels. It is equally important to note the overriding limits imposed by fisheries management. The following section briefly describes the various management agencies that are involved in managing fisheries in the study area. Since all of the commercial fisheries are managed on a sustained yield basis under quotas, selection of different management measures by the agencies may be as important as a change in the resources. Allocation among various portions of the industry are particularly susceptible to change in management regimes. Future decisions by the various management agencies can alter the structure of the fisheries.

2.2.1 Management Agencies

Commercial fishing in Bering Sea waters and other areas of Alaska, are managed by one or more of several regulatory agencies. Inshore fisheries, those occurring within three miles of Alaska's shoreline, have been managed by the Alaska Department of Fish & Game since statehood in 1959. Offshore waters, three to 200 miles, have been managed by the North Pacific Fishery Management Council since it was formed in 1976. Outside of the 200 mile limit, fisheries off Alaska are managed by international treaty agreement. The structure and species managed for each of the different agencies is discussed below.

2.2.1.1 Alaska Department of Fish & Game

The Alaska Department of Fish & Game (ADF&G) is responsible for maintenance, protection, and development of the fishery resources of Alaska. The Commissioner of

ADF&G has the responsibility for operations and administration of the divisions within ADF&G. The divisions are: Sport Fisheries Division, Commercial Fisheries Division, Game Division, Fisheries Rehabilitation and Enhancement Division (FRED), Habitat Division, Subsistence Division, Administrative Division and Division of Boards. All divisions, with the exception of the Game Division, contribute in some way to overall fisheries management.

The Alaska Board of Fisheries develops fisheries policy for ADF&G. The seven member board is appointed by the Governor to promulgate regulations and policy for fisheries management of Alaska's fisheries resources. They meet at least twice a year to review proposed fishery regulation changes and decide regulations to be placed in effect.

ADF&G has statutory authority for fisheries resource management within Alaska's territorial waters (from shore to three miles offshore). However, many of Alaska's fisheries occur beyond this limit. Examples are the king crab and tanner crab fisheries where most catches are made outside the three mile limit. The North Pacific Fisheries Management Council has given ADF&G authority to manage shellfish resources within waters of the EEZ around Alaska. ADF&G maintains management authority for other fishing activities beyond the three mile limit through landing laws. This means that a fisherman has to comply with Alaska's fishery regulations if he wants the capability to land on shore in Alaska. Those groundfish fisheries operating entirely outside the territorial waters have posed some difficult management issues for ADF&G in the past.

2.2.1.2 International North Pacific Fishery Commission

The INPFC was established in 1953 by convention between the United States, Japan and Canada. The INPFC is responsible for resolution of fishery management issues in areas not covered under the member nations' 200 mile fishery conservation zones. The operation of the INPFC is of particular importance to Alaska since a Japanese high seas salmon fishery operates in the Bering Sea outside of the U.S. Fisheries Conservation Zone (FCZ) and is not regulated by any other agency.

The INPFC provides a forum for exchange of scientific data on the fisheries of interest to the member nations through publications and regularly scheduled meetings.

2.2.1.3 International Pacific Halibut Commission

Management authority for regulation of the halibut fishery is the responsibility of the International Pacific Halibut Commission (IPHC). The IPHC was established by convention between Canada and the United States in 1923. The biological research produced by this cooperative management authority is a comprehensive body of data for their single target species - halibut. Because the IPHC predates the implementation of the MFCMA, the IPHC retains management authority for the halibut fishery.

2.2.1.4 North Pacific Fishery Management Council

Groundfish and other species in Alaska's Fishery Conservation Zone (FCZ) are managed by the North Pacific Fishery Management Council (NPFMC). The NPFMC is one of eight regional Councils established in 1976 by the Magnuson Fisheries and Conservation Act (MFCMA). The NPFMC meets regularly to review data on the fisheries resource and make recommendations for regulations. Their recommendations are made to the Secretary of Commerce, and if approved, gain the force of law. The NPFMC also makes recommendations to the Secretary concerning allocations of groundfish to joint-ventures and direct allocations to foreign nations.

2.2.2 Current and Future Management Issues

Fisheries issues come before the regulatory agencies on a continual basis. Some of the issues involve biological conservation of the resource, others involve use patterns or allocation of the harvest among various user groups. Within Alaska's 200 mile limit, the most pervasive event in recent years has been the displacement of the foreign fleet with a domestic groundfish fleet. This growth was made possible by the Magnuson Fisheries and Conservation and Management Act of 1976. The foreign fishing allocations for the Bering Sea were ended by the North Pacific Fishery Management Council at their December, 1987 meeting.

For several years after its beginning in 1977, the NPFMC was able to make popular management decisions in reducing foreign fishing effort. Use conflicts did not cease, however, they just involve new players. The NPFMC has experienced much greater difficulty in mediating allocation disputes between domestic disputes than they enjoyed when dealing with foreign fisheries.

Several fisheries management issues are currently being proposed, discussed or are in the process of being analyzed for future management decisions. The manner in which these issues are resolved will, to some extent, shape the future fisheries in the Bering Sea. Several of these issues are discussed briefly below.

2.2.2.1 Limited Entry in the Groundfish Fisheries

While Alaska has had license limitation of its salmon fisheries since 1975 and many herring fisheries in the state have also been limited, groundfish fishing effort has not been limited. Limited entry in the halibut fishery has been investigated and analyzed for several years. Beginning in 1979, the NPFMC evaluated limited entry alternatives for the halibut fishery. They went so far as establishing a moratorium for entry into the fishery in 1982, but the moratorium was overturned by the Secretary of Commerce. After several more years of study, the Council seems to have backed off implementation of a limited entry program for the halibut fishery, although there is still a great deal of support among segments of the halibut fishermen fishing off Alaska.

The NPFMC has also had requests by fishermen to consider some sort of licence limitation program for sablefish. Since both sablefish and halibut are harvested by the same longline fishing groups, halibut limited entry has again emerged for consideration along with sablefish limited entry. In September 1987, the NPFMC adopted a Statement of Commitment to consider limited entry for the longline sablefish fishery, intending to have a system in place by 1989. The NPFMC may take action on a proposal to limit access in the longline fishery for sablefish in September, 1990.

The eventual decision on limited entry in the longline groundfish fisheries will potentially have a large impact on Bering Sea communities that participate in the sablefish and halibut fisheries. The key will be how participation factors are used to allocate fishing rights in the limited entry program. Many local fishermen in the communities within the study area have not had a long history of participation in the longline fisheries for halibut and cod. Exclusion criteria could potentially favor those with a longer history of participation. Concern over allocation criteria has stalled progress on implementing a system in past years and may continue to present an impediment in the future.

2.2.2.2 Onshore vs. Offshore

Joint-venture fisheries, where domestic fishermen deliver at-sea to foreign processing ships, provided a "bridge" for Americans to enter the groundfish fishery. The first joint-venture fishery off Alaska was in 1980 (for a detailed analysis of the initial year, see Fisher, 1980). The growth of the joint-venture fisheries turned out to be spectacularly successful. They rapidly displaced foreign directed fishing in the Bering Sea and Gulf of Alaska under the priority allocation mechanism of the MFCMA. However, the priority allocation that allowed joint-ventures to flourish now are putting them out of business.

The new allocation dispute is between the shorebased and offshore components (i.e., factory trawlers) of the groundfish industry. The NPFMC is currently evaluating management options that would allocate groundfish between these two user groups. Action on the proposals may take place by the end of 1990.

The quick growth of the domestic processing industry has fishery managers worrying about overcapitalization, in comparison to a few years ago when they were concerned with establishing American participation in the groundfish industry. The potential impacts of this shift in fishery development on communities within the study area are uncertain. It has resulted in an increased demand for fuel and other support services in Unalaska/Dutch Harbor, but Sand Point, King Cove, and other ports have not participated to any significant level in this increased demand.. The eventual mix of on-shore and off-shore processing of groundfish will depend upon the success of current companies, and possible allocation decisions by the NPFMC. The phase-out of joint-venture fisheries will result in some lost economic activities for Unalaska/Dutch Harbor, but the overall impact may be very positive.

2.2.2.3 Allocation of Fishery Resources

There are at least two regional allocation disputes over fisheries resources within the study area. Since 1981, there has been a developing food and bait fishery at Dutch Harbor. A herring sac-roe fishery that began a few years earlier in Togiak and other western Alaska communities growing rapidly after 1979. Proponents of the western Alaska herring fishery have successfully supported changes in fishery regulations in 1987 and 1989 which reduced the Dutch Harbor herring quota.

A second, and similar allocation conflict concerns the Alaska Peninsula salmon fishery. Fishermen from the Yukon/Kuskokwim area have focused attention on the June Unimak and Shumagin Islands fisheries (i.e., the False Pass fishery) which they feel catch chum salmon bound for their fishing grounds. While biological and management considerations enter into the issue, it is primarily an allocation of fishery resources between different Alaskan communities that is being contested.

In addition to major economic impacts to communities resulting from allocation decisions, the uncertainty caused by this system increases risk and costs to participants, and introduces instability into the social and economic base of local communities.

2.2.2.4 Bycatch

A third issue is the associated harvest of species that are caught while focusing efforts on another species or resource. This harvest of non-target species becomes meaningful when the non-target species are already fully harvested by another fishery, and/or are high value species. The NPFMC has established quotas for bycatch by various gear types. Time restrictions and area closures of the groundfish fishery can occur when these quotas are exceeded. Closures would result in the quotas of targeted species not being achieved. Until information from the recently enacted observer program on domestic vessels becomes available, the bycatch rates for different gear types are subject to considerable error.

2.3 Fisheries Resources

2.3.1 Finfish

2.3.1.1 Salmon

All salmon fisheries in the study area (and throughout most of Alaska) experienced a dramatic increase in the years following implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). The increase is attributed to the end of Japanese and other foreign nation's salmon fishing within 200 miles of the Alaskan coast, and adoption of effective management measures including limited entry. For example, Bristol Bay sockeye harvests jumped upward in 1979 and 1980, following the reduced levels of foreign fishing implemented in 1976.

Commercial salmon fisheries within the study area are managed by the Alaska Department of Fish & Game (ADF&G). Actual fishing does not occur throughout the entire area due to regulatory restrictions. The salmon fisheries are managed in relatively small defined areas and restricted with openings and closures to allow adequate escapement for spawning requirements. Seasons are constrained partly by regulations and partly by the availability of the salmon. Figure 2.3-1 shows the approximate periods when the major salmon harvesting activity occurs in the Bering Sea.

Alaska Peninsula/Aleutian Islands: Regulatory Area M includes all of the Aleutian Islands and the Bering Sea (north) side of the Alaska Peninsula east to Strogonof Point, and around the Gulf (south) side of the Peninsula to Kupreanof Point. The fishery is divided into three management areas: the North Peninsula, the South Peninsula and the Aleutian Islands. Each of the three areas has distinct characteristics. The North Peninsula districts and the South Peninsula districts are relatively equal in sockeye harvest. The South Peninsula districts typically contribute the larger share of king, pink, coho and chum harvests. The Aleutian Islands harvests are mostly pink salmon, with even years (e.g., 1988) producing much higher catch levels. Typically there is no commercial salmon effort to the west of Unalaska Island, although the area is open to fishermen. Salmon harvests by species from 1970 through 1989 for the Alaska Peninsula and Aleutian Islands area are shown in Table 2.3-1. Figure 2.3-2 shows the relative catch and value for each of the five species of salmon.

Figure 2.3-1: Bering Sea Salmon Seasons

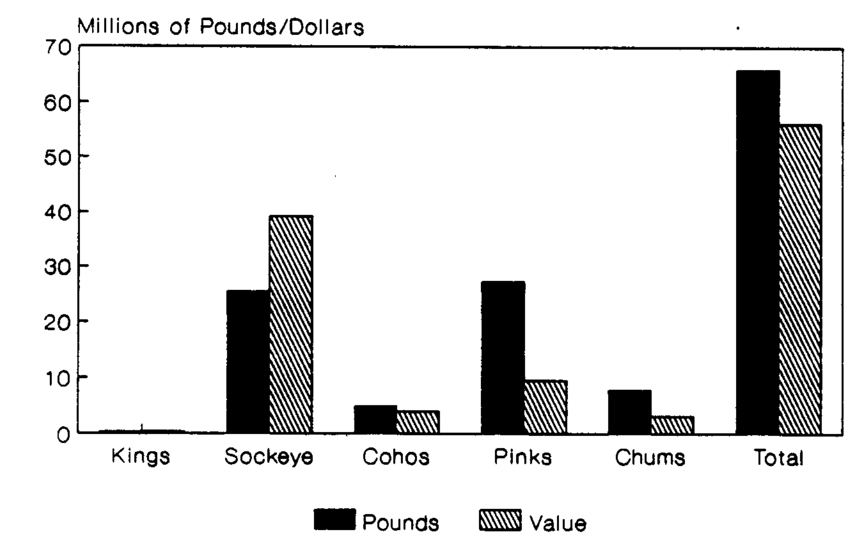
Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aleutian Islands						========						
North Peninsula						==============						
Unalakleet						=============						
Bristol Bay						===========						

Chinook, or king salmon, contribute a relatively small proportion of the total salmon catch on the Alaska Peninsula and Aleutians. For example, the 1989 king salmon harvest totaled 18 thousand. King salmon are the lowest of all five species in terms of the number of pounds caught and second lowest in terms of value.

Sockeye are by far the most important commercial species to fishermen from the Peninsula/Aleutians fisheries. In 1989, sockeye accounted for 39 percent of the total catch, but 70 percent of the total value. Figure 2.3-2 illustrates the overwhelming importance of sockeye.

Figure 2.3-2

Alaska Peninsula/Aleutian Salmon Harvest for 1989 Pounds and Dollar Value



Data Source: ADF&G 1990

Coho rank third in importance for the Alaska Peninsula fisheries in terms of value. As shown in Table 2.3-1 harvests of coho trended sharply upward after 1976, primarily due to greater abundance. Productive fishing areas include the river systems at Nelson Lagoon, Cinder River, Port Heiden and Swanson Lagoon (Alaska Department of Fish & Game, 1989).

The pink salmon harvest for the Alaska Peninsula ranked second in terms of total revenues. Even years (such as 1990) usually produce the largest harvests due to the two year cycle of pink salmon.

Chum salmon is an important species, although it contributes far less than sockeye. In 1989, for example, the chum catch accounted for 12 percent of the catch by weight, but only 6 percent of the value of the catch. As discussed in Section 2.2.3, the chum salmon catch in the Peninsula/Aleutians area is a cause of allocation disputes among fishermen in other communities in the Bering Sea.

Norton Sound: The salmon fishery near Unalakleet is managed by the Alaska Department of Fish & Game as a subdistrict of the Norton Sound management area. The Unalakleet subdistrict receives the most fishing effort in Norton sound. The other subdistricts include: Nome, Golovin Bay, Moses Point, Norton Bay and Shaktoolik. Commercial fishing in the area began in 1961, but has been hampered by insufficient processing facilities and sporadic fishing effort (Alaska Department of Fish & Game, 1989 and 1990, personal communication). In recent years, improvements in processing facilities have resulted in a more consistent and intensive fishery.

Table 2.3-1: Alaska Peninsula-Aleutian Islands Salmon Harvests
(in thousands of salmon)

Year	King	Sockeye	Coho	Pink	Chum
1970	5.0	1007.8	18.7	1403.7	1035.2
1971	4.4	1070.0	25.0	1495.9	1430.9
1972	3.1	737.4	17.6	80.8	812.2
1973	4.8	502.1	33.5	65.3	44.7
1974	5.6	452.6	33.4	110.2	106.8
1975	2.2	501.9	28.2	62.0	141.6
1976	7.0	1016.1	26.2	2367.6	606.1
1977	6.0	782.8	36.2	1449.5	372.3
1978	15.0	1477.5	124.0	6113.5	710.2
1979	19.2	3141.4	469.3	7114.9	548.9
1980	21.6	5019.3	402.1	10760.7	2056.3
1981	28.5	4105.5	317.8	5349.9	2483.7
1982	39.9	3784.0	494.0	8195.0	2609.7
1983	56.4	4654.4	202.8	2833.0	2067.2
1984	32.2	4120.1	507.7	13926.4	2487.1
1985	31.4	4817.9	340.3	4436.9	2078.8
1986	17.3	3694.4	400.1	4096.7	2059.7
1987	23.4	2659.3	396.5	1212.1	1745.0
1988	27.9	3005.3	739.5	7293.1	2299.2
1989	18.0	4404.4	667.8	7212.5	1154.4

Source: Alaska Department of Fish and Game, Annual Management Reports, various years.

Although king and coho salmon accounted for the majority of the early harvests in the fishery, their relative importance has declined due to the increase in harvest of other species. Table 2.3-2 shows the catch by species for the Unalakleet subdistrict for the years 1967 through 1986. Figure 2.3-3 shows the relative species contribution for 1986 pounds and value.

Table 2.3-2: Norton Sound Salmon Catches 1970-1989

YEAR	KING	SOCKEYE	COHO	PINK	CHUM
1970	1,853	0	4,423	64,908	107,034
1971	2,563	0	3,127	4,895	131,362
1972	2,938	0	454	45,182	100,920
1973	1,918	0	9,268	46,499	119,098
1974	2,951	0	2,092	148,519	162,267
1975	2,392	2	4,593	32,388	212,485
1976	2,243	11	6,934	87,919	95,956
1977	4,500	5	3,690	48,675	200,455
1978	9,819	12	7,335	325,503	189,279
1979	10,706	57	31,438	167,411	140,789
1980	6,311	40	29,842	227,352	180,792
1981	7,929	56	31,562	232,479	169,708
1982	5,892	10	91,690	230,281	183,335
1983	10,308	27	49,735	76,913	319,437
1984	8,455	6	67,875	119,381	146,442
1985	19,491	166	21,968	3,647	134,928
1986	6,395	233	35,600	41,260	146,912
1987	7,080	207	24,279	2,260	102,457
1988	4,096	1,252	37,247	74,604	107,966
1989	5,707	265	44,091	123	42,625

Source: Alaska Department of Fish and Game, 1990.

Sockeye play a very small part in the commercial harvest of salmon in Norton Sound. A few are taken incidental to the other species.

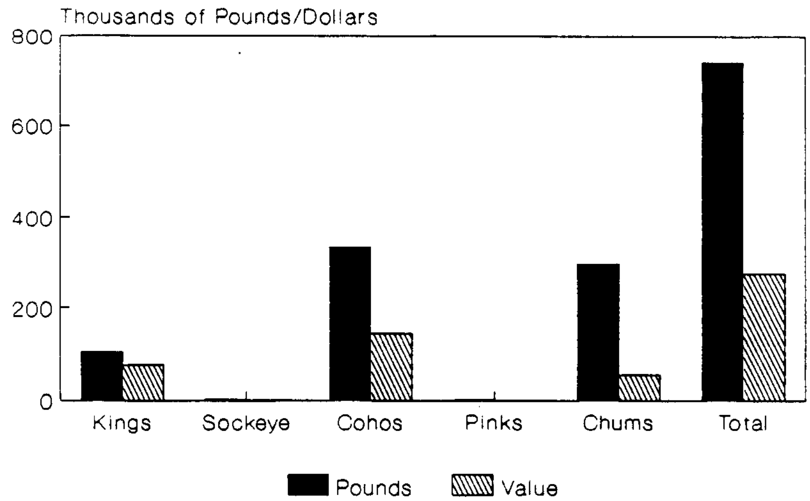
Pink salmon have contributed only a small amount to the Norton Sound salmon harvest in recent years due to below average returns and poor or nonexistent markets. In 1989, only 123 pink salmon were harvested.

Chum salmon account for the largest proportion of the commercial catch in Norton Sound, although their low value ($0.18 per pound in 1989) makes the value of the chum catch rank only third, behind king and coho.

Bristol Bay: Bristol Bay salmon fisheries include all waters inside of a line between Cape Newenham and Cape Menshikof. It is the largest sockeye fishery in the world and also produces substantial harvests of other salmon species, although at lower volumes than sockeye. The area is divided into five management districts: Ugashik, Egegik, Naknek-Kvichak, Nushagak and Togiak. The harvests by species for the years 1969 through 1989 are shown in Table 2.3-3. Figure 2.3-4 illustrates the dominant role of sockeye in the Bristol Bay fishery.

Figure 2.3-3

Norton Sound Salmon Harvest
for 1989: Pounds and Dollar Value



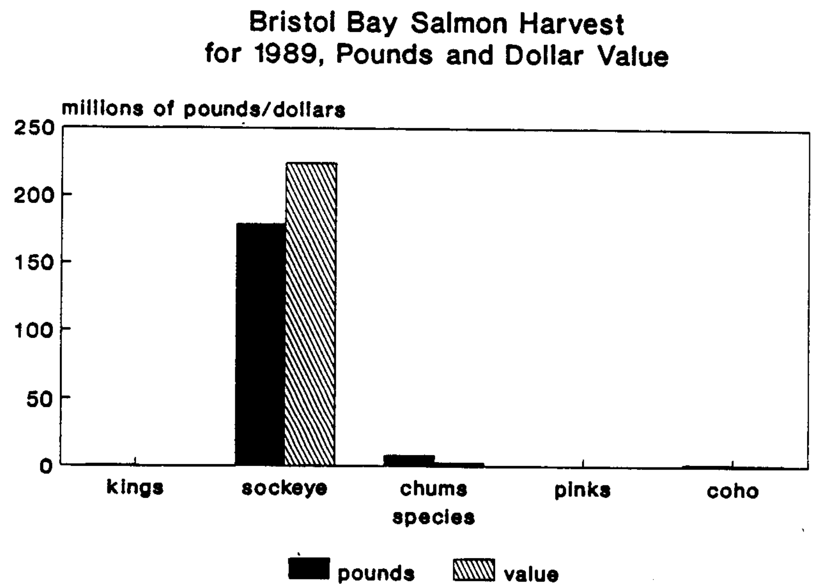
Data Source: calculated by ResourcEcon
data from ADF&G, 1990

Table 2.3-3: Bristol Bay Salmon Harvests
1969-1989 (thousands of salmon)

YEAR	KING	SOCKEYE	CHUM	PINK	COHO
1969	124,908	6,621,698	332,989	1,870	81,376
1970	·140,511	20,720,766	717,846	456,911	14,490
1971	123,015	9,583,987	676,906	212	12,709
1972	69,546	2,416,233	656,609	127,023	13,957
1973	44,044	761,322	684,498	387	57,042
1974	45,664	1,362,479	286,354	939,978	43,745
1975	29,992	4,898,814	325,417	422	46,281
1976	95,968	5,619,282	1,329,052	1,036,543	26,646
1977	130,526	4,877,880	1,598,164	4,517	107,215
1978	191,539	9,928,139	1,158,090	5,152,700	94,271
1979	212,873	21,428,606	906,797	3,849	294,399
1980	95,528	23,761,746	1,301,026	2,563,468	348,484
1981	237,304	25,603,081	1,504,828	7,280	313,705
1982	253,502	15,104,391	921,369	1,492,416	619,812
1983	198,609	37,372,031	1,632,181	484	128,101
1984	101,976	24,710,306	2,022,740	3,366,073	574,612
1985	120,441	23,702,883	1,068,461	457	162,822
1986	92,178	15,888,582	1,132,317	393,612	184,476
1987	75,947	16,047,834	1,510,089	,116	69,750
1988	45,135	13,863,917	1,477,015	935,870	201,750
1989	40,000	28,710,000	1,172,000	1,000	238,000

Source: Alaska Department of Fish & Game, Management Reports, various years.

Figure 2.3-4



Source: calculated by ResourcEcon
data from ADF&G

Harvest Projections:

Fishery forecasts are generally based on projections of four rate parameters. These parameters are: rates of fishing, natural mortality, growth, and recruitment. Recruitment is the most difficult to estimate and also is the greatest source of uncertainty in forecasts of future stock abundance and yield. Future recruitment estimates can be derived from spawner-recruitment models based on the relationship of historic recruitment to spawning stock, or in the absence of spawner-recruit relationship can be based on average or a range of historic recruitment levels.

The rate of fishing is the second most important factor in predicting future levels of abundance and yield. For Bering Sea stocks the rate of fishing is controlled by quota. Quotas are set to achieve a specified level of abundance which is predicted to achieve the optimum long term yield. Management varies quotas and yield in response to changes in abundance. An aggregate harvest ceiling for all groundfish species controls variations in groundfish yields.

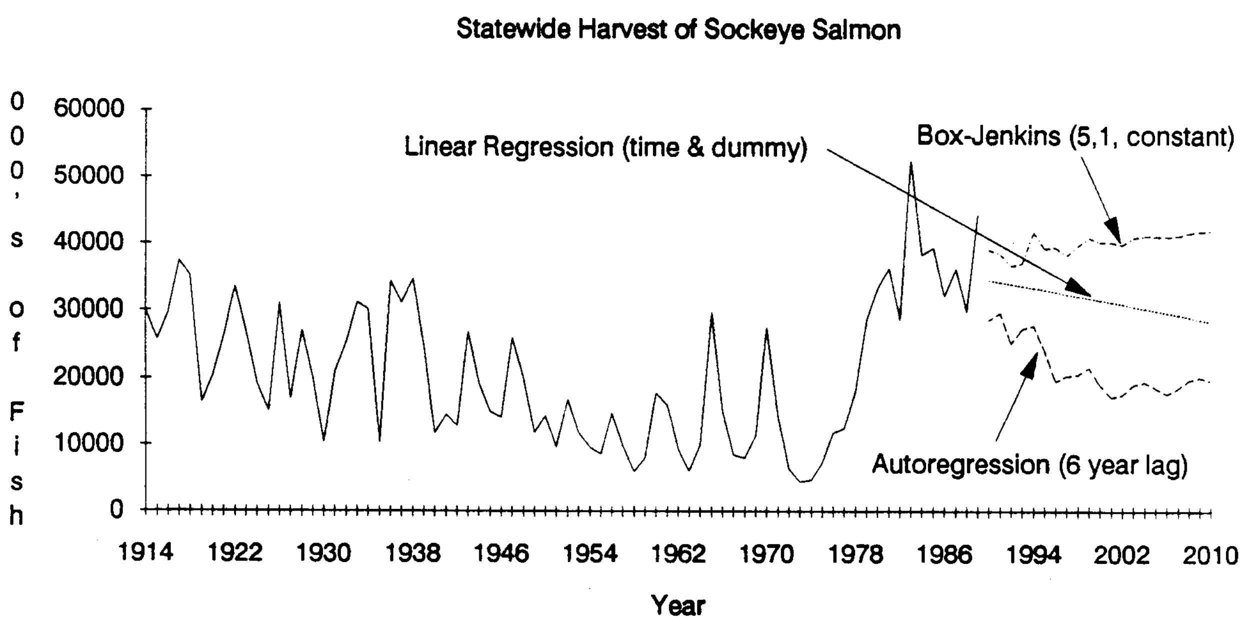
Within major commercial fishery stocks in the eastern Bering Sea, a spawner-recruit relationship has been found to exist for only one species, walleye pollock. Even though a relationship exists for pollock, there is still a considerable amount of residual variance which limits its value as a predictive tool. This uncertainty is a factor in the NPFMC's conservative approach to pollock quotas.

Yellowfin sole comprise the second most abundant commercial groundfish species in the eastern Bering Sea. For this species, there is not a clearly defined relationship between spawning stock and recruitment. In the absence of a spawner/recruit relationship, variability in future abundance was examined using variable recruitment. Three levels of recruitment were simulated: long term average, low and high recruitment levels.

The data for other flatfish groups is not of sufficient quality to perform detailed analysis. current estimates of abundance from trawl surveys show that populations of all species in this group are at an all time high.

For species other than groundfish, including salmon, herring, and shellfish, sufficient data do not exist to use the parameters described above to forecast future harvest levels. Several methods were evaluated to project future harvest levels for these species. These included simple harvest averages, linear regression, auto regression, and Box-Jenkins. As an example, Figure 2.3-5 shows projections of statewide harvest of sockeye salmon using several methods. This figure shows the linear regression estimate in the middle between the higher estimate obtained by Box-Jenkins, and the lower estimate obtained from autoregression.

Figure 2.3-5



The equations for these estimates with adjusted multiple coefficient of determination and t statistic are:

Box-Jenkins (with constant, 5 autoregressive terms, and 1 difference term, with (T-X)' representing the first difference)

182.8061-.48198*(T-1)'-.27054*(T-2)'-.37579*(T-3)'-.10967*(T-4)'+.21965*(T-5)'
(.396) (-4.039) (-2.042) (-2.930) (-0.834) (1.838)

$\bar{R}^2 = .491$

AR1 (regression with autocorrelation correction with constant and 6 autoregressive terms)

3006.762+1.1415*(T-1)-.5657*(T-2)+.3634*(T-3)-.0621*(T-4)+.3818*(T-5)-.4041*(T-6)
(2.071) (9.511) (-3.041) (1.835) (-0.314) (2.096) (-3.322)

$\bar{R}^2 = .527$

Linear Regression (with time and a dummy variable for 200-mile limit)

609266.8-303.704*T+29705.82(Dummy)
(6.687) (-6.487) (10.176)

$\bar{R}^2 = .576$

Project requirements were for forecasting methodologies that could be easily replicated over a 20-year time period. Linear regression was selected since Box-Jenkins and autoregressive methods are more appropriate for short-term forecasting, they entail greater complexity and are more time-consuming to develop, they require larger data sets, and a rough approximation of future harvest patterns is sufficient for MMS' needs (Bails and Peppers, 1982 and Armstrong, 1985).

Bering Sea Salmon Harvest Projections

Salmon harvest projections are based on a linear regression using future harvest levels as the dependent variable, and years as the independent variable. For most estimates, a better equation was obtained when a dummy variable was added for the increased returns after 1979.

Alaska Peninsula salmon harvest projections are shown in Figures 2.3-6 through 2.3-10. The estimated equations with adjusted multiple coefficient of determination and F statistic for each variable are:

king salmon Y = 111.94 - .05(year) + 22.9(dummy) (Figure 2.3-6);
(.006) (.005) (7.435)

$\bar{R}^2 = .583$

(where Y is the estimated forecast in numbers of salmon harvested, year is the year being forecast and dummy is a dummy variable to account for increased harvest levels after 1979.)

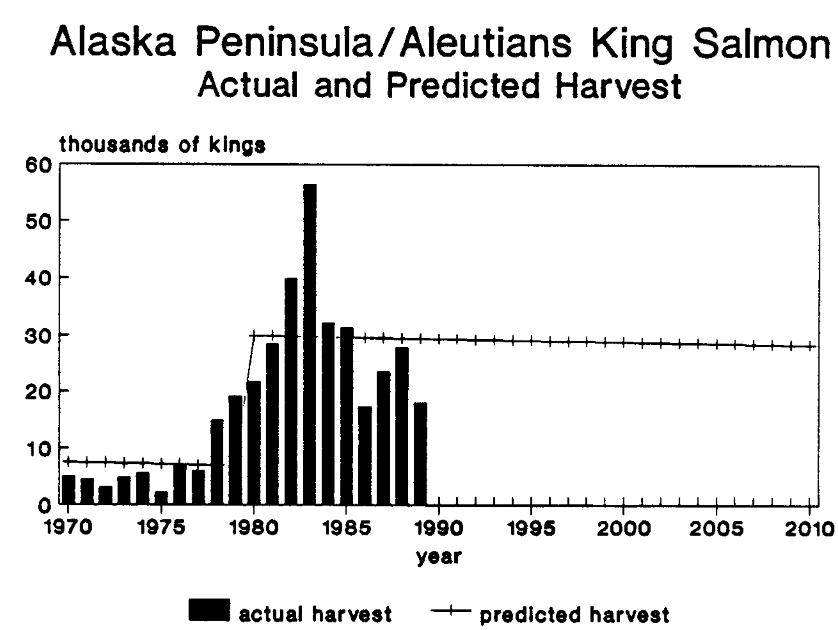
sockeye salmon $Y = 38074.16 - 18.69(\text{year}) + 3044.4(\text{dummy})$ (Figure 2.3-7);
(.09) (.084) (16.781)
$\bar{R}^2 = .752$

coho salmon $Y = -1079.3 + .57(\text{year}) + 344.6(\text{dummy})$ (Figure 2.3-8);
(.007) (.007) (24.101)
$\bar{R}^2 = .852$
(1988 and 1989 outliers not used)

pink salmon $Y = 195079 - 98.34(\text{year}) + 6280.3(\text{dummy})$ (Figure 2.3-9);
(.47) (.465) (14.534)
$\bar{R}^2 = .667$
(with high and low outliers disregarded)

chum salmon $Y = 91920.1 - 46.26(\text{year}) + 2029.7(\text{dummy})$ (Figure 2.3-10);
(2.369) (2.339) (35.712)
$\bar{R}^2 = .838$
(with high and low outliers disregarded)

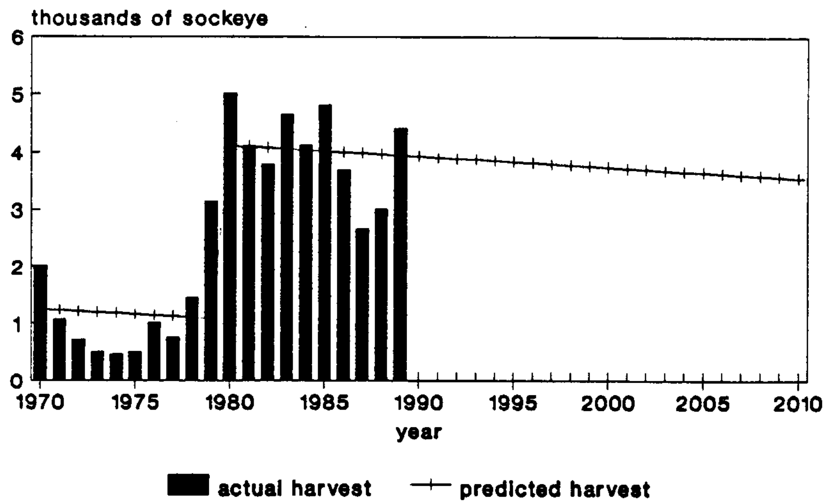
Figure 2.3-6



based on ADF&G data

Figure 2.3-7

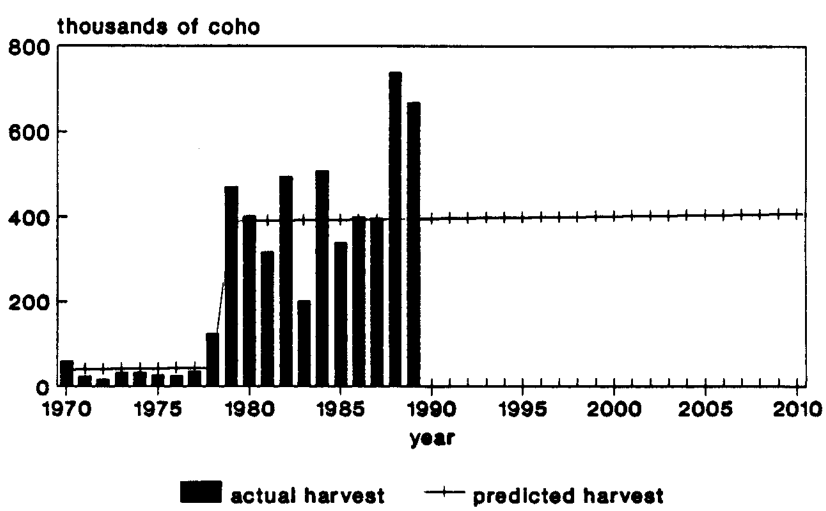
Alaska Peninsula/Aleutian Sockeye Salmon
Actual and Predicted Harvests



based on ADF&G data

Figure 2.3-8

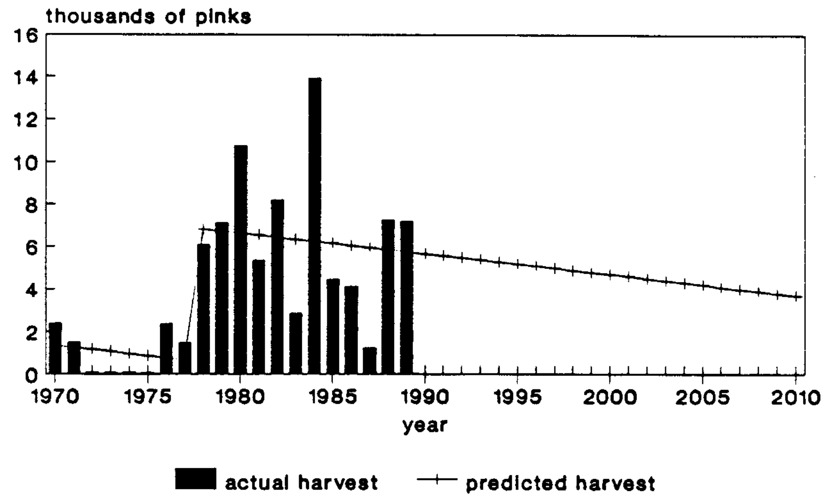
Alaska Peninsula/Aleutians Coho Salmon
Actual and Predicted Harvest



based on ADF&G data

Figure 2.3-9

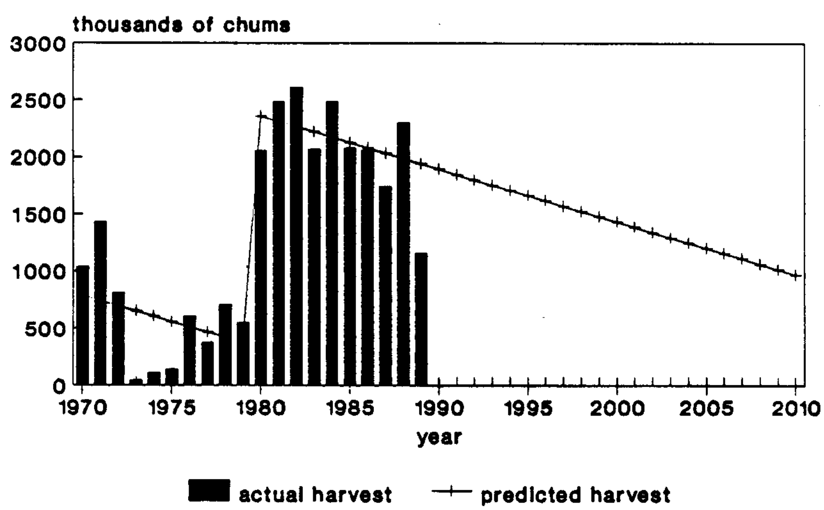
Alaska Peninsula/Aleutians Pink Salmon
Actual and Predicted Harvest



based on ADF&G date

Figure 2.3-10

Alaska Peninsula/Aleutians Chum Salmon
Actual and Predicted Harvest



based on ADF&G data

Bristol Bay salmon harvest projections are shown in Figures 2.3-11 through 2.3-15. The estimated equations are:

king salmon $Y = \underset{(.000)}{-85389.6} + \underset{(.002)}{102.56(\text{year})}$ (Figure 2.3-11)

$\bar{R}^2 = -.052$

where Y is the estimated forecast in numbers of salmon harvested, year is the year being forecast.

sockeye salmon $Y = \underset{(.048)}{23260377} - \underset{(.045)}{113771(\text{year})} + \underset{(5.819)}{15651144(\text{dummy})}$ (Figure 2.3-12)

$\bar{R}^2 = .472$

coho salmon $Y = \underset{(.197)}{-8280867} + \underset{(.199)}{4218.75(\text{year})} + \underset{(1.677)}{157432(\text{dummy})}$ (Figure 2.3-13)

$\bar{R}^2 = .245$

pink salmon $Y = \underset{(.304)}{-43901965.2} + \underset{(.304)}{22184.8(\text{year})} + \underset{(11.381)}{1644587.2(\text{dummy})}$ (Figure 2.3-14)

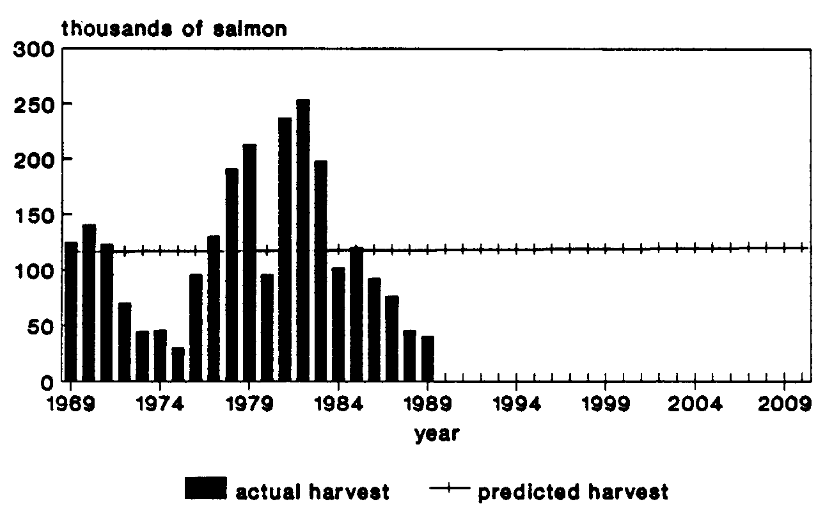
$\bar{R}^2 = .326$

chum salmon $Y = \underset{(.004)}{-2244347.8} + \underset{(.006)}{1414.7(\text{year})} + \underset{(12.047)}{797599.6(\text{dummy})}$ (Figure 2.3-15)

$\bar{R}^2 = .641$

Figure 2.3-11

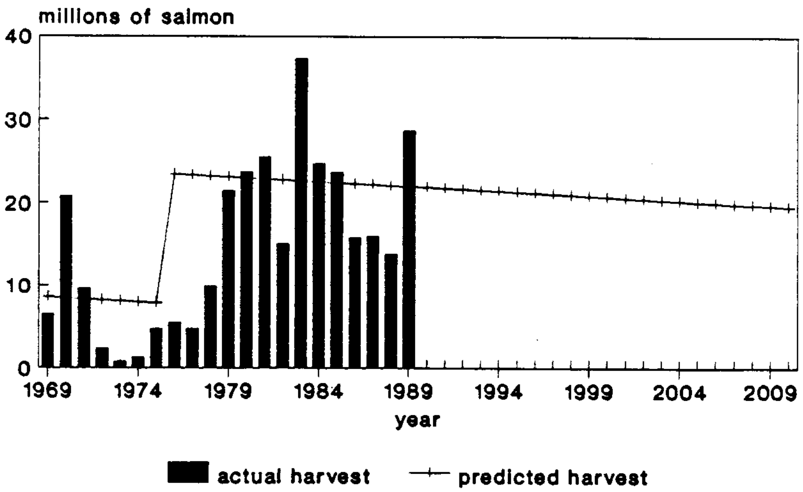
Bristol Bay King Salmon
Actual and Predicted Harvest



based on ADF&G data

Figure 2.3-12

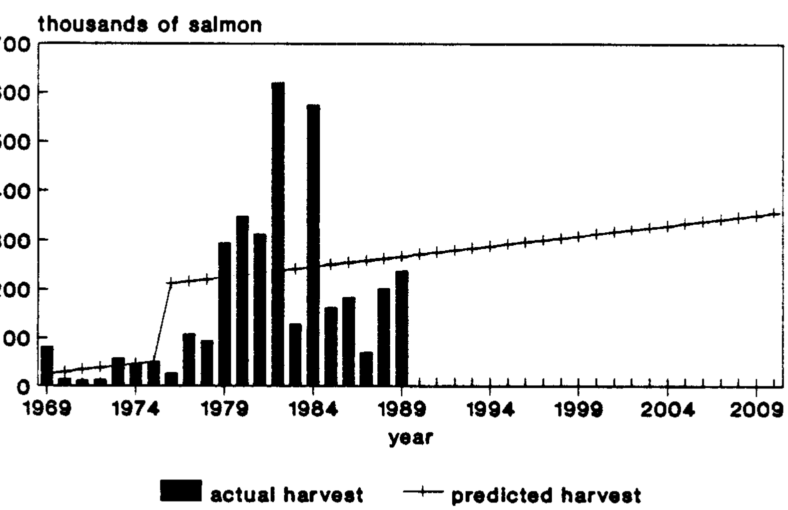
Bristol Bay Sockeye Salmon
Actual and Predicted Harvest



based on ADF&G data

Figure 2.3-13

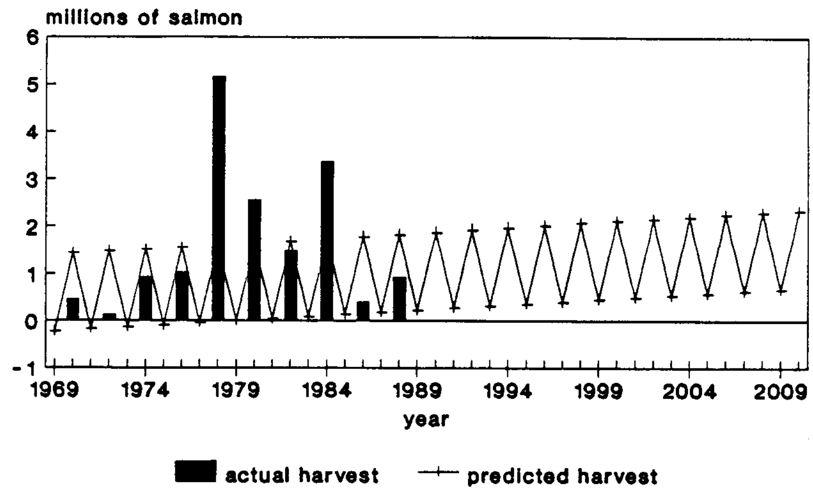
Bristol Bay Coho Salmon
Actual and Projected Harvest



based on ADF&G data

Figure 2.3-14

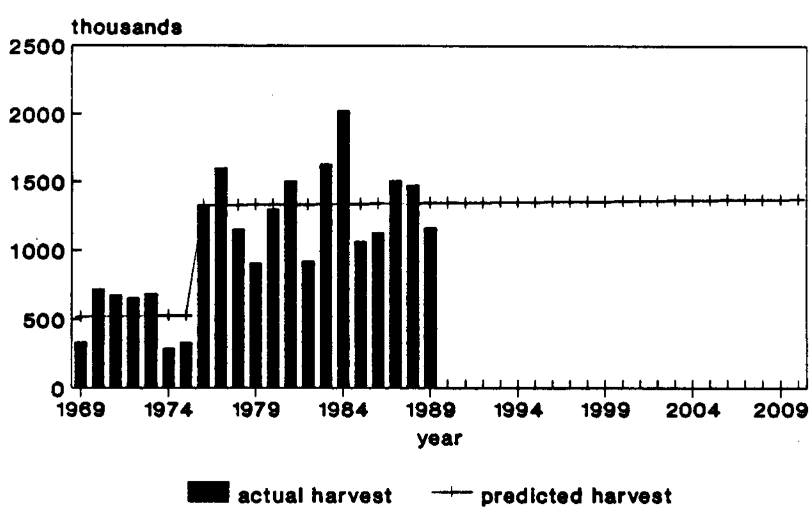
Bristol Bay Pink Salmon
Actual and Predicted Harvest



based on ADF&G data

Figure 2.3-15

Bristol Bay Chum Salmon
Actual and Predicted Harvest



based on ADF&G data

Norton Sound salmon harvest projections are shown in Figures 2.3- 16 through 2.3-18. The estimated equations are:

king salmon $Y = -80111.57 + 41.82(\text{year}) + 5609.55(\text{dummy})$ (Figure 2.3-16)
$\qquad\qquad(.006) \qquad (.005) \qquad (7.435)$

$\bar{R}^2 = .583$

where Y is the estimated forecast in numbers of salmon harvested, year is the year being forecast and dummy is a dummy variable to account for increased harvest levels after 1979.

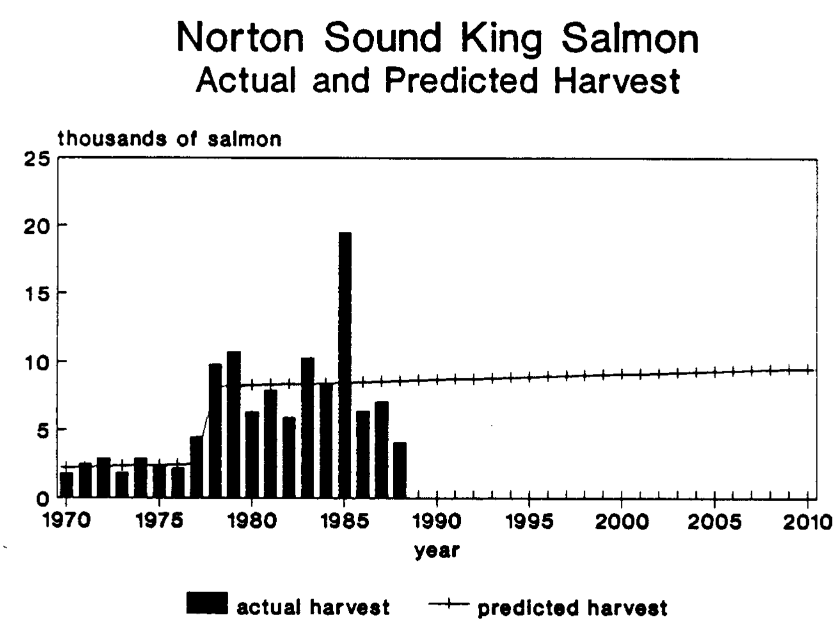
coho salmon $Y = 796002.76 - 400.88(\text{year}) + 41274.66(\text{dummy})$ (Figure 2.3-17)
$\qquad\qquad(.085) \qquad (.084) \qquad (7.363)$

$\bar{R}^2 = .554$

chum salmon $Y = -2396210.89 + 1289.32(\text{year})$ (Figure 2.3-18)
$\qquad\qquad(.28) \qquad (.318)$

$\bar{R}^2 = -.039$

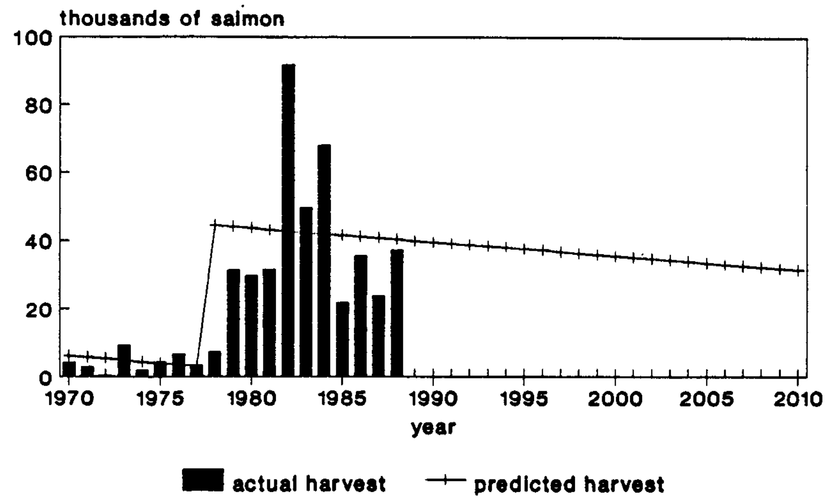
Figure 2.3-16



based on ADF&G data

Figure 2.3-17

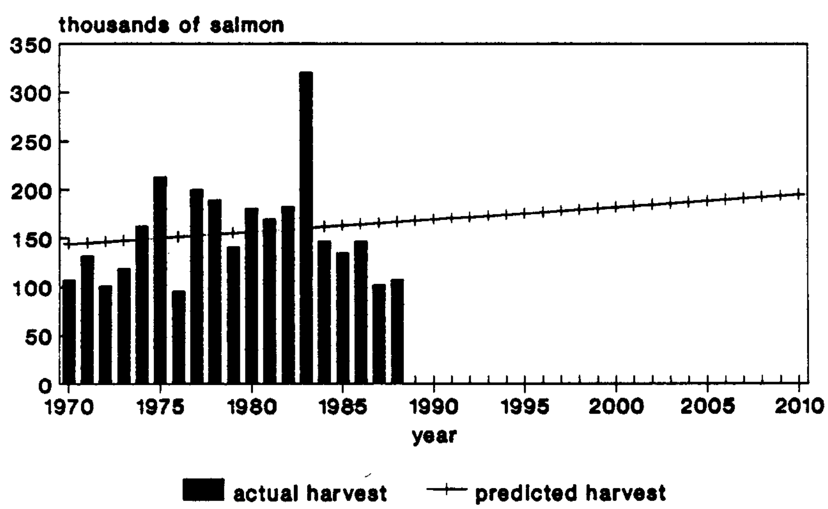
Norton Sound Coho Harvest
Actual and Predicted Harvest



based on ADF&G data

Figure 2.3-18

Norton Sound Chum Harvest
Actual and Predicted Harvests



based on ADF&G data

2.3.1.2 Pacific Herring

There are two types of commercial herring fisheries within the study area: herring sac-roe fisheries along the North Peninsula, Togiak and Norton Sound and a herring food/bait fishery in the waters around Unalaska and Akutan Islands. Figure 2.3-19 shows the relative periods when herring fishing occurs in the Dutch Harbor/Alaska Peninsula, Togiak and Norton Sound areas.

Figure 2.3-19: Bering Sea Herring Seasons

Area	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dutch Harbor/ Alaska Peninsula								= =				
Norton Sound							= =					
Togiak					=							

According to the Alaska Department of Fish & Game (Alaska Department of Fish & Game, 1984), a historical herring food fishery occurred primarily in the vicinity of Unalaska and Akutan Islands. Pacific herring was an early target species of the foreign fishery in the Eastern Bering Sea. Catches in the foreign fishery increased through the 1960's to a peak in 1972 of 127,000 metric ton (mt.) and then declined rapidly. The decline was due to the combination of over-fishing accompanied by a decline of several strong year-classes of herring.

A historic herring fishery by American fishermen operated from 1929 through 1938 and in 1945. The average annual harvest during the historical period was 1,337 mt. (Alaska Department of Fish & Game, 1984). After 1945, there was no significant herring fishery for the next 37 years. The Dutch Harbor food and bait fishery began again in 1981. The harvests for recent years are shown in Table 2.3-4, along with the herring sac-roe harvests for the Alaska Peninsula.

Another type of herring fishery developed in the late 1970's when herring abundance increased. A domestic inshore gill net and purse seine fishery began targeting on spawning fish for the Japanese herring roe market. In recent years the abundance and catch of herring in the roe fishery has been slightly decreasing (see Tables 2.3-5 and 2.3-6) as the herring abundance has decreased.

The long term trends in herring fisheries are difficult to predict since recruitment is highly variable each year. If a strong year-class occurs in the next few years, current levels of harvest will likely be maintained for the next few years.

Table 2.3-4: Dutch Harbor Food/Bait Herring Harvests
and Alaska Peninsula Sac-Roe Herring Harvests
1979-1989 (catch in standard tons)

Year	Dutch Harbor	Alaska Peninsula	Total
1979	0	10	10
1980	0	454	454
1981	704	716	1,420
1982	3,565	644	4,209
1983	3,567	627	4,194
1984	3,578	642	4,220
1985	3,480	1,061	4,541
1986	2,394	1,170	3,564
1987	2,503	831	3,334
1988	2,204	671	2,875
1989	3,081	1,055	4,136

Sources: Alaska Department of Fish & Game, Report to the Board of Fisheries (Regional Informational Reports No. 4K89-33 and 4K89-31).

Overall market strength for herring roe from the Bering Sea fisheries will be as important as resource strength in determining the future of the roe herring fisheries. The Japanese market's maximum demand for roe is approximately 10 to 15 thousand mt. per year. Herring roe is a high value product in Japan and commands a high price. This price makes the Japanese market very attractive to other herring exporting countries (such as Canada and Denmark). These countries are exporting increasing quantities of roe to Japan. If Alaska's roe fishery becomes unprofitable, herring harvests in the Bering Sea could immediately shift the harvest emphasis to food and bait production. In this case, the harvesting center would shift to the Dutch Harbor area where herring with higher oil content are harvested in late summer.

The herring biomass, harvest, value and effort data are shown in Table 2.3-5 for the Norton Sound fishery from 1979 through 1987. This table shows a rapid increase in the harvest, the dollar value and the number of fishermen participating. The Alaska Department of Fish & Game's biomass estimates for the herring resource steadily increased from 7,700 tons in 1979 to 32,370 tons in 1987. However, the biomass estimate has sharply decreased since then. The projected biomass for the 1990 season is 16,520 tons, which would give a harvest quota of 3,304 tons.

The Togiak herring fishery developed in the late 1970's. Harvests in the Togiak fishery are shown in Table 2.3-6. The fishery reached its peak harvest levels in 1983 and 1985. Since then, the harvest levels have decreased reflecting the lower herring biomass. For the 1990 season, the harvest quota is projected to be 10,788 tons, a decrease from 1989.

Table 2.3-5: Herring Biomass Estimates and Commercial Fisheries Data for the Norton Sound District, 1979-1989

Year	Biomass	Harvest[a]	Value[b]	No. of Fishermen
1980	8,400	2,452	0.5	294
1981	25,100	4,371	1.5	332
1982	17,400	3,933	1.0	237
1983	38,100	4,582	1.4	272
1984	23,100	3,662	0.9	194
1985	20,000	3,548	1.4	277
1986	28,062	5,194	2.9	323
1987	32,370	4,082	2.6	563
1988	33,924	4,672	3.9	348
1989	23,857	4,771	2.3	357

Source: Alaska Department of Fish & Game, 1987.

[a]biomass and harvest in standard tons.
[b]dollar value in millions of dollars.

Herring Projections:

Herring projections are shown in Figures 2.3-20, 2.3-21 and 2.3-22. Linear regressions were estimated in the same manner as salmon. In the case of all three areas, however, the projections were set to a constant harvest at some point, rather than continue the trend exhibited in recent years.

In the Dutch Harbor/Aleutian Island fishery, the analysis showed an increasing trend. However, the Alaska Board of Fisheries has implemented very restrictive policies on the Dutch Harbor food and bait fishery in 1990 that will tend to curtail further growth, at least until market conditions mandate a change.

Dutch Harbor herring $Y = -630314 + 319.2(\text{year})$ (Figure 2.3-20)
$\quad\quad\quad\quad\quad\quad\quad (6.576) \quad\quad (6.638)$

$\bar{R}^2 = .361$

where Y is the estimated forecast in standard tons of herring harvested and year is the year being forecast

In the Norton Sound herring fishery, the historic trend was a relatively rapid growth until 1988. However, the resource assessments show a declining biomass, therefore a more static projection is more reasonable.

Norton Sound herring $Y = -585246.8 + 296.8(\text{year})$ (Figure 2.3-21)
$\qquad\qquad\qquad\qquad (18.946) \quad (19.186)$

$\bar{R}^2 = .645$

Table 2.3-6: Togiak Sac-Roe Herring Fishery Harvests, 1977-1989
(harvest in short tons)

Year	Harvest
1977	2,795
1978	7,734
1979	11,558
1980	18,886
1981	12,542
1982	21,489
1983	26,287
1984	19,300
1985	25,616
1986	16,260
1987	15,204
1988	14,382
1989	12,097

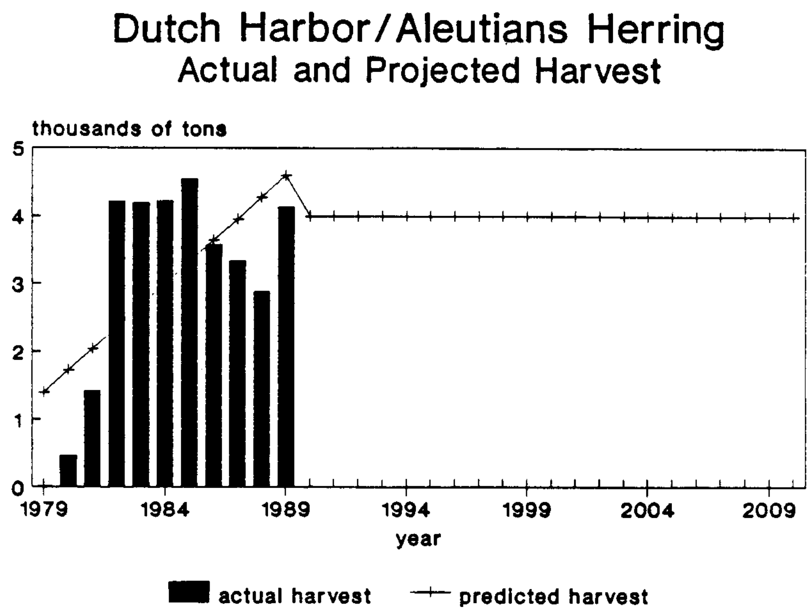
Source: Alaska Department of Fish and Game, 1989.

Finally, the Togiak fishery has displayed a downward trend over the history of the fishery. The downward trend was curtailed for the purposes of this forecast at the projected 1990 harvest level, at approximately 10,000 tons.

Togiak herring $Y = 950033.8 - 470.0(\text{year})$ (Figure 2.3-22)
$\qquad\qquad\qquad\qquad (.535) \quad (.516)$

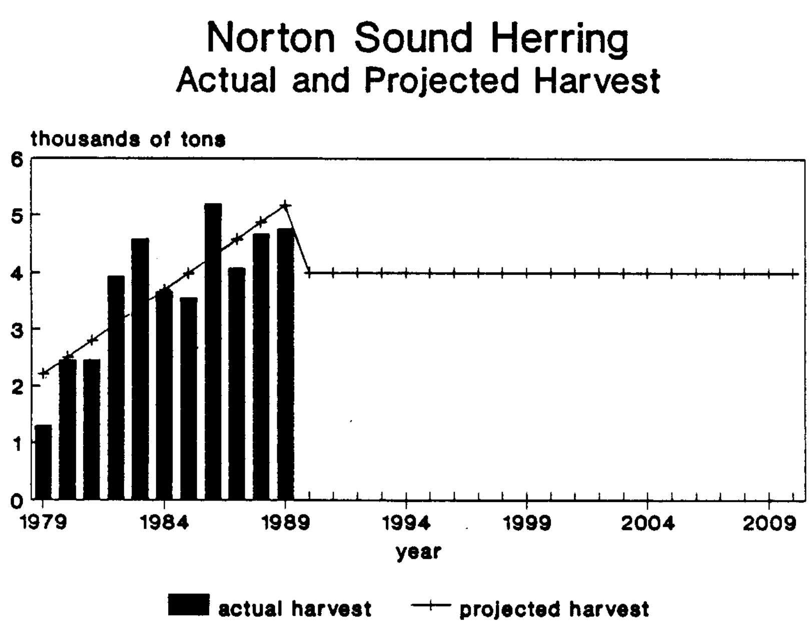
$\bar{R}^2 = -.051$

Figure 2.3-20



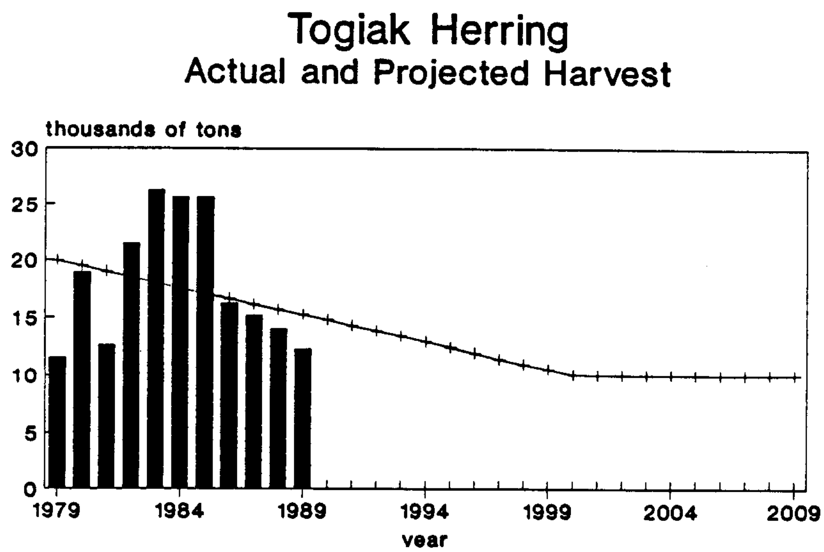
based on ADF&G data

Figure 2.3-21



based on ADF&G data

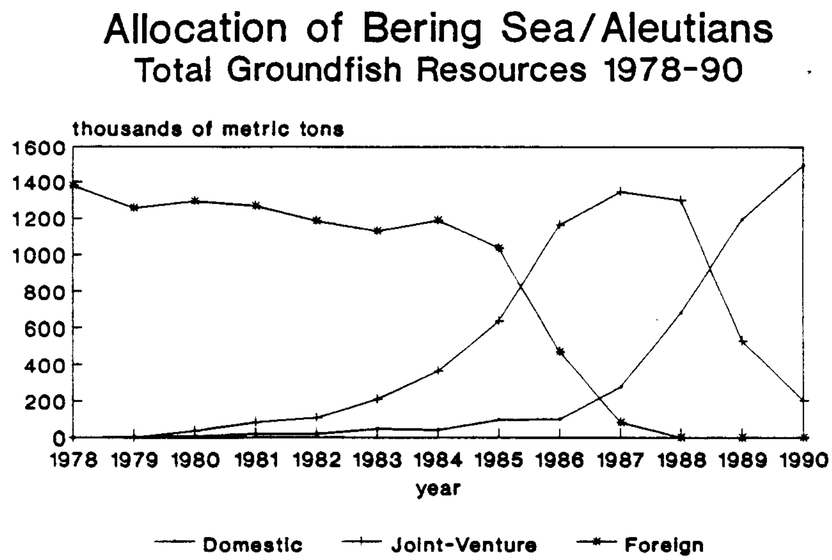
Figure 2.3-22



2.3.2 Groundfish

The groundfish fisheries in the Eastern Bering Sea are in a period of major change. Until the mid 1980's, groundfish were primarily harvested by trawl and longline vessels from Japan, the U.S.S.R, Korea and other nations. U.S. vessels entered the groundfish fishery in the early 1980's via joint-venture fisheries. In joint-venture fisheries, American vessels catch groundfish and deliver the fish to foreign processing vessels at sea. With the first landings of the joint-venture fishery in 1981, the catch from that fishery quickly grew to displace the foreign fleet. In 1987, the joint-venture fishery accounted for about 90 percent of the total Eastern Bering Sea groundfish harvest. Since 1987, however, the joint-venture fishery has itself been displaced by the domestic fishery (with domestic catcher-processors or catcher boats delivering to domestic processing companies). The rapid growth in domestic processing capacity has all but pushed out the joint-venture allocations of groundfish. In 1990, the joint venture fishery was allocated only 204,680 metric tons, or 10 percent of the total allocation. The relative proportions of the domestic and joint-venture allocations reversed in only three years, a radical shift over this short period. Figure 2.3-23 shows the change in the groundfish fishery between 1978 and 1990.

Figure 2.3-23



Sources: 1978-87 and 1990 North Pacific Fishery Mangement Council; 1988-1989, Pacific Marine Fisheries Commission

The rate of domestication of the groundfish fisheries, which has primarily depended on how fast the processing sector developed, progressed with a speed beyond anything anticipated by the industry or the management agencies. For example, MMS Technical report No. 97 (Centaur Associates, 1984) projected the domestic pollock harvest in 1987 to be 25 percent of the total, with the remainder taken by foreign fishing. Instead, the domestic harvest (by joint-venture fishermen as well as those delivering to a U.S. processing company) made up 97 percent of the total in 1987. In 1988, foreign fishermen were out of the fishery entirely.

These rapid changes in the participants in the fishery are having a profound effect on the groundfish management regime. From 1977 when the MFCMA went into effect until the early 1980's, the foreign fisheries predominated. During this period management efforts were directed at reducing perceived "over-fishing" thereby reducing and eventually eliminating catches by foreign fisheries of species of interest to U.S. fishermen (such has Bairdi and Opilio tanner crab, halibut and herring). Foreign catch levels were reduced or held constant and efforts were made to transfer catches to "joint-ventures" or domestic fishermen. There was a concerted effort by most of the fishing industry to remove foreign effort using the provisions of the MFCMA.

The early joint-venture fisheries were encouraged by the management agencies and regulation was minimal. In fact, joint-ventures were often exempted from regulations that were applied to the foreign fisheries for conservation purposes such as time-area closures and by-catch restrictions. However, as the joint-venture fleet grew in size, conflicts began to develop between joint-venture fishermen and wholly domestic fishermen such as crab, halibut, sablefish and herring fishermen. Generally these conflicts have focused on by-catch by the joint-ventures of species allocated to other fishermen. For the most part these conflicts have been gear related: trawlers vs. pot fishermen and trawlers vs. longline fishermen. However, conflicts are now arising between different groups of trawlers relating to access to fishing grounds and fish.

The North Pacific Fishery Management Council is currently dealing with two major issues which will shape the future of the groundfish fisheries within the Bering Sea and Gulf of Alaska. These issues are onshore-offshore and bycatch.

Onshore-offshore refers to a move by shorebased fishermen and processing companies to obtain a priority allocation for part of the groundfish quota over the factory trawlers and large floating processing ships that operate offshore. The main impetus for the onshore components came in 1989 when factory trawlers operating off Kodiak harvested the groundfish quota in a short period, leaving the shorebased vessels and processing companies out of the fishery until the following year.

The ongoing bycatch issue is also one of allocation among the different gear types. At issue is the bycatch of halibut, crab and salmon, primarily by the trawl fleet. Another major issue for the all fishermen within the study areas is the depressed levels of marine mammals, primarily stellar sea lions and fur seals. The populations of sea lions have been classified as threatened. If the population trend continues, major closures in the fishing industry may be enacted.

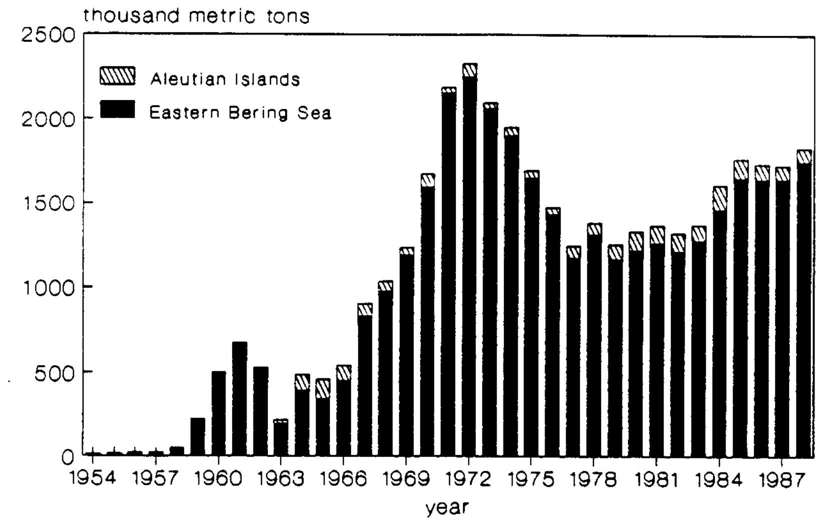
By-catch of species with high economic value such as crab, salmon and halibut in the groundfish fishery may result in yield reductions via time-area closures or quota limitations. As an example, the bycatch of halibut in the joint-venture fishery for yellowfin sole closed the 1990 fishery in March, with less than half of the quota of yellowfin sole harvested.

The Bering Sea groundfish resource is divided into Aleutian Island stocks and eastern Bering Sea stocks. The eastern Bering Sea encompasses the larger area and is also more productive. Figure 2.3-24 shows the total catch in the Aleutian Islands is less than in the eastern Bering Sea.

Pollock is the dominant species in the eastern Bering Sea catch with catches averaging 1.03 million mt., or 78 percent of the total groundfish catch (Figure 2.3-25). Yellowfin sole is the second most important species in catch followed in order of importance by Pacific cod, Greenland turbot, other flatfish (Rock sole, Flathead sole, Alaska Plaice and other minor species), and herring (See Figure 2.3-26). Sablefish and rockfish comprise only a small portion of the eastern Bering Sea catch, but have a higher price than more abundant species. The preceding species are the dominant commercial species. Other species such as arrowtooth flounder, squid, skates, sculpins, etc. are harvested as bycatch but these species have limited or no commercial value and do not constitute target fisheries.

Figure 2.3-24

Bering Sea/Aleutians Groundfish Catch
1954-1988



Source: data from NMFS

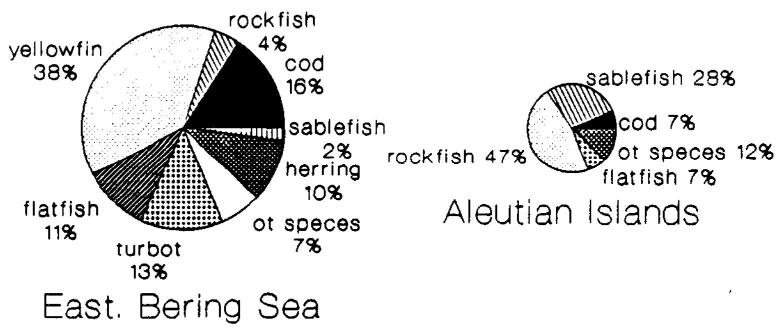
Figure 2.3-25

Pollock Landings vs. Other Groundfish
in the Bering Sea and Aleutians

Average catches in mt. 1954,1989
Source: NMFS data

Figure 2.3-26

Catches of Species Other Than Pollock
in the Eastern Bering Sea and Aleutians



Average catches, 1954,1989
Source: NMFS data

Average catches provide a guide to the future potential of groundfish in the eastern Bering Sea. However, these estimates incorporate influences of over-fishing, quota and/or time area restrictions, possible under or misreporting, and are influenced by the existing environment and each species' response to it.

The groundfish fishery management plan developed by the North Pacific Fishery Management Council is based on an aggregate maximum sustained yield (MSY) and optimum yield (OY) which are expressed as ranges of 1.8 to 2.4 million mt. and 1.4 to 2.0 million mt., respectively. These are believed to be the limits of long term sustainable yield under environmental conditions that have prevailed since the 1950's. However, recent aggregate MSY estimates have been higher than these limits and amendments to the management plan have been introduced to increase current harvest limits.

The reasons that the potential harvest from the eastern Bering Sea may be higher than the ranges indicated above may be due to under-reporting of catch by the foreign fisheries prior to the Magnuson Fisheries Conservation and Management Act, and improved estimates of the abundance of commercial species. Until recently most of the estimates of MSY and stock size were based on reported catch and effort statistics.

Since the 200 mile limit has been in place, biomass estimates have been based on resource surveys and analysis of data collected aboard foreign and joint-venture fishing vessels. These analyses suggest that fish abundance is greater than previously believed.

Trend indicators suggest that some of this growth in the pollock resource has occurred over the past ten years. Furthermore, a portion of this growth may be due to decreased removals (most likely from the controlled and reduced foreign fishing). However, some of the increase in groundfish abundance is due to enhanced survival of young fish in one or more year-classes during the late 1970's to early 1980's. Each of these factors is discussed for each species or species group.

2.3.2.1 Pollock

Japanese vessels began fishing for pollock in eastern Bering Sea waters in the early 1960's. Following the introduction of machinery to mince fish flesh for surimi in 1964, the foreign pollock catch rose rapidly (Figure 2.3-27). The catch peaked in 1972 at a catch of 1.9 million mt. and then declined as catches were reduced through bilateral discussions between the U.S. and foreign nations fishing in the Bering Sea. The impetus for the reductions was evidence of over-fishing (Bakkala et al., 1987). When the MFCMA went into effect in 1977, the catch was curtailed to under 1.0 million mt. Since 1977, the pollock catch has been increasing. The harvest for 1989 was 1.29 million mt. and the proposed allowable biological catch for 1990 is 1.5 million mt.

Recent analysis of pollock catch data show that exploitation has been relatively low (10 to 18 percent vs. an optimum of 29 to 32 percent). A combination of catch data modelling and hydroacoustic trawl surveys show that biomass is much higher than previously estimated. Bakkala et al. (1987) show that the pollock population increased rapidly in the late 1960's following a series of good year-classes in the 1960's. In the 1970's, the population declined as these year-classes died out and were replaced by weaker year-classes. In the late 1970's, a very strong 1978 year-class occurred which resulted in an increase in the biomass. As the 1978 year-class passes from the fishery, weaker year classes are entering and the population is declining again. The potential yield will decline if exploitation is held to current levels (Figure 2.3-27).

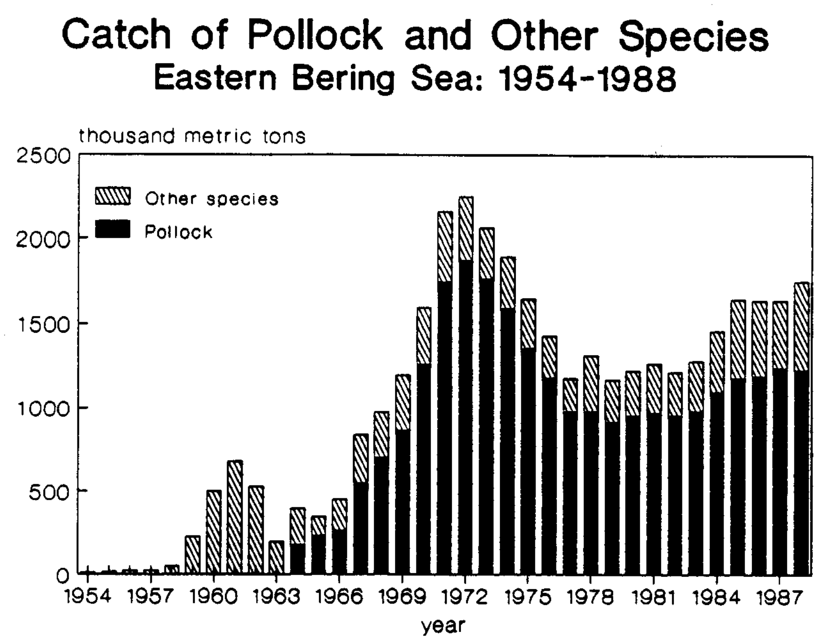
Pollock Projections:

Walleye pollock is the most abundant groundfish species in the Bering Sea and Aleutian Islands. It contributes well over half of the total groundfish catch and is by far the most important species. The 1989 allowable catch quotas (set by the North Pacific Fishery Management Council (NPFMC) were 1,313,000 metric tons for the Bering Sea and 11,432 mt. for the Aleutian Islands. The proposed levels for 1990 are 1,140,000 mt. in the Bering Sea and 11,432 mt. for the Aleutian Islands.

This decrease represents concern on the part of the NPFMC over foreign harvests from the area in the middle of the Bering Sea (known as the "donut hole") which is outside the U.S. 200 mile limit. The estimated annual catch of 1.0 to 1.5 million metric tons in the "donut hole" has an unknown impact on the stocks within Bering Sea waters under U.S. jurisdiction. This high level of catch from a relatively small area of very deep water makes fishery managers feel that much of the harvest is from illegal fishing on eastern

Bering Sea or Aleutian Island stocks. Therefore, the unknown factor of the "donut hole" harvests make the NPFMC conservative in setting allowable catch levels. Even if negotiations bring an end to foreign fishing in the donut hole, there is concern that the area could be fished by the domestic factory trawler fleet operating beyond U.S. jurisdiction.

Figure 2.3-27



Source: NMFS data

National Marine Fisheries Service (NMFS) scientists project decreases in pollock abundance over the next several years, due to below average recruitment in recent years (Wespestad, 1989). Recruitment for the 1988 year class is projected to be average, with below average recruitment in 1989 and 1990. Abundance can be expected to decrease as some of the very strong year classes, such as 1978 decline and are replaced with weaker year classes.

The MSY estimate has a range of 1.97 and 1.99 million metric tons (Wespestad, 1989). If future harvests were projected on the basis of a maximum exploitation factor of F.55, the harvests over the next several years would be:

1990 1.9 million metric tons
1991 1.4 million metric tons
1992 1.3 million metric tons
1993 1.6 million metric tons

At the current lower level of exploitation F.10, the future harvests would be:

1990 1.4 million metric tons
1991 1.2 million metric tons
1992 1.1 million metric tons
1993 1.3 million metric tons

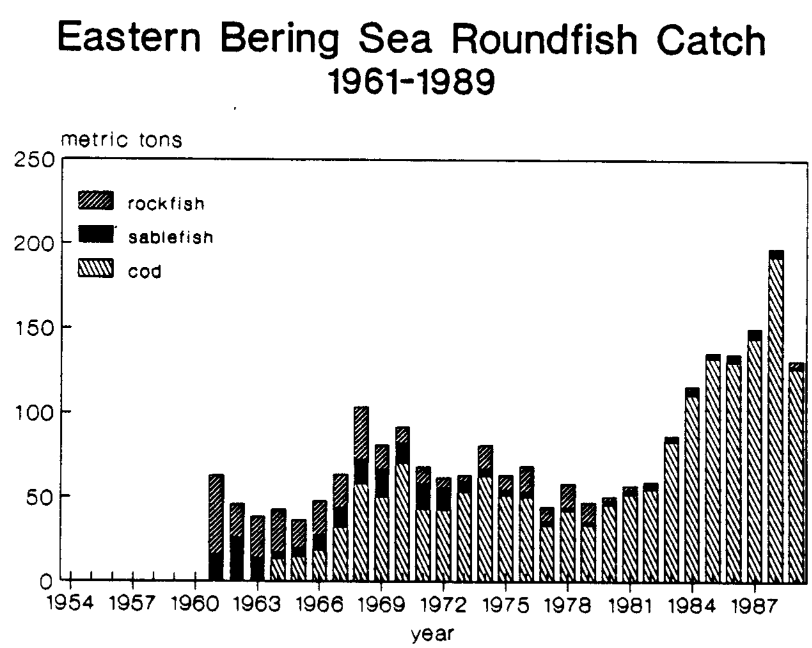
Given the uncertainties of the foreign harvests from the "donut hole" and the ongoing controversy over shorebased and factory trawl allocations, the NPFMC is most likely to adopt the more conservative harvest strategy represented by the lower exploitation rate. Long term pollock harvest is likely to remain relatively constant at 1.2 million metric tons.

The NPFMC may be reluctant to increase pollock catch quotas because of the uncertainty surrounding pollock harvest by foreign vessels in the "donut hole." If the "Donut Hole" stocks are actually part of the U.S. pollock stocks, the resource may be adversely affected by the combined exploitation rate.

2.3.2.2 Pacific Cod

Pacific cod in the eastern Bering Sea have been exploited commercially since the mid-19th century by U.S. longline fishermen. These fisheries ended in the 1950's and were replaced by foreign fisheries. Pacific cod catches were relatively low in the foreign fisheries, ranging from 13 to 83 thousand mt. between 1963 and 1983 (Figure 2.3-28). In the early 1980's, U.S. factory trawlers entered the cod fishery in response to the decline in the world cod catch and increased prices. At the same time, cod from an exceptionally strong 1977 year-class were entering the fishable population. During this period the estimated biomass of cod in the National Marine Fisheries Service (NMFS) Bering Sea groundfish survey increased from 312,000 mt. in 1978 to over 1 million mt. in 1982. Pacific cod biomass estimates have remained high through 1989 with a current estimate of 959,500 mt.

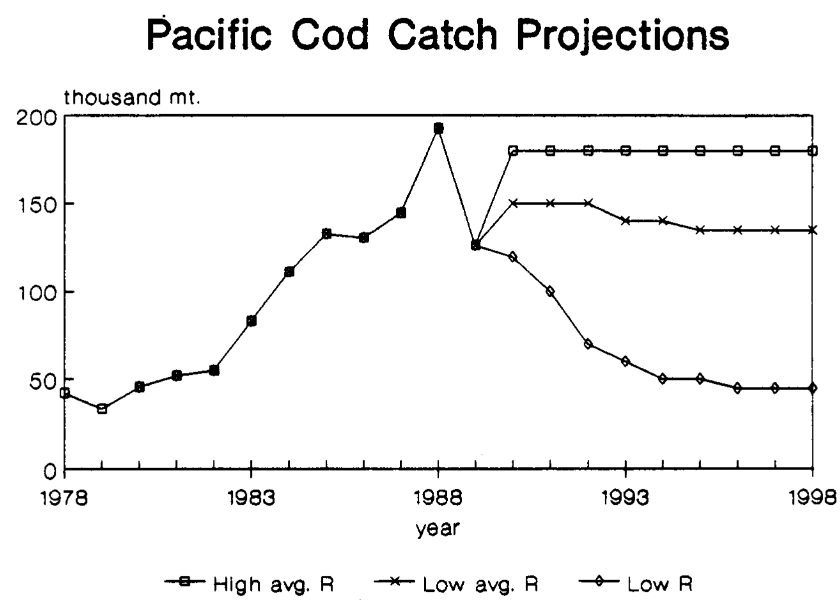
Figure 2.3-28



data from NMFS

The quality of biological data available for cod is not as good as pollock and yellowfin sole, and there is uncertainty about age determination and survival rates. At this time it is unclear if there has been an ecological change which has lead to better cod production or the current high level of abundance is temporary. Most major Atlantic cod populations appear to exhibit strong sporadic shifts in abundance and it is likely that cod in the Bering Sea are also subject to this phenomenon. Simulations of the NMFS data suggest that the estimate of natural mortality used to estimate MSY may be too low and the resulting estimate of yield too large (Wespestad, 1990). Assuming that the instantaneous rate of natural mortality is between 0.3 to 0.4 results in population estimates near those observed in NMFS surveys. Further assuming that cod are recruited to the survey at age 2 and the numbers of age 2 observed in the survey since 1978 are a reflection of future levels of recruitment, the range of potential recruitment is expected to be 81 million cod (lowest level), 336 million (average without strong 1977 year-class), or 442 million (average with 1977 year-class). The optimum exploitation level for cod is estimated to be 22 percent. At this level of exploitation, long term yield is expected to range between 45-180 thousand mt. (Figure 2.3-29).

Figure 2.3-29



data from NMFS
projections by ResourcEcon

The 1989 catch of Pacific cod in the Bering Sea was 170,928 mt. The allowable catch for 1990 is set at 227,000 mt. The long range projection for Pacific cod in the Bering Sea should be between the estimated range of 45 thousand to 180 thousand metric tons. The current high biomass and harvest levels of Pacific cod are a result of extremely large year classes in 1977 and 1984. As these large year classes pass out of the fishery, harvests are anticipated to decline. Current harvest levels should be maintained (and perhaps even be increased) in 1990 and 1991, but will begin to decline in 1992 or 1993. A realistic expectation for a sustainable level of production is around 125 thousand mt.

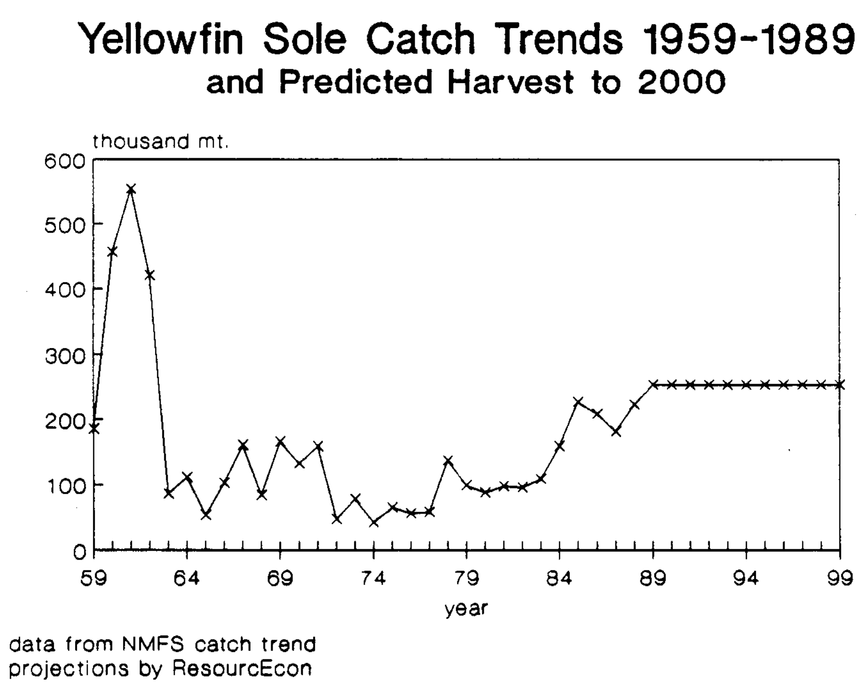
2.3.2.3 Yellowfin Sole

Yellowfin sole have been exploited since the mid-1950's by Japan and the U.S.S.R. Large harvests were taken in the late 1950's-early 1960's and the population declined to a point that fishing effort was reduced by the Japanese and Soviets. In the 1970's recruitment increased and catches were gradually increased (Figure 2.3-30).

Currently, the biomass is estimated to be nearly twice that of the virgin population. The proposed rate of fishing for yellowfin sole is 12 percent removal of the exploitable biomass (ages 7 and older). At current levels of abundance this is equal to a harvest of 254,000 mt. which is near the high end of the MSY estimate of 78 to 260 thousand mt.

The 1989 catch of yellowfin sole in the Bering Sea was 156,437 mt. The allowable catch for 1990 was set at 207,650 mt. The long range projection for Pacific cod in the Bering Sea is between 78 thousand and 260 thousand metric tons.

Figure 2.3-30



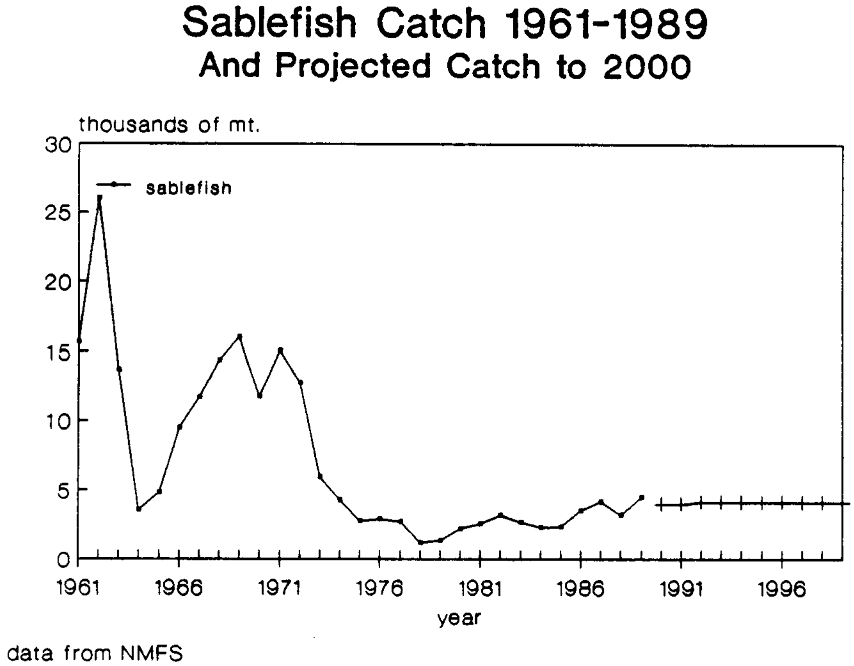
The current high biomass and harvest levels of yellowfin sole are a result of several large year classes. As these large year classes pass out of the fishery, harvests will likely decline. The fishery may be under increasing political pressure to be restricted due to its bycatch of crab and halibut.

2.3.2.4 Sablefish, Pacific Ocean Perch & Other Rockfish

Sablefish, Pacific Ocean perch and other rockfish are species that are more abundant in the Aleutian Islands and Gulf of Alaska. The 'other rockfish' category includes species of the genera Sebastes and Sebastolobus other than Pacific Ocean perch complex. It is often difficult to distinguish the various species of rockfish and historically only the aggregate catch was reported as Pacific Ocean perch, the dominant species. Since 1977, U.S. fishery observers have identified species in the catch and two separate quotas were established.

The yields for these species is relatively low because they are long lived, slow growing species. These species, although low in abundance, have a high monetary value and were early target species of the Japanese and Soviet trawl and longline fleets. For example, the Pacific Ocean perch (POP) resource in the eastern Bering Sea and Aleutian Islands was heavily fished by the Japanese and Soviet trawl fleets throughout the 1960's. Catches of POP peaked at 47,000 mt. in the eastern Bering Sea in 1961 and at 109,000 mt. in the Aleutians in 1965 (Northwest and Alaska Fisheries Center, 1987). The POP resource was not able to sustain that level of fishing pressure and its abundance decreased rapidly. Since the mid-1960's, the resource has been only a fraction of its previous abundance. The 1989 catches were 3,230 mt. in the Bering Sea and 3,788 mt. in the Aleutians. Catches of sablefish and other rockfish were similarly high in the early 1960's and then declined rapidly as the populations were overfished (Figure 2.3-31). Since 1977, the quotas have been held to very low levels by the NPFMC in order to rebuild the stocks. Survey data suggest that above average recruitment has occurred in recent years to these species and that some population increases have been observed.

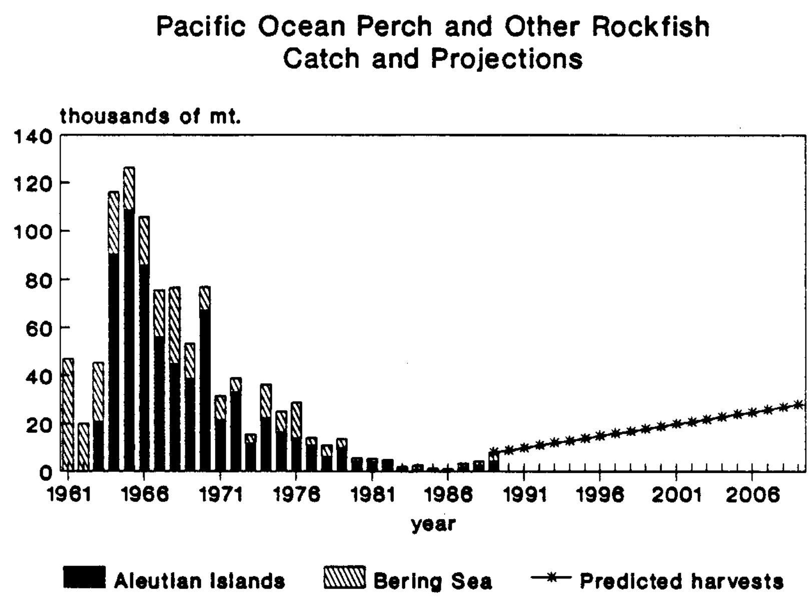
Figure 2.3-31



The sablefish biomass is in a very similar position to that of the Pacific cod. Stocks are currently at a very high level of abundance, but are expected to decline in the near future for lack of strong incoming year classes. The 1989 catch for sablefish in the Bering Sea was 1,254 mt. and in the Aleutian Islands was 3,249 mt. The allowable catch for 1990 is projected to be higher: 2,700 for the Bering Sea and 4,500 for the Aleutián Islands. The long range projection for sablefish cannot be estimated with any degree of confidence, but may be in the range of 3 to 7 thousand metric tons.

Pacific Ocean Perch and other rockfish have an aggregate MSY of around 28,000 metric tons, mostly from the Aleutian Islands. In 1989, catch in the Bering Sea was 3,230 mt. and the Aleutian Islands catch was 3,788 mt. For 1990, the allowable catch levels increased to 6,300 mt. in the Bering Sea and 6,600 mt. in the Aleutian Islands. The long term catches should stabilize near the MSY of 28,000 mt. or below (see Figure 2.3-32).

Figure 2.3-32

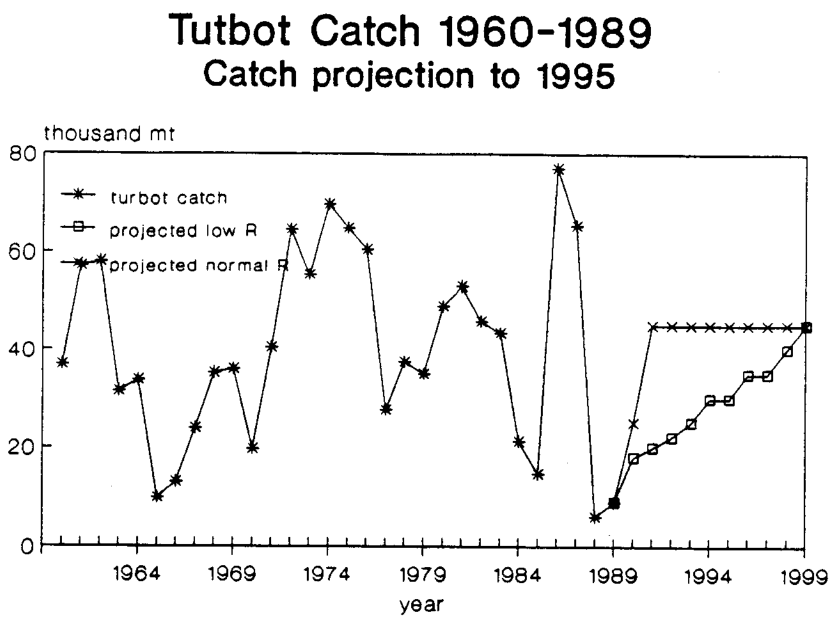


data from NMFS
projections by ResourcEcon

2.3.2.5 Greenland Turbot

Greenland turbot are harvested from the deeper waters of the continental slope, along with arrowtooth flounder, a less desired species with little commercial value. Until recently, the quotas and catches of these species were combined. Historical data combines the catch of both species (Figure 2.3-33). U.S. observer samples indicate that since 1977, Greenland turbot has comprised 75 percent of the combined catch. The catch of turbot was high in the early 1960's, declined and then rose and peaked in 1974 at 91 thousand mt. Through the late 1970's, the catch was relatively stable. In recent years the quotas and catches have been sharply reduced. The suggested reason for curtailing the catch is that recruitment levels are declining.

Figure 2.3-33



data from NMFS
projections by ResourcEcon

The suggestion of falling recruitment comes from NMFS surveys which found fewer small Greenland turbot in recent years compared to the late 1970's. However, the catch per unit of effort (CPUE) in the fishery has been increasing in recent years. Very little is known of the biology of this species in the eastern Bering Sea and most of the fishable biomass occurs outside of the range of the NMFS surveys. Japanese trawlers have surveyed the fishable biomass in 1979, 1982 1983 and 1985. These surveys show only a slight downward trend in the biomass.

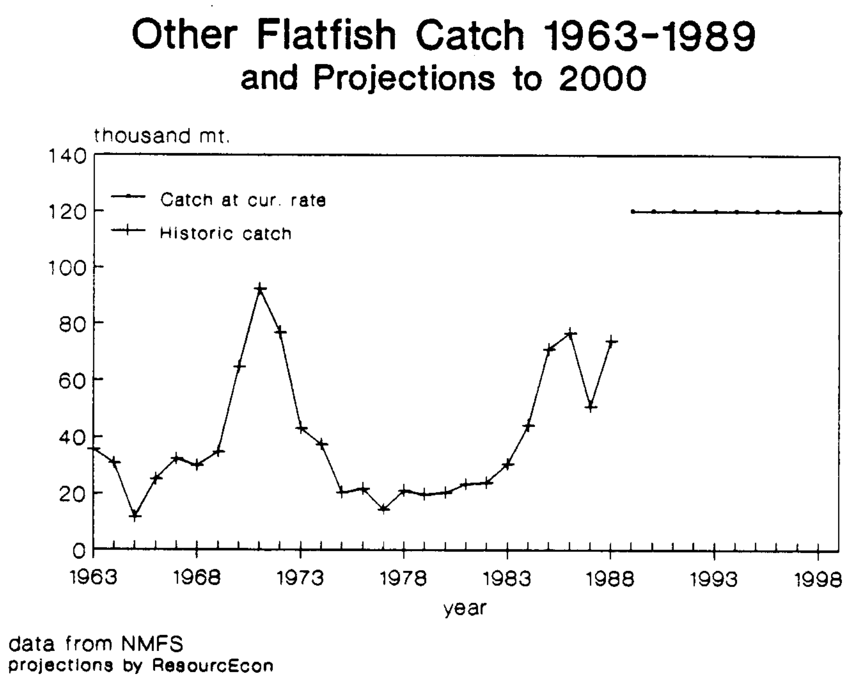
Without a current biomass estimate it is difficult to assess the future trend of this resource. To project future levels of harvest two alternatives are proposed: 1) recruitment is declining and fishing will be curtailed followed by a slow build up to the MSY level of 46,500 mt.; and, 2) recruitment is increasing, but catches will be low for 1-2 years until the increase is evident in the fishery. This will result in a rapid increase in quotas and catch.

Prices for turbot are currently very strong. With increasing effort by longliners, there will be pressure for the NPFMC to increase the quota to higher levels. If the resource can sustain the pressure, quotas will probably increase to approach the MSY level.

2.3.2.6 Other Flatfish

The "other flatfish" category includes rock sole, flathead sole, Alaska plaice and other minor flatfish species that co-occur on the eastern Bering Sea shelf with yellowfin sole. These species have generally been a by-catch in the yellowfin sole fishery, although in recent years a target fishery has developed for roe bearing rock sole. Without a target fishery the catch of these species has been more stable than yellowfin sole. Catches ranged between 11 and 91 thousand mt. prior to 1977 (See Figure 2.3-34). The peak catch was in 1971 at 92,452 mt. It then declined to 14,393 mt. in 1977. Since 1977, the catch has been growing in response to increased joint-venture effort and increased levels of abundance. Strong year-classes occurred in these species in the late 1970's to early 1980's and have entered the fishable population in recent years. The current estimate of abundance is 3.4 million mt. (1.9 million mt. rock sole, and 1.5 million mt. flathead sole, Alaska plaice and other rockfish) which is much greater than the level of biomass required to achieve the allowable harvest levels.

Figure 2.3-34

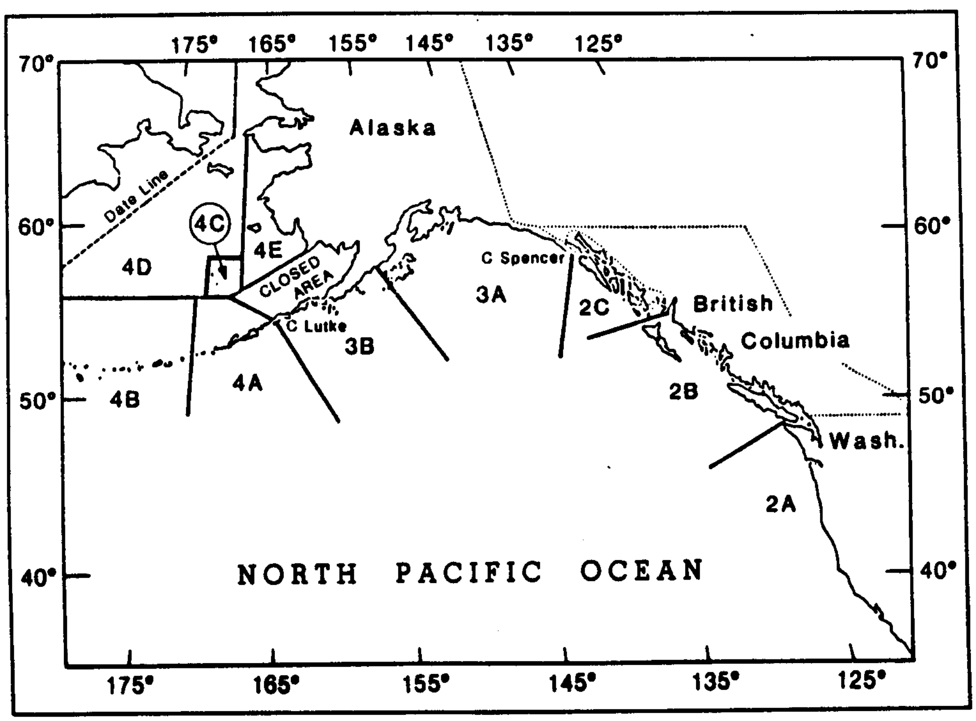


The recommended allowable catch for these fishes for 1990 is 120,150 mt. If area restrictions designed to protect crab and halibut do not interfere with harvests and flatfish markets continue strong, then this level of harvest should be sustainable for several years. It is probable that area restrictions designed to protect crab and halibut may cause the harvest levels to decrease over the next several years.

2.3.2.7 Pacific Halibut

Halibut is an important fishery in several areas of the Bering Sea. The halibut resource is managed by the International Pacific Halibut Commission (IPHC). Our study area includes several IPHC regulatory districts, (4A through 4E) which are depicted in Figure 2.3-35. The relatively small regulatory districts in the Bering Sea are a recent occurrence. Until 1983, the entire Bering Sea and the Gulf of Alaska along the Alaska Peninsula were included in regulatory area 4. In 1983, regulatory area 4 was split into areas 4A, 4B, 4C and 4D. The reported reason for the new districts was to achieve a distribution of catch that more nearly corresponds to the productivity of the area (International Pacific Halibut Commission, 1983). The developing halibut fishery at the communities of St. Paul and St. George were also probably a factor in the decision. In 1984, area 4E was added, with a very small quota of 50,000 pounds. The intent of this change was probably to provide a commercial opportunity for fishermen in communities from Togiak northward. The districts stayed the same in 1985 but in 1986 area 4C was greatly reduced in size.

Figure 2.3-35: Halibut Regulatory Areas



Source: International Pacific Halibut Commission, 1989

The harvest history for recent years in the Bering Sea is shown in Table 2.3-7. A gradual increase in harvest levels is apparent in all areas, with the exception of area 4B. The reason for the decrease in area 4B has been due to early closures in 1985 and 1986. The harvest for area 4A has gone over quota each year and in response, the IPHC has closed area 4B. This early closure has been a matter of strong concern to fishermen at

Atka. They have a developing halibut fishery, but have had very low catches in the 1985 and 1986 seasons because of the early closure.

Table 2.3-7: Halibut Catches in the Bering Sea Regulatory Areas
(in thousands of pounds)

Year	Area 4A	Area 4B	Area 4C	Area 4D	Area 4E
1982	1168	6	244	4	7
1983	2509	1135	415	48	15
1984	1053	1104	580	392	35
1985	1711	1236	620	681	36
1986	3381	261	686	1223	43
1987	3713	1593	707	453	9
1988	1930	1593	707	453	9
1989	1025	2675	600	620	100

Source: International Pacific Halibut Commission, 1989.

The halibut resource has been increasing in recent years, indicating a healthy stock status. Table 2.3-8 shows the exploitable biomass (defined as all halibut over age 8 years) estimates for the years 1974 through 1986. While the halibut biomass in the Bering Sea has increased, it has not increased to the same extent as stocks in other areas of Alaska (i.e. areas 3A and 3B). The reasons for this trend are not known, but there may be some tie to the level of trawl fishing for groundfish and crab pot fishing in the Bering Sea, where halibut is an incidental bycatch. According to the IPHC, the current abundance levels should be sustainable for the next several years, so similar harvest quotas can be expected in the Bering Sea.

Halibut Harvest Projections:

Halibut harvest projections are based on a linear regression using future harvest levels as the dependent variable, and years as the independent variable. A better equation was obtained when a dummy variable was added for the increased returns after 1982, which probably reflects the impacts of reduced foreign fishing after introduction of the MFCMA in 1976. The projection of the trend line is based on the assumption that the growth in the resource will continue. This projection could be reduced if bycatch by other directed fisheries reduces the halibut biomass.

The Bering Sea and Aleutians halibut harvest projection is shown in Figure 2.3-36. The estimated equation is:

Halibut $Y = -419200 + 212.3(\text{year}) + 2246.9(\text{dummy})$
$\qquad\qquad\quad (4.231) \qquad (4.249) \qquad\quad (8.686)$
$\bar{R}^2 = .877$
where Y is the forecast in pounds of halibut harvested, year is the year being forecast and dummy is a dummy variable to account for increased harvest levels after 1982.

Table 2.3-8: Exploitable Biomass for Pacific Halibut in Alaska
(in thousands of pounds)

Year	Area 3A	Area 3B	Area 4
1974	46,492	10,359	7,461
1975	50,073	11,033	7,202
1976	52,487	11,126	6,445
1977	55,922	11,352	5,834
1978	60,693	11,128	4,946
1979	64,539	13,907	5,393
1980	67,894	17,224	5,376
1981	71,885	20,848	5,088
1982	77,741	29,808	6,375
1983	87,706	31,177	6,630
1984	101,562	28,500	6,754
1985	113,927	28,134	8,131
1986	125,736	[a] 23,353	[a] 8,011 [a]
1987			

Source: International Pacific Halibut Commission, 1987 and 1989.

[a]Mid-point of range.

Table 2.3-9 shows the number of fishing days before the allowable quota was taken and the fishery closed for the years 1977 through 1986. The creation of smaller regulatory areas has increased the number of fishing days in the smaller areas, but the number has steadily decreased in Areas 4A and 4B. This shortening of the halibut season has been the impetus for investigations of limited entry alternatives by the IPHC and the North Pacific Fishery Management Council. Additional new subdistricts have been proposed to the IPHC by fishermen from several communities around the Bering Sea, however there appears to be resistance to additional regulatory areas.

Figure 2.3-36

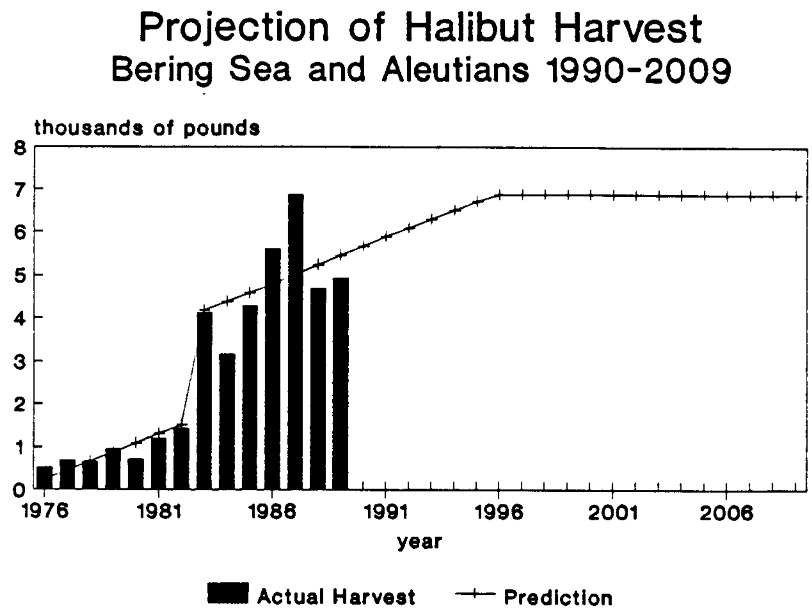


Table 2.3-9: Fishing Days for Halibut in the Bering Sea, 1977-1988

Year	Area 4A	Area 4B	Area 4C	Area 4D	Area 4E
1977	38	a	a	a	a
1978	36	a	a	a	a
1979	36	a	a	a	a
1980	44	a	a	a	a
1981	42	a	a	a	a
1982	27	a	a	a	a
1983	15	29	32	21	a
1984	7	14	33	14	110
1985	9	16	24	23	108
1986	7	6	18	8	48
1987	4	6	6	7	30
1988	6	16	17	12	102

Source: International Pacific Halibut Commission, 1987.

[a]Prior to 1983, all of the Bering Sea was in area 4; prior to 1984, area 4E was not defined as a separate area.

2.3.2.8 Other Species

Other species category contains squid, Atka mackerel, skates, smelts, sharks, etc. which are species of low abundance or little commercial value. For example, the allowable catch of squid in the Bering Sea is 500 metric tons, primarily because there is little interest in the species. The allowable biological catch of squid is 10,000 mt. The harvest in 1989 was 329 metric tons. Species within this group fluctuate in abundance, but generally comprise a constant portion of the catch.

2.3.3 Shellfish

The Bering Sea and Aleutian Island crab grounds are among the most productive in the world, attracting large capital investments in the form of modern fishing fleets and processing capacity. During the 1970's, over ten percent of the world catch of crabs came from the Bering Sea area. During that same period, the Bering Sea production made up 44 percent of the national crab catch of the U.S. and 65 percent of the national value of crabs landed (Otto, 1981). Within Alaskan waters, catches from the Bering Sea/Aleutian Islands area made up about 80 percent of the state's king and tanner crab catch.

The 1989 Bering Sea crab season is depicted in Figure 2.3-37. The relatively short seasons for king crab resulted from heavy harvest pressure on the stocks with quotas reached in a few days.

Figure 2.3-37: 1989 Bering Sea Crab Seasons

	Month											
Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dutch Harbor Brown King									===	===	===	===
St. Matthew Blue King									=			
Bristol Bay Red King									==			
Pribilof Blue King[a]									=			
Adak Red King											===	===
Adak Brown King[a]								==	===	===	==	
Bering Sea C. bairdi	===	===	===									
Bering Sea C. opilio	===	===	===	===								
Korean Hair[b]	===	===	===	===	===	===	===	===	===	===	===	===

Source: Griffin, 1989.

[a]No season.
[b]No effort.

The following subsections discuss recent trends in past crab stock abundance as well as the outlook for future abundance and commercial catches in the Bering Sea and Aleutian Islands areas. One indication of the outlook for future catch levels can be determined from research survey data available for the major crab species in the Bering Sea (Table 2.3-10).

Table 2.3-10: Bering Sea Crab Population Estimates
(Millions of Commercial-sized Male Crabs)

	Red King	Blue King		Tanner		
Year	Bristol Bay	Pribilof Islands	St. Matthew	C. bairdi	C. opilio	Korean Hair
1969	9.8					
1970	5.3					
1971[a]						
1972	5.4					
1973	10.8					
1974	20.9	1.9				
1975	21.0	7.5				
1976	32.7	3.9		109.5		
1977	37.6	9.4		92.1		
1978	46.6	4.3	1.8	45.6		
1979	43.9	4.6	2.2	31.5		16.1
1980	36.1	4.2	2.5	31.0		13.7
1981	11.3	4.2	3.1	14.0		15.9
1982	4.7	2.2	6.8	10.1		7.7
1983	1.5	1.3	3.5	6.7		4.8
1984	3.1	0.6	1.6	5.8	153.2	2.9
1985	2.5	0.3	1.1	4.4	74.9	2.2
1986	5.9	0.4	0.4	3.1	83.1	1.5
1987	7.9	0.7	0.7	8.3	150.8	1.2
1988	6.4	0.2	0.8	17.4	171.0	0.6
1989	11.9	0.2	1.5	42.3	187.1	0.4

Source: Stevens, B. G., R. A. MacIntosh and R. S. Otto, 1989.

[a]Not available.

2.3.3.1 King Crab

Crab catches from the Bering Sea comprise about two-thirds of the total production from the combined Bering Sea/Aleutian Islands area. The predominant species of the area is the red king crab. The red king crab catches from the Bristol Bay and Adak areas are listed in Table 2.3-11. The catch of red king crab is currently at the 12 million pound level, having dropped precipitously from a high of 130 million pounds in 1980. Almost all the catch of this species comes from the Bristol Bay area. A small red king crab fishery also occurs in Norton Sound.

Table 2.3-11: Red King Crab Harvest 1975-1989
(harvest in pounds)

	Bristol Bay	Adak	Total
1975	51,326,259	2,774,963	54,101,222
1976	63,919,728	411,583	64,331,311
1977	69,967,868	0	69,967,868
1978	87,618,320	905,527	88,523,847
1979	107,828,057	807,195	108,635,252
1980	129,948,463	467,229	130,415,692
1981	33,591,368	1,419,513	35,010,881
1982	3,001,210	1,648,926	4,650,136
1983	0	1,701,818	1,701,818
1984	4,182,406	1,981,579	6,163,985
1985	4,174,953	1,367,672	5,542,625
1986	11,393,934	906,293	12,300,227
1987	12,289,067	712,243	13,001,310
1988	7,387,795	1,213,933	8,601,728
1989	10,264,791	1,567,314	11,832,105

Sources: Alaska Department of Fish & Game, 1988 and 1989d.

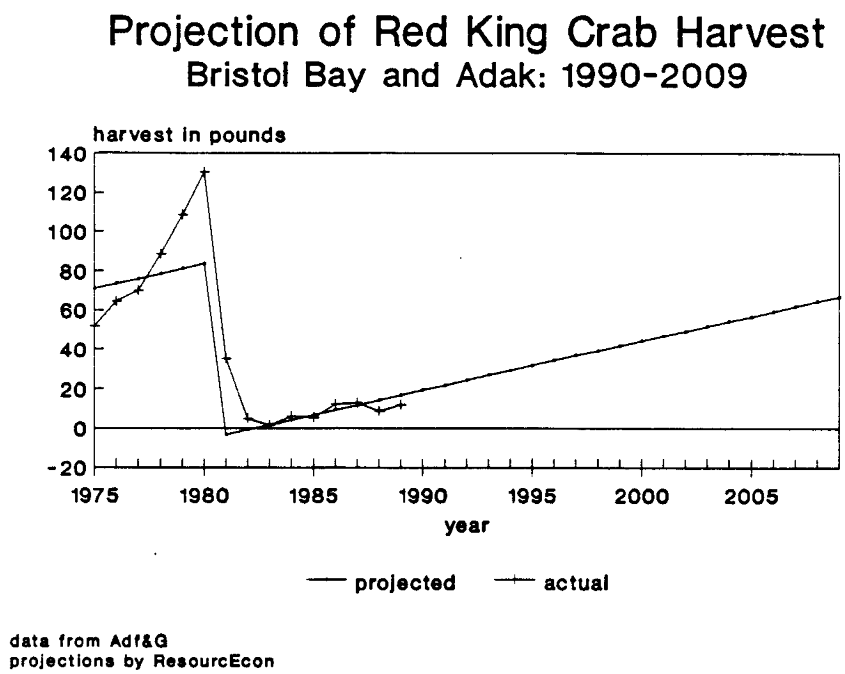
Bristol Bay red king crab are showing signs of recovery from recent low levels. Abundance of small crabs is increasing and the commercial stock appears to be increasing, but at a relatively slow rate. By the early 1990's, catches should be above current levels, but will probably not approach the highs of the late 1970's. Future projected harvest levels for red king crab are shown in Figure 2.2- 38, based on past harvest trends. The future harvests are estimated to be:

Red King crab $Y = -4876576881 + 2505078(\text{year}) - 89282891(\text{dummy})$ (Figure 2.3-38)
$(.817)$ $(.844)$ (14.294)

$\bar{R}^2 = .711$

where Y is the estimated forecast in pounds for red king crab harvests, year is the year being forecast and dummy is a dummy variable to account for the collapse of the fishery in 1981.

Figure 2.3-38



Recent catch levels of blue king crab are also at low levels (1.2 million pounds in 1989) compared with the peak harvest of nearly 18 million pounds in 1982. The blue king crab harvests from 1977 through 1989 are shown in Table 2.3-12 for the Pribilof and St. Matthew regulatory areas.

Stocks of blue king crab are at depressed levels. The Pribilof fishery was closed in 1989 due to the low abundance. The population in St. Matthew regulatory area shows signs of rebuilding with improving recruitment of juveniles. Based on past harvest trends, the future is forecast to be

$$\text{Blue King crab } Y = \underset{(.824)}{1583204137} - \underset{(.866)}{794846.1}(\text{year}) \qquad \text{(Figure 2.3-39)}$$

$\bar{R}^2 = .23562$

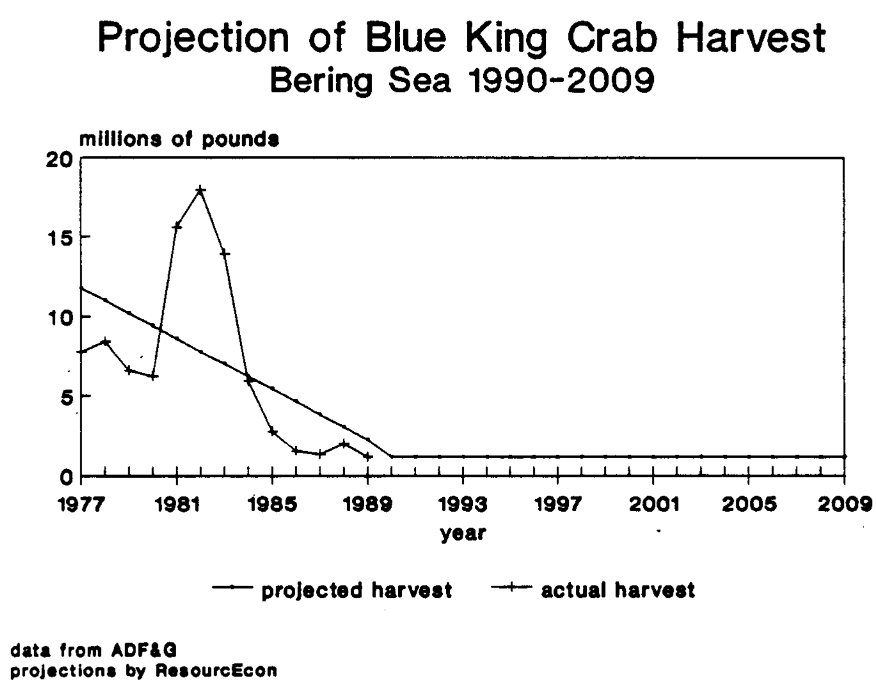
where Y is the estimated forecast in pounds for blue king crab harvests and year is the year being forecast. The negative trend line is modified to a constant 1989 harvest level rather than continue the downward trend. This modification is based on slightly improving stock conditions for the St. Matthew area.

Table 2.3-12: Blue King Crab Harvest 1974-1989
(harvest in pounds)

Year	Pribilof district	St. Matthew	Total
1977	6,611,084	1,202,066	7,813,150
1978	6,456,738	1,984,251	8,440,989
1979	6,395,512	210,819	6,606,331
1980	5,995,231	219,777	6,215,008
1981	10,970,346	4,627,761	15,598,107
1982	9,080,729	8,844,789	17,925,518
1983	4,405,353	9,506,880	13,912,233
1984	2,193,395	3,764,592	5,957,987
1985	306,699	2,472,110	2,778,809
1986	532,735	1,003,162	1,535,897
1987	258,939	1,075,179	1,334,118
1988	701,337	1,325,185	2,026,522
1989	0	1,170,258	1,170,258

Sources: Alaska Department of Fish & Game, 1988 and 1989d.

Figure 2.3-39



The fishery for brown king crab began to expand in 1982, when the stocks of red king crab collapsed, and steadily built to the 17 million pound level by 1990 (Table 2.3-13). Currently, catches of brown king crab come from the area, 171 degrees W longitude to 187 degrees E longitude. The largest catches come from the Seguam Pass area. No information on stock abundance and recruitment is available for this area and the future outlook is uncertain. Since the brown king crab harvests have increased due to exploration of new grounds, it is possible that the current high levels may not be sustainable and that catches will trend lower in the 1990's. Due to the several uncertainties, future harvests of brown king crab are projected at current levels. (see Figure 2.3-40).

Table 2.3-13: Brown King Crab Harvest 1981-1989
(harvest in pounds)

	Dutch Harbor	Adak	Total
1983	1,810,973	8,006,274	9,817,247
1984	1,521,142	8,128,029	9,649,171
1985	1,968,213	3,180,095	5,148,308
1986	1,869,180	11,024,759	12,893,939
1987	1,383,198	12,798,004	14,181,202
1988	1,545,113	8,001,989	9,547,102
1989	1,700,000	8,749,240	10,449,240

Source: Alaska Department of Fish & Game, 1988 and 1989d.

2.3.3.2 Korean Hair Crab

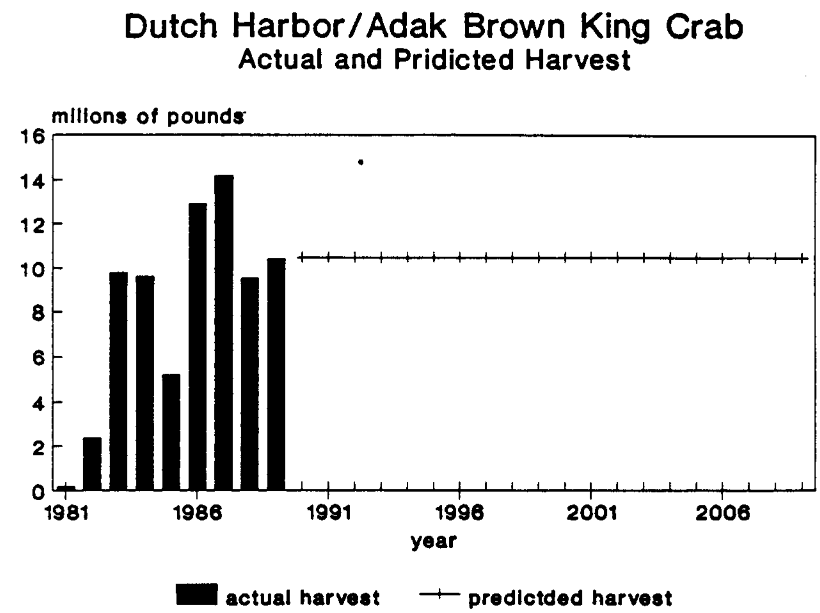
The Korean Hair crab is a relatively minor fishery which occurs near the Pribilof Islands. Abundance in the Bering Sea has been at low levels since about 1984, but small crabs are starting to show up which indicates a population increase. The stock will probably start to increase slightly in the 1990's.

2.3.3.3 Tanner Crab

There are two species of tanner crab fished within the study area: Chionoecetes bairdi and C. opilio. The species are very similar, but the C. opilio is much smaller than the larger C. bairdi. The C. opilio has the higher annual production rate (see Table 2.3-14).

C. opilio catches have risen to a current level of about 150 million pounds from the Bering Sea. This catch is taken primarily from the grounds around the Pribilof Islands and extends to the U.S.-Soviet convention line.

Figure 2.3-40



based on ADF&G and NMFS data

The Bering Sea was closed to fishing for C. bairdi during 1986 and 1987, but reopened in 1988. Recent research survey information (Table 2.3-10) indicates an increase in abundance which has been reflected in the catches. The bairdi fishery has historically occurred primarily in the Bristol Bay, with some production coming from the Pribilof Islands.

Current catch levels of C. bairdi in the eastern Aleutians are shown in Table 2.2-14. Little is known regarding the C. bairdi stocks in the area. From catch data, it appears that the stocks are small and that catches can be expected to remain at current levels.

C. Bairdi crab are caught in relatively small numbers in the western Aleutians (see Table 2.3-14). Abundance appears to be relatively low most years and are caught incidentally during the red king crab fishery.

Projections for future harvests of bairdi and opilio harvests in the study area are shown in Figures 2.3-41 and 2.3-42. Given the level of uncertainties in future resource abundances, harvests are projected at current levels, i.e. opilio harvests to remain at 150 million pounds, with bairdi harvests increasing slowly to 12 million pounds.

c. Bairdi crab $Y = -420450542.4 + 229810.8(\text{year}) - 29765298.9(\text{dummy})$ (Figure 2.3-41)
(.010) (.012) (3.043)

$\bar{R}^2 = .393$

Table 2.3-14: Tanner Crab Harvest
(pounds)

Year	C. bairdi Bering Sea	C. bairdi Eastern District	C. bairdi Western Aleutians	C. bairdi Total Bairdi	C. opilio Bering Sea
1968	17,900			17,900	
1969	1,008,900			1,008,900	
1970	1,014,700			1,014,700	
1971	166,100			166,100	
1972	107,761			107,761	
1973	231,668		71,887	303,555	
1974	5,044,197	498,836	0	5,543,033	
1975	7,284,378	0	0	7,284,378	
1976	22,341,475	534,295	0	22,875,770	
1977	51,455,221	1,239,569	237,512	52,932,302	
1978	66,648,954	2,494,631	197,244	69,340,829	1,716,124
1979	42,547,174	1,280,115	337,297	44,164,586	32,187,039
1980	36,614,315	886,487	220,716	37,721,518	39,572,668
1981	29,732,086	654,514	838,697	31,225,297	52,750,034
1982	11,008,779	739,694	448,399	12,196,872	29,355,379
1983	5,273,881	547,830	384,146	6,205,857	26,128,410
1984	1,208,223	239,585	163,460	1,611,268	26,813,074
1985	3,151,498	165,529	206,814	3,523,841	65,998,875
1986	0	167,339	42,761	210,100	97,984,539
1987	0	160,292	141,390	301,682	101,903,388
1988	2,210,394	309,918	148,005	2,668,317	135,354,637
1989	7,000,000	324,000	45,000	7,369,000	149,400,000

Source: Alaska Department of Fish & Game, 1988 and 1989d.

2.3.3.4 Shrimp

Commercial fishing for shrimp does not currently exist within the study area. The Japanese began fishing shrimp in Alaskan waters north of the Pribilof Islands in 1961, with landings of 11,250 tons that year. The peak year for the Japanese fishery was in 1963 when 34,775 tons were taken. From 1963-1968, the harvests quickly declined to less than one million pounds landed. The decline was probably due to overfishing. After 1968, there was no foreign fishery on shrimp.

Domestic fishermen began fishing the eastern Aleutians in 1972. Harvests in the fishery peaked during the 1977-78 season with a catch of 6.8 million pounds. Since that time, the fishery has declined. No fishing effort has occurred since 1983. This resource is classed as "severely depleted" (Alaska Department of Fish & Game, 1988) and it is unclear when the resource will recover sufficiently to allow a commercial fishery.

Figure 2.3-41

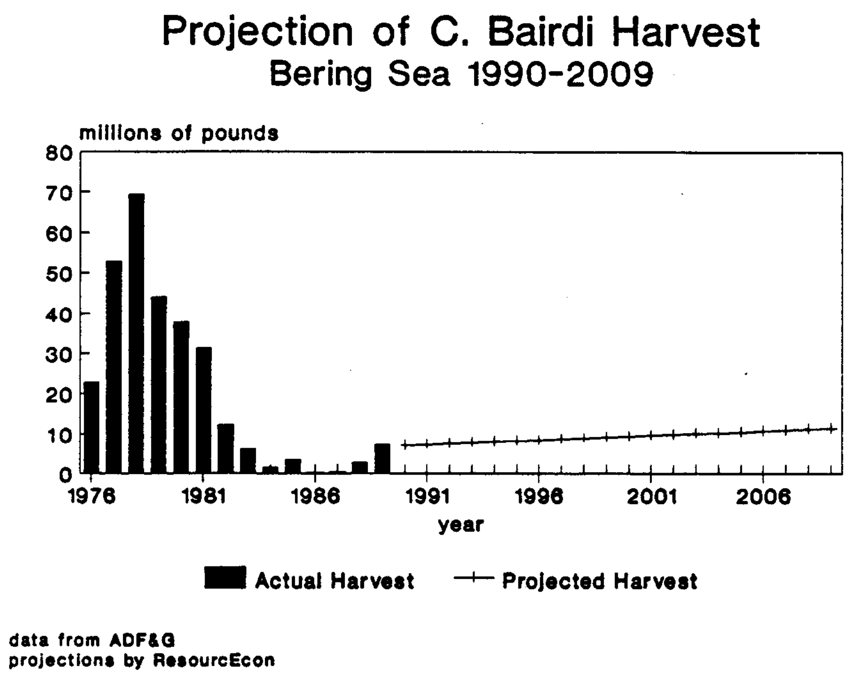
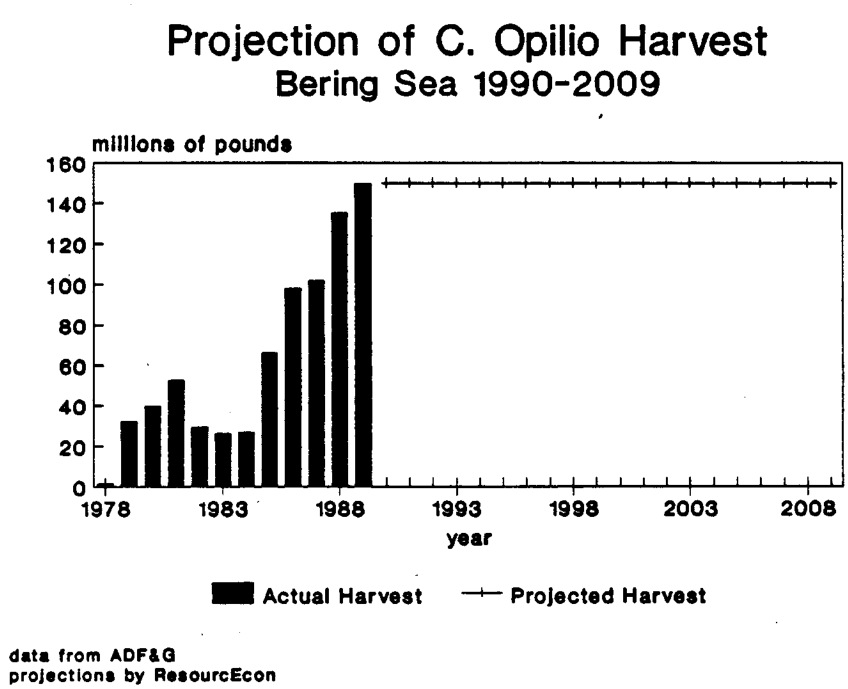


Figure 2.3-42



2.4 Harvesting Sector

The Bering Sea harvesting sector ranges in size from small skiffs, used for seasonal set gillnet and hand longlining, to very large trawlers and crabbers which operate throughout all seasons. To a person familiar with coastal salmon and halibut fisheries, the most impressive factor about the trawl and crab components of the Bering Sea fishing fleet is the large size of the vessels. Vessel size is a function of the volume of resources harvested by each vessel, and the adverse weather these ships are often forced to operate in. This scale factor requires design and construction of support facilities that are different from those of typical Alaska ports. The large boat fleet demands the availability of services to ensure effective use of the considerable investment in each vessel.

The wide range in seasonality, and vessel size and infrastructure requirements for the Bering Sea fleet requires that the fleet be separated into groups for further evaluation. This section presents vessel information by the various gear types used in the Bering Sea.

2.4.1 Domestic Fleet

2.4.1.1 Trawl

The Bering Sea trawler fleet ranges in size from small, coastal trawlers which operate from local ports, to very large vessels which also process their catch. Vessels which conduct harvesting and processing operations are discussed in Section 2.5.2.

For purposes of this report the trawl fleet is further subdivided into the domestic fleet which delivers to U.S. ports or processors, and the joint-venture fleet which delivers at-sea to foreign flag processors. Information on the latter fleet is provided in Section 2.4.2.

This section discusses trawlers which harvest resources and deliver to domestic ports and processors.

Harvesting and Operating Mode

Vessels trawling for groundfish in Bering Sea waters operate in several different fishing modes. One fishing mode is to operate as a catcher vessel for a floating processing ship. In the joint-venture fisheries, the processing ship is foreign owned and operated. Joint-venture catcher vessels deliver to the processing ship by transferring the full cod ends of their trawls. Since the joint venture catcher vessels do not bring their catch on board, many do not have the capacity to store and transport large volumes of fish. These vessels are limited to this type of fishery. As the foreign factory ships are displaced by domestic processors, they will need to find a domestic mothership or catcher-processor to deliver their catch or be forced out of the fishery.

A second mode is trawl vessels that can harvest and deliver to a processor (shorebased or floating) in another location. The trawl vessels using this mode haul their catch aboard and deliver it to a processor when they have a full hold.

Catcher-processors are another mode which incorporates catching and processing operations. When fishing is slow, catcher processors may take deliveries from additional catcher-vessels to augment their own fishing capacity. During periods of peak fishing, catcher-processors can keep their processing plants at full operating capacity and do not require additional fishing capability.

Depending on the species, trawlers use either bottom or midwater trawl gear. For bottom hugging species such as yellowfin sole, trawlers use roller gear to keep the trawl as close to the bottom as possible. Midwater trawls are used for pollock and other species. They can be towed at any depth the fish are found. Net sonars, underwater cameras and other electronic gear can be used to make sure the net is fishing where the fish are.

Employment and Residency

The Alaska fisheries industry is composed of the fish harvesting, fish processing, and secondary industries. However, little data have been available on employment in the fish harvesting sector since most of this employment is classified as self-employment and is not collected in the continuing survey used to collect nonagricultural wage and salary employment.

The Alaska Department of Labor (ADOL) and the Alaska Commercial Fisheries Entry Commission (CFEC) have collaborated to refine a methodology originally developed by ADOL for estimating employment in the fish harvesting sector. Estimates are based on information contained in fish tickets and crew factors (Thomas, 1987). Fish tickets are completed at the time of delivery of fish or shellfish to the buyer, and include vessel license number, area fished, date of catch, number and species of fish caught, and an assigned, unique number for the permit holder. Crew factors are estimates of the average number of people working on a commercial fishing vessel using a given gear type. Employment tables shown in Section 2.4 for each gear type are based upon this methodology.

In 1986, ADOL published a report entitled Seafood Harvesting and Processing in Alaska, 1982-1983 (Thomas, 1986), which provided a preliminary assessment of fish harvesting employment and information on residency by census area and gear type. The residency pattern for each permit holder was based upon their mailing address, and the crew was assumed to be from the same area as the permit holder. CFEC staff established that this assumption was not valid and, as a result, determination of residency for the harvest sector has ceased. The residency of permit holders is provided in this section, but only as a relative indicator of residency for total gear type employment.

The ADOL publications combine joint venture and longline boats with all trawl vessels into a bottomfish category and do not provide the detail required for this study. The data base information available to MMS does not distinguish between catcher boats and catcher/processors using trawl equipment. However, CFEC data apparently show monthly operations for vessels with shore deliveries, and do not include vessels delivering at-sea or catcher/processors. This assumption is based upon the small number of domestic trawl vessels reflected in the CFEC data, the larger number shown in the number of permits issued as shown in the data bases, and NMFS data on the number of groundfish trawl vessels operating in the Bering Sea (NMFS, 1989).

Table 2.4-1 shows the employment levels for domestic trawl fisheries in the Bering Sea for 1981 through 1988. This employment estimate is derived from the median trawl crew factor of 4.0 developed by Thomas (1986), and the monthly vessel data contained in the CFEC data bases provided to MMS.

Table 2.4-1: Employment in the Domestic Trawl Fishery

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg. Crew	Total Crew Mos.
1981	8	12	16	16	16	32	32	36	16	12	8	16	18	220
1982	4	12	16	20	24	24	20	24	16	12	24	24	18	220
1983	24	24	24	20	20	16	20	20	16	4	4	4	16	196
1984	24	24	8	12	16	4	16	16	16	20	8	120	23	284
1985	24	36	32	4	4	12	8	24	16	20	8	100	24	288
1986	8	20	44	28	28	24	20	24	16	8	8	12	20	240
1987	12	28	20	16	8	8	0	24	24	20	24	28	17	212
1988	20	32	52	52	60	36	32	52	52	52	52	48	45	540 [a]

[a]Preliminary data.

Data for the number of unique trawl permits or vessels with landings are not available from agency databases provided to MMS. The data present the number of permits or vessels by year, community, gear, area, and species. The same vessel can fish for more than one species and in more than one area. Several different approaches were used to estimate vessel or permit numbers using this information but the results were substantially different from other sources.

Table 2.4-2 shows NMFS' residency estimates for the number of vessels that landed groundfish in the Bering Sea/Aleutian Islands domestic trawl fishery for 1986 through 1988.

Table 2.4-2: Residency of Vessels in the Domestic Trawl Fishery

Year	At-Sea			Shore-based		
	Alaska	Other	Unknown	Alaska	Other	Unknown
1988	5	31	20	8	34	2
1987	6	32	8	8	23	10
1986	4	20	6	9	15	0

Source: National Marine Fisheries Service, 1989.

Harvest Levels and Earnings

Table 2.4-3 indicates the relative magnitude of total metric tons harvested, and associated earnings for the trawl fleet operating in the Bering Sea. The table combines harvest and earnings data for trawlers and factory trawlers since the computer data bases do not separate these two vessel types. This estimate is derived from community level data so there are a number of records subject to non-disclosure rules. There are also a number of records for 1987 and 1988 for which prices have not yet been estimated. As a result, earnings are not shown for those years. Earnings are the sum of ex-vessel value for the trawl fishery. Ex-vessel value for factory trawlers are calculated as the average price for on-shore trawl deliveries.

Table 2.4-3: Harvest and Earnings in the Domestic Trawl Fishery

Year	Metric Tons	Total Earnings
1988	490,258	a
1987	197,169	a
1986	73,691	$16,708,585
1985	40,049	$ 7,124,025
1984	35,799	$ 9,631,578
1983	39,162	$11,202,798
1982	22,916	$ 8,210,775
1981	13,913	$ 4,819,769

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Not available.

Vessel Characteristics

Table 2.4-4 shows the size distribution and total number of domestic trawlers operating in the Bering Sea for the 1986 through 1988 time period. The CFEC data bases are by species, gear, and area so the information cannot be summed to arrive at the size distribution for the fleet. The data in Table 2.4-4 is from NMFS (1989).

Information on other characteristics of these boats is relatively limited. The National Marine Fisheries Service collects a limited amount of information about each vessel for its role in managing the resource. Additional information has to be gleaned from various trade journals, previous reports, personal communications, and proprietary data files. The other characteristics information presented in this and subsequent harvest sector subsections are aggregated from this compendium of sources, with substantial reliance upon survey work done in 1986 by R & M Consultants.

Table 2.4-4: Vessel Size Distribution for Domestic Trawlers
(Meters)

Year	<18.2	18.3-25.6	25.7-33.2	33.3-40.9	41.0-48.6	48.7-56.4	56.5+	Unk.
1988	5	10	11	24	4	8	22	0
1987	6	9	10	22	4	5	7	3
1986	2	6	9	11	3	4	3	1

Source: National Marine Fisheries Service, 1989.

The size and other characteristics of domestic trawlers operating in the Bering Sea has increased in the past few years as shore-based surimi plants contracted with catcher fleets that are composed of converted oil rig supply boats. The vessels average 185 feet in length and are considerably larger than the typical trawl vessel in the domestic or joint-venture fleets. More detailed information has not been obtained on these newer domestic trawlers.

Table 2.4-5: Selected Characteristics of the Domestic Trawl Fleet

Characteristic	Range	Average
Beam (Width)		
Meters	7-10.4	8.8
Feet	23-34	29
Loaded Draft		
Meters	2.7-6.7	4.3
Feet	9-22	14
Horsepower	720-1,900	1,100
Fuel Capacity		
Liters	34,100-344,400	158,600
Gallons	9,000-91,000	41,900
Refuel Volume		
Liters	11,360-227,100	101,100
Gallons	3,000-60,000	26,700
Fuel Consumption		
Liters/Day	1,900-5,700	3,600
Gallons/Day	500-1,500	950

Sources: R & M Consultants, 1986.

2.4.1.2 Longline

Harvesting and Operating Mode

Longline fishermen fishing for halibut, sablefish, Pacific cod, and similar species use long strings of gear, called skates that are strung along the ocean bottom. Skates are traditionally about 300 fathoms (1800 feet) in length and are anchored at both ends. Buoys at each end of the string mark the location of the gear. Skates of gear can be connected together to any length a skipper may desire. Short lines called "gangions" are connected or snapped to the skate groundline and connect to the hooks. Longlines are set and pulled with hydraulic winches. Automatic gear is available to bait the hooks and connect the gangions to the groundline. One such system is the Mustad Autoline System. Longlines are left to "soak" on the bottom while waiting for fish. The length of the soak can vary from a couple of hours to 20 to 30 hours or longer if poor weather conditions prevent pickup of the gear. The short openings for halibut in recent years tend to reduce the soak time of longline fishing for that species.

Employment and Residency

Table 2.4-5 shows estimated employment levels for longline vessels operating in the Bering Sea for the 1986-1987 time period. The estimate is based upon a 4.3 person crew factor and is for catcher boats only (excludes catcher/processors). This table is derived from data contained in the CFEC data bases, and Thomas (1986).

Table 2.4-6 shows the residency of domestic vessels that landed groundfish in the Bering Sea/Aleutian Islands with hook & line. This designation used by NMFS includes longline and jigging, but longline gear is the dominant method in this classification.

Table 2.4-5: Employment in the Domestic Longline Fishery

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.	Total Mos.
1981	0	0	12	4	0	107	68	103	12	0	0	0	25	309
1982	0	0	0	0	245	172	34	258	17	0	0	0	60	726
1983	0	0	0	0	0	331	326	511	189	4	0	0	113	1,363
1984	0	0	4	4	468	632	223	180	176	21	21	21	146	1,754
1985	4	4	4	206	309	649	602	322	584	12	0	0	225	2,700
1986	17	17	21	141	520	692	662	1,023	60	21	12	4	266	3,194
1987	81	116	167	378	980	1,470	623	1,066	976	460	98	60	540	6,480
1988	43	90	172	266	421	240	283	326	232	120	73	51	193	2,322[a]

[a]Preliminary data.

Table 2.4-5: Residency of Permit Holders in the Domestic Longline Fishery

Year	At-Sea			Shore-based		
	Alaska	Other	Unknown	Alaska	Other	Unknown
1988	25	27	6	46	22	1
1987	25	35	7	66	20	1
1986	9	10	0	35	15	1

Source: National Marine Fisheries Service, 1989.

Harvest Levels and Earnings

Table 2.4-6 indicates the relative magnitude of total pounds harvested, and associated earnings for the longline fleet operating in the Bering Sea. This estimate is derived from community level data so there are a number of records subject to non-disclosure rules. Numerous records for 1987 and 1988 contain zeroes in the value field, indicating that prices have not yet been estimated for these years. As a result, earnings are not shown for those years. In addition, 1988 halibut catches and values have not yet been incorporated into the data base. Earnings are the sum of ex-vessel value for the longline fishery. Ex-vessel value for longline catcher/processors are calculated as the average price for on-shore longline deliveries.

Table 2.4-6: Harvest and Earnings in the Domestic Longline Fishery

Year	Thousands of Pounds	Total Earnings
1988	14,192.6	a
1987	20,536.9	a
1986	8,405.2	$9,843,399
1985	5,155.7	$4,170,494
1984	2,534.8	$1,901,628
1983	2,532.2	$2,792,034
1982	976.4	$1,026,760
1981	838.6	$817,432

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Not available.

Vessel Characteristics

Table 2.4-7 shows the total number of longliners, and a breakdown by different size categories for those vessels operating in the Bering Sea.

Table 2.4-7: Vessel Size Distribution for Domestic Longliners (Meters)

Year	<18.2	18.3-25.6	25.7-33.2	33.3-40.9	41.0-48.6	48.7-56.4	56.5+	Unk.
1988	57	33	6	8	1	4	1	0
1987	64	44	5	3	2	1	0	2
1986	25	29	4	1	1	0	0	0

Source: National Marine Fisheries Service, 1989.

Longlining is the province of the small boat fleet. Large ships are required to handle trawl gear or king crab pots, but even a small skiff can be used in protected waters to longline for halibut, Pacific cod, and other species. Increasing numbers of gillnet and seine vessels are seasonally outfitted with longline gear to participate in the spring halibut and sablefish openings, prior to their primary salmon season. In addition the increasing numbers of small vessels participating in the Bering Sea longline fishery, there are increasing numbers of large catcher/processors joining the fishery. Table 2.4-7 readily shows the trend toward increasing number of large vessels.

The numbers of longline vessels operating in the Bering Sea has increased in recent years. Prices for sablefish and halibut have increased and the longline fleet has moved north and west as quotas are reached in other areas in order to extend the fishing season.

Substantial increases in the number of longline boats in the fleet are not likely. The sablefish and halibut quotas have been decreasing. As the number of boats entering these high-valued fisheries have increased, the quotas have been reached in shorter periods of time resulting in less revenue and higher average costs per fish landed by the average permit holder. In addition, the NPFMC is considering several different management strategies for sablefish, and possibly other groundfish, that could limit the size of the fleet or limit the fishing pressure.

Trade journals and other publications write few articles describing small boats. The information presented below in Table 2.4-8 are aggregated from data for fifteen 15 dedicated longline boats that operated in the Bering Sea (R & M Consultants, 1986). This overstates the draft, fuel consumption, and refuel volume of the entire Bering Sea longline fleet since many smaller vessels which longline as a supplement to salmon or other fisheries are omitted. However, these averages are a more accurate representation of that portion of the longline fleet which spends the greatest amount of time in the Bering Sea, and accounts for a significant percent of the harvest.

2.4.1.3 Crab Pot

Harvesting and Operating Mode

Crab pot fishing vessels are typically 90 to 120 feet in length or larger. This size vessel is required in the Bering Sea because of the adverse conditions encountered during the crab seasons as well as the need to transport heavy, bulky loads of crab pots to and from the fishing grounds. Most of the vessels are relatively new steel-hulled with sophisticated electronic gear that aid in setting and locating the pot strings. Crab vessels need the characteristics of: 1) the ability to maintain stability and maneuverability with heavy loads of seawater in the live tanks, 2) a stable working platform for crew members to set and haul pots, 3) a large deck to carry upwards of 300 pots, 4) a high pilothouse for good visibility of the deck area and 5) capability to work in other fisheries.

Table 2.4-8: Selected Characteristics of the Longline Fleet

Characteristic	Range	Average
Beam (Width)		
Meters	3.6-7.9	5.6
Feet	12-26	18.5
Loaded Draft		
Meters	2.4-4.6	3.2
Feet	8-15	10.5
Horsepower	180-600	370
Fuel Capacity		
Liters	6,056-75,700	23,845
Gallons	1,600-20,000	6,300
Refuel Volume		
Liters	2,650-32,173	9.690
Gallons	700-8,500	2,560
Fuel Consumption		
Liters/Day	379-1,817	946
Gallons/Day	100-480	250

Source: R & M Consultants, 1986.

Several types of pots are used for king and tanner crab fishing. Most are made of welded steel rebar and weigh 400 to 500 pounds empty. The most common configuration is square, with dimensions of 6x6x2.5 feet or 7x7x2.5 feet. Crab vessels are required to have circulating seawater tanks to hold the crab live until they are delivered to a processor. By law, dead crabs have to be discarded.

Herring is the standard bait for crab fishing in the Bering Sea. It is placed frozen in perforated plastic jars which hang in the pot. Additional "hanging bait" such as fresh caught cod, pollock or other species is commonly included in addition to the herring.

Crab pots are typically fished in a string although each is set individually after being baited. When the pot is launched, the coiled lines unravel. The lines are attached to one or more floats which mark the location of the pot. To haul the pot, the vessel is pulled up on the leeward side of the buoys. The pot line is caught with a grappling line or hook and run through a hydraulic pot lifter. The pot lifter has a slipping clutch which keeps a constant tension on the line as the vessel rises and falls with the swell. This keeps the lines from parting under sudden strains. Once the pot is lifted to the surface, it is picked up with a short boom and set on the pot lifter. The catch is removed, the pot is rebaited and reset.

Employment and Residency

Table 2.4-9 shows estimated employment levels for crab vessels operating in the Bering Sea for the 1981-1988 time period. The crew factors for crabbers range from 3.0 persons for dungeness crab in the Aleutian Peninsula area to 5.5 persons in the Bering Sea- Western Aleutian area for king and tanner crab, with a median of 5.0 (Thomas, 1986). The decline in the king crab resource and the transition to harvesting lower valued opilio is readily apparent in the change in employment estimates.

Table 2.4-9: Employment in the Crab Pot Fishery

	Month													Total
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.	Mos.
1981	410	335	240	330	280	105	45	30	455	405	400	565	300	3600
1982	570	485	400	180	150	65	55	115	460	120	300	255	262	3155
1983	100	490	530	220	215	85	25	95	270	270	280	345	243	2925
1984	205	420	450	150	65	45	25	50	215	270	200	150	187	2245
1985	245	320	140	155	130	90	40	30	135	285	105	125	150	1800
1986	305	385	140	140	130	115	95	140	135	410	95	75	180	2165
1987	330	150	250	260	255	215	105	95	220	645	125	90	228	2740
1988	430	355	445	240	150	290	220	75	135	430	160	110	253	3040

Table 2.4-10 indicates the residency for persons fishing crab permits in the Bering Sea/Aleutian Islands region. If an individual fishes several permits in different areas or for different species, each permit is counted. This overstates the number of individual permit holders but that information is not available from CFEC data bases and was not identified in the literature review. The residency by permit does provide a better evaluation of the level of harvesting effort by residency. This table clearly shows the dominant role of out-of-state fishermen in the Bering Sea/Aleutian Islands crab fisheries.

Harvest Levels and Earnings

Table 2.4-11 indicates the relative magnitude of total pounds harvested, and associated earnings for the crab pot fleet operating in the Bering Sea. This estimate is derived from community level data so there are a number of records subject to non-disclosure rules. Earnings are the sum of ex-vessel value for the crab pot fishery. Ex-vessel value for crab catcher processors are calculated as the average price for on-shore crab deliveries. Even though the king crab and C. bairdi tanner crab fisheries have been at depressed levels for several years, there has been an increasing trend in total earnings. The earnings are heavily dependent upon C. opilio tanner crab, rather than spread among several species as in prior years.

Table 2.4-10: Residency of Permit Holders in the Crab Pot Fishery

	Area of Residency			
Year	Bering Sea Region	Other In-State	Out-of-State	Total
1988	150	200	470	820
1987	147	183	440	770
1986	127	112	325	564
1985	127	66	315	508
1984	147	116	384	647
1983	184	132	607	923
1982	234	129	736	1,099
1981	210	148	752	1,110

Source: National Marine Fisheries Service, 1988.

Vessel Characteristics

The Bering Sea crab fleet is composed of: 1) dedicated crabbers which only pursue shellfish species, 2) crab boats which are capable of converting to and from trawling, and 3) smaller boats, such as seiners, for which crabbing is a secondary activity. Table 2.4-12 shows the size distribution and number of boats participating in the Bering Sea crab fisheries. Vessels that participate in more than one fishery, or operate in more than one management area are counted for each permit. As a result, this table overstates the actual number of vessels participating in the Bering Sea/Aleutian Islands crab fishery, but the data do provide an indicator of changes in vessel size over time.

Table 2.4-11: Harvest and Earnings in the Domestic Crab Pot Fishery (thousands)

Year	Pounds	Total Earnings
1988	157,547	$200,895
1987	126,644	$165,686
1986	120,618	$138,846
1985	82,248	$58,345
1984	42,179	$47,461
1983	63,396	$90,916
1982	72,512	$99,737
1981	139,237	$103,586

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

The number of small crab vessels (<18.3 meters; 60 feet) has declined since 1981, while the medium size categories (18.3> <42.7 meters; 61> <139 feet) have experienced mixed results with some size categories reaching their 1981 levels by 1988, and other categories experiencing losses in the number of vessels. The large size categories (>42.7 meters; 140 feet) have increased substantially in the last few years.

Table 2.4-13 shows selected characteristics for the Bering Sea crab fleet from a sample of 23 vessels for which data are available (R & M Consultants, 1986).

Table 2.4-12: Vessel Size Distribution for Domestic Crab Vessels (Meters)

	Number of Vessels by Size										
Year	<6.1	6.1-12.2	12.3-18.2	18.3-24.3	24.4-30.4	30.5-36.5	36.6-42.6	42.7-48.7	48.8-54.8	54.9-60.9	61.0+
1988	1	5	8	27	72	47	21	11	16	4	0
1987	1	5	6	40	87	43	25	12	12	4	0
1986	1	1	5	28	64	40	12	5	4	1	0
1985	3	2	4	19	48	40	16	4	3	0	0
1984	1	3	6	12	58	34	24	5	4	2	0
1983	1	3	3	20	66	45	33	9	6	2	0
1982	2	3	14	28	54	36	30	7	3	2	0
1981	3	5	26	43	71	51	41	11	4	2	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

2.4.1.4 Gillnet

The Bering Sea gillnet fleet is composed of a number of subgroups based upon species, management area and gear type, with varying regulations for each subgroup. These factors result in a wide disparity between the characteristics of the vessels in the fleet. This section aggregates data for the gear type and statistical differences between subgroups are obscured. However, where differences between subgroups are meaningful, the item is discussed. Information on local subgroups can be found in the discussion of the harvesting sector under each community in Section 3.

Table 2.4-13: Selected Characteristics of the Crab Fleet

Characteristic	Range	Average
Beam (Width)		
Meters	6.7-12.2	8.9
Feet	22-40	29.1
Loaded Draft		
Meters	2.4-5.2	4.1
Feet	8-17	13.5
Horsepower	370-1,500	900
Fuel Capacity		
Liters	34,065-43,528	137,396
Gallons	9,000-11,5000	36,300
Refuel Volume		
Liters	11,355-75,700	41,635
Gallons	3,000-20,000	11,000
Fuel Consumption		
Liters/Day	1,514-3,785	2,801
Gallons/Day	400-1,000	740

Source: R & M Consultants, 1986.

Harvesting and Operating Mode

Gillnet vessels are among the smallest commercial fishing vessels within the study area. By regulation, Bristol Bay drift gillnetters are limited to 32 feet in overall length. Vessels fishing the north side of the Alaska Peninsula do not have this regulatory restriction and are longer, with many in the 40 to 50 foot range.

Drift gillnet fishermen fish floating nets that drift with the water currents. Net length, depth and mesh size is usually set by regulation. The nets are floated with a cork along the headrope and are held down by a leadline along the bottom of the net. Nets are set and hauled with a hydraulic net reel. As the net comes over the stern of the vessel, salmon are pulled out of the net and placed in the hold.

In addition to salmon, drift gillnets are also used for the roe-herring fisheries in Togiak and other areas.

Set nets are similar to drift nets, but are fished in a single location. Each end of the net is anchored to hold against the tidal currents. The salmon caught are picked from the net from a skiff or after the net is left dry by the receding tide.

Employment and Residency

Table 2.4-14 shows estimated employment levels for the gillnet fishery for the 1981-87 time period. The crew factors for the salmon drift gillnet fishery ranged from 2.0 persons in the Aleutian Peninsula area to 2.5 in Bristol Bay, with an average of 2.25. Set gillnets ranged from 2.0 to 2.25 in the same areas, with an average of 2.13. Herring drift and set gillnet crew factors are 2.0 persons (Thomas, 1986). The crew factors are multiplied by the number of permits issued for each fishery to arrive at the employment estimates for each year. The monthly employment estimates are based upon fishing patterns for Alaska residents contained in CFEC data bases provided to MMS. Employment during the month of May is predominantly associated with the herring fishery. The Bering Sea salmon fisheries do not generally begin until June. The MMS data bases do not separate that part of Area M fisheries which occur in the Bering Sea from those which occur in the Gulf of Alaska. Since Area M vessels typically begin fishing on the Gulf side before moving north, and some boats return to the Gulf later in the season, this table over-estimates total employment that occurs within the Bering Sea. However, a large portion of the Gulf of Alaska catch is of fish bound for streams draining into the Bering Sea so Table 2.4-14 reflects the employment levels associated with Bering Sea stocks.

Table 2.4-14: Employment in the Gillnet Fishery

		Month												Total
Year	Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Permits
1988	1,940	0	0	0	0	2,261	7,433	8,377	4,161	1,049	0	0	0	4,930
1987	1,832	0	0	0	0	2,545	7,055	7,728	3,711	948	0	0	0	4,769
1986	1,742	0	0	0	0	1,908	6,734	7,661	3,665	938	0	0	0	4,420
1985	1,731	0	0	0	0	1,911	6,714	7,632	3,589	924	0	0	0	4,404
1984	1,606	0	0	0	0	1,250	6,248	7,393	3,481	896	0	0	0	3,966
1983	1,653	0	0	0	0	1,711	6,402	7,340	3,492	895	0	0	0	4,175
1982	1,689	0	0	0	0	2,027	6,529	7,331	3,491	895	0	0	0	4,329
1981	1,521	0	0	0	0	1,597	6,282	7,247	3,438	882	0	0	0	4,075

The Bering Sea salmon fisheries have been subject to limited entry since 1974. Herring fisheries have not previously been subject to this same limitation, although the Commercial Fisheries Entry Commission recently established a cutoff date and requirements for limited entry in the Norton Sound herring fishery. The number of participants in these fisheries is obviously affected by the presence or absence of such regulations, but residency patterns are also affected. For this reason, separate tables are presented for the two fisheries. Table 2.4-15 shows the residency of permit holders for the salmon gillnet fishery, and Table 2.4-16 presents similar information for the herring gillnet fishery. These numbers reflect permits fished and exclude those permits not fished during any given year.

Table 2.4-15: Residency of Permit Holders in the Salmon Gillnet Fishery

	Area of Residency			
Year	Bering Sea Region	Other In-State	Out-of-State	Total
1988	1,404	1,215	1,196	3,815
1987	1,331	1,087	1,094	3,512
1986	1,297	1,081	1,103	3,481
1985	1,336	1,055	1,073	3,464
1984	1,293	1,024	1,039	3,356
1983	1,290	1,018	1,026	3,334
1982	1,313	991	1,026	3,330
1981	1,343	947	1,011	3,301

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

The number of permits fished by residents of the Bering Sea region in 1988 is slightly above the 1981 level, but prior to 1988 the number of permits was fairly stable in the 1250 to 1300 permit level. Issuance of additional permits to Bristol Bay and the Yukon and Kuskokwim area residents due to litigation brought against the Alaska Commercial Fisheries Entry Commission has enabled the number of permits fished by residents of the region to remain relatively stable even with the out-migration of permits to other areas.

Table 2.4-16 shows residency patterns for herring permits fished in the Bering Sea area. Area residents have been expanding their efforts in these open fisheries for several reasons. First, expensive permits are not required for entry and, second, equipment used for set and drift gillnet salmon fishing which are the predominant methods used by area residents can easily used in the herring fishery.

Table 2.4-16: Residency of Permit Holders in the Herring Gillnet Fishery

Year	Area of Residency: Bering Sea Region	Other In-State	Out-of-State	Total
1988	649	216	250	1,115
1987	642	335	280	1,257
1986	510	216	213	939
1985	420	219	301	940
1984	239	171	200	610
1983	286	242	313	841
1982	257	305	437	999
1981	285	235	264	784

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Harvest Levels and Earnings

Table 2.4-17 summarizes information on harvest and earnings for salmon and herring fisheries in the Bering Sea. This data are estimated from community level data bases and non-disclosure rules prevent harvest and earnings information from being included in this table. Although Table 2.4-17 under-estimates total harvest and earnings it does provide a relative indication of changes for this gear type. It is evident that smaller salmon catches have occurred in the last few years in comparison to the early 1980's, but higher prices per pound for salmon have resulted in higher earnings to fishermen. The trend in herring harvests are mixed, but higher prices for herring have resulted in higher earnings for fishermen in this segment of the gillnet fishery

Table 2.4-17: Harvest and Earnings in the Domestic Gillnet Fishery
(in thousands)

	Salmon		Herring	
Year	Pounds	Total Earnings	Pounds	Total Earnings
1988	122,807.0	$227,930	15,865.7	$6,491
1987	120,424.3	$154,399	13,056.1	$4,270
1986	126,787.0	$160,951	17,435.8	$5,361
1985	168,619.6	$137,423	16,548.9	$3,995
1984	190,217.3	$117,059	14,348.0	$1,952
1983	243,387.9	$153,580	19,152.9	$3,648
1982	139,632.7	$94,506	20,502.1	$2,759
1981	197,023.6	$148,345	14,018.0	$2,230

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Vessel Characteristics

Table 2.4-18 presents aggregate data for the Bering Sea gillnet fleet. As previously mentioned, various regulations affect the characteristics of the Bering Sea gillnet fleet; the most widely known vessel regulation is the 9.75 meter (32 feet) limit on Bristol Bay drift gillnet vessels, and results in the large number of vessels shown in the 8-10 meter category. This size vessel is also used extensively in the herring fishery. Vessels which participate in both salmon and herring fisheries are counted twice in this table.

Table 2.4-18: Vessel Size Distribution for Gillnet Fleet
(Meters)

Year	Number of Vessels by Size										
	<6.1	6.1-12.2	12.3-18.2	18.3-24.3	24.4-30.4	30.5-36.5	36.6-42.6	42.7-48.7	48.8-54.8	54.9-60.9	61.0+
1988	102	2681	39	1	3	2			2		
1987	145	2509	26	2	2	1		1			
1986	147	2285	18	3	1	1	2		1		
1985	104	2220	11	1	1		1				
1984	54	1967	23	1	3	3		1			
1983	121	2181	25	5	3	2					1
1982	139	2127	25	2	2	1	1		1		
1981	112	2025	24	4	4	5	3	1	1		

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

The overall length limit regulation imposed on the Bristol Bay drift gillnet fleet directly affects the other characteristics of the Bering Sea gillnet fleet. In response to this limit, vessel beam measurements have steadily increased from the 3.05 - 3.35 meter (10 - 11 feet) common in older boats, to beams up to 4.88 meters (16 feet) for recently constructed boats. In some instances, dual engines totaling over 1,000 horsepower, are required to move these vessels at the high speeds desired by fishermen. In contrast, the set gillnet fisheries typically employ outboard motors of 50 to 75 horsepower.

Vessels used exclusively for set gillnet operations are no longer required to obtain a vessel license from the Alaska Department of Fish & Game. As a result, information on these boats is limited.

2.4.1.5 Seine

Harvesting and Operating Mode

Salmon seine vessels fishing within the study area are limited by regulation to a length of 58 feet. Salmon seining is only permitted in Area M although herring seining occurs throughout the Bering Sea. Purse seine fishermen actively seek out schools of salmon to set the net. A small, high powered skiff is used to pull the net out from the vessel, pulling the net in a circle to enclose the area thought to contain salmon. Once the skiff is back at the vessel, the circle of the net is completed. The net lines are run through a hydraulic power block. The bottom line of the line is pulled first which "purses" the net (hence the name purse seine) and keeps the fish from diving out the bottom of the net. The net is hauled until the catch is in a small part of the net next to the vessel and then the fish are brailed aboard.

Employment and Residency

Table 2.4-19 shows estimated employment levels in the seine fishery for the 1977-1986 time period. The Aleutian Peninsula salmon fishery has a crew factor of 5.0 for a purse seine. Herring purse seine crew factors range from 3.5 in the Dutch Harbor area to 4.25 in Togiak (Thomas, 1986). An average crew factor of 3.9 is used for herring purse seine.

Table 2.4-19: Employment in the Seine Fishery

		Month												Total
Year	Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Opns.
1988	235	0	0	0	0	1,048	533	551	570	121	0	0	0	384
1987	228	0	0	0	0	908	547	569	590	126	0	0	0	352
1986	247	0	0	0	0	1,063	569	589	610	130	0	0	0	396
1985	236	0	0	0	0	896	577	603	625	133	0	0	0	356
1984	232	0	0	0	0	908	560	584	605	129	0	0	0	355
1983	236	0	0	0	0	947	561	584	605	129	0	0	0	365
1982	253	0	0	0	0	1,148	567	585	605	129	0	0	0	417
1981	231	0	0	0	0	865	568	593	615	131	0	0	0	346

As previously discussed, the presence or absence of limited entry regulations affects the number and residency of participants in a fishery. As a result, separate tables are presented for the salmon and herring fisheries. Tables 2.4-20 and 2.4-21 show the residency of salmon and herring permit holders for the seine gear type. Permits fished by local residents have decreased in the salmon fishery, while the number of permits fished in the herring fishery have increased. Permits fished by other Alaska residents have been relatively stable at low levels, while permits fished by out-of-state fishermen have increased in both fisheries.

Table 2.4-20: Residency of Permit Holders in the Salmon Seine Fishery

Year	Area of Residency: Bering Sea Region	Other In-State	Out-of-State	Total
1988	86	5	23	114
1987	87	7	24	118
1986	91	10	21	122
1985	94	11	20	125
1984	91	10	20	121
1983	95	6	20	121
1982	96	4	21	121
1981	100	5	18	123

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Table 2.4-21: Residency of Permit Holders in the Herring Seine Fishery

Year	Area of Residency: Bering Sea Region	Other In-State	Out-of-State	Total
1988	31	167	72	270
1987	25	156	53	234
1986	24	194	56	274
1985	19	159	53	231
1984	26	151	57	234
1983	25	165	54	244
1982	25	183	88	296
1981	18	154	51	223

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Harvest Levels and Earnings

Harvest levels for both salmon and herring peaked earlier in the decade but increasing prices have resulted in earnings for both species reaching records in 1988. The trend in harvest and earnings is shown in Table 2.4-22. The record earnings for salmon in 1988 were due to unusually high prices for sockeye.

Table 2.4-22: Harvest and Earnings in the Domestic Seine Fishery (in thousands)

	Salmon		Herring	
Year	Pounds	Total Earnings	Pounds	Total Earnings
1988	41,505.5	$40,582	22,046.7	$10,617
1987	16,993.0	$12,504	27,480.1	$8,817
1986	28,444.7	$13,580	28,348.1	$6,813
1985	32,824.0	$15,150	45,198.4	$10,569
1984	64,443.8	$21,340	31,229.3	$5,563
1983	29,352.5	$13,456	41,844.1	$8,395
1982	47.437.4	$17,724	34,986.1	$5,326
1981	39,689.0	$20.962	19,206.5	$3,545

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Vessel Characteristics

The Bering Sea salmon seine fleet is composed of two relatively distinct subgroups; the 17.68 meter (58 feet) "limit" seiner, so-called because of regulations establishing the maximum length of seine vessels, and smaller 12 to 15 meter (40 to 50 feet) purse or beach seiners which generally fish in shallower waters. Vessels larger than 18.2 meters (59 feet) in Table 2.4-23 participate in the herring fishery where the size constraint does not apply. The number of seine vessels by size category varies substantially over time, primarily due to changes in the number of boats participating in the herring fishery. As a result it is difficult to discern any trend in size changes of the seine fleet.

2.4.1.6 Other

Other gear types operating in the Bering Sea include, or has included, scallopers, diving/hand pick, and jigs. The number of vessels and permits issued for these gear types is often so small that information is subject to non-disclosure rules.

The number of operations for these other gear types is shown in Table 2.4-24.

Table 2.4-23: Vessel Size Distribution for Seine Fleet
(Meters)

Year	Number of Vessels by Size										
	<6.1	6.1-12.2	12.3-18.2	18.3-24.3	24.4-30.4	30.5-36.5	36.6-42.6	42.7-48.7	48.8-54.8	54.9-60.9	61.0+
1988	6	158	143		2						
1987	9	159	112	1							
1986	11	126	162	1	1						
1985	6	89	141	2							
1984	4	104	155	4	1						
1983	5	100	136	1	2						
1982	7	151	129	1	3						
1981	8	148	109	1							1

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Table 2.4-24: Number of Permits for Other Gear Types

Year	Gear Type			
	Jigging	Diving/ Hand Pick	Hand Line	Scallop Dredge
1988[a]	0	252	0	1
1987	62	160	24	5
1986	73	144	7	7
1985	97	0	1	5
1984	107	272	3	0
1983	110	131	10	0
1982	1		0	1
1981	17	0	0	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1990.

[a]Preliminary data.

Employment and Residency

Crew factors for scallopers operating in the Bering Sea were not provided by Thomas (1986), but Focht (1986) estimated 6.3 persons for vessels dredging for scallops in the Bering Sea. This estimate is substantially lower than the 12 person crew shown for a scalloper operating from Unalaska/Dutch Harbor in 1986 (R & M Consultants, 1986).

Jigs and hand lines are used by fishermen from the Pribilof Islands and other small coastal communities in the Bering Sea to harvest halibut and other bottomfish. The crew factor of 2.0 to 2.25 is typical of a small boat, skiff oriented fishery.

Diving/hand pick is used for harvesting herring roe on kelp and sea urchins more recently. A crew factor of 2 is estimated for this fishery. The majority of these permits are held by residents of western Alaska coastal communities.

Table 2.4-25 presents estimates of employment for a category classified as other gear types during the 1977 through 1988 time period. Increases in the number of jigging and diving/hand pick permits has resulted in increased employment for the other gear type category.

Table 2.4-25: Employment for Other Gear Type Fishery

		Month												Total
Year	Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Permits
1988	44	0	0	0	0	468	0	6	6	6	6	6	32	531
1987	67	6	13	15	251	210	132	126	2	0	0	0	50	805
1986	47	6	6	0	0	284	144	84	0	0	6	8	25	564
1985	35	0	0	6	6	13	79	208	6	13	13	6	76	425
1984	70	0	0	0	0	444	255	135	0	2	0	0	0	835
1983	60	0	0	6	0	256	206	170	53	0	8	0	19	718
1982	19	25	13	32	19	6	0	8	0	2	0	0	126	231
1981	5	0	0	0	0	0	22	16	14	0	0	2	0	54

Harvest Levels and Earnings

Jigging and diving/hand pick are the only gear type categories for which harvest and earnings data are available. The others are subject to non-disclosure rules. Many of the diving/hand pick permits are held by residents of Western Alaska coastal communities.

However, the small number of permit holders in many of the communities is too small to disclose harvest and earnings information. As a result Table 2.4-26 should be considered only as a relative indicator of harvest levels and earnings.

Table 2.4-26: Harvest and Earnings in the Domestic Other Gear Fishery

	Jigging		Diving/Hand Pick	
Year	Pounds	Total Earnings	Pounds	Total Earnings
1988	[a]	[a]	419,047	$293,333
1987	30,813	$25,974	276,604	$146,494
1986	26,504	$22,586	307,628	$148,585
1985	115,468	$78,955	[b]	[b]
1984	111,853	$80,443	405,763	$214,364
1983	134,340	$93,204	245,254	$250,497
1982	[b]	[b]	[b]	[b]
1981	8,165	$7,551	[b]	[b]

Source: Data from Alaska Commercial Fisheries Entry Commission, 1990.

[a] Not Available
[b] Not Disclosed

Vessel Characteristics

The other gear fleet is primarily composed of small boats used for jigging and diving/hand picking for roe on kelp. Vessels larger than 80 feet (24.4 meters) are scallop dredgers. The length characteristics for the other gear fleet is shown in Table 2.4-27.

2.4.2 Joint-Venture Fleet

The joint-venture fishery has been almost totally displaced by domestic processors, either shore based or floating. Joint-venture operations were phased out from most elements of the Bering Sea by 1989.

Table 2.4-27: Vessel Size Distribution for Other Gear Fleet
(Meters)

Year	Number of Vessels by Size <6.1	6.1-12.2	12.3-18.2	18.3-24.3	24.4-30.4	30.5-36.5	36.6-42.6	42.7-48.7	48.8-54.8	54.9-60.9	61.0+
1988	26	78	1	1		1					
1987	45	85	1			1		1			
1986	46	76	1		1	1		1			
1985	31	17	1								
1984	47	110	1								
1983	39	72	1		1						
1982			1	3	6						
1981	9	1									

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

2.4.2.1 Harvesting and Operating Mode

The joint-venture operation involves U.S. flag catcher boats, primarily trawlers, delivering their catch to foreign flag processing ships at-sea. The typical operation has the catcher boat detaching the cod end (which contains the fish) from the trawl net and towing the cod end to a processing ship. The catcher boat attaches the cod end to a cable from the processing ship which is dragged astern. The transfer is completed by the processing ship bringing the cod end onboard for processing.

The joint-venture catcher boats tend to be smaller than the present Bering Sea domestic trawl fleet since they do not have to bring the product onboard and do not require large holds for delivery to shore based plants. Other characteristics are similar to the domestic trawl fleet.

The joint-venture processing ships are large, foreign owned vessels that are used exclusively as floating processors. They are typically older vessels that have operated since the 1960's or even earlier. The vessels used in the yellowfin sole, Marine Resources joint-venture for example, are typically Bolshoi Morpzhini Rybolovny Trawlers (BMRT class large freezer fishing trawler) from the U.S.S.R. They are 278 feet in length and 3100 gross weight tons. Japanese, Korean, Taiwanese and other foreign factory processing ships are similar size or larger.

2.4.2.2 Employment and Residency

Information on the number of joint-venture vessels operating in the Bering Sea on a monthly basis is not available from the CFEC or NMFS data bases, nor were other published sources of this information identified. Table 2.4-28 shows the total number of permits issued for joint-venture operations (NMFS, 1988) and uses a median crew factor of 4.0 for trawl vessels (Thomas, 1986) to estimate maximum employment. Trawl gear represents the vast majority of vessels engaged in joint-venture operations , although joint-venture permits were issued to longline and pot vessels in these years (U.S. Department of Commerce, 1990).

Table 2.4-28: Employment in the Joint-Venture Fishery

Year	Total Permits	Maximum Employment
1987	112	448
1986	104	416
1985	98	392

Table 2.4-29 shows the residency of permit holders for this gear type. Increases in the number of out-of-state boats have accounted for the additional boats in the joint-venture fleet for the three years shown below.

Table 2.4-29: Residency of Permit Holders in the Joint-Venture Fishery

	Area of Residency			
Year	Bering Sea Region	Other In-State	Out-of State	Total
1987	1	13	98	112
1986	2	16	86	104
1985	0	16	82	98

Source: National Marine Fisheries Service, 1988.

2.4.2.3 Harvest Levels and Earnings

Table 2.4-30 shows harvest levels and earnings for the joint-venture fleet for the 1981-1988 time period. The joint-venture fishery harvest peaked in 1987 although earnings were higher in 1988. As domestic processing capacity continues to increase, joint - venture catches will cease.

Table 2.4-30: Harvest and Earnings in the Joint-Venture Fishery

Year	Metric Tons (thousands)	Total Earnings (millions)
1988	1,301.1	$204.6
1987	1,355.4	$188.0
1986	1,156.5	$143.7
1985	636.4	$98.6
1984	357.5	$64.6
1983	210.0	$37.2
1982	108.3	$25.0
1981	78.5	$14.4

Source: U.S. Department of Commerce, 1989.

2.4.2.4 Vessel Characteristics

Table 2.4-31 shows the size distribution, and total number of joint-ventures operating in the Bering Sea for the 1985 through 1987 time period. The size categories for joint-venture boats contained in the NMFS data bases provided to MMS are 0 to 75 feet (0 - 22.8 meters), 76 to 100 feet (22.9 - 30.5 meters), 101 to 125 feet (30.6 - 38.1 meters), 126 to 150 feet (38.2 - 45.7 meters), and greater than 150 feet (> 45.8 meters).

Table 2.4-31: Vessel Size Distribution for Joint-Venture Fleet (Meters)

	Number of Vessels by Size					
Year	<22.8	22.9-30.5	30.6-38.1	38.2-45.7	>45.8	Total
1987	6	49	47	9	4	115
1986	9	45	44	6	1	105
1985	10	48	35	5	0	98

Source: National Marine Fisheries Service, 1988.

Vessels in the joint-venture fleet have other characteristics similar to the domestic trawl fleet. These vessels were described in Table 2.4-5.

2.4.3 Foreign Fleet

Foreign fishing in Alaskan waters began as early as 1929 when Japanese fishermen began to explore the Eastern Bering Sea. However, these operations were minor in comparison to the volumes of resources harvested in the present fisheries. Since the mid-1950's when the Japanese and then the Soviets rapidly expanded their fishing efforts in the Bering Sea, foreign nationals have dominated the harvest of the available resources. Not until recent years have U.S. domestic and joint venture fisheries taken a significant portion of the catch.

The era of foreign groundfish fisheries within the 200-mile FCZ off Alaska ended on December 31, 1987 when the North Pacific Fishery Management Council ended foreign directed fishing allocations. Foreign harvesting vessels will no longer be permitted to operate within the study area boundaries and, subsequently, a discussion of these vessels is not warranted.

The only foreign fishing vessels permitted to operate within the FCZ will be foreign processing ships associated with the joint-venture fisheries. These vessels are discussed in Section 2.5.3.

Foreign operations will continue in Soviet waters and in the "Doughnut Hole", an area of the central Bering Sea beyond the 200-mile zones claimed by the U.S. and the U.S.S.R.

No directed foreign fishing allocations were made for the 1988 or subsequent fishing seasons. With joint-venture operations ceasing in the near term, future participation by foreign firms in the Bering Sea fishing industry will entail additional direct investment in U.S. owned fishing companies. In recent years, foreign firms have provided a large share of capital for the factory trawler fleet to ensure access to the resource.

2.5 Processing Sector

The Bering Sea processing sector is composed of three different groups which operate within the region: 1) Domestic shore-based facilities, 2) domestic floating processors and harvester/processors, and 3) foreign floating processors.

Seafood resources from the Bering Sea are also transported to processing facilities outside the region. In some years, these exported resources may account for a significant amount of the annual product from such plants; these facilities are not discussed here.

2.5.1 Shore-based Processors

2.5.1.1 Organization and Structure

Many of the shorebased processing plants in the study area have had a long history of operation in the area. Several of the plants in the Alaska Peninsula and Aleutians started in the late 1890's as cod stations. Those early plants processed Pacific cod delivered to the plants by a dory fleet of longliners. As the cod populations declined in the 1920' and 1930's, the plants and the fishermen concentrated on other species primarily salmon. Over the years, many fisheries have come and gone. In the Alaska Peninsula, a shrimp fishery began in the mid 1970's then died after several years of frantic growth as the shrimp population disappeared. King crab became the base of the many plants in the mid and late 1970's and similarly had to move on to other species as the king crab population crashed in 1980. The crab processing and fishing has moved to bairdi tanner crab and then to opilio tanner crab.

Beginning with Trident Seafoods in Akutan, shorebased plants in the study area began to process Pacific cod and other groundfish in the early 1980's. They have quickly evolved sophisticated processing facilities for groundfish fillets, fish meal and surimi.

There has been a gradual trend to centralization in processing plants. Early in the history of the salmon industry, canneries were located wherever the salmon were. Without refrigeration, the quickly perishable product had to be caught close to the plants. With chilled seawater holding tanks and much faster boats, processing companies have been able to locate in central locations, thus concentrating their investment. With shortened seasons due to increased effort levels, shorebased plants have to diversify in order to maintain high levels of capacity utilization Another trend for processing plants within the study area, as for Alaska as a whole, is foreign ownership of the companies. Almost all companies in the study region have some degree of foreign equity ownership, and several are almost totally foreign owned. For the foreign owners, who are primarily Japanese companies, the purpose of their investment is to maintain some control over the processing and shipment of the product to Japanese market channels. Since much of Alaska's fishery products are shipped to Japan, the vertically-integrated Japanese companies have a strong market advantage.

Processing companies in the study area have had to be flexible in their operations. As fisheries for some species declined, companies had to scramble at times to diversify into new species and products.

Industry organizations for the processing companies include the Pacific Seafood Processors Association. PSPA is a long established association of salmon and crab processing companies working together on management, legislative and other issues of interest to their members. The Southwest Coalition, a new association of shorebased processors, was formed to work with the onshore-offshore issue. On the other side of this issue is the Alaska Factory Trawlers, a Seattle-based group, primarily made up of factory trawlers of large processing ships. These organizations represent the interests of their members, primarily with the North Pacific Fishery Management Council, due to the importance of allocation issues.

Elsewhere in the State, fishermen's cooperatives have been established in competition with the traditional processing industry. There has been little activity in the study area for development of cooperatives. This may be due to the logistical difficulties with processing and shipping products in the relatively more remote Southwest Alaska or other factors.

2.5.1.2 Employment and Earnings

Employment

Seafood processing employment is covered under state unemployment laws which require employers to submit reports of monthly employment and quarterly payroll. As a result, employment estimates for the shorebased seafood processing sector are more reliable and accurate than those derived for the harvesting sector. However, floating processors operating beyond the 4.83 kilometer (3 mile) limit of state statutory authority, are not subject to these reporting requirements, and the Alaska Department of Labor contends that a number of floating processors which operate within the boundary do not comply with the regulations. Subsequently, total domestic processing employment in the Bering Sea is understated in most publications. These estimates do, however, provide a reasonable estimate of employment in shorebased processing plants.

The Alaska Department of Labor has estimated seafood processing employment for the State of Alaska for the 1977 through 1985 time period for three geographic regions of the State: Southeast, Gulf Coast, and Southwest (Thomas, 1987). Table 2.5-1 shows the various resource management areas that were combined into the three labor market areas which are relevant to this study.

Table 2.5-1: Hierarchy of Labor Market Areas

Subareas	Management Areas	Labor Market Areas
Chignik	Aleutian Peninsula	Southwest
Aleutian Peninsula		
Dutch Harbor	Dutch Harbor	
Western Aleutians	Bering/Western Aleutians	
Adak		
Unimak		
Bering Sea		
Bristol Bay	Bristol Bay	
Kuskokwim	Arctic/Yukon/Kuskokwim	Northern
Kotzebue		
Lower/Upper Yukon		
Norton Sound		

Source: Thomas, 1986.

In a subsequent report, which was used for the 1977 through 1981 data presented in Table 2.5-2, Thomas (1987) stated that seafood processing employment for the Northern and Interior regions were included with Southwest but the Interior region was not defined. It was further stated that both of these regions have minimal seafood processing employment, implying that inclusion of this additional employment should not adversely affect any conclusions about the Southwest region drawn from the data. Other publications from the Alaska Department of Labor (1987) suggest that the Northern region is composed of Fairbanks North Star Borough, Southeast Fairbanks, and Yukon-Koyukuk. The data for 1982 through 1988 are for the southwest labor market area only.

Table 2.5-2: Southwest Seafood Processing Employment

		Month											
Year	Avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1988	3,161	1,893	2,371	2,623	2,685	3,124	4,400	6,408	4,762	3,119	2,210	2,060	2,273
1987	2,523	1,558	1,770	1,872	2,345	2,781	3,350	4,700	3,920	2,820	2,044	1,557	1,553
1986	2,412	1,379	1,515	1,652	2,056	2,691	3,173	5,577	4,506	3,046	1,421	990	932
1985	2,248	732	942	1,161	1,758	2,222	3,324	5,722	4,891	3,325	1,155	915	825
1984	2,036	706	814	1,013	1,167	1,701	2,796	6,247	4,872	2,681	995	785	656
1983	2,467	920	1,221	1,852	1,982	2,855	3,861	5,629	4,578	3,535	1,338	945	891
1982	2,133	845	1,189	1,624	1,716	2,087	2,662	5,319	3,770	3,003	1,603	933	845
1981	2,628	994	1,295	1,868	2,404	2,736	3,870	4,778	3,802	3,558	2,853	2,055	1,325
1980	2,473	938	1,520	1,726	1,701	2,077	2,250	5,282	3,897	2,984	3,313	2,355	1,630
1979	2,757	816	1,076	1,723	2,027	2,792	3,457	5,652	4,185	3,958	3,494	2,432	1,465
1978	2,232	1,033	1,321	1,611	2,039	2,091	2,772	3,495	3,687	2,568	2,585	2,129	1,450
1977	1,654	676	729	1,101	1,187	1,549	2,309	2,900	2,473	1,934	1,863	1684	1,443
Average	2,197	833	1,091	1,484	1,698	2,134	2,890	4,799	3,809	2,923	2,055	1,530	1,121

Source: 1977-1981 data from Thomas, 1987; 1982-1988 data from Fried, 1990.

Average seafood processing employment in the Southwest region decreased in the mid-1980's as crab and salmon stocks declined from their high levels in the late 1970's and early 1980's. Expansion of the groundfish industry is most apparent in the winter months which were generally low periods of employment.

Residency

According to the Alaska Department of Labor (Alaska Department of Labor, n.d.), the seafood processing industry had the largest percent of total wages going to nonresidents of Alaska. The Bristol Bay Borough, Aleutian Islands, and Dillingham census areas had the highest percentage of nonresident earnings. The regional seafood processing industry hires a substantial number of nonresidents to work in its facilities.

Table 2.5-3 presents information for the manufacturing sector in each of the census areas composing the Southwest region for 1985. Although other industries besides seafood processing are included in the manufacturing sector, seafood processing is the dominant industry, and the estimates shown below are representative of the processing industry in the study area.

Table 2.5-3: Resident and Nonresident Total Wages and Employees for the Manufacturing Sector by Census Area, 1988
(Wages in thousands)

	Wages		Employees	
Census Area	Resident	Nonresident	Resident	Nonresident
Aleutians East	$7,019	$15,484	939	2,379
Aleutians West	$9,371	$10,516	740	1,468
Bethel	$815	$530	419	124
Bristol Bay Borough	$6,370	$10,952	1,323	2,200
Dillingham	$1,812	$5,709	504	992
Wade Hampton	$825	$369	372	132
Southwest Region Total	$26,211	$43,559	4,155	7,132
Manufacturing as Percent of Total	37.6%	62.4%	36.8%	63.2%

Source: Alaska Department of Labor, n.d.

Operating Characteristics

Bering Sea onshore processing plants can be divided into those which primarily process salmon, and those which originated as crab processors and have evolved into groundfish processors. There are several small plants which process only crab, but their share of the resource is relatively small.

The typical salmon-based plant will operate 180 days per year, starting with herring in April or May and ending with coho processing in September. Plants on the Alaska

Peninsula can operate year-round but plants further north are affected by seasonal weather and ice.

Maximum employment in these plants ranges from 130 to 250 persons. During the peak of the salmon runs (1 to 1.5 months), about 80 percent of employees will be processing line workers and the balance will be support staff in such occupations as management, clerical and administrative, machinists, and plant operating engineers. During the off-peak months, employment will drop to 20 to 60 employees, and the proportions of workers changes to about 60 percent line workers and 40 percent support staff. In 1987 the average hourly wage for processing workers was reported as $5.50 per hour, with support staff earning from $7.00 to $12.00 per hour. Average hourly wages for all cannery workers in southwest Alaska increased to $6.19 in 1990 (Fried, 1990b). Additional detail by type of worker is not available.

After the botulism scare of the early 1980's, and with increased Japanese demand for frozen domestic salmon after their displacement from the U.S. EEZ, most of the salmon processing plants replaced their canning lines with freezers, or added freezing capability to their plant. In a similar fashion, those plants which are in proximity to other resources have begun to expand their operations to process other species. These other species (e.g., crab, halibut, and sablefish) are handled during the off-peak salmon season and represent a relatively small amount of the volume and value handled during the year. However, this diversification does offer better utilization of the plant and labor which is often under-utilized during these slow periods.

Production levels for a typical salmon processing plant in the Bering Sea area were described by several plant managers and an average of these estimates are shown in Table 2.5-4. Individual plants can have different production levels. Braund (1986) reported that the Peter Pan plant in King Cove had handled 30 to 44 million pounds of raw fish and shellfish annually during the 1980 to 1985 time period. The growing Pacific cod fishery has increased Peter Pan's total production. In 1990, the plant will process approximately 20 million pounds of Pacific cod, in addition to other species.

Table 2.5-4: Typical Production Levels of Salmon Processing Plants
(millions of pounds)

Species	Volume
Crab	
King	1.0
C. Bairdi	0.7
C. Opilio	3.5
Halibut	2.5
Herring	1.5
Sablefish	2.5
Salmon	5.0

The major groundfish processing plants in the Bering Sea are located at Unalaska/Dutch Harbor and Akutan. With the exception of one plant under construction in early 1990, all of the other facilities began as crab processing plants. Expansion into groundfish occurred with displacement of foreign processing capacity. A typical groundfish processing plant will have two or three lines, often in separate buildings. Crab has remained part of their product mix which has expanded to include a line for surimi and another for other groundfish.

These crab/groundfish plants operate all year, although each line may be closed for certain periods due to regulatory openings for certain species, or for equipment maintenance. Surimi lines are typically closed for the months of April and May. Plant managers suggested that pollock yields are lower after spawning, and that the fish scatter from the spawning schools and move from midwater to the bottom after this period which increases the number of boats required to keep the plants operating at capacity.

Employment at these plants ranges from 180 to 425, although current expansion at one plant will result in employment levels in excess of 600 persons. About 70 percent of employees are line workers with the balance as support staff. Line workers are generally employed for 6 months contracts. Support staff are often residents of the community, or long-term employees with the company who have extended rotations between the plant and their home. Line workers receive about $5.50 per hour and with overtime average about $1,800 per month. Support workers receive $9.00 to $12.00 per hour and earn $2,600 to $3,200 per month.

Production levels for a typical large groundfish processing plant in the Bering Sea area were described by several plant managers and an average of these estimates are shown in Table 2.5-6.

Table 2.5-6: Typical Production Levels of Groundfish Processing Plants (millions of pounds)

Species	Volume
Crab	
King	4.0
C. Bairdi	0.7
C. Opilio	6.0
Halibut	1.0
Herring	3.0
Pacific cod	5.0
Pollock	100.0
Sablefish	1.0
Salmon	1.0
Miscellaneous	1.5

Considerable expansions are underway at most of the major groundfish processing plants in the Bering Sea in early 1990. Most of this effort is focused on surimi expansion. Shoreside processors requested 625,785 mt. of pollock for 1990 (Gharrett, 1990). Adjusting these quarterly requests to account for completion of expansions and new construction results in total annual requests of approximately 778,000 metric tons, or 195,000 metric tons per plant. This is approximately 430 millions pounds per year.

Industry representatives estimate that in 1990 the average surimi plant will have a capacity of 1.5 million pounds of pollock (round weight) per day after these expansions are completed. Assuming 300 production days would result in a typical plant using about 450 million pounds a year. Normal operating capacity is probably in the 85 to 90 percent range which would result in production of 383 to 405 million pounds per year; about 4 times the typical plant production in 1987.

2.5.2 Domestic Floating Processors

The domestic at-sea processing industry is composed of two segments: Vessels that only process fish or shellfish, which are often called motherships since they must associate with a group of smaller catcher vessels; and catcher/processors which are vessels that harvest and process while at sea.

The recent buildup of a fleet of domestic floating processors oriented to the Alaska groundfish industry has resulted in a number of articles which, in general, suggest that at-sea processing is a relatively new phenomenon in the industry. Floating processors and catcher/processors have operated in the Bering Sea for a number of years, principally for the traditional salmon and crab fisheries. A substantial portion of the Bering Sea crab fleet is composed of catcher/processors, and Bristol Bay is the summer home for a large number of floating processors or motherships. Table 2.5-7 shows the number of dedicated processing vessels and harvest/processor vessels over the past few years. Published data on the number of crab and salmon processing vessels operating in the Bering Sea are not available.

The decreasing number of salmon floating processors is due to increasing efficiencies and improvements in fish heading and gutting equipment, and freezers. This has reduced the number of vessels necessary to handle large volumes of salmon and also reduced the crew sizes on the ships. The recent increase in crab vessels is primarily associated with conversion of inexpensive oil rig supply boats, and the displacement of foreign and joint-venture fleets has occurred with expansion of domestic groundfish processing capacity, both at-sea and on-shore.

2.5.2.1 Organization and Structure

Floating processors have varying types of company organizations, depending on the fishery in which they are primarily involved. Floating salmon processing ships are typically owned and operated by the major salmon processing companies. These vessels can either operate on their own or add additional processing capacity to one of the firm's existing shorebased plants, as required. In Bristol Bay, the largest share of the salmon landed are frozen in floating processing ships. Before the situation reversed in the early 1980's, most of the salmon in Bristol Bay were processed in shore canneries.

Table 2.5-7: Number of Processing Vessels by Major Species

	Salmon	Crab		Groundfish	
Year	Processor[a]	Catcher/ Processor[a]	Processor[a]	Catcher/ Processor	Processor
1989	40	46	24	57	5
1988	41	55	20	43	3
1987	48	47	23	24	1
1986	52	46	18	13	1
1985	75	46	20	13	1
1984	66	49	26	10	0

Sources: Groundfish data from U.S. Department of Commerce, 1989, and Tremaine, 1989; salmon and crab data from Smith, 1990.

[a] These figures are for vessels that operated throughout State of Alaska waters.

The newly developed floating groundfish processors and factory trawler fleet are primarily new firms, many with foreign financing. There are several 'traditional species' processing companies that have developed factory trawlers, but they are in the minority. Another route into the factory trawling fleet was by successful joint-venture operations that used their market contacts and expertise gained in the joint-venture fisheries to launch into new operations.

Many floating crab processing vessels are owned by the major companies, such as Icicle Seafoods. Others are owned by crab fishermen who moved up to larger boats following successful operations in the late 1970's.

The most visible organization for factory trawlers is the Alaska Factory Trawlers Association. They are involved in lobbying, research and member support for approximately 50 of the large vessels in the fishery.

2.5.2.2 Operating Characteristics

There are a wide variety of domestic vessels processing various species throughout the Bering Sea. Floating processors, or "motherships", have more in common with other vessels of this type than they do with catcher/processors which focus on the same species. The following paragraphs describe the operating characteristics of floating processors followed by catcher/processors.

"Floaters," as they are often called, generally anchor in protected waters and receive crab, salmon, and certain groundfish from smaller catcher boats. Dedicated surimi boats and other large groundfish floating processors usually operate at-sea and receive trawl net cod-ends from catcher boats. Larger catcher/processors will also operate in this manner during times of the year when fish are widely distributed and the vessel cannot catch its processing capacity.

These large vessels remain at sea for extended periods of time and it is not unusual for them to visit port only once in two or three months. Needed supplies are brought from various ports by the catcher boats, crew changes are made by airplane and catcher boats, and product is transferred onto tramp steamers and other cargo ships in protected waters.

Catcher/processors are generally smaller ships although the larger boats of this vessel category exceed the smaller floating processors in size. Most of the catcher/processors operating in the Bering Sea use trawl gear, although longline and pot gear are also employed. Many of the vessels using longline gear also use pot gear since the deck equipment can generally handle both types of gear with little effort.

These vessels are capable of remaining at sea for several months at a time but limited freezer storage typically requires them to unload product every 20 to 24 days (Beeman, 1989). These vessels do unload at-sea or in protected bays to tramp steamers, but since their endurance is generally not as long as the larger floating processors, many of them call at Unalaska/Dutch Harbor where a number of tramp steamers lay at anchor to receive product. They can combine product unloading with refueling, replenishment of other supplies, and crew changes.

When the vessels come into port, they are interested in getting in and out of port as quickly as possible since they are not producing unless they are fishing. They off-load product, a portion of the crew, and garbage. They take on new crew members, water, supplies (including large amounts of packaging materials), and fuel. Any temporary repairs that cannot be handled at sea are completed while in port. Vessels typically return to the Seattle area once a year for major repairs and system overhauls.

2.5.2.3 Employment and Residency

In attempting to determine total employment for domestic factory trawlers, Thomas (1986a) estimated that an average sized factory trawler employs a ships crew of four to six persons, and about 10 employees per shift on a fillet, headed & gutted, or surimi line, for a total of 24 to 26 persons.

A survey conducted by R & M Consultants (1986) contacted over 100 fishing vessels in Unalaska/Dutch Harbor during the summer of 1986. The survey found that groundfish factory trawlers had a range of 23 to 44 crew members, with an average of 32 for the four vessels contacted. The two mothership processors that were contacted had crew sizes of 81 and 120 persons (average of 100), and 8 crabber/processors had a range of 6 to 44 persons with an average crew size of 15. The one longliner/processor was surveyed in Unalaska/Dutch Harbor during this survey had a crew of 12 persons.

Wiese and Burden (1988) contacted a number of companies involved in the groundfish industry and estimated average crew sizes of 30 persons for a 150 to 200 feet (45.7 to 60.9 meters) groundfish factory trawler, 60 persons for a 200 to 250 feet (60.9 to 76.1 meters) factory trawler, and 60 persons for a 300 to 350 feet (76.1 to 106.6 meters) surimi factory trawler. A recent article in National Fisherman (1988) stated that a newly christened 224 feet (68.2 meters) surimi factory trawler would employ a crew of 35 to 50, while a recently launched 334 feet (101.7) surimi mothership would require 90 to 100 persons.

More recent survey work by NMFS resulted in a crew size of 40 persons for factory trawlers involved in headed and gutted product which are typically the smaller (< 200 feet or 60.9 meters) (Baldwin, 1990). Newer entrants into this segment of the fleet have crew sizes around this 40 person average (Arctic Alaska Seafoods, 1988).

Table 2.5-8 uses estimates of 40 crew members for groundfish factory trawlers of less than 200 feet in length, 60 persons for vessels 200 to 300 feet in length, and 100 for vessels greater than 300 feet. Groundfish floating processors are also estimated to have crews of 100 persons, while crab processors are estimated to have crews of 60 persons. Crabber/processors are estimated to have an average crew of 20, and longline catcher/processors are estimated to have a crew of 16 (North Pacific Fisheries Management Council, 1989). Data are not available to permit monthly estimates of activity for salmon and crab processors or catcher processors, so Table 2.5-8 reflects maximum employment, assuming that all vessels were operating at the same time.

Information on residency of crewmembers for domestic floating processors and catcher processors is limited to descriptions in several trade journal articles and interviews with several vessel captains. This data base is not large enough to extrapolate the findings to the entire processing fleet, but suggests that the vast majority of crew on these vessels are from the home port of the vessel, which is generally Seattle.

One company which provides employees for factory trawlers operating in the Bering Sea estimates that 25 percent of the crews are Alaska residents and the balance are from other states (Dahlen, 1990).

2.5.2.4 Vessel Characteristics

Table 2.5-9 presents information on vessel sizes for catcher/processors permitted in the Alaska EEZ. Agency data bases provided to MMS do not distinguish between catcher boats and catcher/processors for the various gear types, and other sources of the information were not identified.

Table 2.5-8: 1989 Employment for At-Sea Processors and Catcher/Processors

Species/Vessel Category	Crew Size	Maximum Employment
Crab		
Processor	110	1,440
Catcher/Processor	20	920
Groundfish		
Processor	100	500
Catcher/Processor		
Trawl Gear		
< 200 feet	40	720
201-300 feet	60	1,440
> 300 feet	100	700
Longline & Pot	16	352
Salmon		
Processor	100	4,000

Sources: Crab and salmon processing vessel figures from Smith, 1990; groundfish vessel size estimates from Pacific Fishing, 1989.

Table 2.5-9: Vessel Size Distribution for Catcher/Processors in the Alaska EEZ

Year	<20	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100+	Total
1989	37	17	12	24	31	13	3	4	3	2	133

Source: Snyder, 1989.

The factory trawler fleet has undergone the most dramatic expansion in the past few years and has attracted the most attention from industry and government analysts. As a result, there is limited information available on other segments of the processing fleet. Table 2.5-10 presents additional information on trawl catcher/processors.

2.5.3 Foreign Floating Processors

2.5.3.1 Organization and Structure

Two types of foreign vessels have been involved in processing of Bering Sea resources. These vessel types are similar to the domestic fleet processing vessel categories: Catcher-processors, and dedicated processors. Catcher-processors, often called factory trawlers, operated independently in catching, processing, and often transporting the product to home ports. These vessels are now restricted to processing fish while operating within the FCZ. The dedicated processors, or motherships, originally operated with a group of associated catcher vessels in a pattern resembling the present joint-venture operations.

Table 2.5-10: Selected Characteristics of the Domestic Trawl Catcher/Processor Fleet

Characteristic	Average
Loaded Draft	
Meters	4.9
Feet	16.0
Horsepower	1,681
Fuel Consumption	
Liters/Day	2,695
Gallons/Day	712

Source: Alaska Department of Commerce, n.d.

2.5.3.2 Operating Characteristics

Early mothership operations concentrated on producing headed and gutted fish, fish roe, and meal. During the 1960's the Japanese processing fleet expanded their products to include surimi, and recent arrivals to the processing fleet can accommodate surimi, headed and gutted product, roe, and meal. Table 2.5-11 shows the percent of product form for various species processed by Japanese motherships in U.S.-Japanese joint ventures during 1986.

Among the other nations operating in the Bering Sea the Soviets have produced a wide variety of headed and gutted products and some fillets. They have not engaged in surimi production. West German operations in the Bering Sea have primarily processed pollock and cod for fillets. Small amounts of some species have been headed and gutted. Korean vessels have recently began producing surimi as well as frozen whole pollock fillets, headed and gutted products, and roe (Pacific Seafood Processors Association, 1985).

2.6 Market Conditions

Domestic consumption of seafood has experienced a long period of continual growth, extending from 1909 to the present. In 1960, seafood consumption was 10.3 pounds per capita annually. In 1988, per capita consumption of seafood was 50 percent greater, at 15.0 pounds. Greater public awareness of benefits from fish as part of the diet is partly responsible for the increase, as well as greater variety and abundance available to the consumer.

Table 2.5-11: Estimated Product Composition for Japanese Joint Venture Processors

	Product Form				
Species	Surimi	Fillets	Headed & Gutted	Gilled & Gutted	Other
Atka Mackrel					100
Arrowtooth flounder			50		50
Pollock	95		2		3
Pacific cod					100
Sablefish					100
Other flounders				100	
Pacific Ocean perch			98		2
Rockfish			98		2
Yellowfin sole					100

Source: Atkinson, 1987.

Seafood products destined for domestic markets are primarily shipped from the study area in refrigerated containers to the Seattle area by barge. The product is then placed in cold storage. Sales are made through company brokers or independent brokers acting as agents for companies owning the product. As sales are made, product is shipped to local wholesalers in the area of distribution and then on to the final seller in retail markets or institutional (restaurant) sales. Major centers of distribution vary by species and product form. Several of the major centers of distribution for seafood products from Alaska include Los Angeles, Denver, Minneapolis, Chicago, Philadelphia, New York and Boston.

One of the largest growth markets has been for surimi, a seafood analog made of minced pollock. Surimi is used in imitation crab and shrimp, and as a base for a variety of processed foods. According to NMFS' estimates, the U.S. produced about 130 million pounds of surimi in 1989 (Seafood Business, 1989). The U.S. markets take a large share of production, with consumption estimated at 135 million pounds in 1988 and growing quickly.

Shipments of surimi from shorebased plants in the study area go to both domestic and foreign markets in Japan. The proportional split between domestic and foreign sales for shorebased processors has varied. In 1988, one company estimated that two-thirds of the surimi processed at the local plant was shipped to Seattle, with the remainder to Japan. In 1989 after Japanese supplies of surimi from the joint-venture fisheries were reduced, approximately 75 percent of the production was shipped to Japan.

Factory trawlers off-load surimi and other products at-sea and inshore. At-sea transfers are primarily to tramp steamers for shipment to Japan. Product off-loaded inshore can go to trampers or to one of the barge lines for transport to either Seattle or to Japan.

3. CURRENT CHARACTERISTICS OF BERING SEA FISHING COMMUNITIES

3.1 Regional Settings

Eight communities have been selected for the purpose of evaluating their relationship to Bering Sea fisheries: Akutan, King Cove, Port Heiden, Port Moller, Sand Point, Saint Paul, Unalakleet, and Unalaska. The selection of these particular communities is based partially on their participation in previous Socioeconomic Studies Program studies, which provide both a comprehensive data base for this study and an opportunity to compare results with previous investigations. There are similarities and striking differences between many of the communities; these are briefly summarized in the regional descriptions presented in sections 3.1.1 through 3.1.3. However, they have in common a certain degree of reliance on commercial fishing.

The focus of this section of the report is to evaluate selected community characteristics in order to understand community interaction with commercial fishing in the Bering Sea: both the role the community plays in supporting fishing and the impact of fishing on the communities. In addition to a brief description of setting and history (mainly as it relates to commercial fishing), socioeconomic, infrastructure, and fishing industry characteristics are described for each community. Information presented or referenced in this section provides a basis for the community level information required in the Bering Sea Fishing Industry Model (FIM) discussed in Appendix A. None of the information shown in this section is from the model results.

3.1.1 Alaska Peninsula/Aleutian Islands

The Alaska Peninsula/Aleutian Islands group contains the bulk of the communities: Akutan, King Cove, Port Heiden, Port Moller, Sand Point, and Unalaska. Commercial fishing, processing and support industries dominate the economies of these communities by providing employment and income, and, in most cases, the basis for the majority of municipal revenues (sales tax, property tax, and raw fish tax revenue sharing). Compared to the other two study areas, Norton Sound and the Pribilof Islands, the fisheries of this region are well established, diversified and relatively lucrative; this is reflected in high per capita incomes. These communities have weathered both changes in the fisheries and in state revenue sharing.

Yet differences exist. Port Heiden for example, has minimal fish processing and municipal government; permit holder and crew employment is the major indicator of commercial fishing influence. Unalaska is the other extreme; a well developed processing and support service sector provides the majority of municipal revenues and employment. Akutan, King Cove, and Sand Point are all within the recently formed Aleutians East Borough. In the past, commercial fishing has generated a significant portion of municipal revenues and of resident employment (through permits and crew share); however residents have largely shunned processing employment. The new borough will rely on revenues generated by the fishing industry, which is still trying to ascertain the effect of the borough on their operations.

3.1.2 Norton Sound

Unalakleet is fairly typical of Norton Sound fisheries and communities. There are two fisheries, salmon and herring, neither of which have the dollar value of the fisheries captured by the Alaska Peninsula/Aleutian Islands communities. Salmon harvests have been decreasing in number and overall value during the last three years, and the herring fishery has just been classified Limited Entry to limit the impact of new entrants on the harvest. There is no locally based processing industry other than fish buyers; ironically, there is great local desire to establish a successful processor to provide more local employment. Unalakleet is subsistence oriented, and local government dominates the limited wage employment opportunities. While the income generated for local residents by herring and salmon is comparatively low, this income is welcome where other employment opportunities are limited. The contribution of fishing to sales tax revenues is minor. The contribution of state revenue sharing is significant and decreases in this income source has resulted in service and employment cutbacks.

3.1.3 Pribilof Islands

Saint Paul has little in common with the other two regions, and is a community in a period of transition. Until 1983, the community was economically dependent on the federal government, who managed the fur seal harvest and service provided to the community. Commercial fishing was established relatively late (1979) by the village corporation, who financed boats, provided training for halibut fishing, and established a small processing plant. The comparative value and harvest of the fishery has been small, and while the employment and income generated is low, its contribution is significant in a community with limited employment opportunities. The federal government pullout established a multi-million dollar trust fund for Saint Paul, and the community has pursued capital improvements, providing support for Bering Sea oil and gas activities, and expanding its role in the fishing industry. Current harbor improvements are oriented towards providing support services to the Bering Sea fishing industry, and attracting fishing vessels to a recently established onshore processing plant.

3.2 Akutan

3.2.1 Description/Setting

Akutan Island is part of the Fox Island Group, located near the eastern end of the Aleutian Island chain. The village of Akutan is situated on the eastern side of the island, on the north shore of Akutan Harbor, itself a deep indentation of Akutan Bay. It lies 35 miles east of Unalaska and 800 miles southwest of Anchorage. The community incorporated as second class city in 1979, and is one of six communities in the newly formed Aleutians East Borough.

Akutan Harbor is surrounded by steep, rugged mountains over 2,000 feet high. The city itself is located on a narrow bench of relatively flat land lying between the bay and very steep slopes of a 1,700 foot mountain ridge. The vegetation is typical of the treeless southern Alaska Peninsula and Aleutians Islands. The climate is typical of the Alaskan maritime zone, with cool summers and mild winters, and is similar to Dutch Harbor. Precipitation is probably between the 55 inches recorded in Dutch Harbor and the 28 inches at Cape Sarichef. Like other Aleutian Chain communities, Akutan is in the path of frequent west-to-east storm tracks of the North Pacific, especially in winter. The waters of the south side of the Alaska Peninsula are ice-free year-around.

Akutan is a Native village surrounded by a non-Native processing industry. In 1878-79, a number of Aleut families and groups from neighboring islands moved to Akutan Island to establish the community. A church and school were established soon after by the Russian Orthodox Church; in subsequent years, a fur storage and trading post, cod fish business, and whaling station located in Akutan. After the outbreak of World War II, residents of Akutan were evacuated to camps in southeast Alaska for the duration of the war, where life for Aleuts was extremely harsh. Residents returned after the war and rebuilt the community. During this period, the fish and crab processing industry located in Akutan, a precursor to present economic conditions. Today, Akutan is somewhat unique among the Aleutian Island communities in this study in that there is no resident fishing fleet; local residents either crew on non-resident boats fishing in the area or work in fish processing.

3.2.2 Socioeconomic Characteristics

3.2.2.1 Local Economy

The people of Akutan have had primarily a cash economy since the whaling station was established in 1912. The cash economy is dominated by the commercial fishing industry, which provides employment and income in the form of crew positions on fishing vessels and processing jobs. Fish processing also provides the tax base for city operations and employment. In many ways, the fishing industry in Akutan is transient; there is only one shore based processor, Trident Seafoods. A maximum of thirteen floating processors operated in Akutan Harbor in 1980. With no "home fleet", all of the fishing vessels coming in and out of Akutan Harbor are transient. The fishing industry has been affected by the decline in the king crab and tanner crab industry, although diversification by Trident Seafoods into other species has added some stability to the fishing industry. After fishing and fish processing, other employers include the City of Akutan, the school, the Akutan Corporation (a village corporation formed under ANCSA), Aleutian/Pribilof Islands Association (a regional, non-profit Native association), and a store and tavern. The Akutan Corporation runs the village store, leases the City Hall to the City, and leases land to Trident and other processors for pot storage, communications facilities, waste disposal, and plant expansion. Capital project expenditures and the construction jobs created have also impacted the economy. In past years when such jobs were available, they became preferred to processing employment (Stephen R. Braund & Associates, 1985).

However, the majority of households still follow Aleut traditions; a 1984 household survey indicated that over 96 percent considered subsistence activities an important part of their life. Akutan residents receive more than half their protein needs from locally harvested resources. Cash from wage employment is necessary for active participation in subsistence activities, particularly with the lack of a home fishing fleet which could provide equipment jointly used for commercial and subsistence harvests.

3.2.2.2 Population

There are three separate elements of the population of Akutan: residents, non-resident workers from the fish processing plant, and a segment that lives offshore in floating processors. Table 3.2-1 presents an overview of Akutan resident and non-resident population. Resident population has generally fluctuated between 60 and 100 over the last 100 years. Official figure show an 29 percent increase between 1980 and 1981, and a relatively constant population until the official readjustment in 1987. The 1980-1981 increase has been attributed by residents to in-migration in response to the opening of the Trident plant, increased fishing employment opportunities and incorporation of the City. As seen in Table 3.2-1, estimates of non-resident population have only been available since 1970; this population didn't change until 1985. Non-resident processing population was estimated at 129 in 1985. In response to a disagreement between the City and the Alaska Department of Community and Regional Affairs over the revenue sharing population figure, a City population survey in 1987 estimated the combined resident/non-resident population at 274. The 1988 resident population estimate by the Alaska Department of Labor was 86.

Table 3.2-2 presents the population characteristics of Akutan. A large portion are male in the three age groups of 15 to 30; this represents a significant part of the present and future workforce. The 1980 Bureau of Census Data for Akutan indicates that males significantly outnumber females, and a small number of children in the population. These characteristics probably result from inclusion of the non-resident fish processing population in the 1980 census. A 1985 survey found 18 children under the age of 16.

Table 3.2-1: Historic Population of Akutan

Year	Resident Population	Non-Resident Population	Total Population
1890	80	NA	80
1900	60	NA	60
1910	NA	NA	NA
1920	66	NA	66
1930	71	NA	71
1940	80	NA	80
1950	NA	NA	86
1953	92	NA	92
1960	NA	NA	107
1970	NA	NA	101
1977	69	100	169
1980	69	100	169
1981	89	100	189
1982	89	100	189
1983	77	100	177
1984	85	100	185
1985	89	129	218
1986	87	[a]	[a]
1987	[a]	[a]	[a]
1988	86	[a]	[a]

Sources: 1890 through 1985 from Stephen R. Braund & Associates, 1986a; 1986 through 1988 from Population Overview, Alaska Department of Labor, various years.

[a]Not available.

The presence of the fishing industry results in some seasonal variations in Akutan's population. Trident's 160 employees are all non-resident and work on a six month contract. Little data is available on the offshore segment of the population. During 1979, a lucrative year for king crab, the offshore population was estimated at more than 1000. With the decline of this fishery, the offshore population is likely to be significantly less.

Table 3.2-2: 1980 Population Characteristics

Age Group	Male	Female	Total
0-4	5	3	8
5-9	0	0	0
10-14	3	5	8
15-19	15	4	19
20-24	26	13	39
25-29	16	8	24
30-34	8	5	13
35-39	8	1	9
40-44	8	2	10
45-49	6	3	9
50-54	7	3	10
55-59	5	3	8
60-64	1	2	3
65+	7	2	9
Total	115	54	169

Source: Stephen R. Braund & Associates, 1986b.

3.2.2.3 Employment

The labor force participation rate of local residents was estimated at 36 percent for 1985, which is higher than the rest of Southwest Alaska but well below the statewide average of 73 percent (Stephen R. Braund & Associates 1985). The employment patterns of Akutan are very atypical compared to the rest of the communities in this study. This is partly explained by the lack of a resident fishing fleet and an increasing preference by residents for non-processing employment. Table 3.2-3 shows the 1988 quarterly employment for the Unimak Island, which includes Akutan.

Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information. For 1988, only up to 30% of total employment information was disclosable. As can be seen, government generally accounts for 20 to 25 percent of wage employment. Given the information on processing employment provided in section 3.2.4.2, fish processing employment (up to 180 in 1987) exceeds government employment.

Historically, commercial fishing has dominated wage and non-wage employment. Local residents either crewed on non-resident boats fishing in the area or worked in fish processing. A 1984 survey associated with the coastal management program (Akutan Coastal Management District 1984) indicated eight residents employed by fish processing and eight residents working as crew to commercial fishing. It is likely that less crew positions are available after decline of the king crab fishery (the historically dominant fishery in Akutan) in 1982, and a trend towards joint-venture operations with relatively small crews (Stephen R. Braund & Associates, 1985).

Processing employment for local residents was historically provided by Trident Seafoods, the M/V Akutan and the M/V Deep Sea. Comments provided in the 1984 coastal management survey indicated that "locals don't want to work" for processors or "can't stand it anymore". Currently no local residents work for Trident Seafoods, although the company has had a strong interest in hiring local employees. It is possible that the higher paying crew shares of the pre-closure crab industry and salaries from capital projects made processing jobs less desirable, although current trends and economic conditions indicate less opportunity for those other jobs. Trident Seafoods currently employ 160 processing employees with a salary range of $1,500 to $2,000 a month; the M/V Akutan employs 24 processing employees with a salary ranges of $833 to $1,250 per month.

Table 3.2-3: Unimak Island Census Sub-Area 1988 Quarterly Employment

Year/ Quarter	Division	Businesses Reporting	Average Employees	Average Payroll	Average Wage
881	Construction	3	n/d	n/d	n/d
881	Manufacturing	3	n/d	n/d	n/d
881	Trans./Comm./Util.	4	n/d	n/d	n/d
881	Trade, retail	2	n/d	n/d	n/d
881	F.I.R.E	4	n/d	n/d	n/d
881	Services	3	n/d	n/d	n/d
881	Misc.	1	n/d	n/d	n/d
881	Govt., Federal	4	25	$210,310	$2,842
881	Govt., Local	6	125	$927,731	$2,481
881	Total	30	874	$4,5[illegible]073	$1,751
882	Construction	1	n/d	n/d	n/d
882	Manufacturing	3	n/d	n/d	n/d
882	Trans./Comm./Util.	4	36	$154,008	$1,426
882	Trade, retail	1	n/d	n/d	n/d
882	F.I.R.E	4	n/d	n/d	n/d
882	Services	2	n/d	n/d	n/d
882	Misc.	1	n/d	n/d	n/d
882	Govt., Federal	4	25	$250,952	$3,302
882	Govt., Local	6	122	$837,440	$2,294
882	Total	26	602	$3,401,397	$1,883
883	Construction	2	n/d	n/d	n/d
883	Manufacturing	3	n/d	n/d	n/d
883	Trans./Comm./Util.	4	38	$163,993	$1,439
883	Trade, retail	1	n/d	n/d	n/d
883	F.I.R.E	4	n/d	n/d	n/d
883	Services	2	n/d	n/d	n/d
883	Misc.	1	n/d	n/d	n/d
883	Govt., Federal	4	25	$214,869	$2,865
883	Govt., Local	6	80	$536,999	$2,237
883	Total	27	680	$5,385,996	$2,639
884	Construction	1	n/d	n/d	n/d
884	Manufacturing	3	n/d	n/d	n/d
884	Trans./Comm./Util.	4	39	$85,362	$730
884	Trade, retail	1	n/d	n/d	n/d
884	F.I.R.E	4	n/d	n/d	n/d
884	Services	2	n/d	n/d	n/d
884	Misc.	1	n/d	n/d	n/d
884	Govt., Federal	4	30	$364,625	$4,007
884	Govt., Local	6	125	$927,208	$2,466
884	Total	26	744	$4,392,423	$1,969

Source: Alaska Department. of Labor, 1989.

n/d: non-disclosure.

Table 3.2-4 presents the non-fishing employment for Akutan for 1978 and 1985 by employer. The number of non-fishing jobs more than doubled over this period from 11 to 29. The City of Akutan, the Akutan Corporation (a village corporation formed under ANCSA), and the Aleutian/Pribilof Islands Association (a regional, non-profit Native association) accounted for 18 of the 25 jobs in 1985.

Table 3.2-4: Non-Fishing Employment

	Number of Jobs in Community 1978[a]	Percent Total Employment 1978	Number of Jobs in Community 1985	Percent Total Employment 1985
School	2-4	25	2	8
Post Office	1	8	1	4
Tavern	3	25	3	12
Telephone Operations	3	25	3	12
Akutan Corporation	0	0	4	16
Store	1	8	1[b]	4
City	0	0	8	32
A/PIA	1	8	5	20
Total	11-13	100	25	100

Source: Stephen R. Braund & Associates, 1986.

[a]Other fishery and various part-time temporary jobs exist in the community but are not included in these classifications.

[b]In 1985, the store was operated by the Akutan Corporation, and the employee is actually a corporation employee, but counted separately.

3.2.2.4 Income

Per capita incom or Akutan was $8,391 for 1983. Published data are not available on income to Akutan residents resulting from participation in commercial fishing and fish processing, but 1987 harvest sector income is estimated at $171,694 (See Table 3.2-8). Based on discussions with Trident Seafoods, processing worker wages range from $1,500 to $2,000 a month. This compares with an $2,000 - $2,700 monthly manufacturing salary for the Unalaska Subarea reporting district for the Alaska Department of Labor. Assuming an average of $1750/ month and eight local employees, annual fish processing income generated to local residents is $168,000. Salaries generated by the City of Akutan (City Council, departmental, and administration) totaled $124,677 in FY 1987. In FY 1984, the Akutan Corporation paid annual salaries of $42,000 to its employees. Despite the lack of a community fishing fleet and low interest in fish processing, it appears that commercial fishing and fish processing accounts for more than 50 percent of wage income.

3.2.2.5 Public Fiscal Characteristics

Revenues

Table 3.2-5 summarizes the city revenue and expenditures over the period of FY 1983 through FY 1987. The fishing industry makes a significant contribution to city revenues; in FY 1987, state revenue sharing from the raw fish tax accounted for 55 percent of total revenue. During the lowest year of the series (1984), fish tax accounted for only 22 percent, and the city ran a budget deficit of $113,575. The sales tax, which also has a fishing industry component, accounted for an additional 18 percent of revenue. Good fishing years and resulting revenue have allowed the City to create a "permanent" fund with a 1987 balance of nearly $1.2 million. The fund has increased 20 percent in value since FY 1983. Other trends worth noting are a drop-off in the levels of state municipal assistance and levels of state revenue sharing that have stayed roughly the same for the last four years. However, with these income categories accounting for only 6 percent of total 1987 revenues, the consequences of their decrease have been insignificant compared to their effect on other communities.

Formation of the Aleutians East Borough has significantly changed the revenue picture for individual communities. The Borough is now collecting a share of the taxes on fish products and other sales, and also providing education and other public services.

Table 3.2-5: Summary of Revenues and Expenditures

Category	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	% of 1987 Total
Revenues						
Sales Tax	$83.1	$27.6	$56.2	$96.8	$140.9	18.2%
Intergovernmental						
Raw Fish Tax	$415.9	$102.8	$120.7	$357.1	$424.6	54.9%
State Revenue Sharing	$54.4	$29.3	$30.6	$31.7	$31.0	4.0%
Municipal Assistance	$52.0	$25.5	$25.6	$24.7	$17.3	2.2%
Other	$221.1	$130.7	$88.0	$23.8	$0	0.0%
Capital Projects	$387.8	$22.7	$12.0	$471.3	$0	0.0%
Sales and Service Charges						
Water and Sewer	$0	$0	$0	$0	$0	0.0%
Electricity	$14.7	$35.3	$43.8	$59.7	$58.3	7.5%
Fuel Oil Sales	$16.6	$19.9	$35.7	$33.4	$20.8	2.7%
Other						
Interest Income	$51.6	$55.9	$104.6	$72.3	$48.2	6.2%
Clinic Rent					$15.4	2.0%
Miscellaneous	$23.5	$11.1	$16.8	$27.6	$17.4	2.3%
Total Revenues	$1,320.7	$460.8	$534.0	$1,198.4	$774.0	100.0%
Expenditures						
General. Government	$399.3	$257.7	$282.7	$258.0	$366.4	54.4%
Public Safety	$28.4	$10.8	$14.8	$12.7	$11.5	1.7%
Public Works	$12.3	$97.5	$133.2	$154.4	$177.1	26.3%
Health Services	$123.3	$5.8	$8.5	$8.5	$12.0	1.8%
Library		$8.0	$3.3	$7.0	$2.6	0.4%
Parks and Recreation	$14.7	$8.4	$12.4	$16.5	$45.6	6.8%
Non-departmental	$178.8	$137.5	$61.0	$33.8	$58.6	8.7%
Capital Projects	$221.4	$48.8	$12.0	$630.5	24515	*
Total Expenditures	$978.2	$574.4	$527.8	$1,121.3	$673.7	100.0%
Excess of Revenues (less other uses)	$342.6	-$113.6	$2.7	$213.7	$75.7	
Fund Balance	$972.7	$873.7	$882.6	$1,096.2	$1,172.0	

Source: City of Akutan, various years.

Expenditures

General government is the major category of non-capital project expenditures. After dropping off by 35 percent in FY 1984, expenditures for general government have increased steadily, and accounted for 54 percent of FY 1987 expenditures. Public works expenditure have become a major budget category, increasing steadily since FY 1984. Public works accounts for 26 percent of the FY 1987 budget. Again, without fishing industry revenues to offset increases in general government and public works, Akutan could find itself in the fiscal crisis facing other rural Alaskan communities.

3.2.3 Infrastructure Characteristics

3.2.3.1 Transportation Facilities

Air Travel

Akutan does not have any type of onshore airport or airstrip. The community is currently served daily from Unalaska by Peninsula Airways, using an amphibious Grumman Goose. A 1981 Legislative appropriation was approved for construction of a landing strip; however, an inadequate amount of suitable land and adverse weather conditions made airport construction infeasible. A seaplane ramp was recently constructed in the last 2 years at the west end of town. Akutan is without aids to air navigation, so flights are flown under visual flight rules (VFR) during daylight hours.

Port Facilities

Port facilities in Akutan are extremely limited. The community of Akutan has a small (approximately 80 feet of face) cargo dock on land owned by the Russian Orthodox Church and leased to Pelican Seafoods. Trident Seafoods has a 30 foot by 100 foot wood dock on five pile belts, built after a fire in 1983 destroyed the old plant (Alaska Department of Community and Regional Affairs, 1983). With ongoing plant expansion, Trident Seafoods will have a dock face of approximately 1200 feet. Deep Sea fisheries has a dock facility at the site of the old whaling station, across Akutan Harbor from the community towards the head of the harbor. In 1983, this facility consisted of a small 20 foot by 80 foot wood piling pier on the west side of the property and a larger 60 foot by 150 foot pier on the east side (Alaska Department of Community and Regional Affairs, 1983).

Akutan does not have a small boat harbor; while the U. S. Army Corps of Engineers (COE) has investigated several potential sites in the vicinity of Akutan, estimated costs were too high for anticipated benefits (Stephen R. Braund & Associates, 1985). Lack of a small boat harbor has been attributed by some residents as a factor in the absence of a local fishing fleet.

Several additional harbor-related projects have been investigated over the last 10 years. A study was conducted in 1980 which investigated requirements for extension of state ferry service to Aleutian Island communities, including Akutan. The study concluded a new pier would be required and that the likelihood of service was remote. The COE study of small boat harbor sites, referenced above took place in 1981. In 1981, the City of Akutan received a $250,000 grant from the state to study the feasibility of developing a large dock and fish processing facility at the head of Akutan Harbor, west of town. The timing of the study reflected the boom in the king crab fishery (prior to its decline), and high expectations regarding American participation in the bottomfish industry. The proposed development suggested a two phase approach to dock construction, road development, and a processing facility/industrial park. Since the completion of the study, neither the State or private developers have come forward with the necessary capital to advance the project to the development stage. Currently, the City, Trident Seafoods, and Akutan Corporation are working together to obtain state funding for a small boat harbor with a capacity of 80 to 125 boats.

3.2.3.2 Marine Services

Marine services are generally limited to those provided by Trident Seafoods and other processors operating in the area (see Section 3.2.4, Support Sector).

3.2.3.3 Utilities

Water, Sewer, and Solid Waste

The Public Health Service constructed both the water and wastewater systems in 1981-2; they are both presently operated by the city. The water system includes a reservoir, 860 feet of transmission line and 1,100 feet of water main connecting 29 houses. The wastewater system consists of two 4,700 gallon septic tanks, 500 feet of sewer main, and a 500 foot sewage outfall. Thirty-three homes are connected to the wastewater system. No water or wastewater service charges are being levied by the system. The 1987 operating expenditures for water, sewer, and solid waste totaled $36,111.

In 1986, the city corrected a solid waste problem by constructing an incinerating facility; wastes are incinerated onshore and the residue disposed of offshore, outside of Akutan Harbor. An ocean dump site has been designated five km east of the city, in 80 feet of water. Garbage is collected by the city, which levies no charge for the service. Fish processors are responsible for disposal of their own solid waste. Earlier water quality studies indicated that processing wastes disposed of in Akutan Harbor tended to accumulate. Seafood processors are now required to obtain an U. S. Environmental Protection Agency permit before operating in Akutan Harbor. Seafood processing wastes must also be disposed of outside Akutan Harbor.

Electricity and Fuel Oil

The City of Akutan generates electricity for its residents. The diesel facility consists of two 85 KWH generators and a 12,000 gallon fuel storage tank. Power demand averages 45 KW in the summer and 80 KW in the winter, which is well within the generating capacity of the two generators. In 1985, the service charge was $.37/KWH. The community receives Power Cost Equalization funds and household costs averaged between $60 and $114 a month. In FY 1987, electric service charges generated $58,284 in revenue, compared to $70,182 in operating costs. Fish processors generate their own power.

The City also sells the fuel oil used by residents for heating and cooking. Bulk fuel storage capacity in Akutan is 60,000 gallons. Fuel costs approximately $58 for a 55 gallon drum; at one drum during the summer and up to three drums during the winter, costs range from $58 to $174 a month. In FY 1987, fuel oil sales generated approximately $20,812 in revenue; fuel purchase costs were $53,921.

3.2.3.4 Housing

There are 32 single family housing units in Akutan that are occupied by residents. Sixteen were built in the late 1930's; 16 additional units were constructed in 1983. Residents spread out to occupy housing as it became available; there are no vacant units. Fish processors provide their own housing. Trident Seafoods has two bunkhouses, and is in the process of expanding their facilities. The M/V Western Sea provides bunk space for other processing employees.

3.2.3.5 Land Availability

The availability of suitable land for development and infrastructure has been a constraint to growth. The steep topography surrounding Akutan Harbor and variable soil conditions limit development potential in the vicinity of the community. There are two potential sites for future development; the church-owned land on the west end of town and the processing/industrial park site at the head of the harbor. The church parcel would be ideal for future residential expansion, but is held under long-term lease with Seawest until 1993, with an option to extend an additional 25 years. There are some land ownership issues that need to be resolved before land at the head of the bay can be developed, particularly the status of City land selections and a private parcel (USS 766) which contains crucial shorefront property.

3.2.4 Industry Characteristics

3.2.4.1 Harvesting Sector

The harvesting sector in Akutan is composed almost solely of transient vessels. Akutan does not have a home port fleet, other than a few skiffs which are used by residents for commercial halibut fishing. The Akutan Corporation has considered boat ownership in order to make money and increase fishing experience for community residents, but at present they do not have the resources to purchase a vessel and operate it.

Major Fisheries

Table 3.2-6 presents data from NMFS and CFEC indicating the number of permits for various species held by residents of the community. These data appear to be incorrect for years prior to 1983. Data for those years show Akutan residents owning large (> 15 meters) vessels (Stephen R. Braund & Associates, 1986). Based upon community interviews, local residents do not and have not owned such boats. The possible source of the error may be that non-resident permit holders use a processing plant for an address.

Akutan residents do not hold limited entry salmon permits since they did not participate in salmon fishing prior to the implementation of limited entry. Participation in other fisheries is possible, but based upon information from 1987 field visits, residents have permits only for halibut and fish for the species from small skiffs. The capital investment required for Bering Sea crab fishing, the primary fishery that villagers have experience in, is well beyond the means of individual community residents, and has restricted their participation in previous years.

Crab is the major resource harvested by non-resident boats calling at Akutan. Trident's expansion into groundfish has resulted in a small fleet of trawlers and longliners focusing on those species. Trident has part ownership in two trawl vessels that deliver pollock to the plant. Information on total landings at Akutan is subject to non-disclosure rules.

Local residents fish during the designated halibut openings, while non-resident vessels operating out of Akutan have fishing seasons that are similar to the entire Bering Sea fleet for the species they pursue (See Section 2.2).

Table 3.2-6: Number of Commercial Fishery Permits by Species

Species	Year											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
King Crab	3	9	4	2	0	1	0	0	2	0	0	0
Tanner Crab	1	8	5	2	1	0	0	0	0	0	0	0
Shrimp	1	0	0	1	0	0	0	0	0	0	0	0
Other Finfish	0	0	0	3	0	1	0	0	0	0	1	2
Halibut	0	0	0	0	1	0	0	1	0	1	6	[b]
Total Permits	5	17	9	8	2	2	0	1	2	1	7	[b]
No. of Individuals Holding Permits	1	7	7	4	2	2	0	1	1	1	5	2

Sources: Data from 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1988; data from 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

Employment

Without vessel ownership, Akutan residents seek employment as crew on vessels from other areas. This is difficult since most boats come to Akutan with permanent crews from Seattle. Villagers are generally regarded as temporary crew on boats that do hire them. Previous studies suggest that typical employment levels on commercial fishing boats ranges from five to eight full-time crab crewmen plus other individuals who work part of the season, and four to six persons during the salmon season (Stephen R. Braund & Associates, 1986). Information obtained during the 1987 field visit (Table 3.2-7) indicated that the salmon crew members were about equally divided between Area M (Bristol Bay) and Area T (Peninsula/Aleutians).

Employment and residency patterns for non-resident crabbers and trawlers contacted at Akutan during the field visit were similar to residency patterns for the fleet of these vessel types (See Section 2.4.1)

Table 3.2-7: 1987 Harvest Sector Resident Employment

Fishery	Total Persons
Halibut	5.0
Crab (crew)	6.5
Salmon (crew)	5.0
Other Finfish	2.0

Income

Harvest sector income for Akutan residents is limited to that earned by the residents who fish for halibut and other finfish, and the residents who crew on other vessels. Table 3.2-8 presents information for estimated 1987 income, based upon a 1987 field visit, data presented by Stephen R. Braund & Associates (1985), and information from CFEC on harvest value for halibut and other finfish in 1987.

Table 3.2-8: 1987 Harvest Sector Resident Income

Fishery	Average Income Per Resident	Total Income for Community
Halibut	$4,651	$27,908
Crab (crew)	$28,149	$112,595
Salmon (crew)	$6,041	$30,203
Other finfish	$494	$988
Total		$171,694

Source: Data from Stephen R. Braund & Associates, 1985 and Alaska Commercial Fisheries Entry Commission, 1989.

Income for halibut and other finfish is from CFEC data bases provided to MMS. Only total pounds were provided for the other finfish category so an ex-vessel price of $0.50 was used to estimate the income for the average fisherman for the other finfish category.

An average of 5 residents were estimated to crew on salmon vessels based upon information presented in Stephen R. Braund & Associates (1986). At least two of the residents crewed in Bristol Bay (Area T) while others worked on Area M boats. Average crew shares for Area T gillnetters are used for two of the positions. Information on the types of vessels or fisheries that False Pass (Area M) crew members are employed on is not available so the 3 positions are allocated at 1 person each to a limit seiner, small purse seiner, and drift gillnetter. Average crew shares are assumed for each fishery.

Boat and Gear Characteristics

Local residents own skiffs for recreation, subsistence, and limited commercial fishing. These are small aluminum skiffs and Lund was the predominant manufacturer noted during the field visit. Based upon community responses during the field visit, the large vessel shown in Table 3.2-9 is not owned by local residents, but was licensed by an individual from outside the community using an Akutan processor address.

Table 3.2-9: Resident Fishing Fleet

Size in Feet	Size in Meters	Year							
		1981	1982	1983	1984	1985	1986	1987	1988 [a]
0-19	0-6.0	0	0	0	1	0	1	4	2
20-39	6.1-12.1	0	0	0	1	0	0	1	0
40-59	12.2-18.2	0	0	0	0	0	0	0	0
60-79	18.3-24.3	0	0	0	0	0	0	0	0
80-99	24.4-30.4	0	0	0	0	0	0	0	0
100-119	30.5-36.5	0	1	1	1	0	0	0	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

The non-resident fleet of crabbers, trawlers, longliners, and processors is similar in size and other characteristics to other boats in each vessel type for the Bering Sea fleet (See Section 2.4.1). Crabbers are the largest part of the catcher fleet calling at Akutan, with trawlers comprising the next largest segment. The number of crabbers calling at Akutan has increased in the last few years as prices have increased.

According to several fishermen and a processor representative, the expansion of the Trident plant and diversification into processing of other species has brought many small (30' - 40') longline boats into the area fishing for halibut, black cod, Pacific cod, and turbot. These smaller boats primarily fish in the summer months only, but larger longliners (70' - 80') are fishing year round.

One small drift gillnet boat was noted rigged for longlining during the field visit in September. This boat was catching Pacific cod and other miscellaneous groundfish for use as bait by crabbers in the forthcoming red king crab season.

Use of Community Infrastructure

There are no boat harbors in Akutan Harbor. As previously mentioned in Section 3.2.3.1, the U.S. Army Corps of Engineers has investigated several sites in the harbor but the estimated costs were too high for anticipated benefits.

When space is available, boats will moor at the City dock or the processor docks, but this space is limited and a number of vessels are typically forced to anchor in Akutan Harbor. The bottom conditions are good for anchorage and the harbor is well sheltered from all except east winds.

The community of Akutan has a small cargo dock on land owned by the Russian Orthodox Church and leased by Pelican Seafoods (Stephen R. Braund & Associates, 1986), that fishing vessels use on a frequent basis. Several crabbers, a processor, and one small (34-36') gillnetter/longliner were noted using the dock during one week in September, 1987. A small storage barge is located on the west side of the dock, and the M/V Western Sea is moored at the end of the dock when it is in Akutan Harbor. A warehouse is located adjacent to the dock and the M/V Akutan was noted loading supplies from the warehouse in the fall of 1987.

With completion of the ongoing plant expansion, Trident Seafoods will have a dock face of approximately 1200 feet.

Deep Sea Fisheries had a dock of 150 feet at their facility in 1984 (Centaur Associates, Inc. 1984). Company representatives were not available to confirm this information during the field visit.

Vessels which operate out of Akutan often use the Grumman Goose seaplane operated by Peninsula Airways to change crew members. Mail, and urgent parts and supplies are often flown in for these boats. The Goose has severe limits on the weight and size of equipment that it can accommodate, so boats needing large, bulky equipment or supplies must have it shipped to Akutan or use the air freight system into Unalaska/Dutch Harbor.

Akutan Harbor has a very limited infrastructure to support the fishing industry and Trident Seafoods is expanding its facilities to provide required services for the fleet. Trident is also working with the City of Akutan to seek state funding for a boat harbor with a capacity of 80 - 125 boats, and an airport instead of the seaplane dock.

3.2.4.2 Processing Sector

The processing sector is composed of the Trident Seafoods shore-based plant, the M/V Deep Sea, a permanently moored floating processor operated by Deep Sea Fisheries, Inc., and a number of floating processors that operate on a seasonal basis in the harbor, including the M/V Akutan, leased and operated by Pelican Seafoods, a subsidiary of ConAgra, which is a joint venture partner in Trident Seafoods.

The number of processors operating in the harbor was reported to range between 11 and 13 during the spring shellfish season (Centaur Associates, 1984). Only 4 floaters were present in Akutan in September 1987 prior to the fall red king crab opening.

Plant Characteristics

Local processing activity began in 1947 when Lowell Wakefield began processing king crab (Stephen R. Braund & Associates, 1986). Processing expanded in the area in the late 1970's when crowded conditions at Unalaska/Dutch Harbor forced part of the floating processor fleet to seek other harbors.

The $12 million Trident Seafoods shoreplant began processing Pacific cod into split, wet salted cod in June, 1982. The plant has been rebuilt and expanded since being almost totally destroyed by fire in April, 1983.

The Trident Seafoods Akutan plant began operations processing Pacific cod. After the fire, management modified the plant to handle salmon from Area M and Bristol Bay, herring from Togiak and other locations in the Bering Sea, all species of bottomfish, crab, and scallops. Management estimates that 90 percent of their product comes from the Bering Sea.

The present facility produces headed and gutted salmon, black cod, and halibut. Fillets are produced from Pacific cod and pollock. All of the product is frozen. Trident has a major expansion underway to triple their pollock fillet production and install a surimi production facility in early 1988. High grade pollock will go to fillets and lower grade will go to surimi.

They are also installing tanks for an additional 1.5 million gallons of fuel to resupply fishing boats, doubling their cold storage capacity, and adding a 52 man bunkhouse for the additional employees required for the fillet and surimi expansion.

The Trident Seafoods shore plant operates year round, although the species processed at any given time are dependent upon regulatory seasons.

The M/V Deep Sea and the M/V Akutan currently process only crab and were not operating in the fall of 1987 prior to the opening of the red king crab season (See Figure 2.2-35 for information on 1987 crab seasons).

Employment

The Trident Seafoods shoreplant employed 160 persons in September 1987, with an annual range of 140 - 180. For a peak workforce of 180 persons during the summer salmon season, 140 are processor workers and 40 are support staff.

The processing line works one shift that can extend to 18 hours per day. The support staff generally works 12 hours per day although longer shifts do occur.

Centaur Associates (1984) reported that processors operating in Akutan harbor added about 800 to 1,000 persons to the area's seasonal population. Using the previous estimate of 11 to 13 processors during this same period (See Section 3.2.4.2), the average processor would employ 70 to 75 persons.

Local residents are typically hired under standard employment terms with indefinite length of employment. Non-residents are typically hired for a 6 month contract by all processors, although Trident hires some persons for the three month salmon season.

The number of persons employed in the processing sector varies significantly over the term of a year as plants hire (or release) employees to handle expected production, and as floating processors move in and out of the harbor as species and area openings and closures occur. Published data are not available to estimate seafood processing employment levels in Akutan.

Trident does not presently employ any Akutan or State of Alaska residents. All hiring is done out of Seattle and most employees are residents of Washington. A few processing workers mentioned they were from California. Trident management indicated that only one Akutan resident sometimes works at the Trident plant, although the company had a strong interest in hiring local residents.

Akutan residents corroborated this employment information and said that the local residents believe they should be paid more for working at the processing plants. In the opinion of the villagers, Trident doesn't take into consideration the costs it incurs for transportation and room and board for imported employees. Wages paid to local residents should reflect this additional cost, with the differential paid to villagers.

Centaur Associates (1984) reported that about 30 residents were employed on the processors in 1983, while a 1984 survey (Akutan Coastal Management District, 1984) listed eight residents with occupations of processing workers. A 1985 survey (Stephen R. Braund & Associates, 1986) suggested that eight persons was a reasonable estimate of the number of local residents who work in the processing industry.

There has been a shift away from processors as the major employers in the community (Stephen R. Braund & Associates, 1986). Two factors were identified in this study: 1) The local institutions (City of Akutan and the Akutan Corporation) are more flexible in employment conditions; and 2) as processing employment becomes more sporadic and less profitable, the inconvenient schedules and rigor of the job becomes less worthwhile.

Income

A typical processing worker will make $1500 - 2000 per month at the Trident shore plant, which is higher than the average monthly wage of $1,443 paid to processing employees within the State of Alaska in 1985 but very close to the 1985 average wage of $1,702 paid to these workers in the southwest Alaska region (Thomas, 1987). Assuming an average wage of $1,750 per month and eight local employees as described above, seafood processing would generate about $168,000 of wage and salary income to the community.

Use of Community Infrastructure

None of the processors operating in Akutan Harbor purchase utility services from the City. Most are self-contained floating processors, and even the Trident shoreplant is self-sufficient. Trident and the village are sharing the costs of installing cable television in the area, with the antenna located in the community.

Local processors use air transportation for crew change and urgent supplies. Large shipments of routine supplies are often dropped off by barges on their way to Unalaska/Dutch Harbor. Catcher boats are also used to transport materials and equipment from Unalaska Island to Akutan if they are proceeding to Akutan after calling at Unalaska/Dutch Harbor.

Other Processors

The M/V Akutan has a long history of involvement with the community, starting with king crab processing in the late 1950's. Some local residents have reported employment of up to 10 years on board the vessel, although only one local resident had worked on the M/V Akutan during the 1984 - 1985 period (Stephen R. Braund & Associates, 1986), and no Akutan residents were employees in September 1987.

All of the ship's crew are long-term employees and, since the vessel spends 11 months out of the year in Alaska, management claims that all six are Alaska residents. However, none of the ship's crew are Akutan residents. Approximately 25 percent of the processing workers are Alaska residents with the remainder from outside.

Normal operation requires 30 persons. Processing workers represent 24 persons and ship's crew are the remainder. At present (September, 1987) only 15 persons are employed on the ship. The M/V Akutan processes all types of crab. It used to process finfish but has not done so in the last few years. Processing workers are on a six month contract and the single shift operation results in work days of 16 to 18 hours during peak processing periods.

The M/V Deep Sea is a permanently moored floating processor which operates in Akutan Harbor. A caretaker crew was onboard the vessel during the field visit and management staff was not available to provide information. According to Stephen R. Braund & Associates (1986), total processing employment on the vessel is estimated at 30 persons. The first crews for the M/V Deep Sea were Akutan residents and the local hire relationship has continued from that time.

3.2.4.3 Support Sector

There are no dedicated marine oriented firms offering services to the fishing fleet in Akutan Harbor. The Akutan store has groceries and some marine supplies, but it is not sufficient for the large boat fleet that predominates at Akutan.

The Trident Seafoods plant provides limited support for the fishing fleet. Some mechanical support, a machine shop, limited groceries and supplies, gear storage, and mail service are available. Trident is constructing a 1.5 million gallon fuel storage system to service the vessels selling fish to them.

3.3 King Cove

3.3.1 Description/Setting

King Cove is located on the south side of the Alaska Peninsula, between Cold Bay to the west and Belkofski Bay to the east it lies 18 miles southeast of the community of Cold Bay and 625 miles southwest of Anchorage. Incorporated as first class city, it is one of six communities in the newly formed Aleutians East Borough. King Cove is located 20 feet above sea level, on a gravel spit that divides an outer embayment and an inner lagoon, and is flanked by steep-sided mountains 1500 feet high. The vegetation is representative of the treeless southern Alaska Peninsula and Aleutians Islands. The climate is typical of the Alaskan maritime zone, with cool summers and mild winters. King Cove is in the path of frequent west-to-east storm tracks of the North Pacific, especially in winter. Periods of strong winds can occur, accentuated by the steep topography which can act as a funnel. Precipitation is relatively light for a maritime climate, although the area is often cloud or fog covered. The waters of the south side of the Alaska Peninsula are ice-free year-around.

King Cove is a fishing community, with significant participation by local residents commercial fishing and fish processing. The community was founded when Pacific American fisheries built a cannery at the head of King Cove in 1911. Some migration to the community occurred in response to employment and education opportunities, and residents are largely descendants of native Aleuts, early Russian settlers and European immigrants. Community residents also participate in subsistence activities. In 1981, the King Cove Corporation, a village corporation formed under ANCSA, had 335 stockholders.

3.3.2 Socioeconomic Characteristics

3.3.2.1 Local Economy

Commercial fishing and seafood processing are the major components of the economy of King Cove. Salmon is the primary species harvested and processed, but fishermen also harvest king, tanner, and dungeness crab, herring for roe, halibut, cod and sablefish. Commercial fishing accounted for 45 percent of annual employment income to residents and fish processing accounted for 32 percent of annual employment income to residents. While not as prominent as commercial fishing, the public sector is also important to the economy. In 1984, the city, school district, and post office accounted for 16 percent of annual employment income to residents and 74 percent of the 46 permanent full-time wage employment. The King Cove Corporation and private businesses are also components of the economy. In addition to Peter Pan Seafoods, other businesses include the Harbor Grill Restaurant, the Fleets Inn Motel, Wilson's Fuel

Sales, Gould and Sons Grocery and General Merchandise, Mt. Dutton Cable Television, the Last Hookoff Tavern, Mack's Trucking, and an auto shop.

Subsistence harvests also represent a component of the local economy, but are of secondary importance to commercial fishing. Despite the relative affluence of the community, 60 percent of meat, fish, and fowl protein consumed in the community is locally derived. The cash value for replacement of subsistence harvest was estimated at $763,000 in 1984, or 9 percent of wage and non-wage income (Stephen R. Braund & Associates, 1986a). There is a strong but complex linkage between commercial and subsistence harvest activities, which often includes concurrent harvest efforts and investment in equipment shared for harvest efforts (boats, motors, nets).

3.3.2.2 Population

The Alaska Peninsula and Aleutian Islands have long been inhabited by Native Aleuts. Nearby Belkofski was most likely the nearest settlement, although King Cove was likely used for seasonal harvest activities. The arrival of the Russians in the 18th century initiated permanent changes to Aleut culture. The regions native population declined from 12,000 at the time of Russian contact to 1,500 by 1825. Transition to American stewardship resulted in commercial diversification of the Aleutians; the cod fishery in particular attracted numerous European immigrants. As mentioned earlier, King Cove was founded as a community when Pacific American fisheries built a cannery at the head of King Cove in 1911. The new cannery attracted Aleut residents of nearby villages with employment opportunities and supplies, and in-migration gradually continued as opportunities elsewhere dwindled and a school was established.

Table 3.3-1 presents the total population of King Cove over the period of 1940 to 1988. The community has experienced periods of rapid growth over the last four decades, primarily based on new employment opportunities opened up through fishing and fish processing (City of King Cove 1981). Population surged 79 percent during the period of 1950-1960, decreased slightly from 1960 to 1970, and grew by 63 percent between 1970 and 1980. Over the last 8 years, population has increased by 16 percent. The population estimates shown in Table 3.3-1 are taken from Population Overview, published by the Alaska Department of Labor. These estimates are substantially lower than the population estimates used by the City of King Cove and the Alaska Department of Community and Regional Affairs, which estimate the 1989 population at 790 persons.

Table 3.3-1: Historic Population
City of King Cove

Year	Population
1940	135
1950	162
1960	290
1970	283
1980	460
1981	513
1982	523
1983	536
1984	521
1985	547
1986	552
1987	a
1988	535
1989	790

Sources: Data for 1940 to 1980 from Stephen R. Braund & Associates, 1986b; data for 1981 to 1988 from Alaska Department of Labor, various years; 1989 data from Alaska Department of Community and Regional Affairs, 1989.

[a]Not available.

Table 3.3-2 shows a comparison of 1970 and 1980 population composition by age and sex. The age structure is characteristic of Alaska's relatively young age structure; the 1980 median age was 24.2. Approximately 41.5 percent of the population is under 20 years of age, compared to 36.1 percent for the State of Alaska, and males slightly outnumber females. Since 1980, the relatively modest population increase has been mostly internal, with approximately 15 births per year and little in-migration. Trends in employment opportunities and the fishing industry are also reflected in population trends. Past city managers have indicated that the closure of the king crab fishery after 1982 has slowed population growth (Levy, 1987).

Table 3.3-2: 1980 Population Characteristics
City of King Cove

Age Group	Male	Female	Total
0-4	24	33	57
5-9	23	20	43
10-14	17	23	40
15-19	29	21	50
20-24	21	26	47
25-29	21	26	47
30-34	31	18	49
35-44	25	19	44
45-54	29	26	55
55-59	6	4	10
60-64	3	2	5
65-74	4	6	10
75-84	0	3	3
85+	0	0	0
Total	233	227	460

Source: Stephen R. Braund & Associates, 1986a.

The population of King Cove experiences a seasonal fluctuation associated with commercial fishing. During the summer, the population increases by 450 (Alaska Department of Community and Regional Affairs, 1987).

3.3.2.3 Employment

Employment in King Cove includes elements of wage and non-wage income, and full time and seasonal employment opportunities. Most full time wage employment tends to be in the public sector and non-fishery privates sector; fish processing provides a greater number of wage employment jobs but on a seasonal basis. Table 3.3-3 shows Unimak Island census subarea payroll industry series data for the 4 quarters of 1986. Table 3.3-4 shows the Unimak Island census subarea payroll industry series data for the 4 quarters of 1988; in this reporting year King cove was combined with Akutan. Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information. For 1988, only up to 30% of total employment information was disclosable. As can be seen, government generally accounts for 20 to 25 percent of wage employment.

The King Cove School district was the major public sector employer in 1987, with 23 full time and 2 part-time employees. The City of King Cove employed 5 full time positions and 12 part-time positions. Among the private employers, King Cove Corporation employed 6 persons full-time in 1987. The seafood processing industry (Peter Pan Seafoods) provided only 5 full-time positions in 1987, but also provided 336 part-time positions. The vast majority of these positions are filled by non-residents; in 1985 only 6 percent of the seasonal processing employment was filled by residents of King Cove. Other private businesses are estimated to provide 6 full-time and 18 part-time positions.

Table 3.3-3: 1986 Area Employment Series Unimak Island Census Subarea

Industrial Classification	1st Quarter Employment Average	1st Quarter Employment Percent	2nd Quarter Employment Average	2nd Quarter Employment Percent	3rd Quarter Employment Average	3rd Quarter Employment Percent	4th Quarter Employment Average	4th Quarter Employment Percent
Mining	32	1.23%	95	3.68%	148	5.39%	82	3.06%
Construction	16	0.62%	15	0.58%	66	2.41%	41	1.53%
Manufacturing	a							
Transportation, Utilities & Communication	219	8.44%	231	8.95%	253	9.22%	237	8.84%
Wholesale Trade	a							
Retail Trade	297	11.45%	320	12.39%	374	13.63%	318	11.86%
Finance, Insurance & Real Estate	71	2.74%	77	2.98%	77	2.81%	78	2.91%
Services	598	23.04%	607	23.51%	581	21.17%	546	20.36%
Government								
Federal	99	3.82%	101	3.91%	101	3.68%	94	3.50%
State	236	9.09%	251	9.72%	247	9.00%	235	8.76%
Local	1027	39.58%	885	34.28%	897	32.69%	1048	39.08%
Miscellaneous	a						3	0.00%
Total	2595		2582		2744		2682	

Source: Alaska Department of Labor, 1987.

[a]Not disclosed.

Table 3.3-4: King Cove Census Sub-Area 1988 Quarterly Employment

Year/ Quarter	Division	Businesses Reporting	Average Employees	Average Payroll	Average Wage
881	Construction	3	n/d	n/d	n/d
881	Manufacturing	3	n/d	n/d	n/d
881	Trans./Comm./Util.	4	n/d	n/d	n/d
881	Trade, retail	2	n/d	n/d	n/d
881	F.I.R.E	4	n/d	n/d	n/d
881	Services	3	n/d	n/d	n/d
881	Misc.	1	n/d	n/d	n/d
881	Govt., Federal	4	25	$210,310	$2,842
881	Govt., Local	6	125	$927,731	$2,481
881	Total	30	874	$4,591,073	$1,751
882	Construction	1	n/d	n/d	n/d
882	Manufacturing	3	n/d	n/d	n/d
882	Trans./Comm./Util.	4	36	$154,008	$1,426
882	Trade, retail	1	n/d	n/d	n/d
882	F.I.R.E	4	n/d	n/d	n/d
882	Services	2	n/d	n/d	n/d
882	Misc.	1	n/d	n/d	n/d
882	Govt., Federal	4	25	$250,952	$3,302
882	Govt., Local	6	122	$837,440	$2,294
882	Total	26	602	$3,401,397	$1,883
883	Construction	2	n/d	n/d	n/d
883	Manufacturing	3	n/d	n/d	n/d
883	Trans./Comm./Util.	4	38	$163,993	$1,439
883	Trade, retail	1	n/d	n/d	n/d
883	F.I.R.E	4	n/d	n/d	n/d
883	Services	2	n/d	n/d	n/d
883	Misc.	1	n/d	n/d	n/d
883	Govt., Federal	4	25	$214,869	$2,865
883	Govt., Local	6	80	$536,999	$2,237
883	Total	27	680	$5,385,996	$2,639
884	Construction	1	n/d	n/d	n/d
884	Manufacturing	3	n/d	n/d	n/d
884	Trans./Comm./Util.	4	39	$85,362	$730
884	Trade, retail	1	n/d	n/d	n/d
884	F.I.R.E	4	n/d	n/d	n/d
884	Services	2	n/d	n/d	n/d
884	Misc.	1	n/d	n/d	n/d
884	Govt., Federal	4	30	$364,625	$4,007
884	Govt., Local	6	125	$927,208	$2,466
884	Total	26	744	$4,392,423	$1,969

Source: Alaska Department. of Labor, 1989.

n/d: non-disclosure.

Non-wage employment is also provided by commercial fishing, in the form of permit holders and crew members. There were 71 salmon permit holders in King Cove in 1986; an additional 28 permits for other finfish and 29 permits for crab were held by King cove residents in 1985. Many individuals hold permits for more than one fishery, and as a result, the total number of individuals holding permits is between the number of salmon permit and combined salmon, halibut, and crab permits. CFEC data shows that 84 individuals who listed King Cove as their residence held permits in 1986, and 86 persons in 1987. See Table 3.3-15 for more detailed information on commercial fishing employment.

3.3.2.4 Income

The per capita income of King Cove, last measured in 1983, was $8,439. Commercial fishing and fish processing dominates income to King Cove residents; it accounted for approximately 69 percent of 1985 wage and non-wage (not counting subsistence value) income of $4.6 million to local residents. An additional $1.9 million was paid to non-residents for Peter Pan Seafood administration and fish processing.

3.3.2.5 Public Fiscal Characteristics

Revenues

Table 3.3-6 summarizes the city revenue and expenditures over the period of FY 1983 through FY 1987. Revenue and expenditure categories for King Cove are divided into General and Special Revenue/Funds: electric/water/sewer, boat harbor, the school district, and health clinic are all special fund categories. Commercial fishing is a significant contributor to the King Cove municipal budget. Not counting capital projects, education, and the health clinic, the sales tax contributed 28.4 percent and raw fish tax contributed 25.0 percent of the revenues in FY 1987. Electric utility service charges was another major category of revenues, contributing 23.1 percent to revenues. Both sales tax and raw fish tax revenue sharing have fluctuated over recent years, depending on the success of fishing seasons. Sales tax has fluctuated from $115,153 in FY 1983 to $372,729 in FY 1987, with raw fish tax revenue fluctuating from $214,815 to $411,700 in FY 1986.

Expenditures

Major categories of expenditures, excluding capital projects, education, and the health clinic, are: public works (40.5 percent of FY 1987 budget); general government (24.1 percent of FY 1987 budget); the boat harbor (12.1 percent of FY 1987 budget); and public safety (10.7 percent of FY 1987 budget).

Table 3.3-5: 1986 Area Payroll Series Unimak Island Census Subarea

Industrial Classification	1st Quarter Average Wage	1st Quarter Total Payroll	2nd Quarter Average Wage	2nd Quarter Total Payroll	3rd Quarter Average Wage	3rd Quarter Total Payroll	4th Quarter Average Wage	4th Quarter Total Payroll
Mining	$2.6	$249	$3.0	$860	$4.3	$1,898	$4.0	$996
Construction	$2.0	$99	$2.4	$105	$3.5	$686	$3.2	$386
Manufacturing	$0.0	$0	$0.0	$0	$0.0	$0	$0.0	$0
Transportation, Utilities & Communication	$2.0	$1,285	$2.4	$1,637	$2.3	$1,771	$2.5	$1,750
Wholesale Trade	$0.0	$0	$0.0	$0	$0.0	$0	$0.0	$0
Retail Trade	$1.3	$1,114	$1.2	$1,185	$1.2	$1,340	$1.2	$1,129
Finance, Insurance & Real Estate	$1.7	$369	$1.7	$399	$1.5	$349	$1.5	$349
Services	$1.5	$2,761	$1.6	$2,917	$1.6	$2,870	$1.8	$2,925
Government								
Federal	$2.2	$649	$2.5	$756	$2.8	$855	$2.7	$770
State	$3.4	$2,411	$3.4	$2,543	$3.8	$2,811	$3.6	$2,561
Local	$1.7	$5,374	$2.1	$6,107	$1.5	$3,961	$1.8	$5,643
Miscellaneous	$0.0	$0	$0.0	$0	$0.0	$0	$0.9	$0
Total	$0.0	$14,329	$0.0	$16,535	$0.0	$16,575	$0.0	$16,548

Source: Alaska Department of Labor, 1987.

3.3.3 Infrastructure Characteristics

3.3.3.1 Transportation Facilities

Airport Facilities

The airport for King Cove is located approximately 5 miles north of town and is connected to the city road system. The airfield is a state-owned facility with a gravel airstrip 4300 feet long. Service is provided by Peninsula Airways out of Cold Bay.

Table 3.3-6: Summary of Revenues and Expenditures City of King Cove

Category	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	% of 1987 Total
Revenues						
Sales Tax	$115,153	$131,792	$363,487	$281,410	$372,729	28.4%
Intergovernmental						
Raw Fish Tax	$214,815	$322,423	$322,423	$411,700	$327,273	25.0%
State Rev. Sharing	$139,643	$94,247	56813	$83,803	$66,757	5.1%
Municipal Assistance	$65,867	$79,692	$71,873	$72,585	$56,519	4.3%
Other	$30,910	$2,200	$13,004	$14,584	$611	0.0%
Federal(Spec. Rev)	$42,100	$101,750	$0	$88,421	$10,167	0.8%
Capital Projects (Special Revenue Funds)					$0	0.0%
Sales and Service Charges (Special Revenue Funds)						
Water/Sewer Service	$36,510	$27,884	$25,244	$30,599	$32,740	2.5%
Electricity	$186,985	$245,558	$248,340	$308,890	$303,144	23.1%
Small Boat Harbor	$119,249	$100,013	$94,327	$89,218	$79,611	6.1%
Education (Special Revenue Funds)						
Local Sources	$79,410	$58,371	$54,904	$61,658		
State of Alaska	$1,201,845	1,143,141	1,191,656	1,315,199		
Federal Sources	$230,261	$174,966	$308,012	$165,700		
Health Clinic (Special Revenue Funds)					168993	
Other						
Interest Income	$17,435	$4,991	$21,547	$31,593	$25,765	2.0%
Equipment Rental	$25,141		$11,528		$15,413	1.2%
Miscellaneous	$6,539	$18,730	$38,564	$57,260	$19,755	1.5%
Other financing	$8,710					
Total Revenues	$2,511,863	2,505,758	2,821,722	3,181,613	1,310,484	100.0%
Expenditures						
General Government	$399,299	$257,658	$282,718	$257,916	$226,753	24.1%
Public Safety	$28,427	$10,751	$14,751	$12,706	$101,206	10.7%
Public Works	$12,302	$97,525	$133,189	$154,391	$381,834	40.5%
Boat harbor					$114,190	12.1%
Health Services	$123,266	$5,787	$8,511	$8,481	$11,992	1.3%
Library		$8,001	$3,295	$6,995	$2,584	0.3%
Parks and Recreation	$14,674	$8,432	$12,363	$16,460	$45,587	4.8%
Non-departmental	$178,755	$137,454	$61,012	$33,809	$58,564	6.2%
Capital Projects	$221,448	$48,802	$12,000	$630,523	$24,515	
Total Expenditures	$978,171	$574,410	$527,839	$1,121,281	$942,710	100.0%
Excess of Revenues	$342,619	-$113,575	$2,707	$213,659	$75,730	
Fund Balance	$972,701	$873,728	$882,573	1,096,232	1,171,962	

Source: City of King Cove, Annual Budget, various years.

Dock Facilities

The small boat harbor has several wharfs which are suitable for movement of crab pots and other fishing gear for large crabbers and trawlers. The Alaska Marine Highway System ferries, and supply barges must use the Peter Pan dock.

Marine Transportation.

There are two aspects to the marine transportation system; the City small boat harbor and the Peter Pan Seafoods dock system. The boat harbor has slips for 86 boats, a transient wharf, and an inner harbor dock for loading larger vessels. The inner harbor dock is 370 feet long and 20 feet wide, and is situated in water deep enough to moor boats on both sides. It is used to load and offload crab pots, nets, other heavy gear and supplies. During the peak use in the summer, there have been up to 43 more transient boats than slips in the harbor. During the winter 23 slips were not permanently occupied in 1986 (U.S. Army Corps of Engineers, 1986).

The Peter Pan Seafoods dock is the principal loading/unloading facility in town; in addition to commercial fishing traffic, both the state ferry and supply barges unload there. The primary dock is 400 long. Peter Pan plans to add a floating dock at the end of the existing structure to aid in unloading smaller vessels. Peter Pan also has additional smaller docks, including drydock facilities and a fuel dock.

King Cove receives seasonal service from the Alaska Marine Highway System. The M/V Tustumena makes 6 visits between May and September. Regular year around barge service is provided by two carriers.

Two harbor improvement projects are currently under consideration. The Alaska Department of Transportation and Public Facilities has proposed construction of additional docking and boat launch facilities. The dock would consist of a 200 foot by 30 foot structure with a 30 foot wide access road, located southeast of the boat harbor on the seaward side of the spit. A 200 foot by 30 foot small boat ramp and staging area would be constructed in the protected area between the dock access road and the spit. The U.S. Army Corps of Engineers is considering expansion of the small boat harbor by 20 berths, primarily for transient vessels. This would reduce navigation hazards and damage to vessels.

3.3.3.2 Marine Services

A variety of marine services are available in King Cove from the city, Peter Pan Seafoods (the primary source of fleet support) and other private business and individuals. These include fuel sales, crab pot storage, a net loft for mending gear. See Section 3.3.4 Support Sector.

3.3.3.3 Utilities

Water and Sewer

Service is provided by the city of King Cove. The Ram Creek Reservoir provides 2 million gallons per day, which meets all year around residential and fish processing needs. Residential water rates are $12 per month commercial rates range from $25 to $750 per month, and industrial clients pay $30,000 per year. Peter Pan Seafoods purchases water from the city. The sewer system was installed in 1970 and upgraded in 1986. Nearly 95 percent of the residences are connected. Residential sewer rates are $9 per month, with commercial rates ranging from $25 to $125 per month. Industrial rates are $500 per month.

Solid Waste Disposal

The city has recently constructed a new 4 acre sanitary landfill, and provide residential, commercial, and industrial service. Rates are $10 per month for residential and $5 per pickup for commercial and industrial dumpsters

Electricity

Electrical service is provided by the City of King Cove. Rates are $.20/KWH, although Power Cost Equalization brings the effective rates down to between $.06-$.10/KWH. Peter Pan Seafoods owns and maintains its own power generation system.

3.3.3.4 Housing

There are 180 single family housing units in King Cove spread between the original townsite and two subdivisions (Ram Creek, 26 units, and Deer Island, 30 units). Housing stock includes old wood frame houses, prefabricated HUD houses, larger and more modern homes, mobile homes, and apartments.

3.3.3.5 Land Availability

Like other Aleutian Islands communities, the restrictive geographic setting places some constraints on land use and community expansion. Developable land in the immediate vicinity of the "downtown" area of King Cove is extremely limited. Most of the remaining buildable land is located at Rams Creek. Other areas that have been identified for potential future development are located beyond the present city limits of King Cove to the north, between the airport and Leonard Harbor.

3.3.4 Industry Characteristics

3.3.4.1 Harvesting Sector

Major Fisheries

The community of King Cove began in 1911 with the establishment of a cannery at the location and local residents have been salmon fishermen for over 70 years. Salmon fishing remains the dominant fishery for local residents (See Table 3.3-7). King crab harvesting began in the late 1950's and in the late 1960's harvesting of tanner crab commenced. Recent years have seen local fishermen begin to pursue halibut, herring, sablefish, and Pacific cod.

Table 3.3-7: Number & Type of Commercial Fishery Permits

	Year											
Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon	61	66	88	78	79	78	78	73	71	72	68	67
King Crab	11	13	12	14	18	22	3	6	5	8	14	8
Tanner Crab	13	14	18	16	22	22	33	22	23	21	20	28
Dungeness & Other	0	0	0	0	0	1	3	4	1	2	0	0
Herring	0	0	6	4	4	10	7	12	5	5	4	3
Sablefish	0	0	0	0	0	0	1	1	5	14	11	9
Halibut	0	0	0	4	0	12	20	9	16	30	53	[b]
Other	0	0	0	0	1	2	3	4	3	8	23	23
Total	85	93	124	116	124	147	148	131	129	160	193	[b]
Number of Individuals Holding Permits	37	45	59	65	70	75	88	78	76	84	86	76

Source: Data for 1977 through 1980 from National Marine Fisheries Service, 1988; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not Available.

The total number of permits held by King Cove residents has more than doubled over the 1977 to 1987 time period while the number of individuals owing permits has increased more than 125 percent. The number of salmon and crab permits are down from their peak of the late 1970's and early 1980's, while the number of groundfish permits has increased steadily from 1980.

As Table 3.3-7 demonstrates, salmon fishing remains the predominant activity of King Cove residents although the number of salmon permits held by local fishermen has declined from half to about a third of the total permits. Almost all of these permits are held in the False Pass (Area M) management area. Table 3.3-8 shows the number and management area for salmon permits held by local fishermen since 1977.

Table 3.3-8: Number of Salmon Permits by Area

Area	Year											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Area M (False Pass)	60	66	87	78	77	78	78	73	70	70	64	63
Area T (Bristol Bay)	3	0	1	0	2	0	0	0	1	2	4	4
Total	69	66	88	78	79	78	78	73	71	72	68	67

Sources: Data for 1977 through 1985 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1986 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.3-9 shows annual salmon harvest and ex-vessel value for King Cove fishermen for the 1981 through 1988 time period. Restriction and quotas on Area M fishermen will likely preclude harvest levels from attaining the peak harvest reached in 1984, although increased prices resulted in record ex-vessel values in 1988.

Table 3.3-9: Salmon Harvests and Ex-Vessel Values
(millions)

Area	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
M (False Pass)								
Harvest	11.5	14.5	11.0	23.9	11.1	10.9	6.1	14.2
Ex-vessel	$6.5	5.6	5.0	8.4	5.9	6.5	5.1	14.1
T (Bristol Bay)								
Harvest	b	0	0	0	b	b	b	b
Ex-vessel	b	0	0	0	b	b	b	b

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

King Cove fishermen also harvest other species of finfish. Table 3.3-10 shows information on the number of permits for other types of fish held by local residents. Increases in the number of other finfish permits issued to King Cove residents reflects the diversification of the fleet into new fisheries. Decreasing participation in herring fisheries has occurred but increasing participation in halibut and sablefish has resulted in increases in the total number of other finfish permits. Data on landings and value of other finfish harvested by King Cove fishermen are not disclosed for most years to ensure confidentiality.

Longline fisheries for halibut and sablefish in waters close to King Cove have accounted for the largest increase in the number of other finfish permits held by King Cove residents over the past 5 years. The types of fisheries and proximity to King Cove reflect the constraints of the resident small boat fleet in the community. Salmon and seine gillnet boats can easily accommodate longline gear, and fishermen can participate in these fisheries prior to and after the primary salmon season.

King Cove residents have harvested crab since the 1950's. Table 3.3-12 shows the change in number of permits issued for crab harvesting over the 1977-1986 time period.

Table 3.3-10: Number of Other Finfish Permit by Area

Area/Type	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Aleutian/Peninsula												
Halibut	0	0	0	4	0	12	19	8	13	28	41	b
Roe Herring	0	0	0	0	3	0	3	3	3	2	3	1
Sablefish	0	0	0	0	0	0	0	0	2	12	11	8
Other Finfish	0	0	0	0	0	0	1	1	2	7	21	20
Bristol Bay												
Roe Herring	0	0	4	3	1	10	4	7	2	3	1	1
Bait Herring	0	0	1	0	0	0	0	2	0	0	0	0
Herring Spawn	0	0	1	0	0	0	0	0	0	0	0	0
Dutch Harbor												
Halibut	0	0	0	0	0	0	1	0	1	1	7	b
Sablefish	0	0	0	0	0	0	0	0	0	1	0	0
Other Areas and Unidentified												
Halibut	0	0	0	0	0	0	0	0	2	1	5	b
Sablefish	0	0	0	0	0	0	1	1	3	2	0	1
Other Finfish	0	0	0	0	0	0	0	0	0	1	2	1
Herring	0	0	1	1	0	0	2	0	0	0	0	0
Total	0	0	7	8	4	24	29	23	28	57	91	

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

Table 3.3-12: Number and Area of Shellfish Permits

Area/Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Adak												
King Crab	0	0	0	0	0	0	0	1	1	2	2	1
Tanner	0	0	0	0	0	0	0	0	0	1	0	0
Aleutian/Peninsula												
King Crab	4	8	9	11	15	20	0	0	0	0	0	0
Tanner	13	11	16	16	20	20	28	19	16	18	16	22
Dungeness	0	0	0	0	0	1	1	1	1	1	0	0
Bering Sea												
King Crab	0	0	1	2	1	0	2	3	4	6	10	7
Tanner	0	3	2	0	2	2	4	2	7	2	3	4
Misc. Crab	0	0	0	0	0	0	2	2	0	0	0	0
Bristol Bay												
King Crab	4	5	2	1	2	1	0	2	0	0	0	0
Other	3	0	0	0	0	1	1	3	0	0	0	0
Totals	24	27	30	30	40	45	37	32	29	30	34	36

Source: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

The number of shellfish permits held by King Cove residents reflects the decline in the king crab resource throughout Alaska. Management closures and declining stocks have resulted in fewer vessels harvesting king crab. The tanner crab resource has been relatively stable through 1988 and the number of permits for these species has not decreased.

Table 3.3-12 shows 0 permits in 1987 for Bristol Bay king crab, but during field visits in the fall of 1987 a number of the limit seiners in King Cove were loading gear to participate in the Bristol Bay red king crab season which was opening in a few days. It seems likely that the permits were obtained for the wrong area or miscoded.

Seiners have harvested king crab in previous years but the vessels and equipment sustained extensive damage each season since the boats were not stout enough to handle the 500 - 700 pound crab pots traditionally used in the Bering Sea. In 1986 a few boats tried a trapezoidal or cone style pot that could be nested and which weigh 100 - 125 pounds. These pots can be easily handled on seine boats without damage to the hull or equipment. The catch rate for these pots is supposedly slightly less than traditional pots, but small boats can carry 80 to 100 of these nested pots in one trip compared to 10 - 16 of the larger pots which have to be stacked. This new technology has attracted the majority of the limit seiners into the fishery (Utecht, 1987)

According to the harbormaster (Utecht, 1987), one vessel caught 42,000 pounds of king crab in 1986 using this gear. Conversations with fishermen who participated in 1986 indicated catches as high as 38,000 pounds with the average catch closer to 25,000 pounds. At $4.05 per pound for red king crab, this short season would have contributed approximately $100,000 in gross revenue to the average vessel. CFEC data files show the average king crab catch at 23,300 pounds with an average income of $87,000.

Table 3.3-13 presents information on landings for previous years by King Cove residents and Table 3.3-8 shows the ex-vessel value for crab during these same years. These estimates should be considered relative indicators of harvest and value estimates for King Cove fishermen since they are only for the Alaska Peninsula area. Other areas are subject to non-disclosure rules.

Table 3.3-13: Landings by Shellfish Species
(thousands of pounds)

Species	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
King	778.4	237.8	0	0	0	0	01	0
Tanner	939.3	439.4	783.9	467.3	1064.4	744.7	439.3	807.8
Dungeness	0	b	b	b	b	b	0	0
Total	1,717.7	b	b	b	b	744.7	439.3	807.8

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

The tanner crab fishery has generated more gross income than king crab since 1982 to King Cove fishermen. However, the number of vessels participating in this fishery is substantially larger, with a subsequent lower average income per vessel.

Table 3.3-14: Ex-Vessel Value by Shellfish Species
(millions of $)

Species	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
King	1.22	0.77	0	0	0	0	0	0
Tanner	0.64	0.56	0.96	0.52	1.40	1.26	0.88	1.77
Dungeness	0	b	b	b	b	b	0	0
Total	1.86	b	b	b	b	b	0.88	1.77

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

This report focuses on the relationship between the Bering Sea fisheries and the selected communities in the region. The set gillnet fishery operated by King Cove residents operates on the south side of the Alaska Peninsula and does not harvest a significant amount of Bering Sea fish. Consequently, this fishery is not discussed in detail in the remainder of this section or following sections for King Cove.

The salmon fishing season for King Cove residents begins in early June on the south side of the Alaska Peninsula with the peak of this effort occurring in the South Unimak fishery between June 15-25. This fishery is not located within the Bering Sea, but a significant portion of the catch of the fishery are salmon on their way to streams which enter the Bering Sea.

Following the end of the South Unimak fishery, the King Cove fleet disperses to pursue the fishing strategy which is most profitable to each gear type. Limit seiners and some of the smaller seiners begin to search outer areas of the southside for chum and pink salmon with their effort concentrated between Morzhovoi Bay to Coal Bay during the months of July and August.

Approximately 2/3 of the total local King Cove boats will travel to fish on the northside of the Alaska Peninsula. This total is broken down between approximately 24 drift gillnet boats and 24, mostly small, seiners.

A number of the smaller purse seiners will move to the Izembeck-Moffett Lagoon areas during the last three weeks of July and the first week in August for chum salmon and then return to the southside for the remaining pink salmon run.

Drift gillnet fishermen proceed to the Port Moller area after the South Unimak fishery. Most of the northside fishery occurs in an area that extends from Port Moller to Cape Stroganof, near Port Heiden. Some drifters will return to the southside near the end of July to beach seine for pink salmon. The remainder will continue to fish along the north beaches, some into the month of September.

Harvest of other species is conducted in accordance with the current regulations (See Figures 2.2-4, 2.2-6 and 2.2-21 for herring, groundfish and shellfish seasons, respectively, in the Bering Sea).

Employment

Section 2.4 discussed employment by gear type for the Bering Sea fisheries. This section addresses resident employment levels in the harvesting sector for the community of King Cove. Table 3.3-15 presents estimates of employment by fishery (and gear type for salmon and herring) for the 1981 through 1988 time period. The table focuses upon employment generated by King Cove permit holders. Crew factors estimated by Thomas (1986) for the single year of 1985 are used for the entire 10 year time period since comparable crew factor estimates are not available for previous years. The crew factors are averages for the management areas found in the Bering Sea.

Based upon discussions with a number of fishermen, this table, and similar tables for the other communities, assumes that the residency of crew members is the same as the permit holder. The consensus of opinion was that there are a number of exceptions to this statement, but the exceptions would tend to offset each other, making the statement generally true. The number of fishing operations is based upon the number of permits with landings in the fishery (Alaska Commercial Fisheries Entry Commission, 1989).

Table 3.3-15: Harvest Sector Resident Employment
(By Species)

Species	Crew Factor	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon									
Purse Seine	5.0	200	205	185	190	190	190	175	170
Drift Gillnet	2.25	77	77	77	65	63	65	54	50
Set Gillnet	2.13	6	6	13	13	9	6	11	15
King Crab	3.75	56	68	8	11	11	23	38	26
Tanner Crab	4.13	75	75	96	67	67	67	63	88
Dungeness & Other	3.0	0	3	3	3	3	6	0	0
Herring									
Purse Seine	3.88	4	19	16	12	12	8	12	8
Gillnet	2	4	36	0	12	4	2	2	2
Sablefish	4.3	0	0	4	4	9	34	34	26
Halibut	4.3	0	77	77	34	56	120	155	[b]

Sources: Crew factors from Thomas, 1986; Fishing permits from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

Income

The salmon fishery is the largest single fishery in terms of gross revenue to the King Cove fleet, and the seine fleet accounts for the major part of this fishery. However, in years where salmon fishing is poor to average, the combined value of other species can account for a substantial part of total ex-vessel value in the community.

Table 3.3-16 shows the ex-vessel value of each species harvested by the resident fleet. These figures should be considered relative indicators of ex-vessel value by species and gear type since they are constructed from detailed records which are subject to non-disclosure rules. Species which have dollar values in Table 3.3-16 (e.g., tanner crab) may understate harvest for this species since data for certain areas may be non-disclosed, and not included in the annual estimate shown in the table. All non-disclosed data for the community are included in the last row of the table which incorporates other species and non-disclosed data.

Table 3.3-16: Total Ex-Vessel Value
(millions of $)

Species	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Purse Seine	5.1	3.8	3.3	6.9	4.1	4.2	3.1	11.4
Drift Gillnet	1.5	1.8	1.5	1.3	1.7	2.3	1.9	2.3
Set Gillnet	b	b	0.1	0.2	0.1	b	0.1	0.4
King Crab	1.2	0.8	b	b	b	0.5	0.9	b
Tanner Crab	0.6	0.6	1.1	0.5	1.4	1.3	0.9	0.7
Dungeness & Other	0	b	b	b	b	b	0	0
Herring								
Purse Seine	0	0.1	0.1	b	b	b	b	b
Gillnet	0	0.1	0	0.1	b	b	b	b
Sablefish	0	0	0	0	b	0.3	c	c
Halibut	b	0.1	0.1	0.1	0.1	0.5	0.6	c
Other/Non-disclosed	0.4	0.3	0.4	0.8	0.9	1.7	1.7	c
Total	8.8	7.6	6.6	9.9	8.3	10.8	9.2	c

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed
[c]Not available.

Boat and Gear Characteristics

King Cove fishermen and the harbormaster agree that the local, permanent fleet is composed of approximately 72 boats. This fleet of 72 vessels is primarily composed of three groups of boats: 1) limit purse seiners; 2) smaller purse seiners; and 3) drift gillnet boats (See Section 2.4 for a discussion of the size and other characteristics of the typical vessels in these groups). Other local vessels include skiffs used by local fishermen for setnet and subsistence fishing. The non-resident, or transient, fleet which uses King Cove includes the three vessel groups mentioned above which fish for salmon in Area M, and crabbers and trawlers who call at King Cove when delivering product, while acting as tenders for the Peter Pan Seafoods plant in the community, or when loading or unloading crab pots and other gear stored at King Cove.

According to the local harbormaster, 24 of the total 72 boats are limit seiners which fish both crab and salmon, and the remaining 48 fish salmon. The latter 48 vessels are split evenly between 24 drift gillnet boats which range from 30-42 feet, and 24 seiners in the 32-48 feet class. Non-resident vessels are believed to be comparable to the average boat in their respective gear type.

Federal and state agency data bases provided to MMS provide vessel size information by species, gear, and area, and cannot be reliably adjusted to show number of boats by length for all vessels in the community. However, since salmon fishing is the primary activity in the community, Table 3.3-17 shows size information for those boats fishing in Area M.

Table 3.3-17: Length of Resident Fishing Fleet

Size in Feet	Size in Meters	Year							
		1981	1982	1983	1984	1985	1986	1987	1988 [a]
0-19	0-6.0	1	1	1	1	0	2	2	3
20-39	6.1-12.1	50	49	41	33	32	38	37	33
40-59	12.2-18.2	22	24	25	22	23	24	26	26
60-79	18.3-24.3	0	1	1	0	0	0	0	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Halibut and sablefish are taken by longline gear and all of the crab species are taken by pots. Salmon is the only species that is taken by multiple gear types. Table 3.3-17 shows the number of salmon limited entry permits for each gear type fished by King Cove fishermen.

The number of salmon permits held by King Cove residents has decreased since the early 1980's. The number of drift gillnet permits has decreased from 42 held in 1979 to 22 in 1988 and account for the majority of permits which have left the community. Purse seine permits remained relatively stable for a period of time but have declined in the last few years.

Table 3.3-17: Number of Salmon Permits by Area and Gear

Area/Gear Type	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Area M (False Pass)												
Purse Seine	30	34	40	37	40	41	37	38	38	38	35	34
Drift Gillnet	27	30	42	37	34	34	34	29	28	29	24	22
Set Gillnet	3	2	5	4	3	3	6	6	4	3	5	7
Unidentified	0	0	0	0	0	0	1	0	0	0	0	0
Area T (Bristol Bay)												
Drift Gillnet	0	0	0	0	1	0	0	0	1	1	1	1
Set Gillnet	3	0	1	0	1	0	0	0	0	1	3	3

Source: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1988; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.3-18 shows the differences in ex-vessel value of salmon harvested between gear types landed by King Cove residents in Area M. Salmon contributed about $89,000 to the purse seine fleet in 1987, which was the lowest amount during the 1981 through 1988 time period. The highest income was in 1988 when salmon contributed about $335,000 to the resident seine fleet. The range for resident drift gillnet fishermen was from $45,000 in 1984 to $105,000 in 1988. For the years where information is available, the ex-vessel value of salmon caught by set gillnet fishermen has ranged from $23,000 in 1983 to $56,000 in 1988.

Use of Community Infrastructure

The existing boat harbor was completed in 1978 with 80 stalls and has been expended to 86 stalls. The harbor can accommodate approximately 100 vessels with rafting. Controlling depth in the entrance channel and basin is 13 feet (National Ocean Service, 1987). The King Cove boat harbor provides electricity, a grid, two small gear transfer docks, and a net loft for hanging and storage of gear. Freshwater is available from spring months through the fall but the line freezes in winter and vessels are then forced to get freshwater from the Peter Pan plant. Annual moorage fees are $0.70 per square foot, and transient fees are $2 per linear foot per day.

Table 3.3-18: Ex-Vessel Value of Salmon Harvest by Gear Type
(millions of $)

	Year							
Area/Gear Type	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Purse Seine	5.1	3.8	3.3	6.9	4.1	4.2	3.1	11.4
Drift Gillnet	1.5	1.8	1.5	1.3	1.7	2.3	1.9	2.3
Set Gillnet	b	b	0.1	0.2	0.1	b	0.1	0.4
Total								

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

In September, 1987, 31 non-local crabbers had pots and other gear stored on City of King Cove property. The city charges $0.25 per pot per month and $2 for transfer of each pot. A private firm, Mack Trucking moves the pots to and from the vessel and yard. Their charges for this service are unknown.

Peter Pan Seafoods has the only major dock in the community. This dock is used by fishing boats for fuel transfer, movement and storage of some gear and supplies, and product unloading.

Two small docks are available within the boat harbor for moving gear and pots, but the staging area on each is limited. The docks are usually sufficient for the needs of most catcher vessels.

The cannery had a slipway for boat haulout but with the twin developments of residents owning their own boats and construction of the boat harbor, Peter Pan has allowed the slipway to fall into disrepair and it is no longer useable. As a result, there are no local facilities available for haulout of boats. A 150 ton travelift has been acquired but was not operational as of March 1, 1990.

Discussions with captains of crab vessels loading pots for the 1987 red king crab season identified the low level of support services in the community as a major inconvenience in using the port. Specifically mentioned were the poor air service, no transportation services, inadequate case food supplies, and limited phones. Two vessel skippers indicated that they were going to move their pots to Unalaska/Dutch Harbor for storage since the services were available in that community.

3.3.4.2 Processing Sector

Plant Characteristics

Peter Pan Seafoods, which operates the only shore based plant in King Cove, is owned by Nichiro Gyogra Kaisha, a major Japanese seafood company that bought the company from the Bristol Bay Native Corporation in 1980. The company is headquartered in Seattle and operates processing plants throughout Alaska. The plant has freezing and canning capability.

In 1987 there was only one floating processor (the Blue Wave owned by Peter Pan) operating in the area, with only a few cash buyers. In good years there have been as many as ten floaters in the area. These ships are in the area during the South Unimak fishery, and after that fishery is completed they proceed to Bristol Bay.

The cannery in King Cove was founded in 1911 by Pacific American Fisheries, and until statehood in 1959, depended upon company fish traps for most of its salmon requirements. In 1958 the plant diversified to king crab processing with later inclusion of salmon roe in the 1960's and tanner crab in the 1970's (Earl R. Combs, Inc., 1982). In 1976 the cannery was partially destroyed by fire which prompted construction of an efficient, modern plant in 1979 with further expansion in 1981. Since 1979 the King Cove cannery has been the largest processing facility in the State of Alaska (Stephen R. Braund & Associates, 1986a).

The Peter Pan Seafoods plant in King Cove is equipped to can and freeze fish and shellfish. Salmon is the major product handled in the plant, but black cod (sablefish), crab, halibut, herring, and Pacific (gray) cod are also processed. Tanner crab are the second most important resource to the plant.

Between 1979 and 1985 the King Cove plant processed between 30 and 44.4 million pounds of fish and shellfish on an annual basis (Stephen R. Braund & Associates, 1986a). The plant has the capacity to process about 1 million pounds of salmon per day. Of this total approximately 250,000 can be frozen and the remainder would be canned. The daily capacity of the freezing facility is about 300,00 pounds of crab, 100,000 pounds of herring, and 100,000 pounds of halibut. The plant freezing capacity is under-utilized for much of the year, reaching capacity for only a few days at the peak of the salmon season, and for periods immediately after herring and halibut openings..

Peter Pan contracted with a trawler to conduct test fishing during the winter of 1987-88 in the Gulf of Alaska around King Cove to determine the potential for harvesting Pacific Ocean perch, Pacific cod, Greenland turbot, and rockfish. Peter Pan management believes there is enough product of suitable quality for the King Cove plant to start processing groundfish.

Tentative plans are to process up to 100,000 lbs per day of headed and gutted groundfish product, although Pacific cod would be processed as fillets.

Peter Pan management provided the following estimates of the percent of their raw product, by species, that comes from the Bering Sea:

Salmon	- 20% (includes Bristol Bay)
King Crab	- 10%
Halibut	- 10%
Tanner Crab	- 0%
Sablefish	- 0%
Herring	- 50%

The King Cove plant has generally been operating 10 months a year, from January through October, and closing during November and December. A field visit in November of 1987 found that the plant was operating with a small processing crew to process Pacific cod. If sufficient quantities of product continue to be delivered it is quite likely that the plant will operate throughout the year.

Employment

Normal operation during the summer salmon season requires 250 to 300 employees. With 250 total positions, processing workers will account for approximately 200 positions, support personnel will be 40, and 10 will be administration. During the fall and winter months, employment drops to 55 or less. Management indicated that "a lot" of these 55 persons stay the entire 10 month season. The remaining employees are generally hired for the salmon season.

Processing line employees work one shift, but the shift can last as long as 14 hours (8 a.m. to 12 midnight with an hour off for both lunch and dinner).

The planned groundfish processing expansion will require an additional 50 - 60 people. It is not likely that the plant will process groundfish during the summer salmon season so these will be additional jobs in the off-peak months.

Few long-term King Cove residents are employed by Peter Pan, although many of the plant's management employees live in King Cove most of the year. Management estimated that less than 1 percent of the plant employees are local residents.

During the winter and fall months, approximately 70 percent of the employees are Alaska residents. During the peak summer months state resident employment drops to 50 percent of total employees.

Income

If processing line employees stay for the entire 10 months, they average about $25,000 in wages. Line workers employed during the mid-June to end of August salmon season will make $6-7,000.

Average hourly wages are $5.65 for processing line, $12.00 for machinists, and $7-8 for others, except for 2 management staff who are salaried. Management could not provide estimates of average seasonal wages for machinists or other employees. Table 3.3-19 presents an estimate of processing wages paid based upon the wage and income data shown in this section and employment estimates shown in the previous section.

Use of Community Infrastructure

Peter Pan Seafoods uses the city landfill, and sewer and water utilities. The plant provides its own power. However, the city and Peter Pan are interconnected so that either power plant can provide power to the other entity in case of an emergency.

There are no public dock facilities for large vessels in King Cove. Alaska Marine Highway System ferries, and private barges with materials and supplies for the community load and unload at the Peter Pan dock. This does not pose a congestion problem according to plant management. Peter Pan ships its product out on barges and trampers that are loaded over its dock.

Air transportation is used for employee transfers and emergency supplies.

Table 3.3-19: Processing Sector Wages Paid

Employee Category	Number of Employees	Average Wages per Employee	Total Wages by Category
Line Workers (Base)	25	$25,000	$625,000
Line Workers (Peak)	175	$6,500	$1,317,500
Support	40	$40,000	$1,600,000
Administrative	10	$25,000	$250,000
Management	2	$50,000	$100,000
Total			$3,712,500

3.3.4.3 Support Sector

Peter Pan provides the only fleet support available in King Cove other than limited groceries at the local store. This support includes fuel, food, supplies, replacement parts and equipment, mechanics, bookkeeping, mail service, and insurance to the fleet. There are no dedicated marine oriented repair or sales businesses in the community. When supplies and equipment are needed on a boat, Peter Pan arranges for the purchase and transportation to King Cove. These needs are primarily obtained from Seattle although there are limited purchases from communities in the State of Alaska.

Peter Pan employs 4-5 persons in its store during the 10 months that the plant is open. The store manager and employees reside outside the community. Their state of residence is unknown.

3.4 Port Heiden

3.4.1 Description/Setting

Port Heiden is located on the north side of the Alaska Peninsula, in a small bay called Port Heiden, created where the Meshik River enters Bristol Bay. The village has recently relocated from its previous location on the shoreline to one less prone to coastal erosion. Chignik is the nearest community, 47 miles to the southeast; Pilot Point is approximately 60 miles northeast of Port Heiden. The community is a second class city and is located within the Bristol Bay REAA. The terrain in the vicinity of Port Heiden slopes gently up from the shoreline to the Aniakchak Caldera (4450 feet), five miles to the east. Vegetation is typical of poorly drained tundra, dominated by grasses and shrubs. Port Heiden is considered to be a northern sub region of the Aleutian climatic province; it is a transition between maritime and continental zones. Summers are generally cool and wet; winter temperature extremes can result in some freezeup of Bristol Bay. The annual precipitation of 25 inches is half that on the south side of the Alaska Peninsula, and Port Heiden is exposed to the more severe storm weather of the Bering Sea.

Like other sites on the north shore of the Alaska Peninsula, the area surrounding Port Heiden was populated during aboriginal times. It is likely that the Aleutiq Eskimo population was absorbed by expanding Aglegmiut population from the upper Bristol Bay. With the development of the Alaskan cod fishery in the late 1800's, Scandinavian immigrants married into local families and Port Heiden was recognized as settlement. The Bristol Bay salmon fishery was established in the early 1900's, including the location of a saltery at Port Heiden. Traditional processing operations ceased in the early 1960's.

The commercial salmon fishery dominates the economy of Port Heiden, with significant resident participation in fishing. A small number of residents are employed by both the local family fish buyer and the City of Port Heiden. Residents still remain somewhat dependent on regional subsistence resources (Earl R. Combs Inc. 1982). Subsistence production emphasizes salmon and caribou, and to a lesser degree moose and migratory waterfowl.

3.4.2 Socioeconomic Characteristics

3.4.2.1 Local Economy

Through resident participation as permit holders, crew, and processing labor, commercial salmon is the mainstay of Port Heiden's economy. In 1986, approximately 20 percent of the population held Limited Entry Salmon Permits; based on 1981 field data, at least another 20 percent were employed as gillnet crew members or set net helpers. Fish processing employed 6 percent. Government is the major component of the wage economy, although city and school employment is significantly less than fishing employment. Subsistence remains a significant component of the economy, with all households participating to some degree, and 90 percent of all protein derived from locally harvested foodstuffs (Earl R. Combs, Inc., 1982).

3.4.2.2 Population

Table 3.4-1 presents population characteristics of Port Heiden. Gaps in historical population make analysis of trends difficult, although the population appears to have steadily increased since 1920, after the disastrous flu epidemic. The population is relatively young, and in 1980, males outnumbered females by 62 to 47 (Earl R. Combs Inc., 1982). Average ages for males is 25.5 and females 24; half the population was under 22 years of age. The population is predominantly Aleut, although 20 percent of the households were Caucasian in 1980. Given the family-run nature of the fish processing plant and fishing characteristics, there is 30 percent seasonal influx of population created by the fishing season, bringing the population up to 150.

Table 3.4-1: Historic Population

Year	Population	Year	Population
1890	40	1981	91
1900	75	1982	94
1910	a	1983	97
1920	30	1984	109
1930	51	1985	108
1940	a	1986	114
1950	a	1987	108
1960	74	1988	121
1970	66	1989	121
1980	92		

Sources: Data for 1890 through 1980 from Earl Combs Inc., 1982; data for 1981 through 1988 from Population Overview, Alaska Department of Labor, various years; 1989 data from Alaska Department of Community and Regional Affairs, 1989.

[a]Not available.

3.4.3 Infrastructure Characteristics

3.4.3.1 Transportation Facilities

Airport Facilities

Port Heiden's airport dates from military activities during World War II. It has two gravel runways of 7,600 feet and 4,200 feet. The airport is operated by Reeve Aleutian Air, and Reeve, Peninsula Airways and Northern Air Cargo provide passenger and cargo service. Northern Air Cargo hauls fresh fish from the Christianson and Sons plant to Anchorage for processing. There are up to 6 private planes in the community.

Port Facilities

There are no port facilities in Port Heiden. The beach is used for local boats and for offloading supplies.

3.4.3.2 Marine Services

The local store provides groceries and limited supplies for the local fleet and transient salmon boats. The city has a Caterpillar tractor and hydraulic ram operated trailer for boat haul-out.

3.4.3.3 Utilities

Water, Sewer Service, and Solid Waste

There is no community water or sewer system, although there is a sewage lagoon for the school. Every house has its own well. The city operates a landfill and provides refuse pickup services; service charges are $11 per month for each residence.

Electricity

The City generates power with a 165KW diesel generator. Generation capacity exceeds demand. Residential rates are $.20/kwh.

3.4.3.4 Housing

There are 35 to 40 single family housing units in the community, and the housing stock is in good shape. Some of the housing stock is available for rent. Eleven new houses are scheduled to be constructed by HUD, which could result in a temporary housing surplus. However, the availability of housing could attract more people back to the community (John Matson, personal communication, 1987).

Table 3.4-3: Summary of Revenues and Expenditures
City of Port Heiden

Category	FY 1984	FY 1985	FY 1986	FY 1987	% FY 1987
Revenues					
Intergovernmental					
State Revenue Sharing	90119	91450	89976	68367	26.07%
Municipal Assistance	12870	12871	12394	9548	3.64%
Federal Revenue Sharing	851	2157	913	295	0.11%
Pilot Raw fish Tax	0	0	0	12280	4.68%
Sales and Service Charges					
Electricity	44994	52813	49934	61149	23.32%
Fuel Oil Sales	104417	97498	93211	68435	26.10%
Other					
Interest Income	2182	2293	1467	1422	0.54%
Equipment rental	2728	45	16353	4330	1.65%
Miscellaneous	38961	21361	11633	36405	13.88%
Total Revenues	297121	280488	275881	262231	100%
Expenditures					
General Government	36217	23484	24809	29691	9.95%
Public Safety	1187	170	5555	14539	4.87%
Public Works	127339	174618	116265	128628	43.12%
Electric Service	72248	69653	65437	72246	24.22%
Other Services	3861	1437	1761	3267	1.10%
Health Services	11186	9040	8466	14340	4.81%
Project/Grants Payment45453	12596	0	0	0%	
Other	9430	10030	18119	35569	11.92%
Total Expenditures	306921	301029	240412	298279	100%
Balance	-9800	-20541	35470	-36048	
Beginning Cash Balance	43016	33250	12708	47468	
Ending Cash Balance	33215	12709	48178	11420	

Source: City of Port Heiden, Annual Budget, various years.

3.4.3.5 Land Availability

There are no documented problems in Port Heiden related to land availability.

3.4.4 Industry Characteristics

3.4.4.1 Harvesting Sector

Major Fisheries

Port Heiden fishermen primarily participate in the salmon fishery with some residents also fishing for roe herring (See Table 3.4-4). The number of permit holders in the community has declined from the peak of 27 in 1979 and 1980 to 21 individuals in 1988.

Information shown in Table 3.4-4 overstates the total number of permits held by residents of the community. Port Heiden is located within the boundaries of Area M (False Pass) even though the fishermen primarily participate in the Bristol Bay fishery. The CFEC established the Port Heiden area as a buffer zone between the two districts by setting overlapping boundaries for Area M and Area T except during a "regulatory period" at the peak of the Bristol Bay red salmon run which generally extends from late June to mid-July. This action accommodates the historic practice of Port Heiden drift gillnet fishermen traveling between the Ugashik and Meshik River systems before limited entry was established. When Port Heiden fishermen sell fish harvested from the Meshik River (primarily kings and silvers) this is noted as a sale in Area M, and when the sale occurs in the Ugashik area it is noted as a sale in Area T. As a result, the same drift gillnet permit is included in both districts in the NWAFC data.

The salmon fishery dominates fishing activity in Port Heiden as shown in Table 3.4-4. Participation in the herring fishery has increased in the past few years but is still significantly less than salmon.

The season begins in May for some of the Port Heiden drift gillnet fishermen with the Togiak herring run and, following completion of that fishery, these fishermen return and join the rest of the Port Heiden fleet in harvesting Meshik River king salmon starting in late May to early June. In mid-June the fleet moves to Pilot Point for the red salmon season in Ugashik Bay. According to local fishermen, very seldom does any Port Heiden fisherman move from Ugashik to another area, even during years of poor returns to that system. The species composition includes chum and pink salmon, particularly when the red salmon run begins to taper off in mid-July. Following the end of the red salmon season (mid- to late July), the fleet returns to Port Heiden with some owners storing their boats for the winter at that time. The remainder of the fleet begins to fish the Meshik River for silvers in mid-August and continues for several weeks. Set gillnet fishing has traditionally been a province of women and older men in the community, while younger men work the drift gillnet boats in Bristol Bay. Even though the set gillnet permits could be moved to more productive area, they fish local beaches in order to keep the household operating.

Table 3.4.4: Number of Commercial Fishery Permits by Area and Species

Type	Year											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Bristol Bay (Area T)												
Salmon	7	14	12	13	13	16	21	20	20	22	21	19
Herring	0	0	0	0	0	0	4	2	6	4	1	2
False Pass (Area M)												
Salmon	18	21	23	24	24	24	19	24	23	22	22	20
Other	1	0	1	0	0	0	0	0	0	2	0	0
Total	26	35	45	37	37	40	44	46	49	50	44	41
Number of Permit Holders	20	23	27	27	22	25	24	26	25	24	24	21

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.4-5: Landings by Species
(millions of pounds)

Species	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon	1.4	1.7	1.9	1.9	1.5	1.2	0.8	1.0
Herring	b	b	b	b	0.2	b	b	b

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

Employment

Port Heiden fishermen participate in two management areas and can be considered non-resident (non-local) in the Bristol Bay red salmon fishery since they move from their community to the village of Egigik for that activity. This fishery comprises the largest percentage of their annual income. The local fishery on king and silver salmon stocks returning to the Meshik River is conducted within Area M. Local fishermen consider themselves to be Bristol Bay fishermen and look with disfavor upon the encroachment of Area M fishermen onto the North Peninsula beaches near their community.

Local residents indicated that a segment of the Area M fleet, represented primarily by "Russians" from the community of Ninilchik, use Port Heiden during weekend closures. These vessels will anchor together and members of the crew will walk to the Port Heiden store during low tide.

Section 2.4 discussed employment by gear type for the Bering Sea fisheries. This section addresses employment levels in the harvesting sector for the community of Port Heiden. Table 3.4-6 presents estimates of employment by fishery for the 19817 through 1988 time period. The table focuses upon employment generated by Port Heiden permit holders. Crew factors estimated by Thomas (1986) for the single year of 1985 are used for the entire 10 year time period since comparable crew factor estimates are not available for previous years.

Table 3.4-6: Harvest Sector Resident Employment
(By Species and Gear)

Species	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Drift Gillnet	32	29	36	38	38	41	38	36
Set Gillnet	19	23	11	17	17	13	13	11
Herring								
Gillnet	0	0	8	4	12	10	2	4

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Income

The principal source of income for the Port Heiden fleet is from the Bristol Bay red salmon runs (See Table 3.4-7). Kings and silvers are harvested locally from the Meshik River stocks. According to local residents, Port Heiden fishermen do not pursue pink salmon in local river systems or Bristol Bay. Total ex-vessel value has ranged from $1.0 million to $1.8 million. In 1987 total gross income from salmon averaged about $43,000. In the peak year of 1988 a fisherman's average income from salmon would have been about $86,000.

Boat and Gear Characteristics

The Port Heiden fleet is primarily composed of fiberglass hull gillnet boats built to the 32 feet limit imposed by regulation on the Bristol Bay fishery (See Table 3.4-8). Most of the Native residents of Port Heiden were issued permits at the initiation of limited entry or have received them from relatives. These individuals have newer fiberglass boats, typically built by the Modutech company of Seattle, that range to 14 feet wide and have the latest electronic gear. Other local fishermen have purchased Area T permits and make debt payments on both the permit and vessel. These persons have older boats that are typically 11 to 12 feet wide with less sophisticated electronics. The smaller boats shown in Table 3.4-8 represent setnet skiffs.

Federal and state agency data bases provided to MMS provide vessel size information by species, gear, and area, and cannot be reliably adjusted to show number of boats by length for all vessels in the community. However, since salmon fishing is the primary activity in the community, Table 3.4-8 shows size information for those boats fishing in Area T. This area was selected because CFEC records show more resident fishermen participating in Area T than Area M, and the statement that local fishermen consider themselves to be Bristol Bay fishermen.

Table 3.4-7: Total Ex-Vessel Value
(In millions of $)

Species	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon	$1.1	1.2	1.2	1.3	1.3	1.6	1.0	1.8
Herring	0	0	b	b	0.1	b	b	b

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

Table 3.4-9 shows the number of limited entry permits by management area for each gear type fished by Port Heiden fishermen. The discussion preceding Table 3.4-4 which addressed the ability of Port Heiden residents to fish in both Area M and Area T with the potential for counting each drift gillnet permit more than once, also applies to the numbers shown in Table 3.4-8. The number of salmon permits have increased for all areas and gear types except Area M set gillnet. The total number of permits has declined in the past two years from the peak number of 49 permits held by local residents in 1985 and 1986.

Table 3.4-8: Size of Resident Fishing Fleet

Size in Feet	Size in Meters	Year							
		1981	1982	1983	1984	1985	1986	1987	1988 [a]
0-19	0-6.0	0	1	1	0	0	0	0	1
20-39	6.1-12.1	12	13	15	14	15	17	16	15

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

During the 1977 to 1986 time period Port Heiden fishermen have altered their fishing patterns to the extent that more fishermen participate in the Bristol Bay salmon fishery than in the False Pass and North Peninsula fishery. This change occurred in both drift and set gillnet fisheries. Three of the four "Other" permits held by Port Heiden residents in 1986 are gillnet herring permits in the Kuskokwim/Good News Bay area.

Table 3.4-10 shows the differences between gear types for the ex-vessel value of salmon landed by Port Heiden residents in Areas M and T. Drift fishermen would have averaged about $55,000 gross revenues from both areas in 1987, the lowest year in the 1981 through 1988 time frame. In the peak year of 1988 they would have grossed about $106,000. In comparison, set gillnet fishermen would have averaged about $12,300 in their lowest year of 1987, and about $39,000 in their peak year of 1986.

Table 3.4-9: Number of Commercial Fishery Permits by Area and Gear

Area/Gear	Year											
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Bristol Bay (Area T)												
Salmon												
Drift Gillnet	7	13	11	12	12	13	16	17	18	18	17	16
Set Gillnet	0	1	1	1	2	3	5	3	2	4	4	3
Herring												
Gillnet	0	0	9	0	0	0	4	2	6	4	1	2
False Pass (Area M)												
Salmon												
Drift Gillnet	9	12	12	12	14	13	14	16	16	16	16	15
Set Gillnet	9	9	11	12	9	11	5	8	7	6	6	5
Other	1	0	1	0	0	0	0	0	0	1	0	0
Total	26	35	45	37	37	40	44	46	49	49	44	41

Source: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1988; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Use of Community Infrastructure

Port Heiden is a large bay which is about 9 miles in greatest width and extends inland about the same distance. The seaward side of the bay is formed by barrier sandbars 5 to 10 feet above high water. These barrier sandbars and other submerged sandbars restrict passage to much of Port Heiden during adverse weather conditions. Vessels using Port Heiden must anchor in the bay since no other facilities are available. The bottom in Port Heiden is sand and mud, and the holding properties are considered poor. Movement of boats in and out of the bay has to be in concert with the 12.3 feet tidal range since tidal flats are exposed at low water. Sea ice usually restricts small vessel activity from November through April, although navigation is seldom entirely suspended.

Table 3.4-10: Ex-Vessel Value by Gear Type
(millions of $)

Gear Type	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Drift Gillnet	1.1	1.0	1.2	1.2	1.2	1.2	0.9	1.6
Set Gillnet	0.1[b]	0.2[b]	0.1	0.1[b]	0.1[b]	0.4	0.1	0.2[b]

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Area M only; Area T non-disclosed.

Bank erosion in the vicinity of the original village is a significant problem that has resulted in the loss of several homes and building of new HUD housing in upland areas well away from the bay. A wharf which was reported in the community in 1984 (Centaur Associates) was not in existence in the fall of 1987.

Cargo is unloaded over the beach and fishing boats are beached when not being used. Fishing boats are forced to operate in concert with daily tides since a boat harbor is not available in the community. The requirement to move vessels, unload fish and load equipment and supplies during high tides results in additional time being required for these activities and ultimately in extra costs to the harvesting and processing sectors.

The local fishermen each contributed $250 a few years ago to purchase a boat trailer with hydraulic rams that can be used for moving fishing vessels in and out of the water. The city received ownership of the trailer and provides a Caterpillar tractor for moving the boat and trailer.

Air transport is the only means other than marine transport of moving people and material to or from Port Heiden. Local residents and crew members fly into the community on either Reeve Aleutian Airways or Peninsula Airways. There are approximately a half dozen private airplanes owned by local residents. About half are equipped with wheels for use on the airport while the others are equipped with skis and floats. These private planes are used for travel during the fishing season and occasionally to pick up needed repair parts for a boat but, according to a local fishermen, are not used for herring or salmon spotting.

3.4.4.2 Processing Sector

Port Heiden does not have a processing plant in the community. A local resident owns a fish buying company, Christianson & Sons, that provides a market for local fishermen. The company was started in 1973 and initially handled only silver salmon for transshipment to wholesalers in Anchorage. In 1976 the company expanded its operations and facilities to handle all salmon species. The firm has a 20 ton per day ice plant, and a small building that is used to load the fish in totes with a covering of ice prior to air transport to Anchorage where Anpac, Inc. processes the fish.

The company is operated as a family business with two sons and a daughter, and some part-time help, taking care of day to day operations of the firm. The company only operates in Port Heiden and does not move to Egigik or other locations to purchase fish from local fishermen. The only red salmon handled by the firm are those caught by local setnetters fishing in Meshik Bay. These fish are destined for Bristol Bay systems and the quantity of red salmon intercepted by setnet fishermen is usually low.

In response to the wishes of the local fishermen, the firm does not buy fish from non-local residents. Since floating processors do not operate in Port Heiden, non-local fishermen do not have a ready market for selling fish caught in the Port Heiden vicinity. As a result, they tend to fish in areas away from Port Heiden and closer to other processors or buyers, and competition is therefore reduced for Port Heiden fishermen.

3.4.4.3 Support Sector

Support services are extremely limited in Port Heiden. Marine oriented service and supply firms are not present in the community. Local fishermen reported buying groceries at the local store and fuel from the city. All other needs were obtained from Naknek, Dillingham, Anchorage, or Seattle.

The City of Port Heiden provides fuel to local boats, but most owners typically fill their vessels at the beginning of the season at Port Heiden and then purchase fuel from tenders and floating processors during the remainder of the season. Fishing activity during the latter part of the season for silvers takes place within the bay with limited fuel consumption so owners draw down their tanks during this period.

3.5 Port Moller

3.5.1 Description/Setting

Port Moller is located on the north side of the Alaska Peninsula, southwest of Port Heiden. The processing plant is located on the east side of the bay, just inside the extensive shoals which are present at the mouth.

Port Moller is located in a remote area of the Alaska Peninsula, distant from major communities, but the salmon fleet has adapted to operating in this outlying location. The Peter Pan plant has historically provided sufficient services to the salmon fleet, but support for other types of vessels is extremely limited.

3.5.2 Socioeconomic Characteristics

Port Moller is an enclave for the Peter Pan Seafoods processing plant which is located at the site. One Native family of four persons lives in the vicinity of Port Moller and represents the only local residents. Since Port Moller is not an established community or settlement, this analysis is limited to a discussion of the fishing industry which operates at the site.

3.5.3 Industry Characteristics

3.5.3.1 Harvesting Sector

The harvesting sector in Port Moller is composed almost solely of non-local vessels since the family which resides in the vicinity has one drift gillnet boat. Information on the resident harvesting sector is non-existent. Some information on the harvesting sector does exist for Port Moller but these data are probably for non-residents who use a Port Moller address. The harvesting sector at Port Moller is probably similar to the drift gillnet fleet at King Cove and Sand Point.

The non-resident fleet is composed of a number of permit holders from the community of Nelson Lagoon, which is located on the west side of Port Moller bay, as well as fishermen from outside the region. A number of non-resident fishermen consider Port Moller their base for fishing operations. Peter Pan Seafoods provides a number of support services, including meals, to the fishermen and many of them store their boats at the plant.

Major Fisheries

Port Moller is the center for north peninsula salmon fishing conducted by Area M fishermen. Vessels fishing out of Port Moller also participate in local and Togiak herring fisheries, and trawlers and crabbers operating in the area use Port Moller as a port of refuge and for some limited services (e.g., mail and crew change).

The fishing grounds for the yellowfin sole trawl fleet have been moved west by regulatory order in recent years to avoid incidental catch of crab. As a result, there are fewer trawlers seen in Port Moller. According to plant management, there were up to 17 trawlers anchored in the bay during spring storms.

The decline of the Bristol Bay red king crab fishery has resulted in fewer crabbers and floating processors using Port Moller in recent years as well. Peter Pan management anticipated 5 to 6 floating processors would anchor in Port Moller for the 1987 fall red king crab fishery.

Interviews indicated that the local family only fished on the north side of the Peninsula. Non-resident fishermen who are active in the Port Moller area often participate in the May herring fisheries within Herendeen Bay, and further north at Togiak. Following the completion of these herring fisheries, most of the fishing vessels move to the southside of the Alaska Peninsula for the South Unimak fishery in June, and return to the northside in July. Most Port Moller and Nelson Lagoon fishermen continue to fish until mid-September while non-resident fishermen usually cease fishing sometime in the month of August.

Fishing effort in Area M has increased substantially in the last decade. Prior to limited entry, many fishermen who were residents of Area M fished all three gear types (seine, drift gillnet, and set gillnet) during different parts of the season. After limited entry, these local residents sold some of their permits for cash or gave permits to other family members to establish their own fishing operations. The result is that instead of part-time or periodic efforts using each gear type, there are now larger, permanent fleets or user groups for each gear type. As a result, fishermen have lengthened the amount of time they spend fishing in order to meet their required income goals. Fishermen used to quit fishing by August 1, but now many of them fish to September 1 and some until September 15.

According to respondents, individuals who obtained multiple permits tended to keep the seine permits, and give, or sell, the drift gillnet permit to a family member. If the set gillnet permit was not also given or sold to a family member, it was the permit most likely to be sold.

Employment

Data for actual residents (not declared residents) of Port Moller are not available. Information on characteristics of King Cove drift gillnet and set gillnet fishermen, which may resemble the employment pattern of Port Moller residents, is presented in Section 3.3.4.1.

Income

Data for actual residents (not declared residents) of Port Moller are not available. Information on characteristics of King Cove drift and set gillnet fishermen, which may approximate the income for Port Moller residents, is presented in Section 3.3.4.1.3.

Boat and Gear Characteristics

The local residents of Port Moller are reported to have one drift gillnet permit and one set gillnet permit.

Port Moller residents only participate in Area M drift gillnet and set gillnet fisheries. As a result, the size of vessels is probably in the 20 to 39 feet (6.1 to 12.1 meters), similar to the pattern in the remainder of Area M.

Use of Community Infrastructure

Port Moller does not have a boat harbor. Vessels are forced to anchor in this mostly shallow bay which has extensive shoals just inside the entrance. Fishing boats and tenders can moor at the processing plant dock, but it is exposed to South and Southeast winds which come up quickly and vessels have to be ready to move on short notice. Good moorage is located 1 mile south of the plant in about 7 fathoms (National Ocean Service, 1987).

The Peter Pan dock has a 400 foot face with alongside depths of approximately 6 feet at low tide.

Port Moller has a small gravel airstrip served by Peninsula Airways that is used by the salmon fishing fleet, and occasionally by trawlers and crabbers operating in the Bering Sea, for parts and supplies, and personnel transportation.

3.5.3.2 Processing Sector

The Port Moller plant is operated by Peter Pan Seafoods without any support from a local community. As a result, the plant has evolved as a self-sufficient enclave.

Plant Characteristics

The Port Moller facility is a freezer operation that handles herring, salmon, and crab. The facility was founded as a salmon processing plant, and herring has been added in the last 4 years. Crab processing began in the fall of 1987.

Salmon processed at the plant are harvested within an area that extends from Cape Stroganof near Port Heiden, to Nelson Lagoon. Local management estimates that 75 percent of the salmon processed at the plant are reds, 5 percent are kings, 10 percent are chums, and 10 percent are silvers. The plant will occasionally process fish from the south side of the peninsula, but minimal amounts. During a slow season in Bristol Bay an occasional tender may come down to Area M for fish, but Port Moller has never processed fish from Bristol Bay.

If wholesale prices increase for yellowfin sole and other bottomfish the plant might process these species. The relatively high operating cost of the plant currently precludes it from competing with catcher processors or larger onshore processing plants. However, it may be possible for the plant to process selected bottomfish species at certain times of the year.

The plant might be able to serve as a support station for trawlers and crabbers operating in the vicinity, but problems with limited winter water supply and relatively small fuel storage capacity will need to be solved.

The plant opens in early April for the herring season in Herendeen Bay and Togiak. Peter Pan obtains most of its herring from King Cove and False Pass boats participating in these fisheries.

In earlier years the plant closed in August, but as fishermen have lengthened the duration of the salmon season, the plant has remained open until mid-September. The Port Moller facility remained open for the Bristol Bay red king crab season for the first time this year. This season started September 25, 1987 and lasted 11 days. The plant closed in early October.

Employment

Peter Pan Seafoods employs 130 total employees at the peak of the salmon season. Of this total, approximately 80 persons are processing line workers and 50 employees are support staff. Five of the support crew are administrative staff, and the remainder are machinists, dock crew, cooks, laundry, and related positions.

The support crew works 11 hours in a typical day, while processing workers generally work 14 to a maximum of 18 hours per day on a single shift operation during the peak of the season.

The majority of the processing line workers are employed during the 2 1/2 salmon processing season which extends from June 10 to approximately September 1. Most support staff work 4 1/2 to 5 months, from mid-April to mid-September.

At the peak of the red salmon season the plant will employ about 130 persons. During times when other species are processed, fewer employees are required. Table 3.5-6 presents estimates of the number and type of employees during processing operations for other species.

Table 3.5-1: Processing Employment
(By Species)

Species/Product	Processing Line	Support Staff
Red Salmon	80	50
Silver Salmon	30	20-25
King Crab	50	15-20
Herring	30	20-25

There are no local residents employed at the Peter Pan plant. Alaska residents comprise approximately 20 to 25 percent of the crew. According to local management, increasing the percentage of Alaska residents employed at the facility will take time since the company has had union contracts for many years. Under existing union contracts, employees have to be offered employment in their previous jobs at the beginning of each season unless they have been terminated for reason. As a result, a large proportion of the staff are long-term employees who return every season, particularly in the higher-paying support jobs.

A large percentage of Filipino nationals were employed at the plant in the fall of 1987, although none were observed in the higher paying occupations.

Income

Net take home pay for processing worker during the 2 1/2 month salmon season ranges from $3,000 to $4,000, with a typical gross income of $4,000 to $5,000 for the season. The plant also provides transportation and room and board. The support staff averages about $11 per hour with gross wages of $16,000 to $18,000 for the 2 1/2 month season.

3.5.3.3 Support Sector

Peter Pan Seafoods provides the only support available in Port Moller for the fishing industry. The facility has a small store, ships chandlery, and medical clinic staffed with a physicians assistant, that are available to fishermen selling to the plant. Peter Pan fishermen can purchase meal tickets for use at the meal hall, and mechanics and carpenters are available to assist with vessel repairs.

The plant maintains a Travelift for haulout and storage of drift boats. Fishermen also rely upon the plant for telephone service and arranging air transportation of parts, supplies, and crew members.

3.6 Sand Point

3.6.1 Description/Setting

Sand Point is located on the northwestern corner of Popof Island, one of the Shumagin Island Group, off the southern coast of the Alaska Peninsula. Cold Bay, the air transportation hub of the region is 87 miles west of Sand Point; Anchorage lies 571 miles to the northeast. Several other small communities lie within a 100 mile radius. Sand Point was incorporated as a first class city in 1978 and is one of six communities in the newly formed Aleutians East Borough. The terrain of the northwestern portion of Popof Island is generally rolling, with the exception of a small rocky section between the city and airport where elevations reach 400 feet. The highest point on the island is 1,550 feet above sea level. Vegetation is representative of the treeless (except for a few imported Sitka spruce) dry tundra of the southern Alaska Peninsula. The climate falls within the Alaskan maritime zone, with cool summers and mild winters. While Sand Point is in the path of frequent west-to-east storm tracks of the North Pacific, its location on the leeward side of Unga Island protects its harbor from ocean waves and wind. Precipitation averages 51.6 inches a year and the area is often cloud or fog covered. The waters of the south side of the Alaska Peninsula are ice-free year-around.

Sand Point differs from other communities in the region in its relative lack of aboriginal occupation or village relocation, resulting in less of a Native influence in the community. The village of Sand Point was established in 1872, when a San Francisco fishing company set up a trading post, salmon fishing station, and a supply post for cod fishing. Early residents were Scandinavian fishermen and Aleuts from other villages. Fish processing began nearby with Alaska Pacific Salmon Company in the 1930's, and eventually became the dominant element of the economy. Halibut processing began in the late 1940's, followed by crab processing in 1966. As jobs were created and Aleuts from nearby communities came to Sand Point, the community grew; in fact, Sand Point has exhibited the most significant growth within the region over the last three decades.

3.6.2 Socioeconomic Characteristics

3.6.2.1 Local Economy

Commercial fishing has traditionally been and remains the economic base of Sand Point. Residents are involved in all phases of the industry, with activities ranging from fish harvesting and processing, boat repair, and providing services to the local and outside fleets. However, while fishing remains dominant, the economy has diversified over the last 6 years. New businesses have been formed by residents or migrants to the community to provide services to meet the needs of local residents; for example, the number of restaurants has increased from one to four and welding operators from one to five, over the last 2 years. In 1985, there were 55 business licenses registered in Sand Point.

Sand Point has also been affected by the increasing regionalization of the local economy. The city has actively pursued the objective of becoming a regional service center for both the fishing industry and other neighboring communities. The formation of the Aleutians East Borough has increased the role of Sand Point in the region, with some of the new borough's administrative services being provided out Sand Point.

Finally, both city government and the Shumagin Corporation, the village ANCSA corporation, have taken active and cooperative roles in economic development. The city has carefully evaluated the markets for and feasibility of various economic development projects, and is programming capital projects on this basis. As a major landowner, Shumagin Corporation has sold land and made investments, working in cooperation with the city. Two other Native village corporations locate their offices in Sand Point: Sanak Corporation, and Unga Corporation. They are involved in various economic ventures, ranging from the Apollo Mine to development of the Meadow Subdivision and operation of a motel and restaurant.

3.6.2.2 Population

Historically, the city's population has increased dramatically during periods of rapid growth in commercial fisheries (often followed by a decline and development of a new fishery). The availability of additional housing has also influenced growth by causing a population influx, such as during the period of 1970-80. With the decline of the crab fishery in the early 1980's and the stability of the salmon fishery, the City's permanent population has steadily risen during the last five years. Between 1980 and 1985, the annual average growth in population was approximately 3.3 percent. Table 3.6-1 presents historic population data for Sand Point.

Table 3.6-1: Historic Population
City of Sand Point

Year	Population
1920	60
1930	69
1940	99
1950	107
1960	254
1970	360
1980	773
1981	794
1982	697[a]
1983	797
1984	889
1985	900

Sources: U.S. Census, various years, for 1920 - 1980 and; Alaska Department of Community and Regional Affairs, various years, for 1981 - 1985.

[a]Decrease in population levels due to change in counting rules, rescinded in 1983

The majority of Sand Point residents are of Aleut and Scandinavian descent (see Table 3.6-2). The population is relatively young, with the proportion of people in the 5-18 age group higher than is generally exhibited in other remote Alaskan fishing communities (Darbyshire and Associates 1985).

Table 3.6-2: 1980 Population by Race
City of Sand Point

Aleut	White	Eskimo	Indian	Asian	Black	Other
345	241	2	10	13	0	14

Source: Darbyshire and Associates, 1985

Outmigration is low and length of residency high, with 51 percent of the population having lived in Sand Point for 16 years or longer (Table 3.6-3). Federal census figures for 1980 indicate that the region's population was 54.4 percent male and 45.6 percent female.

Table 3.6-3: Length of Residency in Community As of 1983
City of Sand Point

0-2 Years	3-5 Years	6-10 Years	11-15 Years	16-20 Years	20+ Years
14%	13%	14%	10%	5%	46%

Source: Darbyshire and Associates, 1985

Like many Alaskan fishing communities, there is a summer influx of workers that swells the seasonal population of the town. Most of these temporary residents are associated with the cannery, fishing fleet, and capital project construction workforce. In recent years, the city has estimated the summer population of Sand Point to be as high as 1200 (Cotten, 1987).

3.6.2.3 Employment

In looking at combined wage and non-wage employment, commercial fishing and fish processing is responsible for the majority of employment opportunities in Sand Point. Table 3.6-4 presents the results of a 1980 city survey of employment. At that time, 87 percent of employment was provided by fishing and fish processing. However, in recent years, construction, commercial service, and government employment have all increased. A partial survey by Impact Assessment, Inc. in 1986 showed an increase in construction employment from 4 to 30, and slight increases in education and government.

Table 3.6-4: 1980 Composition of Employment

Industrial Classification		Number of Employees	% of Total
Commercial fishing	(B)	279	52
Seafood processing	(B)	189	35
Commercial services	(S)	17	3
Construction	(S)	4	1
Transportation	(S)	7	1.5
Education	(S)	18	3
Technical/professional services	(S)	2	0.5
Government: Federal	(G)	3	0.5
State	(G)	5	1
Local	(G)	8	1.5
Corporations and non-profit organizations		6	1
	TOTAL	538	100%

Source: City of Sand Point, 1981.

(B)Basic employment (S)Support employment (G)Government employment

Table 3.6-5 shows the employment portion of the Port Moller census subarea employment and payroll industry series data for the 4 quarters of 1986. In addition to Sand Point, it includes the community of Nelson Lagoon and outlying reporting areas of Port Moller, Unga Island, Herendeen Bay, Pavlof, and Squaw Harbor. Due to regulations on disclosure of data, data is available for only five industrial classifications: manufacturing; transportation, communication, and utilities; federal government; state government; and local government. In 1986, the Sand Point School district employed 20 people; 17 people were employed by federal, state, or local government.. Businesses employed 53 people, including the Aleutian Commercial Company store, a bank, cafe, tavern, motel, electric utility, telephone company, health clinic, Native corporations, gift shops and vending machine companies, airlines and air charter companies.

Table 3.6-5: 1986 Area Employment Series Port Moller Census Subarea

Industrial	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
Classification	Avg.	Percent	Avg.	Percent	Avg.	Percent	Avg.	Percent
Construction	a	a	a	a	a	a	a	a
Manufacturing	a	a	a	a	257	a	33	a
Transportation, Utilities & Communication	55	46.61%	16	21.05%	14	4.18%	20	14.08%
Retail Trade	a	a	a	a	a	a	a	a
Finance, Insurance & Real Estate	a	a	a	a	a	a	a	a
Services	a	a	a	a	a	a	a	a
Federal Government	2	1.69%	3	3.95%	3	0.90%	3	2.11%
State Government	3	2.54%	3	3.95%	1	0.30%	4	2.82%
Local Government	58	49.15%	54	71.05%	60	17.91%	82	57.75%
Miscellaneous	a						a	0.00%
Total Industries	118		76		335		142	

Source: Alaska Department of Labor, 1987.

[a]Not disclosed.

Trident Seafoods provides administrative and processing employment in its plant. Sixteen residents are employed year around in management, bookkeeping, engineering support and maintenance. Peak processing employment during the summer salmon season is 104, 15 of which were local residents (Impact Assessment, Inc., 1987).

Non-wage employment is also provided by commercial fishing, in the form of permit holders and crew members (See Section 3.6.4.1).

Table 3.6-6 shows the Port Moller census subarea payroll industry series data for the 4 quarters of 1988, which also includes Port Moller. Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information.

3.6.2.4 Income

Per capita income and household income in Sand Point have traditionally been among the highest in Alaska. The 1983 per capita income of $21,206, reported by the Department of Labor, was the highest in the state. Household income in 1980 was $47,951. Because of the economic dominance of fishing and fish processing, resident income can vary significantly between years, depending on the success of commercial fishing (See Section 3.6.4.1).

Table 3.6-7 presents 1986 quarterly wage information for the Port Moller census subarea which is dominated by the City of Sand Point. This provides representative data on government, service, and fish processing wage income.

Table 3.6-6: Port Moller Subarea 1988 Quarterly Employment

Year/ Quarter	Div	Businesses Reporting	Average Employees	Payroll	Average Wage
881	Mining	1	n/d	n/d	n/d
881	Construction	1	n/d	n/d	n/d
881	Manufacturing	2	n/d	n/d	n/d
881	Trans./Comm./Util.	7	n/d	n/d	n/d
881	Trade, Retail	5	n/d	n/d	n/d
881	F.I.R.E	2	n/d	n/d	n/d
881	Services	2	n/d	n/d	n/d
881	Misc.	1	n/d	n/d	n/d
881	Govt., Federal	1	3	$12,182	$1,523
881	Govt., State	1	1	$1,813	$907
881	Govt., Local	2	70	$446,584	$2,137
881	Total	25	n/d	n/d	n/d
882	Mining	1	n/d	n/d	n/d
882	Construction	2	n/d	n/d	n/d
882	Manufacturing	2	n/d	n/d	n/d
882	Trans./Comm./Util.	7	27	$99,208	$1,210
882	Trade, Retail	5	n/d	n/d	n/d
882	F.I.R.E	2	n/d	n/d	n/d
882	Services	2	n/d	n/d	n/d
882	Misc.	1	n/d	n/d	n/d
882	Govt., Federal	1	3	$15,279	$1,910
882	Govt., State	1	0	$602	$602
882	Govt., Local	3	67	$473,036	$2,353
882	Total	27	302	$1,424,086	$1,574
883	Mining	1	n/d	n/d	n/d
883	Construction	2	n/d	n/d	n/d
883	Manufacturing	2	n/d	n/d	n/d
883	Trans./Comm./Util.	5	19	$69,694	$1,202
883	Trade, Retail	6	n/d	n/d	n/d
883	F.I.R.E	2	n/d	n/d	n/d
883	Services	1	n/d	n/d	n/d
883	Misc.	1	n/d	n/d	n/d
883	Govt., Federal	1	3	$12,558	$1,570
883	Govt., Local	3	66	$431,947	$2,182
883	Total	24	n/d	n/d	n/d
884	Mining	1	n/d	n/d	n/d
884	Construction	2	n/d	n/d	n/d
884	Manufacturing	2	n/d	n/d	n/d
884	Trans./Comm./Util.	5	19	$74,753.00	$1,335
884	Trade, Retail	7	42	$140,044	$1,111
884	F.I.R.E	2	n/d	n/d	n/d
884	Services	1	n/d	n/d	n/d
884	Misc.	1	n/d	n/d	n/d
884	Govt., Federal	1	3	$13,150	$1,461
884	Govt., Local	3	74	$468,609	$2,101
884	Total	25	n/d	n/d	n/d

Source: Alaska Department of Labor, 1989.
n/d: non-disclosure

Table 3.6-7: 1986 Area Payroll Series Port Moller Census Subarea

Industrial Classification	1st Quarter Avg. Wage	1st Quarter Total Payroll	2nd Quarter Avg. Wage	2nd Quarter Total Payroll	3rd Quarter Avg. Wage	3rd Quarter Total Payroll	4th Quarter Avg. Wage	4th Quarter Total Payroll
Construction	a	a	a	a	a	a	a	a
Manufacturing	a	a	a	a	$2,622	$2,021,703	$3,316	$328,326
Transportation, Utilities & Communication	$1,217	$52,338	1134	$55,575	$1,559	$63,909	$1,453	$88,648
Retail Trade	a	a	a	a	a	a	a	a
Finance, Insurance & Real Estate	a	a	a	a	a	a	a	a
Services	a	a	a	a	a	a	a	a
Federal Government	$1,847	$12,927	1877	$15,019	$3,386	$1,354	$1,654	$14,888
State Government	$840	$8,403	709	$7,087	$1,927	$1,843	$796	$10,354
Local Government	$1,816	$314,177	2240	$362,893	$1,881	$340,440	1875	$461,192
Miscellaneous							a	
Total Industries		$925,253		$1,314,642		$2,697,665		

Source: Alaska Department of Labor, 1987.

[a]Not disclosed.

3.6.2.5 Public Fiscal Characteristics

Revenue.

Table 3.6-8 summarizes city revenues and expenditures for Sand Point over the period of FY 1983-1987. Excluding the capital projects/grants category, commercial fishing and fish processing is a significant contributor to the municipal budget. In FY 1987, Sales Tax and Rax Fish Tax accounted for 42.4 percent of revenues. Boat harbor fees contributed another 13.7 percent. With regard to expenditures, general government and public works totaled 80.7 percent of the budget.

Table 3.6-8: Summary of Revenues and Expenditures City of Sand Point

Revenues	FY83	FY84	FY85	FY86	FY87	% of 1987 Revenues
Revenue						
Sales Tax	262,559	$177,901	$194,042	$0	$282,000	31.3%
Intergovernmental						
Raw Fish Tax	$128,807	$75,718	$87,740	$0	$100,000	11.1%
State Revenue Sharing/ Municipal Assistance	$240,365	$204,895	$189,064	$0	$183,000	20.3%
Federal	$17,754	$19,476	$17,249	$13,965	$2,100	0.2%
Capital Projects/Grants	$1,007,850	$417,708	$1,196,850	$0	$0	0.0%
Sales and Service Charges						
Water and Sewer Service	$41,480	$40,492	$43,108	$35,000	$35,000	3.9%
Boat Harbor Fees	$105,535	$119,444	$107,687	$110,000	$124,000	13.7%
Rentals	$78,458	$46,239	$120,537		$176,000	13.4%
Other		$1,913	$31,572	$0		
Total Revenues	$1,882,808	$1,101,873	$1,958,190	$190,537	$902,100	100.0%
EXPENDITURES						
General Government	$399,299	$257,658	$282,718	$257,916	$366,373	54.4%
Public Safety	$28,427	$10,751	$14,751	$12,706	$11,531	1.7%
Public Works	$12,302	$97,525	$133,189	$154,391	$177,106	26.3%
Health Services	$123,266	$5,787	$8,511	$8,481	$11,992	1.8%
Library	$8,001	$3,295	$6,995	$2,584	0.4%	
Parks and Recreation	$14,674	$8,432	$12,363	$16,460	$45,587	6.8%
Non-departmental	$178,755	$137,454	$61,012	$33,809	$58,564	8.7%
Capital Projects	$221,448	$48,802	$12,000	$630,523	24515 *	
Total Expenditures	$978,171	$574,410	$527,839	$1,121,281	$673,737	100.0%
EXCESS OF REVENUES (less other uses)	$342,619	-113575	$2,707	$213,659	$75,730	
FUND BALANCE	$972,701	$873,728	$882,573	$1,096,232	$1,171,962	

Source: City of Sand Point, Annual Budget, various years.

3.6.3 Infrastructure Characteristics

3.6.3.1 Transportation Facilities

Airport

Sand Point has a state-operated 3,745 by 150 foot gravel airstrip. Service from Cold Bay is provided 6 days a week by Reeve and Markair. Runway length and orientation has been constrained by terrain, resulting in limitations on size of aircraft that can use the runway, and use of the runway during periods of adverse weather. A runway design study developed recommendations for runway realignment and extension. However, a subsequent feasibility analysis that evaluated air traffic demand, and available funding recommended against City financing runway improvements for the time being. As of 1986, the airport was not used for transportation of fish products; however, convenient air service will be important in pursuing City objectives of becoming a regional fishing fleet service center.

Port Facilities

Sand Point has a small boat harbor and several docks. The Humboldt Harbor small boat harbor is a concrete float system, and provides the only storm protection for vessels in the vicinity of Sand Point. It has moorage capacity for 134 vessels under 65 feet in length, up to 10 vessels 165 feet in length, and additional transient space on a fourth float. The harbor is currently charging fees of $12 a foot per year. Dry storage during the winter is provided for approximately 25 boats. A harbor expansion project is underway to provide more onshore space adjacent to the harbor for storage and marine services. The proposed marine industrial area involves placement of sheetpile bulkhead with fill behind, creating 4.5 acres of land and a new dockfront in the harbor. A tidelands lease has been obtained from the Alaska Department of Natural Resources for this purpose.

The Sand Point Public Dock is located just south of the boat harbor. Trident Seafoods has two dock facilities, used for loading and unloading fish and processed product, and for fishing fleet support. Peter Pan Seafoods operates a buying station out by the airport, and uses an old dock facility at that site.

The City operates a 150-ton marine travel lift at the small boat harbor, the only facility of its kind presently operating in the Aleutians. Haulout fees for using the marine travel lift are $12 a foot for haulout, up and back. In addition to generating fees for the city, the presence of the lift has most likely contributed to the growth of the marine service sector in Sand Point.

Sand Point receives barge service from Seattle year round, and the Alaska Marine Ferry, the M/V Tustumena calls at Sand Point six times between May and September.

3.6.3.2 Marine Services

Sand Point provides marine services for its home-based fishing fleet as well as for fishermen living outside the area and transient fishing fleets moving through the area to the Bering Sea, Bristol Bay, or other waters. The small boat harbor has permanent moorage stalls for 132 boats under 65 feet, seven to ten vessels up to 165 feet, and additional transient space on a fourth float. During the peak of fishing, 50 to 60 additional transient vessels can be accommodated in the harbor. The city also operates a marine travellift for boat haulout. The 150-ton lift can handle vessels up to 85 feet. Three major docks are available for vessel loading and unloading. The harbor provides water and electricity to moorage stalls, on-shore boat storage and other services. Several repair businesses are located in the harbor to provide electrical repair, welding, vessel repair, mechanical repairs, and gear repair.

The City of Sand Point recently expanded the harbor with a project that provides a deep water bulkhead and several acres of adjacent uplands for development. The Sand Point public dock is located just outside the main harbor and is used for barge freight deliveries. The Trident Seafoods dock is used for unloading and loading fish and processed products. Trident Seafoods also provides marine diesel fuel and gasoline bulk storage and sales for Sand Point. Peter Pan Seafoods operates a service dock to support salmon purse seiners, gillnetters, and tender vessels at their facility near the airport. The Peter Pan site also has gear storage available to fishermen.

Other community services available to fishermen include recreational facilities, medical services, lodging, and restaurants.

3.6.3.3 Utilities

Water and Sewer

Water and sewer services are provided by the City of Sand Point. Water comes from an impoundment dam on Humboldt Creek; residential and commercial rates are both $12 per month. Community growth and demand for water has strained storage capacity, particularly during the summer when fish processing is at its peak. An additional 500,000 gallon storage facility will be on-line by mid-1988.

The original system was built by the Public Health Service in 1976. Sewage receives secondary treatment including aeration, clarification, and chlorination before being pumped through a 1,000 feet outfall to the ocean. With the exception of a few houses, all the homes in the community are connected to the sewage system.

Solid Waste

The City has just implemented a uniform refuse collection service and will be operating a new incineration facility. Operations are conducted on a 5.6 acre site.

Electric

Electric service is provided by Sand Point Electric Inc. Power is provided by two diesel generating plants with a total capacity of 3.8 megawatts. System upgrades to increase generating capacity are currently in the design stage. The base residential rate was $.27/KWH for the first 200 KWH, and $.244/KWH for anything over 200 KWH. Commercial rates are $.244/KWH for the first 100KWH, $.219/KWH for the next 100 KWH, and $.167/KWH for anything over 200 KWH. The community receives Power Cost Equalization funds, reducing household rates by $.044/KWH for residential and commercial users, and by $.039/KWH for consumption over 200 KWH.

Fuel

Trident Seafoods provides marine diesel, home heating fuel, and gasoline bulk storage and sales for the community. Village Green Service Station also sells gasoline, diesel oil and stove oil.

3.6.3.4 Housing

The community has 125 single family dwellings, 40 apartments, and 50 mobile homes. Fish processors provide local housing for 100 workers in dormitory style housing. Rental rates for a one bedroom apartment ranges from $450 to $550 per month. Housing stock condition varies from poor to good, depending on age. Historically, housing vacancy has reflected the success of commercial fishing seasons, but by 1984, housing became hard to obtain. Subdivision development by the Shumagin Corporation addressed the need for housing, and in 1986, 6 privately financed and 15 HUD homes were under construction. Twenty building permits have been filed with the city in the last two years, and there are 40 vacant lots scattered throughout the community.

3.6.3.5 Land Availability

Sand Point has physically expanded during the last six years. This is due to both expansion within older residential and commercial areas, and development within new subdivisions such as Shumagin Corporation's Meadows subdivision. Humboldt Harbor

Estates and Mountain View Estates are also relatively new subdivisions. Land suitable for marine industrial and commercial use adjacent to the harbor is extremely limited, and is viewed by the city as a constraint to expansion to the marine service industry. The city harbor expansion project, described above, is a response to such constraints, essentially creating 4.5 acres of land by filling tidelands in behind a sheet pile bulkhead. Any major marine projects, beyond the boat/gear storage and small marine service vendors envisioned by the City, will face land availability constraints. Some vacant commercial and industrially zoned land is available out by the airport, but lacks the benefits of facilities, services and protection available adjacent to Humboldt Harbor.

3.6.4 Industry Characteristics

3.6.4.1 Harvesting Sector

Major Fisheries

The community of Sand Point began in 1887 as a cod fishing station and has remained a fishing community for 100 years. Salmon fishing has replaced cod as the dominant fishery for local residents (See Table 3.6-9). Halibut fishing was initiated in the 1940's and crab harvesting began in the 1950's. The number of king crab permits has declined substantially as the stocks have decreased. Recent years have seen local fishermen begin to pursue Pacific cod again, as well as herring and sablefish. Major expansion has occurred in the "Other" category which includes the Miscellaneous Finfish category, of which Pacific cod is a major component. The number of individual permit holders in the community has increased significantly over the 1977 to 1988 time frame. The average number of permits held by each permit holder has ranged from 1.7 in 1983 to 2.7 in 1987.

The number of salmon permits held by Sand Point residents has been fairly stable since 1978 with a range of 97 to 113. Tanner crab has decreased to 34 permits from the 1984 peak of 39, but remains within the historic range of 29 to 39 permits. The number of permits issued for king crab has declined from a peak of 49 in 1979 to 3 permits in 1988. It appears as if Sand Point fishermen have substituted halibut fishing for king crab harvesting during the past decade. The number of halibut permits issued was at its lowest point in the 1978 to 1981 time period, the peak of the king crab fishery, and increased to a record 86 permits in 1987 with king crab stocks remaining in their depressed condition. Permits issued for sablefish and other miscellaneous groundfish increased rapidly in the last few years.

Table 3.6-9: Number of Commercial Fishery Permits by Species

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon	79	97	113	101	108	99	105	106	109	102	104	105
King Crab	24	28	49	40	45	41	3	3	3	2	5	3
Tanner Crab	34	39	32	36	29	39	38	39	36	31	34	34
Dungeness & Other	0	0	0	0	0	1	5	1	5	2	2	1
Herring	0	1	5	4	1	4	3	2	2	4	1	7
Sablefish	0	0	0	0	0	0	1	1	4	5	18	9
Halibut	28	11	13	6	10	47	60	53	55	69	86	b
Other	6	6	7	4	5	1	0	1	0	9	95	115
Total	171	192	219	191	198	232	215	206	214	224	345	b

Source: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

As Table 3.6-9 demonstrates, salmon fishing was the dominant activity of Sand Point residents, with the combined number of permits for other species not exceeding the number of salmon permits until 1987. Almost all salmon permits are for the False Pass (Area M) management area, and the number of permits has remained comparatively stable since 1980. Table 3.6-10 shows the number and type of salmon permits held by local fishermen since 1977.

Total pounds of salmon harvested by Sand Point fishermen have ranged from 12.1 to 32.7 million pounds in the 1981 through 1988 time period. Recent restrictions and quotas imposed by the Alaska Board of Fisheries make it unlikely that these harvest levels will be exceeded in future years.

Table 3.6-10: Number of Commercial Salmon Permits by Area

Area	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Pr. Wm. Sound	0	2	0	0	0	0	1	1	1	1	1	1
Chignik	2	1	1	0	0	0	0	0	1	0	0	0
False Pass	77	93	110	101	105	99	103	105	107	101	100	101
Bristol Bay	0	1	2	0	0	0	1	0	0	0	2	1
Unidentified/Other	0	0	0	0	3	0	0	0	0	0	1	2
Total	79	97	113	101	108	99	105	106	109	102	104	105

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Income to Sand Point fishermen from salmon harvests in Area M have ranged from an average of $93,000 in 1983 to $240,000 in 1988. The record high prices for salmon paid in 1988 resulted in total ex-vessel values that were almost double the previous record for total annual ex-vessel value. Information on salmon harvests and income from other areas is subject to non-disclosure rules and is not shown in Table 3.6-11.

Sand Point fishermen also harvest other species of finfish. Table 3.6-12 shows information on the number of permits held by local residents for other types of fish.

Table 3.6-11: Landings and Ex-Vessel Value for Salmon
(in millions)

Type	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 a
Pounds	23.6	25.3	17.5	32.7	20.6	17.2	12.1	22.1
Value	$13.6	$11.2	$9.6	$13.2	$10.1	$10.6	$10.8	$24.3

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.6-12: Number of Other Finfish Permits by Area

Area/Species	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Aleutian/Peninsula												
Halibut	28	11	12	6	10	47	60	52	55	68	81	b
Herring	0	0	0	0	1	0	3	0	1	0	1	5
Sablefish	0	0	0	0	0	0	0	1	4	5	15	7
Other Finfish and Other	1	3	3	0	5	1	0	1	0	8	83	103
Bering Sea												
Halibut	0	0	1	0	0	0	0	0	0	0	1	b
Other Finfish and Other	0	0	1	1	0	0	0	0	0	0	3	3
Bristol Bay												
Herring	0	0	5	3	0	4	3	2	1	2	0	2
Other Areas and Unidentified	0	1	0	1	0	0	0	0	0	2	15	11
Total	29	15	22	11	16	53	66	58	61	85	199	b

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a] Preliminary data.
[b] Not available.

Halibut permits accounted for 80 percent of other finfish permits held by Sand Point residents in 1986, and accounted for over 89 percent of other finfish permits during the 1982 to 1985 time period.

Halibut is the only species in the other finfish category for which data are consistently available on landings and value. Information on longline halibut harvests in the Peninsula/Aleutian area are presented in Table 3.6-13. Data on landings and value of other finfish harvested by Sand Point fishermen are not disclosed to ensure confidentiality. Halibut has increasingly become an important income source to Sand Point fishermen. In 1977 the average permit holder grossed slightly over $4,000 from halibut landings. In 1987 this ex-vessel value had increased to over $15,000. This amount is still relatively minor when compared to the $108,000 average ex-vessel value for salmon harvested by Sand Point fishermen in 1987, or the $240,000 average salmon harvest in 1988. Data on halibut landings are not yet available for 1988.

Table 3.6-13: Landings and Ex-Vessel Value for Halibut
(in thousands)

	Year										
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Pounds	93	30	30	17	6	124	128	396	508	700	867
Value	119	46	61	15	6	132	145	318	392	1,031	1,236

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1987 from Alaska Commercial Fisheries Entry Commission, 1989.

Halibut is the dominant species within the other finfish group for Sand Point fishermen. As Table 3.6-14 shows, halibut accounted for over 700,000 pounds and $1 million in value in 1986. Sablefish, which was next in order of importance, accounted for about 228,000 pounds and over $206,000. The eight permits for miscellaneous saltwater finfish harvested slightly less than 30,000 pounds for about $5,100.

The total number of shellfish permits held by Sand Point fishermen has declined substantially over the last decade, primarily as a result of the king crab closure in the Aleutian/Peninsula area. In addition, Sand Point residents no longer participate in the Bristol Bay king crab fishery. Tanner crab permits have remained relatively stable over this time period. Table 3.6-13 shows the change in number of permits issued for crab harvesting over the 1977-1988 time period.

Table 3.6-15 presents information on shellfish landings for previous years by Sand Point residents and Table 3.6-16 shows the ex-vessel value for shellfish during these same years. These tables present information on the Aleutian/Peninsula area, which is on the south side of the Alaska Peninsula, and not in the Bering Sea, since this area is the only area where there are enough permit holders to disclose harvest and value data.

Table 3.6-14: Number of Shellfish Permits by Area and Species

Area/Species	Year 1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Aleutian/Peninsula												
King Crab	13	27	37	36	39	36	0	0	0	0	0	0
Tanner	31	32	29	36	27	38	36	39	27	29	29	32
Dungeness	0	0	0	0	0	1	5	1	3	2	2	1
Bering Sea												
King Crab	3	4	3	0	1	2	2	0	3	2	5	3
Tanner	3	7	3	0	2	1	2	0	3	2	1	1
Misc. Crab	0	0	0	0	0	0	0	0	0	0	0	0
Bristol Bay												
King Crab	5	7	7	4	1	0	0	2	0	0	0	0
Dutch Harbor												
King Crab	3	0	1	0	1	3	1	0	0	0	0	0
Chignik/Unimak												
Tanner Crab	0	0	0	0	0	0	0	0	5	0	4	1
Unknown/Other												
King Crab	0	0	1	0	1	0	0	1	1	0	0	0
Totals	58	77	81	76	72	81	46	43	42	35	41	38

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

The number of Sand Point residents holding tanner crab permits for this area has ranged from a high of 39 in 1985 to a low of 27 in 1982, with 32 permits in 1988. The average permit holder grossed over $90,000 from the tanner crab fishery in 1988. This is the peak ex-vessel value during the 1981-1988 time frame. The lowest average ex-vessel value was $33,000 in 1984.

Table 3.6-15: Landings By Shellfish Species
(millions of pounds)

Type	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
King	1.9	1.3	0	0	0	0	0	0
Tanner	1.3	2.3	1.6	1.2	0.9	1.5	1.3	1.3
Dungeness	0	[b]	[b]	[b]	[b]	[b]	[b]	[b]

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

Employment

Section 2.2 discussed employment by gear type for the Bering Sea fisheries. This section addresses employment levels in the harvesting sector for the community of Sand Point. Table 3.6-17 presents estimates of employment by fishery (and gear type for salmon and herring) for the 1981 through 1988 time period. The table focuses upon employment generated by Sand Point permit holders. Crew residency is assumed to be the same as the permit holder. Crew factors estimated by Thomas (1986) for the single year of 1985 are used for the entire time period since comparable crew factor estimates are not available for previous years. The crew factors used in the table are averages for these fisheries in the Bering Sea.

Table 3.6-16: Ex-Vessel Value by Shellfish Species
(millions of $)

Type	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
King	2.9	4.1	0	0	0	0	0	0
Tanner	0.9	2.9	2.0	1.3	1.3	2.5	2.5	2.9
Dungeness	0	[b]	[b]	[b]	[b]	[b]	[b]	[b]

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

Table 3.6-17: Harvest Sector Resident Employment

Species/Gear	Crew Factor	1981	1982	1983	1984	1985	1986	1987	1988
		Year							
Salmon									
Purse Seine	5.0	245	235	245	220	245	230	225	230
Drift Gillnet	2.25	50	47	43	47	41	38	34	32
Set Gillnet	2.13	72	66	75	85	85	81	85	87
King Crab	3.75	146	131	8	8	11	8	15	8
Tanner Crab	4.17	100	121	142	146	108	121	121	133
Dungeness & Other	3.0	0	3	9	3	6	6	6	3
Herring									
Purse Seine	3.88	4	16	12	4	4	8	4	19
Gillnet	2.0	0	2	0	0	2	0	0	2
Sablefish	4.3	0	0	0	4	17	22	47	30
Halibut	4.3	43	237	237	198	206	254	310	a

[a]Not available.

Salmon fishing employs the largest number of persons although halibut fishery employment has increased substantially over the 1981-1988 time period. However, the halibut fishery is limited to a small number of 24 hour periods and fishermen are engaged in halibut fishing for a relatively small number of days during the year. Salmon fishing is often regulated by openings but the frequency is such that fishermen are continually involved for periods of 3 to 4 months.

Income

Table 3.6-18 shows the ex-vessel value for harvest by Sand Point fishermen. The amounts shown in this table should be considered as relative indicators of the importance of each fishery since this table is summed from species, area, and gear categories which have data subject to non-disclosure rules. The last row in the table provides information on the total value of these non-disclosures and are summed with the other fishery values to arrive at total ex-vessel value for the community.

Between 1981 and 1987 total ex-vessel value to community residents ranged between $12.9 million to $18.8 million. Record high prices for salmon in 1988 resulted in a total ex-vessel value of $27.9 million in that year, almost 50 percent higher than the previous record year. This record does not include revenues from halibut fishing which are not yet available, so the final amount may approach $30 million.

Boat and Gear Characteristics

The Sand Point fleet has experienced significant growth in recent years. Impact Assessment, Inc. (1987) estimated the resident fleet at 127 vessels in 1986, up from 91 vessels in 1981. Approximately half of the fleet were purse seiners and the remainder were drift gillnet boats. Federal and state agency data bases provided to MMS show size information by species, gear, and area, and cannot be reliably adjusted to arrive at the total number of vessels by size in the community. Based upon Impact Assessment, Inc.'s observation that the fleet is primarily salmon fishing vessels which also participate in other fisheries, Table 3.6-19 shows size data for the Sand Point salmon fleet.

Table 3.6-18: Harvest Sector Ex-Vessel Value
(millions of $)

	Year							
Type	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Purse Seine	$10.0	$8.5	$6.5	$8.6	$7.5	$6.3	$5.8	$18.1
Drift Gillnet	1.7	1.7	1.4	1.1	1.5	1.7	1.1	1.6
Set Gillnet	1.9	0.9	1.7	3.5	1.1	2.6	4.0	4.5
King Crab	2.9	4.1	b	b	b	b	0.5	b
Tanner Crab	0.9	2.9	2.0	1.3	1.3	2.5	2.5	2.9
Dungeness & Other	0	b	b	b	b	b	b	b
Herring								
Purse Seine	b	b	b	b	b	b	b	0.1
Gillnet	0	b	0	0	b	0	0	b
Sablefish	0	0	0	b	0.1	0.2	b	b
Halibut	0	0.1	b	0.3	0.4	1.0	1.2	c
Other/Non-disclosed	0.4	0.6	0.7	0.3	1.0	0.8	1.1	0.7
Total	$17.8	$18.8	$12.3	$15.1	$12.9	$15.1	$16.2	c

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.
[c]Not available.

Previous MMS studies (e.g., Combs, 1982) have described the strategies used by Sand Point fishermen to pursue salmon and other fisheries resources. These strategies involve gear types, vessels, and area locations. The tactics are similar to those previously described for King Cove fishermen and are not duplicated here (See Section 3.3.4).

Table 3.6-19: Resident Fishing Fleet

Size in Feet	Size in Meters	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
0-19	0-6.0	18	15	17	15	6	15	13	9
20-39	6.1-12.1	55	53	53	47	30	42	49	48
40-59	12.2-18.2	39	39	37	36	32	42	41	43
60-79	18.3-24.3	0	0	0	0	0	0	2	0
80-99	24.4-30.4	1	0	0	0	0	0	0	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Halibut and sablefish are taken by longline gear and the crab species are taken by pots. Shrimp were taken by trawl gear in earlier years. Salmon is the only species that is taken by multiple gear types.

Table 3.6-20 shows the number of salmon limited entry permits for each gear type fished by Sand Point fishermen. The number of purse seine permits has declined by u permits from the high of 53 in 1980. Drift gillnet permits declined from a high of 25 in 1979 to 14 in 1988. In contrast, in 1988 the number of set gillnet permits have almost doubled from the 22 permits held by Sand Point residents in 1977.

The increasing number of set gillnet permits is probably due to the cost of limited entry permits for the other gear types. In March, 1990 the Alaska Department of Commerce, Division of Investments listed the value of Area M purse seine permits at $214,500, drift gillnet permits at $349,583, and set gillnet permits at $79,156. Newer entrants into the salmon fishery would find it extremely difficult to make a reasonable wage and service the debt for a seine or drift permit and vessel without substantial assistance. A set gillnet operation can be obtained for substantially less money and equity can be built up in the operation to be used in purchasing a more expensive gear permit and vessel in the future.

Table 3.6-20: Number of Salmon Permits by Area

	Year											
Area/Gear	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [a]
False Pass												
Purse Seine	39	49	53	48	49	47	49	44	49	46	45	46
Drift Gillnet	16	21	25	22	22	21	19	21	18	17	15	14
Set Gillnet	22	23	32	31	34	31	35	40	40	38	40	41
Chignik												
Purse Seine	2	1	1	0	0	0	0	0	1	0	0	0
Bristol Bay												
Drift Gillnet	0	1	2	0	0	0	1	0	0	0	2	1
Other	1	1	0	0	3	1	1	1	0	1	2	3

Sources: Data for 1977 through 1980 from National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987; data for 1981 through 1988 from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.6-21 shows the differences between gear types for the ex-vessel value of salmon landed by Sand Point residents in Area M. The range of ex-vessel values for the average purse seine permit holder ranged from $128,000 in 1987 to $394,000 in 1988. The average for drift gillnet permit holders ranged from $54,000 in 1984 to $117,000 in 1988. Set gillnet fishermen have experienced average ex-vessel values ranging from $27,000 in 1985 to $109,000 in 1988.

Table 3.6-21: Ex-Vessel Value by Gear Type
(millions of $)

Gear Type	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Purse Seine	$10.0	$8.5	$6.5	$8.6	$7.5	$6.3	$5.8	$18.1
Drift Gillnet	1.7	1.7	1.4	1.1	1.5	1.7	1.1	1.6
Set Gillnet	1.9	0.9	1.7	3.5	1.1	2.6	4.0	4.5

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Use of Community Infrastructure

The small boat basin at Sand Point was reported to have a controlling depth of 14 feet in October 1984, with moorage space for 230 vessels (National Ocean Service, 1987).

In addition to the resident fleet which uses the Sand Point harbor year-round, a small number of vessels owned by non-residents also use the harbor. These include about 8 seiners from Chignik and 7 drift boats of Washington state residency (Impact Assessment, Inc., 1983).

Additional users of the harbor include the large number of transient vessels which call at Sand Point during the year.

Other docks used by the fishing industry include the 180 foot dock at Trident Seafoods which has a depth of 24 feet alongside, and the oil dock which has a 60 foot face and 15 feet alongside (National Ocean Service, 1987).

3.6.4.2 Processing Sector

Plant Characteristics

The processing sector in Sand Point is composed of Trident Seafoods and Peter Pan Seafoods.

The Trident Seafoods plant was originally built in 1946 at the site of the original cod saltery. The plant was designed to process halibut, but has diversified over the years to handle other types of seafood. Wakefield Fisheries began processing king crab at the plant in the 1950's and added tanner crab in the 1960's. Salmon processing was added to the species list in 1980 under AMFAC/Pacific Pearl management. Trident Seafoods purchased the plant in March 1986 from Pelican Seafoods.

Peter Pan Seafoods maintains a station in Sand Point to arrange for the purchase of salmon from local fishermen. This salmon is processed in King Cove. In return for commitments to sell fish to Peter Pan tenders operating on the fishing grounds, the local station provides a number of support services to the fishermen, principally repairs and gear storage.

The Trident Seafoods plant is a freezing operation which before the recent purchase primarily handled salmon, crab, halibut, and herring. Trident has expanded the product line to receive Pacific cod and sablefish.

The Peter Pan station has warehouse and storage facilities, and a small repair facility which includes a machine shop.

In prior years, the Trident plant closed down at the end of salmon season and then reopened after the first of the calendar year for the crab season (Impact Assessment, Inc., 1987). Trident is now operating the plant on a year-round basis.

Peter Pan begins its operation sometime in May and shortly after that time barges arrive with parts, supplies, and materials needed for the season. The facility remains open until mid- to late September, dependent upon the season and the number of vessels fishing.

Employment

Impact Assessment, Inc. (1987) estimated that 104 seasonal workers were employed at the Trident Seafoods plant during the 1986 salmon season on two 12 hour shifts of 52 workers. Recent employment in crab processing has ranged from 50 persons in 1985 to 80 employees in 1986. The average crab season employment is toward the low end of this range. Employment at the Peter Pan station was noted at 10 persons in 1981 (Combs, 1982).

The Trident Seafoods processing workforce is primarily non-local. Sixteen residents are employed in management, clerical, engineering, and maintenance, and 15 residents are employed on the processing line. All of the remaining processing workers are from outside the State of Alaska. The number of local residents is not likely to increase substantially as Trident Seafoods has stated its intent to bring in minority families, principally Filipino and Vietnamese, to work in the plants (Impact Assessment, Inc., 1987).

The Peter Pan buying station employs one resident as a year-round caretaker, and another resident during the summer months. All others are from the Seattle area (Impact Assessment, Inc., 1987).

3.7 Saint Paul

3.7.1 Description/Setting

The community of Saint Paul is located on the south side of Saint Paul Island, the largest island of the Pribilof Islands group in the southeastern portion of the Bering Sea. The Pribilof Islands lie 300 miles north of the Aleutian Island chain, and 775 miles west of Anchorage. Saint George is the nearest community, 60 miles to the south on Saint George Island. Saint Paul is situated on the midpoint of a peninsula, between Village Cove and Zolotoi Bay. Saint Paul incorporated as second class city in 1971.

The terrain surrounding Saint Paul consists of straight, steep rocky bluffs at the water edge, with elevation gently sloping up behind the village. Vegetation of the Pribilof Islands is similar to that of the Aleutians; treeless and dominated by grass, shrubs, and tundra. Soil and vegetation are sparse, usually leaving the underlying lava rocks well exposed. The climate is typically maritime, with cool wet summers and relatively mild winters; daily temperature ranges are limited. Annual precipitation averages 24 inches, and frequent storms occur from October to April, often accompanied by gale force winds. The winter ice pack of the northern Bering Sea occasionally moves south and surrounds the island during periods of prolonged northerly and northeasterly winds.

The Pribilof Island were unpopulated until discovered in 1786 by Russian explorers; Russian fur traders later brought in Natives from Atka and Siberia to harvest fur seals. After the transition of Alaska to American stewardship, the U.S. Government awarded a sealing lease to the Alaska Commercial Company in 1870, which provided housing, fuel, food and medical care to Native residents in exchange for participation in the fur seal harvest. The island came under direct federal government control in the early 1900's.

During the Second World War, Aleut residents of Saint Paul were relocated along with other Aleuts from the Bering Sea to southeast Alaska. Residents were repatriated after the war, but remained politically and economically dependent on the federal government until the National Marine Fisheries Service withdrew from Saint Paul Island. In doing so, seal harvest management and provision of essential community services were transferred to local entities, and a $12 million transition trust fund was established for Saint Paul residents. Additional funds ($8.5 million) were provided as compensation for unjust treatment of Pribilof Islands residents by the federal government between 1870 and 1946. Since the federal government departure and fund establishment, Saint Paul has gone through a period of significant transition, including construction of major capital projects, provision of utility and health and social services, and pursuit of strategies to diversify the economy through the development of commercial fisheries and support of oil and gas exploration operations.

3.7.2 Socioeconomic Characteristics

3.7.2.1 Local Economy

Up until 1980, the economy of Saint Paul centered around fur sealing operations and federal support of the community. As recently as 1982, the federal government still accounted for 63.1 percent of employment opportunities in Saint Paul. The federal government pullout in 1983 precipitated further action to diversify the economy. An Economic Strategies Plan was prepared in 1983, and identified four areas of potential long-term development: commercial fishing and support services; tourism; continuation fur seal harvest; and support of oil and gas activities in the Bering Sea.

Tanadgusix Corporation (TDX), the Saint Paul village ANCSA corporation, initiated commercial fishing on Saint Paul in 1981 as a demonstration project to evaluate the potential for establishing a commercial fishing industry. Boats purchased under the project fished in 1982 and landed 18,000 pounds of halibut; this number increased to a peak of 143,000 pounds in 1984. A fish processing plant was later built by TDX and transferred to the IRA Council.

A modest tourism industry has been established on Saint Paul and shows potential for growth. However, constraints associated with limited hotel/restaurant capacity and quality, expense associated in getting to Saint Paul, and weather constraints on access have changed little during the last eight years.

Lack of U.S. Senate action on a fur seal protocol resulted in a ban on commercial harvest of fur seals; subsistence harvests were permitted in 1985 and 1986 with wages paid to participants by the IRA Council. Due to conflicts with other employment opportunities, it is uncertain whether subsistence harvests will continue.

Saint Paul is well suited for support of OCS activities for both the Navarin Basin and Saint George Lease sales. Pribilof Offshore Support Services constructed a support facility in 1984 at a cost of $10 million. This facility was operated in 1985 by a consortium of oil firms. The abrupt cessation of OCS activities and lease complications have led to the dismantlement of everything but the building shell.

Transition funds have financed construction of several capital projects, including a harbor project and bulk fuel storage. The resulting construction employment has had an impact on the economy.

Saint Paul is constructing a harbor for vessels drawing up to 24 feet. The first phase of the project, an 800 feet long breakwater, was completed in October, 1984 and destroyed by a storm in November. The U.S. Army Corps of Engineers redesigned and built the new breakwater in 1985. Subsequent construction includes an extension of the original breakwater by 900 feet, a secondary breakwater of 1,400 feet, and 500 additional feet of dock.

3.7.2.2 Population

Table 3.7-1 presents total population figures from 1960 through 1989. The population of Saint Paul increased significantly during the period of 1960 through 1980 (30 percent from 1960-70 and 21.1 percent from 1970-80). Part of this increase may be attributable to federally sponsored moves by Saint George residents to Saint Paul. According to city estimates another rapid increase occurred between 1980-81. Some out-migration due to employment and education opportunities, or marriage to non-residents has occurred, along with short-term inmigration in response to construction employment opportunities. In 1980, the population was predominantly Aleut (81.7 percent), and males outnumbered females by 56 percent to 44 percent. Since 1970, trends in age composition have included a percentage increase in individuals in older age brackets (60 years +), a percentage decline in the middle age brackets (35-59 years), and a decline in resident children under 10. While the number of employable individual has increased by only one, their percentage in the population has increased. Household size has remained relatively constant since 1980. The shortage of adequate housing and social and economic factors tended to keep families together in the same household, balanced by out-migration (Impact Assessment Inc., 1987).

Table 3.7-1: Historic Population
City of Saint Paul

Year	Population
1960	350
1970	355
1980	551
1981	591
1982	595
1983	610
1984	491
1985	466
1986	573
1987	466
1988	521
1989	586

Sources: Data for 1960 and 1970 from Impact Assessment Inc., 1987; data for 1980 through 1988 from Alaska Department of Labor, various years; 1989 data from Alaska Department of Community and Regional Affairs, 1989.

3.7.2.3 Employment

The dramatic social and economic changes that have affected Saint Paul are reflected in employment trends. Table 3.7-3 shows the Saint Paul employment history from 1980 through 1986. In 1980, NMFS accounted for 61 percent of the 149 full time equivalent (FTE) employment; employment by TDX Corporation, the Pribilof School District, the IRA Council, and the City of Saint Paul each ranged from approximately 9 to 6 percent of the FTE employment. By 1985, a peak construction and OCS activity year, FTE employment had increased to 240.5. Combined federal employment dropped to 4 percent of FTE employment; the largest employer was the City of Saint Paul, with 30 percent of the FTE employment. Other major employers included TDX Corporation (16 percent), the Pribilof School District (13 percent), and the IRA Council (12 percent). OCS and construction related employment both accounted for 8 percent of 1985 FTE employment. FTE employment dropped to 148.5 in 1986; the City was still the major employer (39 percent of FTE), but OCS employment ceased and total employment dropped in all sectors.

Table 3.7-2: 1980 Population Characteristics
City of Saint Paul

Age Group	Male	Female	Total
0-4	34	22	56
5-9	29	23	52
10-14	30	25	55
15-19	29	28	57
20-24	23	22	45
25-29	23	16	39
30-34	23	15	38
35-39	14	12	26
40-44	13	11	24
45-49	11	6	17
50-54	10	5	15
55-59	12	9	21
60-64	12	8	20
65+	10	9	19
Total	273	211	484

Source: Impact Assessment Inc., 1987

Boat equipment purchase and training of fishermen has been paid for by TDX Corporation. Employment in commercial fishing increased from 6 skippers and crew in 1982 to 29 in 1985. The IRA Council runs the fish processing plant and employed five seasonal workers plus a supervisor during the 1985 season.

3.7.2.4 Income

Table 3.7-4 shows the Priblof Islands census subarea payroll industry series data for the 4 quarters of 1988, which also includes Saint George. Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information. In the case of this census area, government accounts for 40 to 60% of wage employment; services also account for a major portion of wage employment in the 3rd and 4th quarters.

Table 3.7-3: Saint Paul Employment History: 1980-86

	Employment						
	1980 Total	1980 F.T.E	1982 Total	1985 Total	1985 F.T.E	1986 Total	1986 F.T.E
National Marine Fisheries Service	135	91	173	3	1	3	2
U.S. Post Office	2	1.5	4	2	2	2	2
National Oceanic & Atmospheric Administration.	2	2	3	3	1	3	1
Federal District Court				1	0.5	1	0.5
U.S. Fish and Wildlife Service			3	1	3	0.5	
Federal Aviation Administration.				3	3	3	0.5
U.S. Coast Guard	2	2	2	2	2	2	2
City of Saint Paul	10	8.5	11	72	72	75	58
IRA Community Council	14	14	28	64	28	20	20
Tanadgusix Corp.	45	10	19	66	39	36	22.5
Aleutian/Priblof Islands Association.		2	1	1	1	1	
Clinic	4	3.5	3	6	6	6	5
Public Safety	4	4	3.5	4	2		
Priblof School District	13	13	18	32	31	22	15
Tourism	2	2	1				
Airlines		2	5	4.5	6	4	
Restaurants	15	3.5	16	7	3	6	2.5
OCS			25	19			
Construction			50	19	24	10	
Other		21	5	2			
Total Employment	242	155	308	354.5	239	215	146.5

Source: Impact Assessment, Inc., 1987.

Table 3.7-4: Pribilof Islands Subarea
1988 Quarterly Employment

Year/ Quarter	Division	Businesses Reporting	Average Employees	Payroll	Average Wage
881	Manufacturing	3	n/d	n/d	n/d
881	Trans./Comm./Util.	1	n/d	n/d	n/d
881	Trade, Retail	2	n/d	n/d	n/d
881	F.I.R.E	2	n/d	n/d	n/d
881	Services	3	n/d	n/d	n/d
881	Govt., Federal	5	25	$126,042	$1,658
881	Govt., Local	5	133	$877,459	$2,194
881	Total	21	270	$1,585,347	$1,955
882	Manufacturing	3	n/d	n/d	n/d
882	Trans./Comm./Util.	1	n/d	n/d	n/d
882	Trade, Retail	2	n/d	n/d	n/d
882	F.I.R.E	2	n/d	n/d	n/d
882	Services	3	n/d	n/d	n/d
882	Govt., Federal	5	26	$149,650	$1,944
882	Govt., Local	5	136	$911,071	$2,239
882	Total	21	280	$1,694,340	$2,015
883	Manufacturing	3	30	$93,748	$1,030
883	Trans./Comm./Util.	1	n/d	n/d	n/d
883	Trade, Retail	2	n/d	n/d	n/d
883	F.I.R.E	2	n/d	n/d	n/d
883	Services	3	73	$355,478	$1,623
883	Govt., Federal	5	26	$150,445	$1,904
883	Govt., Local	5	119	$857,113	$2,401
883	Total	21	304	$1,768,683	$1,937
884	Manufacturing	2	n/d	n/d	n/d
884	Trans./Comm./Util.	1	n/d	n/d	n/d
884	Trade, Retail	2	n/d	n/d	n/d
884	F.I.R.E	2	n/d	n/d	n/d
884	Services	3	69	$374,276	$1,799
884	Govt., Federal	5	25	$129,298	$1,701
884	Govt., Local	5	133	$862,919	$2,157
884	Total	20	268	$1,586,954	$1,974

Source: Alaska Department of Labor, 1989.

n/d: non-disclosure.

3.7.2.5 Public Fiscal Characteristics

Revenues

Loans from the Saint Paul Island Trust Fund have increasingly become the major source of City revenue since 1982, accounting for over two thirds of revenue in 1987. Due mostly to this source, revenue increased from roughly $250,000 in 1982 to over $3,000,000 in 1985. Interest income has also increased but not as dramatically. The combination of revenue sharing and city sales tax account for less than 15 percent of total revenue.

Expenditures

Total City expenditures have followed similar patterns, increasing from approximately $550,000 in 1982 to nearly $2.5 million in 1985. In 1985, public works accounted for 35 percent of expenditures, closely followed by general city administration at 29 percent, and construction at 26 percent. These sectors have seen the most dramatic increase in total dollar value of expenditures.

3.7.3 Infrastructure Characteristics

3.7.3.1 Transportation Facilities

Airport Facilities

Saint Paul airport has a north-south oriented 5,075 foot long and 160 feet wide gravel runway. The airport is equipped with navigation aids, including runway lights, rotating and non-directional beacons, lighted wind sock, approach light system, visual approach indicator, and distance measuring equipment. Other facilities include a 8,000 gallon aviation gas storage tank and a small storage building. Cargo and passenger service is provided by Reeve Aleutian Air, Peninsula Airways, Northern Air Cargo, Markair, and FS Airways. Locally processed seafood is flown from Saint Paul to Anchorage at a rate of $0.25 per pound.

Port Facilities

The existing Village Cove dock is a reinforced concrete pier with a face length of 100 feet and water depths of up to 10 feet. It has a 10 ton capacity self-propelled skid crane. A second dock is located at East Landing which is used when weather conditions prevent use of the Village Cove Dock. Neither dock is capable of offloading passengers or cargo from medium and deep draft vessels.

Saint Paul is in the process of constructing a major harbor facility. Most of the Phase I breakwater has been completed, and dredging will be completed in the summer of 1990. About 400 feet fo concrete dock is available with 25 feet of water depth. Petroleum, electricity, and water service are available from the dock. Additional construction and dredging is underway, and future plans call for a small boat harbor and fish dock.

3.7.3.2 Marine Services

Western Pioneer, a subsidiary of Delta Western, and Tanadgusix Corporation operate a grocery store for the fleet. Other supplies and services are limited. Services can be provided in Saint Paul by contractors from Seattle, Anchorage, or Unalaska/Dutch Harbor.

Pacific Alaska Fuel Services, a subsidiary of Crowley Maritime, provides fuel, lubricants and oils and water at the port. Tank storage capacity is about 2 million gallons. Other companies provide fuel at-sea in the vicinity of the island, either with barges or vessels. The processor fleet that anchors off Saint Paul also provides fuel and supplies to its catcher fleet.

Vessels as large as 61 to 70 meters (200 to 220 feet) can be brought into the port, and there is discussion about providing a small pusher tug to assist larger vessels in entering the port (Dwight, 1990).

3.7.3.3 Utilities

Water and Sewer Services

Water and sewer is provided by the City of Saint Paul. Five wells provide water to three 200,000 gallon storage tanks. These wells are capable of producing 500,000 gallons of water/day; current demand does not exceed 80,000 gallons/day. Sewage improvements were recently completed to connect the sewage system to the ocean outfall. However, this system provides minimal treatment and could require improvements should large quantities of fish processing wastes be generated in the future. The combined residential water and sewer bills are $15 per month.

Solid Waste

The City operates a landfill 3.5 miles outside of town, and provides refuse collection twice a week. Residential refuse rate are $10/ month. This facility does not meet current state standards and requires modification or development of a new site. Requirements for vessel trash disposal under MARPOL V regulations could create further constraints.

Electricity

Saint Paul Electric Utility provides power to the community. Generating capacity is 12.5 MW, which is nearly double the peak demand of 6 MW. Residential electric rates are $.45/kwh, although Power Cost Equalization reduces these rates by $.156/kwh. Commercial rates to the 30 plus customer are variable.

Fuel

The city handles bulk fuel, purchase, storage, and distribution. Storage capacities are 600,000 gallons of diesel fuel, 100,000 of gasoline, and 25,000 gallons of aviation fuel (including the POSS site). Fuel prices are $1.45 per gallon for diesel/home heating fuel and $1.51 per gallon for gasoline.

3.7.3.4 Housing

Housing stock ranges from older concrete homes to new modular units. There are 131 single houses, 25 multi-family units and a 20 unit dormitory. Other temporary housing is available for tourism and construction crew uses. As of 1985, there was no vacant housing and demand for additional housing exists, estimated to total 69 new units by 1990 (Stephen R. Braund & Associates, 1986a).

3.7.3.5 Land Availability

Land for future residential and commercial development has been designated by the city. Use of these areas will require some redevelopment, but adequate land seems available for marine commercial and industrial uses.

3.7.4 Industry Characteristics

3.7.4.1 Harvesting Sector

Saint Paul Island is in the middle of the Bering Sea fishing grounds and surrounding waters yield enormous harvests of crab and groundfish. Almost all of this harvest is conducted by non-local boats which, until recently, have had minimal contact or impact on the community. This section focuses on those skiff-oriented fisheries in which Saint Paul residents residents participate. The larger crab and groundfish boats which operate in the vicinity of the island resemble the fleet characteristics of each gear type described in Section 2.

Major Fisheries

The residents of Saint Paul Island do not have a long history of commercial fishing, although subsistence fishing has been practiced throughout their occupation of the island. Only in the past 8 years have significant numbers of local residents participated in the commercial fishing industry. The Tanadgusix Corporation (TDX), the local Alaska Native Claims Settlement Act village corporation, started the local halibut fishery as a demonstration project to determine the potential for local residents to adopt commercial fishing technology and techniques. A fisheries consultant was hired in 1981 to train local people, and the Cooperative Extension Service of the University of Alaska offered a small boat training course in 1983 to further increase the skills and knowledge of potential fishermen. The effect of these training efforts can be seen in Table 3.7-5 which shows the number of commercial fishing permits held by Saint Paul residents during the past ten years. The number of permits has declined significantly from the peak of 44 permits in 1983. The number of permits held by each individual permit holder has ranged from 1.1 to 1.3 permits per person during the 1981 through 1987 time period.

Table 3.7-5: Number of Commercial Fishery Permits

Species	Year						
	1981	1982	1983	1984	1985	1986	1987
Halibut	21	0	44	31	20	13	10
Number of Individual Permit Holders	19	0	36	26	15	11	8

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Halibut has been the major focus of fishery development on Saint Paul Island, although there is some interest in harvesting other species. However, the limited size of the local boats make it difficult to economically harvest sufficient amounts of lower valued groundfish. The major impediment to additional harvest by Saint Paul fishermen is competition from the nonresident, large boat fleet. The International Pacific Halibut Commission established a 1985 quota of 600,000 pounds for all fishermen in Area 4C (See Figure 2.2-20), which includes the Pribilof Islands. Saint Paul fishermen caught

143,000 pounds (24 percent) of the quota (Stephen R. Braund & Associates, 1986). In 1986 the total catch in Area 4C was 686,000 pounds with local fishermen (Saint Paul and Saint George Islands) taking 121,000 pounds (18 percent) of the total (International Pacific Halibut Commission, 1987). The IPHC has since established trip limits and other restrictions in Area 4C for all vessels that are not domiciled in the Pribilof Islands. Table 3.7-6 shows the landing by pounds for Saint Paul fishermen since halibut fishing started in 1981.

The period of operations for Saint Paul fishermen is controlled by regulations promulgated by the IPHC for Area 4C. The 1985 halibut season opened in Area 4C in June and was closed in July after 24 fishing days. The 1986 season opened on June 1 and closed on July 6 after 18 fishing days.

TDX sponsored Korean hair crab fishing on an experimental basis in 1979 and 1980, and established markets and located stocks for a local day boat fishery. However, larger, non-local boats decimated the local stocks and abrogated the potential for this fishery (Stephen R. Braund & Associates, 1985).

Table 3.7-6: Halibut Landings
(thousands of pounds)

Species	1981	1982	1983	1984	1985	1986	1987
Halibut	8[a]	0	58[a]	141[a]	143	77	99

Sources: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Some data withheld to prevent disclosure.

Employment

Table 3.7-7 shows the estimated number of Saint Paul residents engaged in fishing by gear type. The table uses a crew estimate of 2 per longline permit rather than the 4.3 average for longliners estimated by Thomas (1986) because this skiff fishery is much smaller in scale.

Field work in the community (Stephen R. Braund & Associates, 1985) resulted in lower employment estimates. It is difficult to ascertain the basis for large differences between the employment estimates. However, it may be that a number of local residents have purchased permits in prior years in anticipation of commercial fishing for halibut, but have not participated during the season. The number of permit holders decreased each year from 1983 to 1985 and by the latter year had begun to approach the field work estimates. This may reflect the diffusion of information among residents about the fisheries, and a more realistic expectation of the amount of money that can be made from fishing.

Income

Table 3.7-8 presents estimates of ex-vessel value from CFEC files. Even though the number of permit holders and landings have decreased in recent years total ex-vessel value has increased. The average permit holder would have made only $1,300 in 1983, but almost $15,000 in 1987.

Table 3.7-7: Estimated Employment in Harvesting Sector

	Year						
Gear Type	1981	1982	1983	1984	1985	1986	1987
Longline	10	0	26	32	28	14	10
Jigs	32	0	62	30	12	12	10
Field Work	[a]	6	12	29	29	[a]	[a]

Sources: Data from Alaska Commercial Fisheries Entry Commission, 1989;; Stephen R. Braund & Associates, 1985; and Thomas, 1986.

[a]Not available.

Table 3.7-8 Total Ex-Vessel Value
(thousands of $)

Species	Year						
	1981	1982	1983	1984	1985	1986	1987
Halibut	8[a]	0[a]	47[a]	100[a]	100	114	118

Sources: National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987.

[a]Data for one gear type withheld to ensure confidentiality.

Boat and Gear Characteristics

The first boats used for commercial fishing on Saint Paul Island were purchased by TDX in 1981 for training local residents. These boats were 24 foot fiberglass skiffs outfitted with LORAN and depth sounders. In 1984, following the University of Alaska training program, a number of new fishermen and vessels entered the fishery. The IRA Council guaranteed vessel loans to aid fishermen in purchasing two 32 foot aluminum boats, two 26 foot aluminum boats, and three 24 foot fiberglass covered plywood boats. All of the vessels were equipped with LORAN, depth sounders, and hydraulic gear to pull longlines, and the 26 and 32 foot boats were also equipped with radar (Stephen R. Braund & Associates, 1986). Information on vessel size is provided by gear, areas, and species categories and it is difficult to reliably adjust the figures to shows size data for the total number of vessels in the resident fleet. Table 3.7-9 shows vessel size distribution for the longline and jig fleet. Stephen R. Braund & Associates's findings and these data suggest that the same boats are used for both gear types.

Table 3.7-10 shows the number of permits by gear type held by Saint Paul residents. The number of permits for all gear types has declined since 1983 with the largest decrease seen in the jig gear type.

Table 3.7-9: Resident Fishing Fleet

Size in Feet	Size in Meters	1981	1982	1983	1984	1985	1986	1987
Longline								
0-19	0-6.0	0	0	1	1	2	1	1
20-39	6.1-12.1	2	0	7	7	7	5	4
Jigs								
0-19	0-6.0	9	0	8	5	2	3	3
20-39	6.1-12.1	0	0	5	4	2	2	2

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.7-11 presents data on total landings and ex-vessel values for Saint Paul permit holders. Average revenues for jig permits ranged from $500 to $900 between 1981 and 1986, and peaked at $1,800 in 1987. Ex-vessel values for longline permit holders have ranged from $1,540 in 1983 to $21,800 in 1987.

Out of the total revenues received by each permit holder, boat payments, expenses for insurance, gear, equipment, and bait, and crew shares must be paid. The remainder, if any, goes to the permit holder as profit and return on investment. It is likely that most Saint Paul fishermen are in a situation of break-even or small profits. In 1984, all but one of the boat owners made boat payments, but in 1985 only two were able to meet this obligation (Stephen R. Braund & Associates, 1985). Higher prices and larger landings per permit have resulted in relatively good years for the remaining fishermen.

Table 3.7-10: Type of Gear
(Number of Permits)

Type	1981	1982	1983	1984	1985	1986	1987
Halibut							
Hand Line	0	0	1	1	0	0	0
Longline	5	0	13	16	14	7	5
Jigs	16	0	30	14	6	6	5
Total	21	0	44	31	20	13	10

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

Table 3.7-11: Landings and Ex-Vessel by Gear
(in thousands of pounds and $)

	1981	1982	1983	1984	1985	1986	1987
Hand Line							
Landings	0	0	a	a	0	0	0
Value	$0	$0	a	a	$0	$0	$0
Longline							
Landings	a	0	20	132	137	74	91
Value	a	$0	$20	$93	$96	$109	$109
Jigs							
Landings	8	0	38	9	6	3	7
Value	$8	$0	$27	$8	$4	$5	$9

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Not disclosed.

Use of Community Infrastructure

Saint Paul is in the process of constructing a major harbor facility. Approximately 800 feet of the eventual 1800 feet of breakwater have been constructed, along with 300 feet concrete dock with 24 feet of water depth. Additional funds have been obtained from the State of Alaska and the Federal government for dredging and further expansion on the dock.

At present, local vessels must be pulled from the water immediately after returning from fishing to prevent damage from storms and surf which can arise quickly. The present Saint Paul fishing fleet is comprised of small boats up to 32 feet that can be lifted by a mobile crane and launched or pulled at the Village Cove Dock, or the East Landing when weather conditions prevent use of the Village Cove dock. After completion of the breakwater and dock facilities the local boats may be able to remain in the water although swells and storm surges may require that they be hauled out at times.

Because of IPHC regulations, Saint Paul fishermen have the opportunity to provide fresh halibut for a considerable length of time during the summer months. The saint Paul airport plays an important role in the ability of local fishermen to benefit from the higher prices paid for fresh halibut.

The airport is also used for crew changes and medical evacuation for the larger vessels that operate in the Bering Sea.

The development of additional processing plants will bring lower transportation rates for resources harvested by local fishermen. The remote location of the community has resulted in relatively high transportation costs with subsequently lower ex-vessel prices to resident fishermen. Only high prices associated with fresh high-value species could absorb these costs. Trampers which now call at St. Paul to move processed crab to Japna and other destinations offer access to markets the local fleet could not reach in prior years, and the potential for selling larger quantities of lower valued species.

3.7.4.2 Processing Sector

Saint Paul Island is a major processing center in the Bering Sea. However, most of this effort occurs on processing ships which are anchored offshore of the island. At times up to a dozen ships may be anchored in the lee of the island. This section discusses the onshore processing facilities because the only interaction the processing ships have with the community occurs through their limited demand for support services.

TDX Corporation started fish processing on the island in response to a need for a facility when the halibut demonstration project started in 1981. TDX sold the plant to the IRA Council in 1984 which operated it through 1988. According to field interviews (Stephen R. Braund & Associates, 1986), factors such as the short fishing season and high transportation costs to move fish to markets in Anchorage resulted in an unprofitable operation.

Pribilof Island Processors handles crab and finfish and Saint Paul Seafoods is developing a surimi and fishmeal plant which will be completed in the fall of 1990.

Plant Characteristics

Pribilof Island Processors (PIP) opened in January, 1989 to process opilio and bairdi crab. The plant also processes Pacific cod, and halibut for local fishermen only. The plant is located within a surplus government warehouse which was used for storing fur seal pelts

Saint Paul Island Processors is constructing a surimi and fishmeal plant in the building formerly used by Exxon during exploration activities in the Bering Sea in the mid-1980's. The location of this plant will necessitate trucking pollock from the dock to the plant, and then trucking the product back to the dock for transfer to a tramper or barge.

Employment

The IRA halibut processing operation employed one supervisor and 5 processing workers, 16 to 17 years of age, during the limited days of the 1985 halibut season. All of these persons were local residents (Stephen R. Braund & Associates, 1985).

In contrast, PIP employs about 200 people during the crab season (January through April), with 135 processing line employees. About one-quarter of the employees are local residents of Saint Paul. After crab season the number of processing line employees drops from 135 to less than 30. This level of staff can be supplied by local residents.

Income

In 1985 processing workers were paid $9.00 per hour. Total 1985 processing wages were estimated at $15,120, with an average wage of approximately $2,500 (Stephen R. Braund & Associates, 1986). Wage information was not available from PIP.

Use of Community Infrastructure

The City of Saint Paul provides power and water service for fish processing. Employees are presently housed in the hotel annex, and in several trailer camps on the island which were developed for OCS activities. Additional housing for processing workers will need to be built before Saint Paul Seafoods begins operations with an additional 125 employees.

City harbor facilities are used for transferring the landed halibut to processing facilities. Processed halibut is then flown out of the Saint Paul airport.

3.7.4.3 Support Sector

Support services for the fishing industry are extremely limited in Saint Paul. The IRA Council runs the cooperative marine shop where local fishermen can purchase fishing gear and equipment. According to a 1985 survey (Stephen R. Braund & Associates, 1985), approximately half of the local fishermen purchase stores at the marine store and the remainder purchase gear and supplies from Anchorage or Seattle. According to this same source, the IRA Council was completing the conversion of Point Warehouse into a ships chandlery and boat repair in 1985.

Fuel storage has been expanded to 2 million gallons to provide fuel for crabber, trawlers, and other large boats in the Bering Sea fleet.

The Saint Paul Overall Economic Development Plan (OEDP) Committee envisions that Saint Paul Island could become a marine support center, and have plans for a number of services including emergency repair, ship chandlery, provisioning, crab pot storage, ice and water supply, emergency medical services, communications, cold storage, and mechanical repair (Stephen R. Braund & Associates, 1986). To some degree, these plans have become reality.

3.8 Unalakleet

3.8.1 Description/Setting

Unalakleet is a coastal community located at the mouth of the Unalakleet River on the eastern end of Norton Sound, 150 miles southeast of Nome. It is one of 10 communities on the shores of Norton Sound between the mouth of the Yukon River and Nome and, in addition to being the second largest community in the region, serves as a subregional center for eastern and southern Norton Sound communities. Unalakleet is incorporated as a second class city.

The coastal Nulato Hills rise to elevations of 500 feet about three to five miles northeast of Unalakleet, and average 100 to 200 feet in areas further inland. The climate has two distinct seasonal characteristics: a cool, wet summer typical of maritime climates and a dry cold winter typical of inland continental regimes. Norton Sound is ice covered during winter months; breakup on the Sound occurs after the rivers breaks up in late May. Climatic factors such as cold, snowless winters (affecting mortality of rearing and overwintering fish) and breakup of Norton Sound have significantly influenced commercial fishing during recent years.

Unalakleet is a traditional subsistence-oriented village, with diverse marine and upland subsistence resources. Based on archaeological evidence, human habitation of the Unalakleet area dates back to at least 200 B.C. (Kevin Waring & Associates, 1985). The community is located along a boundary dividing Inupiaq and Central Yupik linguistic groups. Research of subsistence activities indicate patterns of subsistence use followed for hundreds if not thousands of years.

In many ways, however, the economy of Unalakleet is unlike its neighboring communities. Residents are relatively well-educated and have played prominent leadership and professional roles in Norton Sound's Native and public affairs. The establishment of the Covenant School, wartime construction of an airport and development as a distribution center, and the transfer of administration offices of the Bering Straits Rural Education Attendance Area (REAA) from Nome have all contributed to Unalakleet emergence as the regional governmental subcenter for eastern Norton Sound. Unalakleet plays a significant role in support of salmon and herring fisheries in eastern Norton Sound.

3.8.2 Socioeconomic Characteristics

3.8.2.1 Local Economy

As previously mentioned, the mixed economy of Unalakleet includes elements of traditional subsistence activities, wage employment by various units of local government, and commercial fishing. Subsistence is still a persistent element of community life and part of the community's cultural identity.

The public sector dominates full-time employment; a 1982 survey of Unalakleet employment showed that 70 percent of full time employment was provided by the public sector. Commercial fishing also contributes to the cash economy. While perhaps not as lucrative as fisheries to the south of Norton Sound, the estimated gross value of all salmon species caught in Norton Sound to Unalakleet commercial fishermen has ranged from $182,000 to $428,000 since 1981. The herring fishery has increased in both value and popularity over recent years reaching an ex-vessel value in excess of $834,000 for resident fishermen in 1988.

3.8.2.2 Population

Like other traditional Native communities, the population of Unalakleet has historically fluctuated in response to cycles in availability of subsistence resources, outbreaks of disease, and education, trade, and employment opportunities. Improved environmental health, lowered infant mortality and better economic conditions have contributed to recent population trends.

Table 3. presents the total population of Unalakleet over the period of 1880-1987. It includes decennial U.S. Census data through 1980, and State of Alaska population estimates.

Table 3.8-1: Historic Population
City of Unalakleet

Year	Population
1910	247
1930	261
1940	NA
1950	469
1960	574
1970	434
1980	623
1981	672
1982	604
1983	654
1984	745
1985	759
1986	769
1987	a
1988	740
1989	740

Sources: Data for 1910 through 1970 from Kevin Waring & Associates, 1985; data for 1980 through 1988 from Alaska Department of Labor, various years; 1989 data from Alaska Department of Community and Regional Affairs, 1989.

[a]Not available.

Table 3.8-2 shows a comparison of 1970 and 1980 population composition by age and sex. A rise in median age from 17.8 to 22.8 is attributed to factors such as a decline in birth rate, an influx of adult newcomers and returning residents, and a decrease in young adults leaving Unalakleet. In recent years, Unalakleet has gained more new residents from net migration than natural increase, and leakage of young adults is less than in most rural communities. Improved local economic conditions in the first half of the 1980's may partially account for this situation. However, it appears that Unalakleet's resident population is now stabilizing at a new equilibrium which will lead to a slower rate of natural increase (Kevin Waring & Associates, 1985). In addition, the increase in the absolute and relative size of the working population means than the potential workforce is growing faster than the population as a whole, and that if employment growth does not keep pace, the rate of employment and underemployment is likely to rise.

Table 3.8-2: 1980 Population Characteristics
City of Unalakleet

Age Group	Male No.	Male %	Female No.	Female %	Total No.	Total %
0-4	36	10.8%	31	10.7%	67	10.8%
5-9	29	8.7%	34	11.7%	63	10.1%
10-14	33	9.9%	28	9.7%	61	9.8%
15-19	44	13.2%	40	13.8%	84	13.5%
20-24	28	8.4%	35	12.1%	63	10.1%
25-34	64	19.2%	45	15.5%	109	17.5%
35-44	43	12.9%	26	9.0%	69	11.1%
45-54	21	6.3%	17	5.9%	38	6.1%
55-64	19	5.7%	19	6.6%	38	6.1%
65+	16	4.8%	15	5.2%	31	5.0%
Total	333	100.0%	290	100.0%	623	100.0%

Source: Kevin Waring & Associates, 1985.

Historically, Unalakleet has not experienced a seasonal shift in population from in-migration related to fishing industry employment. This is due to the relatively small size of the commercial salmon fishery (a peak of 74 permits in 1984), the tendency to employ crew from within the community or for two permit holders to fish together, and extremely limited fish processing employment opportunities, particularly in recent years. However, the increasing popularity of the Norton Sound herring fishery has resulted in a short term but significant increase in population. Unalakleet is the staging area for the eastern Norton Sound herring fishery. An unprecedented 563 boats and 10 processors participated in the fishery in 1986. In their application for fish tax revenue based on fishing industry impact to the community, the City of Unalakleet estimated that an additional 500 people came to the city during the 1986 herring season. This represents an 65 percent increase in the 1986 population of 769.

3.8.2.3 Employment

The public sector is the dominant source of employment in the region. Table 3.8-3 presents Nome census area employment industry series data for the 4 quarters of 1986. Government as a whole accounted for an average 52 percent of the census area employment, with local government representing 39 percent. An employment survey conducted specifically for Unalakleet in 1982 suggests that the community is even more dependent on public sector employment than the region as a whole (Kevin Waring & Associates, 1985). Nearly 70 percent of all full time wage employment was with governmental agencies or government-funded non-profit service organizations. At that time schools and school district administration accounted for more than half of the public sector employment. The City of Unalakleet has provided significant levels of part-time construction employment on capital project construction through force accounting. Private sector employment represented 48 percent of full time employment in the region, and 30 percent in Unalakleet. Among the major private sector employers are Unalakleet Village Corporation and the airline industry. A joint construction venture between Unalakleet Native Corporation and Neeser Construction in Anchorage has also provided construction employment.

Table 3.8-4 presents a detailed breakdown of full-time employment in Unalakleet in 1982. Table 3.8-5 shows the Saint Michael census subarea payroll industry series data for the 4 quarters of 1988, which also includes Saint Michael and Stebbins. Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information. Government, retail trade, and services comprise the dominant sectors of wage employment.

Table 3.8-3: 1986 Area Employment Series Nome Census Subarea

Industrial Classification	1st Quarter Employment		2nd Quarter Employment		3rd Quarter Employment		4th Quarter Employment	
	Average	Percent of	Average	Percent of	Average	Percent of	Average	Percent of
Mining	32	1.23%	95	3.68%	148	5.39%	82	3.06%
Construction	16	0.62%	15	0.58%	66	2.41%	41	1.53%
Manufacturing	a							
Transportation, Utilities & Communication	219	8.44%	231	8.95%	253	9.22%	237	8.84%
Wholesale Trade	a							
Retail Trade	297	11.45%	320	12.39%	374	13.63%	318	11.86%
Finance, Insurance & Real Estate	71	2.74%	77	2.98%	77	2.81%	78	2.91%
Services	598	23.04%	607	23.51%	581	21.17%	546	20.36%
Government								
Federal	99	3.82%	101	3.91%	101	3.68%	94	3.50%
State	236	9.09%	251	9.72%	247	9.00%	235	8.76%
Local	1027	39.58%	885	34.28%	897	32.69%	1048	39.08%
Miscellaneous	a						3	0.00%
Total	2595		2582		2744		2682	

Source: Alaska Department of Labor, 1987.

[a]Not disclosed.

Table 3.8-4: Full Time Employment, Unalakleet, 1982

Employer	Total Employees	Non-Native Employees
Public Sector		
IRA Council	3	
City Council	16	6
Unalakleet Valley EC	5	2
Bering Straits School District	33	20
Degnan School	30	14
Covenant School	16	16
Headstart	4	
Bering Straits CRSA	1	
State of Alaska		
DOT/PF	3	1
HSS	6	1
Other	5	1
Health Clinic	3	1
Post Office	3	
Subtotal	128	62
Private		
Unalakleet Village Corp.	22	1
Wien Air Alaska	7	1
Ryan Air Service	13	6
Alaska Commercial Company	8	
Rendezvous Club	4	2
Musk Ox Farm	2	2
Subtotal	56	12
Total Full Time Employment	184	74

Source: Kevin Waring & Associates, 1985

Table 3.8-5 Saint Michael Subarea
1988 Quarterly Employment

Year Quarter	Division	Businesses Reporting	Average Employees	Payroll	Average Wage
881	Mining	1	n/d	n/d	n/d
881	Construction	1	n/d	n/d	n/d
881	Trans./Comm./Util.	3	120	$540,768	$1,498
881	Trade, Retail	4	42	$162,120	$1,297
881	F.I.R.E	2	n/d	n/d	n/d
881	Services	8	34	$153,558	$1,520
881	Govt., Federal	2	4	$28,593	$2,383
881	Govt., Local	4	53	$139,068	$869
881	Total	25	262	$1,052,553	$1,337
882	Mining	1	n/d	n/d	n/d
882	Construction	1	n/d	n/d	n/d
882	Trans./Comm./Util.	2	n/d	n/d	n/d
882	Trade, Retail	4	47	$159,084	$1,136
882	F.I.R.E	2	n/d	n/d	n/d
882	Services	8	19	$32,074	$553
882	Govt., Federal	2	4	$33,997	$2,833
882	Govt., Local	4	72	$158,599	$738
882	Total	24	167	$472,448	$945
883	Mining	1	n/d	n/d	n/d
883	Construction	1	n/d	n/d	n/d
883	Trans./Comm./Util.	2	n/d	n/d	n/d
883	Trade, Retail	4	65	$180,849	$927
883	F.I.R.E	2	n/d	n/d	n/d
883	Services	8	18	$22,654	$427
883	Govt., Federal	2	4	$31,876	$2,656
883	Govt., Local	4	77	$210,228	$914
883	Total	24	234	$775,107	$1,106
884	Mining	1	n/d	n/d	n/d
884	Construction	1	n/d	n/d	n/d
884	Trans./Comm./Util.	2	n/d	n/d	n/d
884	Trade, Retail	4	57	$213,186	$1,247
884	F.I.R.E	2	n/d	n/d	n/d
884	Services	8	39	$57,932	$495
884	Govt., Federal	2	4	$28,489	$2,374
884	Govt., Local	4	83	$202,286	$816
884	Total	24	272	$1,009,217	$1,235

Source: Alaska Department of Labor, 1989

n/d: non-disclosure

Commercial fishing is a significant source of non-wage employment in the community. Commercial fishing employment can be projected from the number of salmon and herring permit holders and estimates of crew size. Local participation would potentially generate maximum crew employment of about 140 local residents for salmon and 270 local residents for herring. There is also an increasing trend for two permit holders fishing together and eliminating the need for crew. It should be noted that many salmon and herring permit holders are also employed in full-time jobs; one fisherman estimated this number at 20.

Fish processing employment has never been significant in Unalakleet. When the local fish processing cooperative (Norton Sound Fishermen's Cooperative) was operating a few years ago, up to 20 local people were employed. However, financial and health permit problems have kept the plant from operating over the last several years. Currently, herring are processed offshore, and salmon are iced down and flown out to Anchorage by representatives of two processing companies. Two local residents were employed in 1987 to oversee purchase and shipment of salmon.

3.8.2.4 Income

The average per capita income for Unalakleet residents in 1983 was $6,125. While specific community wage income data are not available for Unalakleet, 1986 payroll data for the Nome Census Subarea is presented as representative in Table 3.8-6.

3.8.2.5 Public Fiscal Characteristics

Table 3.8-6 summarizes revenue and expenditure statements for the City of Unalakleet over the last four fiscal years. The major sources of revenue have traditionally been a 3 percent local sales tax and state and federal revenue sharing. The volume of revenue generated by the sales tax has been going up, increasing by 50 percent from FY1983 to FY1987. However federal revenue sharing has drastically declined by 58 percent over the same period; state revenue sharing and capital project grants have also declined over the last two years. General revenue sharing and municipal assistance has declined 32 percent and 38 percent from FY1983 to FY1987. These declines have significantly outweighed the increase in sales tax revenues, resulting in reduction in services provided by the city. Two other notable sources of revenue in FY1987 are $538,360 in construction grants and the $8,322 received from the state in the first year of a pilot fish tax revenue sharing program for municipalities that are impacted by fishing activities but have no ability to generate offsetting revenues by taxing fish processing.

Table 3.8-6: 1986 Area Payroll Series Nome Census Subarea

Industrial Classification	1st Quarter Avg. Wage	1st Quarter Total Payroll	2nd Quarter Avg. Wage	2nd Quarter Total Payroll	3rd Quarter Avg. Wage	3rd Quarter Total Payroll	4th Quarter Avg. Wage	4th Quarter Total Payroll
Mining	$2.6	$250	$3.0	$860	$4.3	$1,898	$4.0	$996
Construction	$2.0	$99	$2.4	$105	$3.4	$686	$3.2	$386
Manufacturing	a							
Transportation, Utilities & Communication	$2.0	$1,285	$2.4	$1,637	$2.3	$1,771	$2.5	$1,750
Wholesale Trade		a						
Retail Trade	$1.3	$1,114	$1.2	$1,185	$1.2	$1,339	$1.2	$1,129
Finance, Insurance & Retail Trade	$1.7	$369	$1.7	$399	$1.5	$349	$1.5	$349
Services	$1.5	$2,761	$1.6	$2,917	$1.6	$2,870	$1.8	$2,925
Government								
Federal	$2.2	$649	$2.5	$756	$2.8	$855	$2.7	$770
State	$3.4	$2,411	$3.4	$2,543	$3.8	$2,811	$3.6	$2,561
Local	$1.7	$5,374	$2.1	$6,108	$1.5	$3,961	1.85	5,643
Miscellaneous							$855	
Total	$14,329		$16,535		$16,575		$16,548	

Source: Alaska Department of Labor, 1987.

[a]Not disclosed.

Table 3.8-7: Summary of Revenues and Expenditures
City of Unalakleet

	FY88	FY87	FY86	FY85	FY84	FY83
Revenues						
Sales Tax	126742		134779		83870	99685
Fed. Revenue Sharing	34035		54795		81534	75050
State Revenue Sharing	329576		708251			
general	54214				79704	51075
muni assistance	82051				132263	78038
fish tax	8322					
program grants (cmp)	183715				154452	
construction grants	538360		1528263			
other	1274				9650	65664
Service Charges	141456		121409			
bingo	21280					
water	117836					
electric	322					
telephone	183					
other	705					
contract	1130					
Other Charges						
building rental/sale	24727				25626	20000
rents and royalties	36713				92513	
fines	260				270	360
misc.(includes equipment rent	14338				14000	52108
Total sum	1717239				673882	441980
Total actual	1252421					
cash	288771					
total	1541192					
Expenditures						
Administrative	98534		517675		321451	168545
Transportation						
roads bridges sidewalks	82281		94905		15000	5088
Public Safety	131478		154453			
police	128978				239314	230929
fire	2500				31930	11968
health						16999
Recreation	4003				40451	23435
Utilities						
water	282776		134168			
electric	4647					
other					109111	127107
Other			40041			
retirement	18882					
telephone	10285					
payroll taxes	34883					
construction grants	440212		1549707			
search and rescue	30073					
enterprises	33899					
insurance	60952					
donations	1418					
intergovt transfer	184321					
equipment						14947
building purchase						18276
debt service	31662					
Total sum	1550122				757257	617294
Total actual	1452876					
Balance	88316				-83375	

Source: City of Unalakleet, 1988.

Major expenditures not involving the transfer of inter-governmental revenues include administration, public safety, transportation and utilities. The city has attempted to cut levels of service in response to decreasing revenues: For example, the net decrease between FY1983 and FY1987 was 69 percent for administration and 52 percent for public safety. Other categories of expenditures have increased with recent capital improvement programs and the associated operations and maintenance costs. Increases in expenditures between FY1983 and FY1987 were 448 percent for transportation and 163 percent for utilities. With the current economic conditions, the city is experiencing difficulties in collecting service charges from residents: 1987 revenue from water service charges is only 42 percent of the expenditures.

3.8.3 Infrastructure Characteristics

3.8.3.1 Transportation Facilities

Airport

Unalakleet has a north-south gravel runway 6000 feet long and 150 feet wide and a east-west cross-wind runway 1700 feet long by 150 feet wide. Runways have medium intensity runway lighting, and VORTAC, non-directional beacon, distance measuring equipment and localized navigation aids are present. The airport includes a small terminal currently being operated by Ryan Air, a Ryan Air complex, a Northern Air Cargo terminal, and a 300 by 400 foot gravel apron with 12 tiedowns for aircraft. Daily passenger service is being provided by Ryan Air; both Ryan Air and Northern Air Cargo provide freight service. Bering Air and Hermans provide air charter services out of Unalakleet.

The airport plays dominant role in transport of salmon caught by local fishermen. With the Norton Sound Fishermen's Cooperative processing plant limited to icing down fish, fish are purchased by representatives of two Anchorage processing plants, iced down and flown to Anchorage by Northern Air Cargo. One of these individuals uses a Cessna 207 to buy fish in the outlying communities of Shaktoolik and Koyuk and transport them to Unalakleet, where they are shipped out with the Norton Sound Subdistrict 6 catch.

Port Facilities

Port facilities in Unalakleet are extremely limited. In 1985, the city constructed a dock facility at the south end of town by the mouth of the Unalakleet River, using funds from state construction grants. The dock is of sheet pile construction with gravel fill behind it; it has a dock face of approximately 15 feet high and a length of 60 feet. The Norton Sound Fishermen's Cooperative processing plant is located behind the dock. Some supplies come over the dock; a barge offloading area further up the Kouwegok Slough is used by North Star, Black Navigation, and other barge companies to offload shipments of fuel oil, building materials, boats, and other equipment and supplies for local residents, businesses and public agencies. There are no small boat harbor facilities. Residents pull their boats up on the banks of the Kouwegok Slough during open water where they are relatively well-protected, other than storm generated tides and flooding. Boats are usually stored in yards or other areas during the winter. In previous years, the City has included a Beach Reclamation Project for Small Boat Landing on the Kouwegok Slough, with an estimated budget of $200,000.

The city dock has supported the fishing industry since its construction. The two fish buyers operating in Unalakleet purchase local fish at the city dock, where they are iced down before being brought to the airport for shipment to Anchorage. Buyers paid a $648 service charge to the city for use of the dock in 1987.

3.8.3.2 Marine Services

Marine-related services in Unalakleet are limited, and consist of fuel sales, engine and boat repair, and aluminum boat construction. Fuel is sold by the Unalakleet Native Corporation and Alaska Commercial store. The 1985 price of fuel oil was $2.05 per gallon. Both stores provide engine repair services. One local resident has been building aluminum boats in recent years for sale to other residents. Aluminum plate is shipped in, and the welded construction of the boats is done locally. Approximately 2 - 3 boats are built annually.

3.8.3.3 Utilities

Water and Sewer

Service is provided by the City of Unalakleet. The water supply system was built by the Public Health Service and transferred to the city. Most houses in the community are connected. In recent years, the system was subject to freeze-up and resulted in water shortages. Some of the system has been rebuilt, but there are still substantial leakage problems in other parts of the system. More capital improvements are scheduled. Combined water/sewer rates are $38 per month for residential and $50 per month for commercial; senior citizens are charged $28 per month. Under current economic conditions, the city is experiencing troubles with collection of service charges. This problem, plus increased operations and maintenance costs for the system result in 1987 revenue from water service charges totalling only 42 percent of the water system expenditures.

The sewer system was also constructed by the Public Health Service. It consists of 7,300 feet of sewer main, 7,200 feet of service lines, three lift stations and a 2.2 acre sewage lagoon. Most houses and commercial buildings are hooked up to the system. The Norton Sound Fishermen's Cooperative plant receives water from the city but has not been hooked up to the sewer system, and when in operation was dumping processing wastes directly into the Unalakleet River. The city is experiencing problems with the capacity of the sewage lagoon being inadequate for current volumes. Design and construction of an expanded lagoon is being pursued with a state grant.

Solid Waste Disposal

The city maintains a dumpsite at the east side of the road north of the airport. Residents transport their own wastes to the dumpsite or a private carrier provides weekly service for $15 per month. There is no room left in the dump, and the city is experiencing problems maintaining it as a landfill and windblown trash is a problem. It needs relocation or improvement.

Electricity

The Unalakleet Valley Electric Cooperative (UVEC), associated with Matanuska Electric Association, supplies power to 258 customers in Unalakleet. Facilities include four diesel generators and a 185,000 gallon bulk fuel storage tank. Peak demand in 1984 was 600KW. With recent single and multi-family residential construction, and 15 HUD houses slated for next year, demand will be approaching capacity (Knisely, 1987). In 1984, the base residential rate was $.3865/KWH for the first 50 KWH, and $9.66 monthly for the next 50 KWH. The average monthly residential bill in wintertime was $60 per month. Monthly commercial rates were $19.33/first 50KWH, $12.89/next KWH, and $38.64/next 200 KWH. The monthly commercial bill averages $75.00 (Kevin Waring & Associates, 1985).

3.8.3.4 Housing

There are no reliable current estimates of housing. A 1982 city survey indicated 217 households, up 37 percent from 1980. Residential construction during 1987 was estimated at 4 single family units, and 15 HUD units were scheduled for construction in 1988. Multi-family units consist of a 24-plex, an 8-plex, a 5-plex and a 4-plex. Rent averages $650 per month. The quality of the housing stock is generally fair to poor. With recent economic and population growth, demand for housing has been increasing and exceeds supply. Limited room for community expansion and complications with land ownership and ANCSA 14(c)3 transfers further aggravate the situation. The 1985 Comprehensive Plan forecast a cumulative housing demand of 108 units by the year 2000.

3.8.3.5 Land Availability

As indicated in the housing discussion above, land availability for community expansion is a distinct problem. Growth has utilized all of the easily available land; the community is hemmed in by Norton Sound to the west, the Unalakleet River and Kouwegok Slough to the south and east, and the airport to the north. Areas not built up face natural hazard (flooding) and regulatory constraints (wetlands). FAA clear zone requirements limit use of "vacant" land adjacent to the airport. The city has evaluated alternatives from moving the airport further north to leapfrogging the airport and expanding to the north. Complications with land ownership include substantial Native allotment holdings surrounding the city and slow progress ANCSA 14(c)3 reconveyance of lands to the city.

3.8.4 Industry Characteristics

3.8.4.1 Harvesting Sector

Major Fisheries

As Table 3.8-8 demonstrates, salmon and herring fishing are the predominant fishing activity of Unalakleet residents with salmon permits accounting for about 30 percent of the total permits held by local fishermen in 1988, and herring permits for about 70 percent. The number of salmon permits has remained relatively stable since 1980, while the number of herring permits has cycled from a high of 98 permits in 1981 to a low of 70 permits in 1984, and then to a peak of 136 permits in 1988. Almost all of these permits are held in the Norton Sound management area. Table 3.8-9 shows the number and type of permits in each management area held by local fishermen since 1981.

The total number of salmon permits held by Unalakleet residents is approximately the same as the number of permits held in 1981. The geographic distribution has changed with the number of Lower Yukon River permits dropping from 14 to 7. It is likely that some of these permit holders sold their permits, bought Norton sound permits, and represent part of the increase in Norton Sound permits held by Unalakleet residents.

Table 3.8-10 shows the landings of Norton Sound and Lower Yukon River salmon and Norton Sound herring for Unalakleet fishermen. Other areas are omitted due to non-disclosure rules.

Table 3.8-8: Number of Commercial Fishery Permits by Species

Type	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Roe Herring	85	65	78	37	63	74	95	99
Salmon	76	73	70	73	69	68	70	73
Herring Spawn	13	32	0	18	0	0	0	1
Food/Bait Herring	0	4	11	15	15	14	27	36
Halibut	0	0	0	0	1	0	0	0
Total	174	174	160	141	148	156	192	209

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.8-9: Number of Permits by Species and Management Area

Species/Area	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Bristol Bay	3	3	3	3	3	3	4	3
Lower Yukon	14	15	10	9	9	8	7	7
Norton Sound	59	55	57	61	57	57	59	63
Roe Herring								
Norton Sound	85	65	78	37	63	74	95	99
Herring Spawn								
Norton Sound	13	32	0	18	1	0	0	1
Food/Bait Herring								
Norton Sound	0	4	11	13	15	14	27	36
Other	0	0	0	0	1	0	0	0
Total	174	174	160	141	148	156	192	209

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Table 3.8-10: Landings By Species
(millions of pounds)

Species	1981	1982	1983	1984	1985	1986	1987	1988 [a]
	Year							
Salmon	1.2	1.1	1.2	0.8	0.6	0.4	0.4	0.6
Herring	1.4	1.7	2.0	1.0	0.1	0.2	0.1	0.2

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Employment

This section addresses employment levels in the harvesting sector for the community of Unalakleet. Table 3.8-11 presents estimates of employment by fishery for the 1981 through 1988 time period. The table focuses upon employment generated by Unalakleet permit holders. Crew factors estimated by Thomas (1986) for the single year of 1985 are used for the entire 10 year time period since comparable crew factor estimates are not available for previous years.

Table 3.8-11: Harvest Sector Resident Employment
(By Species)

Type	1981	1982	1983	1984	1985	1986	1987	1988 [a]
	Year							
Salmon	133	124	128	137	128	128	133	141
Herring	194	198	178	136	156	176	236	272

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Income

The total value of the Unalakleet subdistrict salmon catch by Unalakleet fishermen averaged $326,000 during the period of 1981-88. With an average of 59 permit holders during this period, average gross value to a permit holder was $5,525; local estimates of a good season ranged from $14,000 to $20,000. Crew shares for salmon are estimated at 25 to 30 percent of the value (roughly $1,400-$1,700 of the average gross value), and other expenses typically ranged from $1,400-2,000 depending on the need for major repairs and gear replacement. This rough calculation results in a range of net income to a salmon permit holder of $1,700 to $2,700. Discussions with local fishermen indicated that adverse environmental conditions led to poor returns and corresponding poor harvest in 1986 and 1987, resulting in lower levels of income. The 1986 Norton Sound salmon season was the lowest dollar value on record since 1976 for Unalakleet salmon fishermen and was 44 percent below the eight year average. There is an increasing trend for two permit holders fishing together and eliminating the need for crew.

The number of Norton Sound herring permits held by Unalakleet fishermen has ranged from 50 to 135, and averaged 89 permits during the 1981 to 1988 time frame. Average earnings by permit holder have averaged $4,000 over this time period, ranging from $2,300 to $6,600. Crew shares for herring are estimated at 15 percent per member ($600 per crew member on average). Other expenses typically ranged from $800 to $1,000 depending on the need for major repairs and gear replacement. This calculation results in a range of net income to a herring permit holder of $1,000 to $4,800, with an average of $2,500.

Table 3.8-12 shows landings and ex-vessel value for Norton Sound and Lower Yukon River salmon and Norton Sound herring. Catch and value for other areas and species are subject to non-disclosure rules, but are shown in the Other/Non-disclosed row of Table 3.8-12, if available.

Total income to Unalakleet fishermen reached a peak of $1.4 million in 1988, but was relatively stable for the previous years, ranging between $0.8 and $1.0 million. The decline in income from salmon harvest has been offset by increased income from herring catches.

Table 3.8-12: Landings and Ex-Vessel Value
(in millions of $)

Type	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Landings	1.2	1.1	1.2	0.9	0.6	0.4	0.4	0.6
Value	0.5	0.5	0.5	0.4	0.4	0.2	0.2	0.4
Herring								
Landings	1.4	1.7	2.0	1.0	1.3	2.0	1.3	2.0
Value	0.2	0.2	0.3	0.1	0.3	0.6	0.4	0.8
Other/Non-disclosed								
Landings	0.3	0.2	0.4	b	0.2	b	0.2	0.1
Value	0.2	0.1	0.2	b	0.1	b	0.2	0.2

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Non-disclosed.

Boat and Gear Characteristics

Table 3.8-13 shows the number and size of vessels in the resident fishing fleet at Unalakleet. A number of boats in the community are probably used in both salmon and herring fisheries but data are not available from the agency data bases provided to MMS to reliably estimate the total number and size of vessels in the community fleet. The table presents information on the two largest fisheries. The absence of salmon vessels less than 6.1 meters after 1983, and the significant drop in the number of boats over that length starting in 1984 reflects change in the regulations which no longer require vessel licenses for set gillnet skiffs.

Table 3.8-14 shows the number of permits for each salmon and herring by gear type fished by Unalakleet fishermen.

Table 3.8-13: Resident Fishing Fleet

Size in Feet	Size in Meters	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon									
0-19	0-6.0	4	16	14	0	0	0	0	0
20-39	6.1-12.1	10	21	30	2	6	4	2	3
Herring									
0-19	0-6.0	28	24	16	8	8	13	11	12
20-39	6.1-12.1	34	40	50	28	54	62	84	106
40-59	12.2-18.2	0	0	1	1	1	1	2	1
60-79	18.3-24.3	0	0	0	0	0	0	0	0
80-99	24.4-30.4	0	0	0	0	0	0	2	1
100-119	30.5-36.5	0	0	0	0	0	0	0	0
120-139	36.6-42.6	0	0	.0	0	0	1	0	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Use of Community Infrastructure

There are no boat harbor facilities in the community. Residents pull their boats up on river banks where they are relatively well protected.

The shoal which extends about 1.5 miles offshore from the mouth of the Unalakleet River makes the community accessible only to shallow draft boats. Larger vessels have reportedly found good anchorage about 2 miles offshore in 5 fathoms.

The sheet pile dock at the mouth of the Unalakleet River has a dock face of 60 feet which is used by fishermen for unloading fish to the Norton Sound Fishermen's Cooperative processing plant located behind the dock.

The airport plays a significant role in the commercial fishing industry in the community. The two fish buyers stationed in Unalakleet air freight salmon to Anchorage for processing.

Constraints on water supply and the limited capacity of the sewer system contributed to problems experienced by local fish processors in the past. They will continue to be a constraint to resumption of local fish processing.

Table 3.8-14: Number and Gear Type of Permits
(By Species)

	Year							
Species/Gear	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Drift Gillnet	3	3	3	3	3	3	3	3
Set Gillnet	73	70	67	70	66	65	67	70
Herring								
Gillnet	84	68	78	37	63	74	90	99
Hand Pick	0	0	0	18	0	0	0	1
Other	14	33	0	0	0	0	5	0

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

3.9 Unalaska/Dutch Harbor

3.9.1 Description/Setting

Unalaska/Dutch Harbor is a "community" that actually spans two islands of the Fox Island group in the middle of the Aleutian Island chain. Unalaska, the largest city in the Aleutian Islands, was incorporated as first class city in 1942. The portion of the community located on the northeast side of Unalaska Island at the head of Iliuliuk Bay, an arm of Unalaska Bay, is referred to as Unalaska. Dutch Harbor, on Amaknak Island, is located on a sheltered cove on the northwest side of Iliuliuk Bay. Unalaska Island and Amaknak Island are connected at Unalaska/Dutch Harbor by a low highway bridge across the south channel from Captains Bay. Unalaska/Dutch Harbor is located 763 miles southwest of Anchorage.

The terrain of Unalaska Island is characterized by steep, rugged mountains that rise from the shoreline in most areas. In contrast, Amaknak Island is relatively level, and because of this, most of the development and expansion potential is located on this island. The vegetation is typical of the treeless southern Alaska Peninsula and Aleutian Islands, dominated by grass and shrubs. The climate is that of the Alaskan maritime zone, with cool summers and mild winters. Precipitation in Dutch Harbor is 60.5 inches a year, including up to 72 inches of snow. Unalaska/Dutch Harbor is in the path of frequent west-to-east storm tracks of the North Pacific, especially in winter. The waters of the southern Aleutian Chain are ice-free year-around.

There is evidence of pre-contact Aleut settlement on both islands. The first recorded contact with Russian explorers came in 1741. In 1759, Unalaska had a population of over 1,000 contained in 24 settlements. The Russians transported Aleuts from Unalaska to the Pribilof Islands to harvest fur seals. The pre-World War Two American period in Unalaska was characterized by a series of booms and busts. Trade in otter skins was the major economic activity until the turn of the century. Several other factors affected the growth of Unalaska, including its location in relation to major shipping lanes and use as a staging area for the Nome gold rush. Fox farming was a lucrative activity until markets collapsed during the Great Depression. Seafood processing of salmon, herring, and whale was established in the early 1900's, although major fisheries based on herring were not established until the late 1920's. In 1941, the U.S. Army and Navy established major bases at Unalaska/Dutch Harbor. After the outbreak of the war, Aleut residents were evacuated from Dutch Harbor and interned in southeast Alaska. The economy was depressed after the war, until interest in the fishing industry increased in the late 1950's; the present crab fishery was established in the early 1960's. Since that time, the level of activity associated with commercial fishing and fish processing has both increased and diversified, and is now the basis of the local economy.

3.9.2 Socioeconomic Characteristics

3.9.2.1 Local Economy

Of all the communities selected for this study, Unalaska/Dutch Harbor has the most diversified and complex economy. While commercial fishing and fish processing is still the major economic component, the fishing and port-related service sector is well developed compared to the other area communities. The port of Unalaska ranks second in the state behind Kodiak and has consistently been a top ranking U.S. port in amount and value of commercial fish landed. Historically, fishing and fish processing were centered around the king crab fishery; however, when that fishery declined in the early 1980's, the fishing industry diversified into bottom fish and related products like surimi, resulting in a shift from seasonal to year round economic activity. Five fish processors are located onshore in Dutch Harbor: Alyeska Seafoods, East Point Seafoods, Universal Seafoods, and Aleutian Processors. Icicle Seafoods and Universal Seafoods also have floating processors moored at docks in the community. Westward Fisheries is constructing a plant on Captain's Bay and Icicle Seafoods is in the permitting process for an onshore plant also on Captain's Bay.

The proximity of Unalaska/Dutch Harbor to major shipping routes contributes to its role as a shipping center for fish products and regional distribution of supplies to other communities. Unalaska/Dutch Harbor is served by both American President Lines and Sea Land. Marine support services are provided to the fishing and shipping industry, and include fuel and water, warehousing, ship repair, and lodging and meals. Major operators include Crowley Maritime, Delta Western, Underwater Construction/Northern Offshore, Petro Marine, Offshore Systems Inc., and Walashek Industries. During 1980-85 oil and gas exploration activities in the Bering Sea, the oil industry used Unalaska/Dutch Harbor as a support base. A support facility was constructed at Captains Bay in 1982 and was operated by OSI until 1986 when oil and gas activities ceased. This facility has since been converted to other support services for the fishing industry.

The Ounalashka Corporation, the village ANCSA corporation, is an active participant in the community economy. Their primary activity is real estate, leasing property to various users. The City of Unalaska is also an major economic influence. They provide water, sewer and electric service, and operate the small boat harbor, the Ballyhoo dock and the airport. In the fourth quarter of 1985, the city accounted for 15 percent of total wage employment and 33 percent of non-fish processing wage employment. Alaska Commercial Company and Carl's Commercial Company are the two largest of the five retailers located in the community. Other services include five hotels, seven restaurants, two auto rental and parts/repair services, a bank, and an accounting/property management service.

In addition to the cash economy, Native Alaskan residents also participate in subsistence activities, although dependence on this element has declined since the 1960's (Impact Assessment Inc., 1983). Important resources include salmon and halibut, marine invertebrates such as crab, chitons and sea urchins, and berries. Some seal and waterfowl hunting also occurs.

3.9.2.2 Population

Table 3.9-1 presents the historical population characteristics for Unalaska/Dutch Harbor. Because the community has been a temporary home to many transient residents, accurate estimates of resident population have been difficult to obtain (Impact Assessment Inc., 1987). Different methodologies used in estimating population further impact reliability.

Table 3.9-1: Population of Unalaska 1939-1985

Year	Population
1950	173
1960	218
1970	342
1972	548
1973	510
1977	1971
1980	1322
1981	1944
1983	1992
1984	1447
1985	1331
1986	1354
1987	1331
1988	1131
1989	2269

Sources: Data for 1950 through 1977 from Impact Assessment, Inc., 1983, 1987; data for 1980 through 1988 from Alaska Department of Labor, various years; 1989 data from Alaska Department of Community and Regional Affairs, 1989.

The figures available show steady growth from 1939 through 1973, followed by a dramatic increase by 1977, a drop in 1980, peaking again in 1983 and then deceasing through 1988. The 1980 through 1988 population estimates are based upon Alaska Department of Labor estimates of the resident population, which can be considerably less than the total population of the community. The City of Unalaska estimated total population at 1,090 in 1988, and 2,265 in 1989. The growth of the crab fishery and associated processing contributed to the increase in the mid-1970's, and the fishery's decline is reflected in the 1983 population decrease.

Unalaska has experienced significant population growth in the past two years, due in part to "Americanization" of the groundfish fishery and related support activities. The 1989 Alaska Dept. of Community and Regional Affairs figures reflect this growth even though it differs from earlier figures, in both methodology and the inclusion of non-residents for revenue sharing purposes.

The non-resident seasonal component of the Unalaska/Dutch Harbor population is significant; between 1972 and 1977, the non-resident component of the population increased from 21.5 percent to 68.8 percent of total population. A 1988 total population estimate of 1,909 is 69 percent higher than the resident population. Previous studies have broken the transient population into 3 categories: semi-permanent, long-term, and short term.

Ethnicity and age characteristics are also influenced by the transient component. Between 1970 and 1980, Caucasian increased from 31.0 percent to 64.1 percent of the population; Alaskan Natives decreased from 63.4 percent to 15.1 percent and other ethnic groups increased from 5.6 percent to 19.3 %. During the boom years, males outnumbered females by a ratio of 3:2, and in the 3 age groups from 25 to 54, there were twice as many males as females. As the population has stabilized, relatively more females and families have moved into the community; however, the transient population remains predominantly single male and non-Native individuals leave the community as they get older.

3.9.2.3 Employment

Table 3.9-2 presents Unalaska census subarea quarterly payroll industry series data for the period of 1983 through 1986. Manufacturing (i.e., fish processing) dominates wage employment, accounting for 63 percent to 74 percent of total employment and 50 percent to 63 percent of total wages, depending on the quarter. Local government employment is the second largest sector (8.4 to 14.7 percent), followed by Transportation, Utilities, and Communication. Seasonal fluctuations are significant in the processing sector; in 1985, 3rd quarter employment was 978, compared to 451 in the 4th quarter.

The non-wage labor component of the economy consists of commercial fishing (harvest sector) and subsistence. See Section 3.9.4.1 which provides the number and type of commercial fisheries permits held by Unalaska.

Table 3.9-3 shows the Unalaska census subarea payroll industry series data for the 4 quarters of 1988, which also includes Chernofski. Non-disclosure of information, due to the limited number of businesses reporting, limits the usefulness of this information. In this sub-area, fish processing (manufacturing) represents the major source of wage employment (65 to 75%). Retail trade, local government, and transportation/communications/utilities are roughly equal as the next most important sources (7 to 10% each).

Table 3.9-2: 1986 Area Employment Series Unalaska Census Subarea

Industrial Classification	1st Quarter Employment		2nd Quarter Employment		3rd Quarter Employment		4th Quarter Employment	
	Average	Percent of	Average	Percent of	Average	Percent of	Average	Percent of
Mining	a	0.00%	a	0.00%	a	0.00%	a	0.00%
Construction	5	0.65%	9	0.92%	18	1.36%	21	2.59%
Manufacturing	480	62.83%	665	68.07%	978	73.98%	451	55.61%
Transportation, Utilities & Communication	55	7.20%	76	7.78%	77	5.82%	70	8.63%
Wholesale Trade	a							
Retail Trade	49	6.41%	56	5.73%	72	5.45%	64	7.89%
Finance, Insurance & Real Estate	28	3.66%	26	2.66%	34	2.57%	29	3.58%
Services	11	1.44%	12	1.23%	11	0.83%	10	1.23%
Government								
Federal	10	1.31%	10	1.02%	17	1.29%	25	3.08%
State	14	1.83%	11	1.13%	3	0.23%	15	1.85%
Local	112	14.66%	112	11.46%	112	8.47%	126	15.54%
Miscellaneous	a						a	0.00%
Total	764		977		1322		811	

Source: Alaska Department of Labor, 1987.

[a]Non-disclosed.

Table 3.9-3: Unalaska Subarea 1988 Quarterly Employment

Year Quarter	Division	Businesses Reporting	Average Employees	Payroll	Average Wage
881	Mining	1	n/d	n/d	n/d
881	Construction	6	9	$43,527	$1,555
881	Manufacturing	12	1063	$6,168,221	$1,934
881	Trans./Comm./Util.	14	102	$647,288	$2,122
881	Trade, Wholesale	4	n/d	n/d	n/d
881	Trade, Retail	12	98	$411,061	$1,398
881	F.I.R.E	2	n/d	n/d	n/d
881	Services	7	12	$81,459	$2,202
881	Misc.	2	n/d	n/d	n/d
881	Govt., Federal	2	7	$49,972	$2,380
881	Govt., State	1	6	$18,509	$1,028
881	Govt., Local	2	101	$844,442	$2,778
881	Total	65	1443	$8,581,978	$1,982
882	Mining	1	n/d	n/d	n/d
882	Construction	6	11	$53,771	$1,680
882	Manufacturing	11	913	$4,659,520	$1,702
882	Trans./Comm./Util.	15	114	$639,494	$1,875
882	Trade, Wholesale	3	n/d	n/d	n/d
882	Trade, Retail	12	108	$484,102	$1,490
882	F.I.R.E	2	n/d	n/d	n/d
882	Services	6	9	$59,716	$2,212
882	Misc.	3	n/d	n/d	n/d
882	Govt., Federal	2	9	$121,438	$4,337
882	Govt., State	1	4	$13,653	$1,241
882	Govt., Local	2	99	$984,516	$3,326
882	Total	64	1304	$7,413,014	$1,894
883	Mining	1	n/d	n/d	n/d
883	Construction	5	14	$71,275	$1,697
883	Manufacturing	12	918	$4,999,099	$1,815
883	Trans./Comm./Util.	16	132	$840,647	$2,128
883	Trade, Wholesale	3	n/d	n/d	n/d
883	Trade, Retail	13	116	$501,781	$1,446
883	F.I.R.E	2	n/d	n/d	n/d
883	Services	5	11	$91,740	$2,780
883	Misc.	2	n/d	n/d	n/d
883	Govt., Federal	2	8	$87,178	$3,487
883	Govt., State	1	4	$18,607	$1,692
883	Govt., Local	2	96	$862,611	$3,006
883	Total	64	1361	$8,194,755	$2,007
884	Mining	1	n/d	n/d	n/d
884	Construction	6	25	$253,197	$3,422
884	Manufacturing	12	831	$5,219,698	$2,093
884	Trans./Comm./Util.	16	112	$817,827	$2,427
884	Trade, Wholesale	3	15	$202,643	$4,503
884	Trade, Retail	14	98	$487,977	$1,665
884	F.I.R.E	2	n/d	n/d	n/d
884	Services	7	13	$104,296	$2,607
884	Misc.	3	12	$366,823	$10,190
884	Govt., Federal	2	7	$64,512	$3,072
884	Govt., State	1	9	$44,322	$1,583
884	Govt., Local	2	110	$968,455	$2,935
884	Total	69	1278	$8,951,495	$2,335

Source: Alaska Department of Labor, 1989.
n/d: non-disclosure.

3.9.2.4 Income

Table 3.9-4 shows 1986 payroll for the Unalaska Island Census Subarea. Fish processing dominates total payroll with local government second in payroll value.

Table 3.9-4: 1986 Area Payroll Series: Unalaska Island Census Subarea (000's of $)

	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
Industrial Classification	Average Wage	Total Payroll	Average Wage	Total Payroll	Average Wage	Total Payroll	Average Wage	Total Payroll
Mining	$0.00	$0	$0.00	$0	$0.00	$1,897.67	$0.00	$995.94
Construction	$1.04	$17	$1.81	$105	$1.76	$95	53.46	$386
Manufacturing	$1.42	$2,047	$1.36	$2,709	$1.51	$4,439	$0.00	$0
Transportation, Utilities & Communication	$2.07	$342	$2.21	$502	$2.67	$617	$2.34	$489
Wholesale Trade	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Retail Trade	$1.43	$208	$1.41	$238	$1.52	$328	$1.17	$224
Finance, Insurance & Real Estate	$1.80	$153	$1.69	$1307	$1.22	$125	$1.55	$135
Services	$2.19	$74	$2.21	$77	$2.23	$71	$2.11	$63
Government								
Federal	$1.69	$49	$1.91	$55	$3.39	$169	$3.44	$254
State	$1.76	$75	$1.74	$59	$1.93	$15	$1.50	$69
Local	$2.66	$893	$2.68	$897	$2.37	$796	$2.21	$835
Miscellaneous	$0.00	$0	$0.00	$0	$0.00	$0	$0.00	$0
Total	$0.00	$4,134	$0.00	$5,015	0.00	$7,020	$0.00	$4,726

Source: Alaska Department of Labor, 1987.

3.9.2.5 Public Fiscal Characteristics

Revenues

Table 3.9-5 presents revenue and expenditure characteristics for the City of Unalaska for the period of FY 1983 through FY 1987. They are broken into General Funds and Special Funds, which include federal revenue sharing, utilities, education, port and harbor operations, airport terminal operations and capital improvements. The major sources of general revenues are property taxes (33%), sales and use tax (30%), and state aid and grants (26%), which includes revenue sharing from the raw fish tax. Fishing and support industry related property and sales are most likely the major component of these revenues. Property tax and sales and use tax elements of revenue have remained relatively stable over the last 5 years, offsetting decreasing state aid and grants since FY 1983. Recent special fund revenue trends include the decrease in federal revenue sharing and increase in ports/harbor and airport terminal operations funds.

Expenditures

Principal general expenditures include general government (city council, non departmental, admin./finance) (33%), public works (23%), public safety (23%), and a contingency fund (7%). Expenditures associated with general government, public works, and public safety have all slightly deceased since FY 1983, although percentages have basically stayed the same.

3.9.3 Infrastructure Characteristics

3.9.3.1 Transportation Facilities

Port Facilities

Table 3.9-6 shows the characteristics of Unalaska/Dutch Harbor transportation infrastructure, which is the most extensive in the region. They includes a city small boat harbor and a number of dock facilities (including ship repair). The marine network is oriented towards commercial fishing, including boat storage and repair, other marine services, fish offloading and product shipment. The city pays Ounalashka Corporation $18,000 annually for tidelands lease on the fishing boat dock on the spit. The port has plans to expand the Ballyhoo Dock.

Table 3.9-5: Summary of Revenues and Expenditures
City of Unalaska

CATEGORY	FY 1983	FY 1984	FY 1985	FY 1986
GENERAL FUND REVENUES				
Property Tax	$953,000	$1,091,425	$982,662	$1,107,963
Sales and Use Taxes	$1,000,000	$595,000	$938,165	$1,000,000
Licenses and Permits	$273,350	$237,690	$99,518	$147,445
State Aid and Grants	$1,324,786	$973,109	$971,504	$879,445
Other	$205,000	$173,900	$207,800	$231,400
Total General Fund Revenue	$3,756,136	$3,071,124	$3,199,649	$3,366,253
Fund Carryover	$150,000	$653,192	$0	$79,465
Total General Revenues	$3,906,136	$3,724,316	$3,199,649	$3,445,718
GENERAL FUND EXPENDITURES				
General Government				
City Council	$13,500	$12,500	$12,000	$12,000
Non-departmental	**	$624,082	$568,180	$510,991
Admin/Finance	$116,451	$664,802	$554,150	$613,725
Contingency Fund	$87,816	$200,000	$195,733	$254,460
Public Safety	$1,102,569	$841,738	$703,518	$79,191
Public Works	$1,131,127	$979,266	$827,288	$806,794
Parks, Cultural, and Recreation	$372,494	$337,274	$253,484	$332,395
Planning	$119,179	$65,694	$87,296	$123,884
Total Expenditures	$2,943,136	$3,725,356	$3,201,649	$2,733,440
SPECIAL FUNDS				
Federal Revenue Sharing	$242,427	$170,000	$152,000	$0
School Debt	$267,790	$264,540	$275,303	$278,932
Water Operating	$431,298	$409,060	$348,061	$327,397
Electric Operating	$887,759	$1,409,879	$1,096,577	$1,269,638
Port and Harbors	$315,728	$237,188	$333,000	$387,729
Airport Terminal	$0	$60,000	$446,771	$676,416
Sewer Operating	$0	$0	$0	$213,213
Capital Improvements	$5,888,907	$8,565,068	$11,490,107	$7,055,656
Total Special Funds	$8,033,909	$11,115,735	$14,141,819	$10,208,981

Source: City of Unalaska, Annual Budget, various years.

Airport

The airport is 4000 by 100 feet and runs from the Dutch Harbor to Unalaska shore, making expansion difficult and costly. It is barely adequate for jet service, and instrument and visual approaches are limited by runway location and terrain. Airport improvements have been evaluated, but the funding required is significant and yet to be obtained. The often inclement weather at Unalaska/Dutch Harbor, coupled with the short runway length often results in flight cancellations into the community. The community is served daily by Markair and Peninsula Airways; it functions as a regional transportation hub and serves outlying communities. Northern Air Cargo provides cargo service, which includes seafood product shipment.

The fishing industry uses the airport at Unalaska/Dutch Harbor for crew rotation and emergency supplies and equipment. For vessels awaiting new crew members before sailing or requiring a piece of machinery before they can return to fishing, delays due to cancelled flights are costly. Air transportation delays were cited as a major problem by vessel captains in a 1986 survey (R&M Consultants, 1986).

Table 3.9-6: Unalaska/Dutch Harbor Marine and Airport Infrastructure

Facility	Ownership	Dock Length	Water Depth	Services
Port and Dock Facilities				
Municipal				
Ballyhoo Dock	municipal	420 ft	40 ft	Wr,C,Fl,W
Small Boat Harbor	municipal	561 ft	10-30 ft	
Spit Dock	municipal	975 ft	10-30 ft	
Private				
Aleutian Processors	private		20 ft	C,W,E
Alyeska Seafoods	private	505 & 220 ft	24 ft	Fr,C,Wt
American President Lines	private	300 ft	40 ft	Wr,Fr,C,W,E
Crowley Maritime	private	410 ft	35 ft	Wr,C,Fl,W,E
Captains Bay Dock	private	150 ft	80 ft	Fr,Fl,W,E
Delta Western Fuel	private	750 ft	45 ft	Wr,C,Fl,W
Delta Western Warehouse	private	2000 ft	24 ft	Wr,Fr,C,Fl,W,E
East Point Seafoods.	private	460 ft	30 ft	Wr,Fr,C,W,E
Offshore Systems Inc.	private	420 ft	40 ft	Wr,Fr,C,Fl,W,E
Ounalashka Corp.	private	2-50 ft	20 ft	W
Universal				
Galaxy	private	45 ft	20 ft	Wr,E
Greatland	private	250 ft	36 ft	Wr,Fr,C,W
Pot	private	80 ft	20 ft	E
Unisea	private	110 ft	20-30 ft	
Viceroy	private	95 ft	10-30 ft	E
Vita	private	140 ft	20-30 ft	W
Walashek Ship Yard	private		45 ft	C,W,E

Source: R & M Consultants, 1986.

W - water; Wr - warehouse; Wt - waste disposal; C - cold storage; E - electricity; Fl - fuel; Fr - freezer.

3.9.3.2 Marine Services

Unalaska/Dutch Harbor is served by American President Lines (APL) and SeaLand, and a number of foreign freighters, in addition to several smaller domestic shipping and tug and barge companies. APL moves containers to the Far East, and SeaLand moves containerized cargo via barge service to Kodiak for transfer to its container ships going to Seattle. Sunmar operates coastal freighters that can handle vans, and Western Pioneer handles most of the barge traffic from Unalaska.

The total number of foreign vessels calling at Unalaska/Dutch Harbor is unknown but records for the Ballyhoo dock show 350 foreign cargo vessels using the dock in 1989. The number of foreign cargo vessels may decline as foreign processing is reduced in the EEZ, but this decrease may be more than offset by increases in the number of domestic cargo vessels since domestic trampers tend to be smaller, with less capacity than foreign cargo ships (Beeman, 1989).

Transshipment of product from Unalaska/Dutch Harbor may increase as American processors begin to process more bottomfish. However, foreign interests have a large involvement in the Bering Sea fishing fleet through partnership or financing arrangements, and may substantially influence the transportation and marketing of the product. For example, Pacific Fishing reported that Arctic Alaska Seafoods, which owns the new surimi processor U.S. Enterprise and seven other processors or catcher/processors, has the Japanese marketing company of Aburai Kabo as a partner, and that the Shinwa Shosen Co., Ltd. will be providing tramper service for product from the U.S. Enterprise for sale in the Shigoma Fish Market (Pacific Fishing, 1988). Similar offloading and transportation arrangements for processors and catcher/processors could substantially reduce the demand for additional infrastructure in U.S. Bering Sea ports.

The community and the shipping industry presently have limited capacity for handling additional product and "over-the-side" transfers from processors to freighters may continue until this capacity is expanded. Constraints on expansion of onshore transfers include insufficient dock or upland areas for loading vans, and loading and unloading processors, and inadequate equipment for moving product to domestic ports.

According to several residents, coastal freighters are too small (they carry a limited number of vans) and too expensive, and the value of the product can't support the high transport costs. Tug and barge combinations have other disadvantages: Refrigeration units can't be monitored while the vessels are underway so losses from refrigeration failure can increase; and tug and barges are poor at meeting schedules.

3.9.3.3 Utilities

Water and Sewer

The City of Unalaska provides water and sewer services. Metered water consumption indicates a use level of over 22 million gallons per month; fish processing is a significant component of demand. The City received $2.0 million from the state for water system improvements and system upgrades will result in two new wells, 10,000 feet of new pipe in 1988, allowing the city to serve at least four additional processing plants. The improvements will replace the wood stave water system which has been in place since World War II. Residential rates are $18.75 per month; commercial rates range from $37.50 to $127.50 per month for service lines under 2 inches and from $2.18 to $1.13 per thousand gallons, depending on metered use.

The original water and sewer system was built in the 1940's by the Navy. The sewer system has recently been upgraded to accommodate fish processing plants, but still serves only part of the community. Further improvement are planned. Residential rates are $10 per month; commercial rates vary depending on the type of service.

Solid Waste

The city operates a 10 acre landfill; Williwaw services provides trash pickup. Residential rates average $11.25 per month and industrial rates are $125 per 150 yard container. The landfill is barely adequate to meet current city needs; requirements of marine waste disposal set forth by MARPOL V could create the need for additional landfill space.

Electricity

The City provides power generation from a 4.1 megawatt diesel generating plant, and an additional 3 megawatt generator has been proposed. Peak consumption is 2.7 megawatts. Residential electric rates are $.12/KWH for the first 750 KWH and $.19/KWH after that. Commercial/industrial rates range from $.09 to $.12/KWH for the first 750 KWH and from $.11 to $.20/KWH after that. Larger fish processors can generate their own power for $0.04 to $0.08 per KWH cheaper than the City, and if they do not already produce their own power, have plans to do so..

Fuel

Four companies presently sell fuel, and have a combined storage capacity of 21.9 million gallons of diesel, gasoline, and aviation fuel. These firms use the storage facilities to provide fuel to the marine fishing fleet, as well as supplying fuel to western Alaska. Fuel demand in western Alaska is estimated at 301 million gallons in 1990 (Beeman, 1989b), with the Bering Sea fishing industry (excluding Bristol Bay) accounting for 75 to 100 million gallons (Dwight, 1990).

3.9.3.4 Housing

The City has virtually no available housing; every unit is occupied (N. Gross, personal communication, 1987). The condition of housing stock is fair, with the housing in the old townsite World War Two vintage and newer housing located in outlying areas. One 18 unit HUD housing project was completed in 1982, and an additional 15 homes have been indefinitely scheduled. In 1985, single family/duplex accounted for 74 percent of the housing; multi- family and trailers accounted for 11.7 percent and 14.3 percent respectively. Group living quarters for processing workers are located adjacent to the various processing plants.

3.9.3.5 Land Availability

There is vacant land available for new development, although it is limited in the downtown area. There are problems with access to land suitable for support facilities. Ounalashka Corporation, the major landholder, has instituted a policy of leasing land for development by other parties.

3.9.4 Industry Characteristics

3.9.4.1 Harvesting Sector

Unalaska/Dutch Harbor resident fishermen participate in almost every fishery in the Bering Sea and the ice-free port enables the fleet to fish throughout the year. As a result, the community does not have a dominant fishery comparable to the salmon or herring fisheries in the other study communities.

Major Fisheries

The Bering Sea groundfish and shellfish harvests are dominated by fishermen from the Pacific Northwest states, and particularly the Seattle area. Although a large number of vessels operate from Unalaska/Dutch Harbor, there are relatively few local residents who participate in these fisheries. Reductions in the number of crab permits, particularly king crab, has been the major factor in the decrease in the total number of permits held by Unalaska/Dutch Harbor fishermen. Recent increases in other finfish permits have helped to offset the crab reduction. Table 3.9-7 shows the number and type of commercial fishing permits held by Unalaska/Dutch Harbor residents. This table excludes the few freshwater fish permits issued to local residents.

The total number of permits held by Unalaska/Dutch Harbor residents over the 1981 through 1988 time period mirrors the "boom-bust" cycle associated with king crab harvests in the Bering Sea. While the total number of permits held by residents in 1988 is about the same as the number held in 1981, 1988 represents an approximate 44 percent decrease from the number of king crab permits held in 1982.

Table 3.9-7: Number & Type of Commercial Fishery Permits
(By Species)

Species	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon	11	11	12	11	11	14	12	7
King Crab	50	55	51	35	33	33	42	31
Tanner Crab	31	39	42	23	21	22	17	29
Dungeness & Other	17	12	12	17	6	3	11	8
Shrimp	6	2	2	0	0	0	0	3
Herring	5	5	6	1	1	0	3	6
Sablefish	0	4	0	7	2	2	11	8
Halibut	17	14	30	28	16	17	26	b
Other Finfish	16	19	11	10	11	7	25	33
Other/Unknown	1	5	0	0	0	1	6	7
Total	154	161	166	132	101	99	153	
Number of Permit Holders	73	65	86	65	45	48	70	57

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

The number of Bering Sea salmon fishery permits held by Unalaska/Dutch Harbor residents has remained relatively steady over the past few years, excluding the preliminary 1988 data. There has been a change with the number of permits in Area M (False Pass) decreasing slightly, and the number of Area T (Bristol Bay) permits increasing slightly. Table 3.9-8 shows the number and type of salmon permits held by local fishermen since 1977.

Table 3.9-8: Number of Salmon Permits by Area

Area	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Pr. Wm. Sound	0	0	1	0	1	3	2	1
Cook Inlet	0	1	3	1	1	1	1	1
False Pass	8	8	5	5	4	6	5	4
Bristol Bay	2	2	3	5	4	4	3	1
Other	1	0	0	0	1	0	0	0
Total	11	11	12	11	11	14	11	7

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

Unalaska/Dutch Harbor fishermen also harvest other species of finfish. Table 3.9-9 shows information on the number of permits held by local residents, by area and species.

Total permits held by Unalaska/Dutch Harbor residents for finfish species other than salmon have increased since 1981. The only geographic area which has seen a discernible increase in permits is Dutch Harbor. This reflects the fact that an expanding small boat fleet at Unalaska/Dutch Harbor is restricted to nearby waters, and is diversifying from traditional salmon fishing.

Data on landings and value of other finfish harvested by Unalaska/Dutch Harbor residents are subject to non-disclosure rules and because of the small number of permits for each species, area, and gear type very few of the landings or ex-vessel value data points can be provided. Total estimates of landings and value for other finfish and other/non-disclosed categories are included in the discussion of income (Table 3.9-13).

Table 3.9-9: Number of Other Finfish Permits by Area

Area	Year							
	1981	1982	1983	1984	1985	1986	1987	1988
Aleutian/Peninsula								
Halibut	0	0	7	4	2	1	2	b
Herring	0	1	2	1	1	0	1	2
Sablefish	0	0	0	1	1	0	2	0
Other Finfish	2	1	0	0	1	0	1	0
Bering Sea								
Halibut	13	13	0	0	1	1	1	b
Other Finfish	4	8	5	2	3	1	8	9
Sablefish	0	2	0	0	0	0	2	1
Bristol Bay								
Herring	2	1	4	0	0	0	0	0
Dutch Harbor								
Halibut	4	1	17	23	12	15	18	b
Sablefish	0	2	0	5	1	0	3	7
Other Finfish	8	9	4	6	4	5	9	24
Other Areas/Other/ Unidentified								
Halibut	0	0	6	1	1	0	5	b
Sablefish	0	0	0	1	0	2	4	0
Other Finfish	2	1	2	2	3	1	7	0
Herring	3	4	0	0	0	0	1	4
Other	1	5	0	0	0	1	5	6
Total	39	47	47	46	30	27	69	

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not disclosed.

Table 3.9-10 shows the change in number of permits issued for shellfish harvesting over the 1981-1988 time period. Shellfish permits have declined in number since their peak of 108 in 1982. Recent years have seen some increase since the low of 58 permits in 1986. the increase in the number of permits for Area O (Dutch Harbor) is correlated with an increase in the number of smaller boats (< 18 meters or 59 feet) harvesting these species in Area O. It is likely that awareness of the new cone or trapezoidal style crab pots has prompted these vessels to enter fisheies that were not profitable with standard gear. These smaller boats operate in the Dutch Harbor management area because of the necessity to be close to protected waters and the limited time they can remain at sea.

Table 3.9-10: Number of Shellfish Permits by Area

Area/Species	Year							
	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Adak								
King Crab	1	8	15	13	10	9	11	12
Tanner	0	4	3	4	0	2	1	1
Misc. Crab	0	1	0	1	0	0	1	01
Aleutian/Peninsula								
King Crab	3	1	0	0	0	0	0	0
Tanner	2	2	3	1	2	1	1	2
Dungeness	0	0	0	1	0	0	0	0
Bering Sea								
King Crab	13	15	25	5	14	20	25	12
Tanner	15	20	17	5	11	13	8	11
Misc. & Other	7	6	7	9	2	1	2	0
Bristol Bay								
King Crab	12	4	0	3	0	0	0	0
Dutch Harbor								
King Crab	21	26	11	13	5	4	5	7
Dungeness	0	1	2	4	3	2	7	7
Misc. & Other	9	4	3	2	1	0	1	0
Tanner	14	13	14	11	6	4	6	15
Shrimp	6	2	0	0	0	0	0	3
Kodiak								
King Crab	0	1	0	0	0	0	0	0
Tanner Crab	0	0	5	2	1	2	0	0
Other/Unknown	1	0	2	1	5	0	4	2
Totals	104	108	107	75	60	58	72	72

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a] Preliminary data.

Table 3.9-11 presents information on landings and ex-vessel values of king and tanner crab in the Adak, Bering Sea, and Dutch harbor areas. Other areas and species are omitted due to the high percentage of non-disclosed data. As a result, the amounts shown in Table 3.9-11 should be considered as an indicator of relative change in landings and ex-vessel values over time.

Table 3.9-11: Landings and Ex-Vessel Values by Shellfish Species
(in millions)

	Year								
Area	1981	1982	1983	1984	1985	1986	1987	1984	1988 a
King									
Landings	2.4	1.8	3.1	1.3	2.8	3.3	3.0	2.3	
Value	2.3	3.9	8.1	3.1	5.2	10.3	9.3	7.7	
Tanner									
Landings	2.7	4.2	3.3	0.1	6.7	10.1	6.4	4.6	
Value	1.0	3.4	1.5	0.1	2.5	5.4	4.9	3.7	

Source: Alaska commercial Fisheries Entry Commission, 1989.

Employment

Table 3.9-12 presents estimates of employment by fishery (and gear type for salmon and herring) for the 1981 through 1988 time period. The table focuses upon employment generated by Unalaska/Dutch Harbor permit holders. Crew factors estimated by Thomas (1986) for the single year of 1985 are used for the entire 10 year time period since comparable crew factor estimates are not available for previous years.

Table 3.9-12: Harvest Sector Resident Employment
(By Species)

	Year							
Type	1981	1982	1983	1984	1985	1986	1987	1988 [a]
Salmon								
Purse Seine	20	20	15	25	20	20	20	15
Drift Gillnet	7	9	9	11	9	9	9	5
Set Gillnet	2	2	6	0	0	2	2	0
King Crab	75	94	94	56	53	60	71	45
Tanner Crab	58	83	75	42	46	54	33	58
Dungeness & Other	3	3	6	9	9	6	18	18
Shrimp	13	7	4	0	0	0	0	7
Herring								
Purse Seine	0	4	8	4	4	0	0	4
Gillnet	6	4	6	0	0	0	4	6
Sablefish	0	12	0	12	8	8	13	26
Halibut	47	73	73	99	52	65	77	[b]
Other	4	13	0	0	0	2	11	4

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

Income

The economy of Unalaska/Dutch Harbor, and the incomes of most of its residents, is dependent upon the fishing industry. This section provides estimates of the revenues generated in the community by resident fishermen. Table 3.9-13 shows the total sales of seafood products by the local harvest sector. Even with the downturn of the crab industry in the early 1980's, crab remains the major component of harvest sector income for Unalaska/Dutch Harbor fishermen. In 1984 crab accounted for 42 percent of toal harvest sector income, but in 1987 crab harvests were almost 90 percent of total ex-vessel value. Even though the small boat fleet in the community has expanded in number and diversified into other fisheries, the income generated by large crab boats dwarfs the revenues of the smaller vessels.

Table 3.9-13: Harvest Sector Ex-Vessel Value
(in millions of $)

Species	1981	1982	1983	1984	1985	1986	1987	1988 [a]
	Year							
Salmon	0.4	0.5	b	0.8	0.2	0.1	0.1	b
Other Finfish	0.2	0.4	0.5	0.2	0.1	0.1	0.1	b
Crab	5.3	7.6	10.4	3.2	7.7	15.8	14.3	11.5
Other/Non-Disclosed	1.0	0.9	1.7	3.4	2.4	2.6	1.5	2.5
Total	6.9	9.4		7.6	10.4	18.6	16.0	

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.
[b]Not available.

Boat and Gear Characteristics

Table 3.9-14 provides information on the size characteristics of the resident fishing fleet. The available information cannot be reliably summed to arrive at size characteristics for the community fleet. Since king crab and other finfish categories account for the largest number of boats in the Unalaska/Dutch Harbor fleet, and tend to be somewhat separate vessel types, information is presented for these two subfleets is presented in Table 3.9-14 as representative of the entire fleet registered in the community.

Impact Assessment, Inc. (1983) reported that less than a dozen boats were owned by local fishermen. A survey by R&M Consultants (1986) found a similar number of boats substantial enough to endure Bering Sea storms and harvest shellfish and groundfish, although a larger number of skiffs and small boats for use in coastal fisheries were available. This latter survey was undertaken during the month of June and, as a result, all of the smaller resident salmon boats were in other communities participating in salmon fisheries. A review of the data in Table 3.9-14 shows a trend of increasing vessel size in the local fleet. Over time they have accumulated the capital required to purchase large crab boats which were beyond their means in previous years.

Table 3.9-14: Resident Fishing Fleet

Size in Feet	Size in Meters	Year 1981	1982	1983	1984	1985	1986	1987	1988 [a]
Other Finfish Boats									
0-19	0-6.0	1	1	0	0	0	0	0	2
20-39	6.1-12.1	1	1	4	4	0	0	3	10
40-59	12.2-18.2	2	1	0	2	1	1	3	6
60-79	18.3-24.3	0	6	0	1	6	1	3	0
80-99	24.4-30.4	3	2	4	0	0	0	3	2
100-119	30.5-36.5	0	0	0	0	0	0	1	1
King Crab Boats									
0-19	0-6.0	0	0	0	0	0	0	0	0
20-39	6.1-12.1	3	2	1	0	0	0	0	0
40-59	12.2-18.2	6	8	2	0	0	0	0	0
60-79	18.3-24.3	5	3	5	5	2	7	5	4
80-99	24.4-30.4	5	8	7	5	3	4	5	4
100-119	30.5-36.5	3	2	0	0	3	1	3	0
120-139	36.6-42.6	3	0	0	0	0	0	0	0
140-159	42.7-48.7	0	0	0	0	2	3	4	4

Source: Data from Alaska Commercial Fisheries Entry Commission, 1989.

[a]Preliminary data.

The Unalaska/Dutch Harbor resident fleet operates in a number of different fisheries throughout the year, and in a number of different management areas with different gear for specific species. As a result, non-disclosure rules make it impossible to adequately compare landings and ex-vessel value by gear type.

Use of Community Infrastructure

The community of Unalaska/Dutch Harbor has four primary harbors and anchorages: Iliuliuk Bay, Dutch Harbor, Iliuliuk Harbor, and Captain's Bay. The channels to Iliuliuk Bay and Dutch Harbor are free from dangers, except along the shore. Iliuliuk Harbor is obstructed at its entrance by ledges, but is not difficult to transit with vessels under 250 feet in length. Captain's Bay is a broad bay with good holding bottom (National Ocean Service, 1987).

The port of Unalaska/Dutch Harbor has substantial areas of good protected moorage and construction of man-made harbors has not been required to provide protection from storms. Two public moorage facilities have been built in recent years to alleviate the congestion that occurred at private docks in prior years. The largest of these is located on the spit which surrounds Dutch Harbor and the smaller mooring space is located in Iliuliuk Harbor in proximity to the Walashek ship repair facility. The spit dock was designed to provide transit moorage for most of the larger vessels in the Bering Sea fleet and is operated by the City of Unalaska on land leased from the Ounalashka Corporation.

The dock located in protected Iliuliuk Harbor was originally located at the spit but the design of the dock was inadequate for the large vessels which used the facility so it was relocated to the present location following construction of the present spit dock. Small longliners, draggers, gillnetters, and small recreational boats are the primary users of this structure. The State of Alaska constructed the dock at its present location but the City of Unalaska has refused to accept the obligation and liability of operating of the facility until certain improvements are made.

Fishing vessels use docks for three primary purposes: 1) unloading of product; 2) servicing of vessels; and 3) moorage, which was discussed in the previous section. The processors provide facilities for unloading the vessels that deliver to them. These include docks at East Point Seafoods, Alyeska Seafoods, and Greatland Seafoods. Universal Seafoods provides docks for use by vessels associated with it or Greatland, a sister company, but deliveries to the Unisea, a permanently moored floating processor, are handled over the side of the boats. Vessels delivering to the Whitney, a permanently moored floating processor previously owned by Whitney Fidalgo Seafoods but now owned by Aleutian Processors, also deliver over the side.

Catcher/processors and processing ships need to offload the packaged product which they have produced during their time at sea for shipment to markets. In some instances, these vessels deliver over the side to tramp steamers at sea or in protected waters, but they often call at Unalaska/Dutch Harbor to offload product. At present the Ballyhoo Dock owned by the City of Unalaska and the American President Line (APL) dock are the preferred docks for offloading of product. In most cases this frozen, boxed product is loaded into freezer vans for shipment on APL or Sealand vessels.

The concept of a service dock for fishing vessels in the Bering Sea has undergone significant change in the past few years with innovations started by SeaAlaska at the old

ConAgra processing dock, and continued by Delta Western, the present owner of the facility.

In the early 1980's vessels would deliver to a processor, then move to the fuel dock, then move to another dock where they could tie up for a period of a few hours to a few days as they replenished and made needed repairs. Since some services required dockside access and boats were often rafted 3 to 4 boats deep, delays were frequent. The present service dock concept attempts to improve efficiency by providing multiple services during the time that the vessel is at the dock face. Vessels are placed on a waiting list for fuel to prevent congestion at the dock and during the time they are refueling (typically 5-8 hours) they use the other services that are located at the dock. The Delta Western facility presently provides a ships chandlery, fuel service (provided by Petro Marine), case lot food sales, several electronic repair shops, engine repair, net loft, restaurant, liquor and convenience store, dormitory rooms, storage for nets and pots, and several other services.

Delta Western also owns the former Chevron fuel dock where it provides fueling services. No other services are presently provided from that facility.

Several other service docks are offering multiple services, but not to the degree provided at Delta Western. Petro Marine recently constructed fuel storage tanks behind the Ballyhoo Dock and provides refueling services at that facility while vessels unload.

Pacific Alaska Fuel Service (PAFS), a subsidiary of Crowley Maritime, is providing fuel service, warehouse and outside storage for gear and supplies, pot storage, machinery repair and welding, and a bunkhouse at its facility on Captains Bay. PAFS is also encouraging other marine services firms to locate at its facility.

Offshore Systems, Inc. (OSI) has recently begun to offer fuel services and gear storage for fishing vessels at its Captains Bay location. This 40 acre location presently offers fuel services, warehousing, storage, lodging, and crab pot repair. A number of service companies have located at the facility and OSI offers the only cold storage facility in Unalaska/Dutch Harbor. The OSI dock is the principal facility used by Sunmar Shipping, and Arctic Alaska and Emerald Seafoods have offices and warehouses in the complex to expedite turn-around by the vessels in their fleet.

3.9.4.2 Processing Sector

The seafood processing industry in Unalaska/Dutch Harbor is presently composed of the following major firms: Aleutian Processors, Alyeska Seafoods, Eastpoint Seafoods, Greatland Seafoods, and Universal Seafoods. Icicle Seafoods uses the Bering Star, a floating processor, near the spit at the site of the existing pot dock which was used by

Exxon during OCS activities. Westward Fisheries is constructing a multiple line plant, including surimi, on Captain's Bay to open in June, 1990. Icicle Seafoods is in the permitting process for an onshore plant, also in Captain's Bay.

In addition to these more permanent processors, a number of floating processors may be anchored within Dutch Harbor during severe weather in the crab season and vying with local processors to purchase crab from catcher vessels.

In the late 1970's and early 1980's, processing in Unalaska/Dutch Harbor was predominantly oriented to king crab. A number of the firms which operated in the community in the peak of the king crab season have sold their facilities and left the region. In subsequent years the industry has been forced to modify existing plants and operations to handle other species and products.

The plants at Unalaska/Dutch Harbor produce a wide variety seafood products that are shipped to markets in Japan or to the Pacific Northwest for transshipment to final markets. The processing industry now operates all year although each plant has its peak season at different periods depending upon the various species produced.

Employment

The processing industry at Unalaska/Dutch Harbor is in a period of transition from the "hire'em and fire'em" practices that were prevelant during the peak king crab when the fishery demanded full time work for relatively short periods of time, to identifying and hiring stable, long-term workers for work on rigidly controlled shifts. Groundfish processing and surimi production represent a different type of employment in the region. They are close to year-round fisheries with relatively low margins and can not support high wage labor. Surimi production is relatively sophisticated, so the ideal worker is one who will learn the processing technology and be capable of handling increased responsibility over time.

A trend towards employment of Alaska residents was evident at all of the processing companies in Unalaska/Dutch Harbor and is based upon several factors. First, is the State of Alaska's emphasis on local hire and the perceived notoriety that the processing sector has incurred for hiring workers from outside of the State. The processors are sensitive to this issue and have responded to the pressure. Second, the shift from large volumes of high profit king crab fisheries to lower profit species has forced processors to cut labor expenses. Some firms are moving away from the traditional six month contract with free transportation to Seattle, and replacing it with a standard employment concept with rewards for longevity (Impact Assessment, Inc., 1987). Other companies actively seek employees among local residents of Unalaska/Dutch Harbor.

Table 3.9-15 shows employment data for the Unalaska census subarea for the 1981 through 1988 time frame. Annual employment levels in recent years are still far below the 1981 peak of 1,241 employees associated with the king crab fishery, but have increased more than 50 percent above the low of 616 persons in 1984.

The Unalaska census subarea was changed in March, 1988 by transferring Akutan to the Unimak Island census subarea to recognize its presence in the Aleutians East Borough. As a result, the employment estimates for 1988 are not comparable with prior years. The small increase noted between 1987 and 1988, even accounting for the removal of over 200 fish processing employees at Akutan, means that the seafood processing sector in Unalaska/Dutch Harbor expanded over 200 employees in one year. Expansion of facilities, including a full year of operation for the second surimi plant in the community likely accounted for most of this increase.

Table 3.9-15: Seafood Processing Sector Employment

Year	Annual Average Employment
1981	1,241
1982	893
1983	842
1984	616
1985	643
1986	731
1987	925
1988	931

Source: Alaska Department of Labor, 1989.

Income

Table 3.9-16 shows total estimated annual payroll for the processing sector in Unalaska/Dutch Harbor, and average monthly wage.

Table 3.9-16: Processing Sector Payroll and Wages

Year	Total Annual Payroll (millions)	Average Monthly Wage
1981	$19.7	$1,317
1982	$14.9	$1,379
1983	$14.9	$1,479
1984	$13.6	$1,850
1985	$11.4	$1,478
1986	$13.9	$1,618
1987	$18.7	$1,700
1988	$21.0	$1,886

Source: Alaska Department of Labor, 1989a.

Alyeska Seafoods

The Alyeska Seafood plant was originally built by Pan Alaska Seafoods after they purchased land at the head of Unalaska spit from the owner of Carl's Commercial Company in 1962. This plant was the first shore-based processor within the City limits. In 1975 Castle-Cook, a major American processor took over the firm (Impact Assessment, Inc. 1983). Alyeska Seafoods, which is a joint venture of Taio Fisheries (50 percent), Wards Cove Packing (45 percent), and Marubeni Corporation (5 percent) purchased the plant from Castle-Cook in December 1985. The surimi plant was completed in January 1987.

The Alyeska complex contains two distinct processing facilities: a seafood plant and a surimi plant. The seafood plant is capable of handling all types of fish and shellfish although crab, halibut, black cod, and Pacific cod have been the major species handled to date. The surimi plant exclusively handles pollock. Incidental species delivered with the pollock are transferred to the seafood plant.

The seafood plant has a capacity of approximately 200,000 pounds per day of tanner crab, 300,000 pounds per days of king crab and 400,000 pounds per day of cod.

The Alyeska surimi plant has a capacity of 150 tons (300,000 pounds) per day, but construction is presently underway to expand capacity to 500 metric tons per day. Fish meal and bone meal are other products of the plant. The company employs 5 catcher boats converted from oil rig supply boats to supply the surimi plant. After expansion is completed, the company will employ 6 or 7 trawlers for pollock deliveries. The lesser number will be sufficient when the pollock resource is in the vicinity of Unimak Pass. During certain times of the year, as local stocks decrease or when stocks undertake their seasonal migrations and catcher boats must travel greater distances to deliver product, the plant may need 7 boats.

The company has plans to increase the freezing capacity of the seafood plant for the additional groundfish processing it anticipates. The additional processing will also require the plant to upgrade their power plant, and seawater and hydraulic systems.

The seafood plant primarily produces frozen headed and gutted finfish products and shellfish sections. The firm also has a split and salted Pacific cod line. Alyeska management indicated that product is differentiated on the basis of quality with higher quality longline caught finfish generally going to Japan and lower quality trawl caught finfish primarily shipped to Europe.

Alyeska Seafoods operates year-round. The species processed and the employment vary during the year according to the regulations and quotas established by the various regulatory agencies.

The number of employees varies during the year in response to regulations and resource availability. The November through March time period is busy, but peak employment occurs during the first 3 months of the year when tanner crab is processed at the seafood plant and pollock roe stripping is underway at the surimi plant.

The maximum number of employees at the Alyeska complex is 450 persons. The availability of housing constrains the number of persons the plant can employ. This is apportioned with 180 persons at the seafood plant and 140 to 150 employees at the surimi plant. The balance of the employees are support staff. This employment figure is based upon each plant operating at peak capacity which only occurs for a few months during the year for the surimi plant, and rarely occurs for the seafood plant since the peak of the king crab years. Two 12 hour shifts are required when the plant is operating at capacity.

The seafood plant support staff provides services for the entire complex. Support staff estimate includes 12 persons in the galley, 30 to 35 engineers/maintenance staff, 16 administrative and managerial personnel, with the remainder in laundry and janitorial positions.

Processing workers work 12 hours per day on a 6 month contract, with some workers staying up to 16 months. Support staff also work 6 month contracts although most managerial, and some support staff, are local residents. All of the processing workers are housed at the plant.

Alyeska uses the state job service operated by the Alaska Department of Labor, and Salt Water Productions, an employment agency in Anchorage to fill job openings. About 4 percent of the workforce are residents of Unalaska/Dutch Harbor, and these are mainly management staff. The Alaska Department of Labor (1989b, 1990) estimated that Alaska residents were 45.4 percent of total employees for 1987, and 42.3 percent in 1988. This technique used to arrive at this estimate matches employment records with permanent fund dividend recipients, and is a conservative estimate of residency.

Average wages were estimated by management at $5 per hour for processing workers and $9 per hour for support staff. Estimates of seasonal or total contract wages were not provided.

The City of Unalaska provides water and sewer to the facility. Alyeska Seafoods provides its own power.

Most of Alyeska's inbound freight is delivered by tugs and barges operated by Western Pioneer (a sister company to Delta Western) and Coastal Barge Company. Carl's Commercial Company, which is located adjacent to Alyeska Seafoods, also uses the Alyeska dock for unloading its inbound freight.

Surimi is primarily bound for domestic markets and is loaded on a daily basis into SeaLand vans for transport by contract barges to Kodiak where the vans are loaded onto SeaLand ships bound for Seattle. Surimi bound for Japan is shipped via American President Lines.

Eastpoint Seafoods

East Point Seafoods is owned by E.H. Bendicksen of Oysterville, Washington. Eastpoint operates a freezing plant and processes all species of crab and some herring. The crab are primarily sold as frozen sections. During the peak of the king crab boom this plant was capable of processing up to 250,000 pounds of crab per day (Impact Assessment, Inc., 1983).

The firm has plans for a processing line and additional cold storage to handle Pacific cod. This equipment would also enable them to process black cod and other bottomfish.

The plant relies upon all species of crab for its raw product and, as a result of being primarily a single product facility, operates only when crab are harvested. The period of operation parallels the seasons for crab in the Bering Sea and Aleutian Islands. During periods between crab openings the management and support staff conduct maintenance on the plant so the plant does not close during the year.

Peak employment at the plant occurs during the opilio crab season which begins in January and ends when the quota is reached. In some years this lasted almost the entire calendar year. Processing the various king crab species begins in the fall and can last until late winter.

Employment varies according to crab species but presently ranges from 21 to 65 workers on the processing line with an additional 12 support staff. Brown crab requires the fewest processing workers (21 to 22 persons), with king crab operations using almost twice as many (35 to 40) individuals, and opilio requiring the most (60 to 65 persons). During the years of the king crab boom in Unalaska/Dutch Harbor this same plant employed over 150 persons (Impact Assessment, Inc., 1987).

The hours worked per day by the processing workers varies, but can range up to 18 hours per day during the opilio season. The plant operates only 1 shift.

The processing workers sign 6 months contracts but 5 months is the average length of employment. Support workers are employed under standard employment conditions with indeterminate length, and are typically longer term employees.

Most of the support staff are local residents and consider Unalaska/Dutch Harbor as home. The exception are 2-3 engineers who are from the Pacific Northwest. The galley and laundry staff are Vietnamese, most of whom have resided in Dutch for 6 years. In 1987 about 15 of the processing workers were hired from Anchorage although only a few (2 to 3) of them were born and raised in Anchorage. That same year Eastpoint also had seven employees from Eagle, Alaska, and several from Fairbanks. Eastpoint Seafoods is not listed in the Alaska Department of Labor's residency analysis publications.

Management staff estimated average hourly wages for processing line, laundry, and galley workers at $5 per hour. Estimates were not provided for total seasonal or annual wages for employees.

The City of Unalaska provides water to Eastpoint Seafoods, and the firm has plans to connect to the sewer system. The company provides its own power since it is cheaper than city power. Eastpoint also rents land for pot storage and some buildings from the Ounalashka Corporation.

Greatland Seafoods

Greatland Seafoods (GLS) originally operated as a joint venture between Universal Seafoods and Nippon Suisan. Universal is a subsidiary of Nippon Suisan. GLS presently functions as a division of Universal Seafoods.

GLS began operations in March, 1986 with the first surimi plant in Unalaska/Dutch Harbor. The plant is located on land previously occupied by Pacific Pearl, adjacent to the Universal Seafood plant.

The GLS plant has a capacity of about 300 metric tons of raw pollock per day, construction underway will increase this capacity to about 900 metric tons per day. Surimi is the principal product from the plant with fish oil, fish meal, and bone meal being by-products that have commercial value.

In early 1987 GLS had 4 trawlers fishing for them. However, two 190 feet oil rig supply boats were converted to trawlers and later in the year were placed under long-term contract to GLS to provide pollock. Each of these boats can deliver about 430 metric tons of pollock at delivery.

After expansion is complete, GLS will use 9 or 10 more trawlers. These new boats will be smaller than the existing trawlers, and have operated as joint-venture catcher boats in the past. GLS management plans on using these vessels in order to avoid further overcapitalization of the industry.

The plant operates for 10 months, closing during the mid-April to mid-June period when the pollock resource is of low quality and low abundance following the January to March spawning season. Employees work full-time even though the plant only operates 10 months of the year. During the down months, employees take vacations and leave without pay, and work on annual maintenance and installation of new equipment.

In 1987 the GLS plant employed about 60 persons for normal full-time employment, with an additional 50 to 60 persons during the roe stripping season which lasts from January to March-April. About 25 persons were support staff (e.g., engineers, laundry, galley) and the remainder were processing line employees working in a single shift operation. Most employees worked 10 hour days, 6 days a week.

By early 1990 the plant employed 140 to 145 persons working double shifts, with an additional 60 persons during the roe-stripping season. After expansion the surimi plant will employ about 200 persons.

Less than 5 percent of current employees were prior residents of the community, or Alaska when the plant opened. Most of the hiring is through the Redmond office and most of the original workers were from the Seattle area. ADOL estimates that 27 percent of the 289 total employees in 1987 were Alaska Residents, and 25 percent of the 406 total employees in 1988 (Alaska Department of Labor, 1989b and 1990).

Universal Seafoods

Universal Seafoods is a subsidiary of Nippon Suisan, a large Japanese seafood company. Universal Seafoods owns the Unisea, a floating processor permanently moored in Iliuliuk Harbor and a number of other facilities and services in the community (See Section 3.9.4.3 Support Sector).

Universal was incorporated in 1974, and local production on the Unisea commenced in September, 1975. In 1977 the company purchased their second processor, the Vita, from Vita Seafoods, which became their second moored floating processing plant in the community (Impact Assessment, Inc., 1983). The Vita was sold for scrap and towed away in the fall of 1987.

The Unisea was not operating between December, 1985 and early 1988. In late 1987 it was being refurbished to process crab. At that time the company was also considering installation of equipment to handle groundfish. According to Impact Assessment, Inc. (1987), Universal attempted to process Pacific cod in previous years, but were unable to make a profit. This situation has changed since the Unisea presently has a capacity of aobut 120,000 pounds per day of crab and 200,000 pounds per day of Pacific cod. The Unisea also processes small quantities of salmon, sablefish, halibut, and local herring.

Universal is considering plans for a pollock fillet line which would probably be located in the expanded GLS plant. Universal operates year-round although processing activities vary according to openings and closures of the various species. The company has a major expansion underway which will substantially increase its processing capacity for surimi and other fisheries products.

The Unisea employs about 160 to 180 persons with a peak of 200 during the busiest season in January through March. Universal Seafoods also owns the UniSea Inn and restaurant which employ approximately 30 to 35 persons, depending on the time of year. The company also has a shore crew (i.e., carpenters, mechanics) of 10 to 12 employees. ADOL estimates of Alaska residency for Unisea, Inc. range from 46.8

populace. This section addresses those sectors and major firms which provide direct support of the fishing industry.

Delta Western, Pacific Alaska Fuel Services, and Offshore Systems, Inc. operate major marine supply facilities in Unalaska/Dutch Harbor. The latter two firms have modeled their businesses after the one-stop supply concept developed by SeaAlaska, and expanded by Delta Western. This concept has one firm providing the facility and several basic services, with numerous vendors and firms supporting the fleet located on the premises.

Northern Marine Electronics and Northwest Instrument are electronic sales and service facilities in Unalaska/Dutch Harbor. In previous years, technicians were flown into Unalaska/Dutch Harbor to repair electronic equipment, but these Seattle-based firms now have locally-based technicians to repair and calibrate equipment.

The marine repair facility owned by the Ounalashka Corporation and operated by Walashek Industries of Hawaii is the major repair facility north of Seward, Alaska. The facility is a renovated World War II submarine dock. The facility was previously operated by Panama Marine, a subsidiary of the Aleut Corporation. Walashek Industries took over the facility in 1986, and maintains machine, wood, propellor, boiler, and hydraulic shops, a net loft, and a warehouse. The company also performs general above- and below-waterline repair and maintenance on steel-, wood-, and fiberglass-hulled vessels up to 600 feet in length; engine work is subcontracted. Walashek is capable of performing major repairs for a majority of the Bering Sea fleet and vessels with significant hull damage (e.g., grounding on rocks with several large punctures in the hull) have been noted on the ways. However, most vessel owners move their boats to Seattle for major overhauls and scheduled repairs.

The marine ways is capable of handling vessels up to a range 300-350 tons and 120-150 foot in length. The five section marine railway has a cradle length of 100 feet, a clear width of 32 feet, and maximum water depths of 15 feet forward and 18 feet aft at mean high water. There is room for one vessel onshore in the warehouse-like structure at the end of the ways which can enclose all of a vessel except for the rigging. The marine ways is the only facility west of Seward capable of moving large vessels from the water.

Adjacent dock space can accommodate up to seven vessels, although only 2 to 3 are typically present. Walashek is considering additional mooring spaces at their facility. Conceptual plans call for a finger pier and sheet pile dock adjacent to the existing dock, and a 300 foot long sheet pile dock adjacent to the road. These would only be available for repair work. Other firms in the community provide marine hydraulic services, winch repair, and metal fabrication and repair.

percent of 205 employees in 1987 t 29.1 percent of 639 employees in 1988 (Alaska Department of Labor, 1989b and 1990).

Universal and GLS generate part of their electric power requirements and purchase the remainder from the City. At some point in the future the companies plan to provide all of their power. Other utilities are purchased from the City.

Other Processors

Aleutian Processors, a small American owned company, bought the floating processor, Whitney, from Whitney Fidalgo in early 1986. The vessel has since been renamed the Royal Aleutian. In June, 1986 the Whitney was processing tanner crab with plans to handle brown king crab as well. The capacity of the Whitney is approximately 80,000 pounds per day (Impact Assessment, Inc., 1987). The workforce of 40 to 50 contract employees is housed on board the ship. The workforce was primarily Filipino in 1987. Alaska residents accounted for 35.6 percent of the 261 total employees hired during 1987, and 37.8 percent of the 172 persons hired in 1988 (Alaska Department of Labor, 1989b and 1990).

In the fall of 1987 the Whitney was in Seattle having repairs done to her hull and, according to Impact Assessment, Inc. (1987), having main engine, shaft and prop installed to permit the vessel to be self propelled.

Sans Souchi Seafoods is a small Japanese-owned firm that commenced operation in 1984. The company processes all species of crab for shipment to Japan. Plant output varies according to deliveries and the workforce is hired on as -needed basis. In 1987 the company hired a total of 152 employees, with Alaska residents accounting for 44.1 percent. In 1988, Alaska residents accounted for 62.5 percent of 48 total employees.

As previously discussed, Icicle Seafoods uses the Bering Star, a floating processor, in its Unalaska operations.

3.9.4.3 Support Sector

Unalaska/Dutch Harbor is the major marine support facility in the Bering Sea and development of the support sector is a major component of growth in the community. Some of the services provided in the community are directly tied to the fishing industry, such as marine electronics and repair, while others, such as a floral shop, were founded to provide services to the local population. Alaska Commercial Company and Carl's Commercial Company, which are the two grocery and general retail stores in the community provide examples of firms which serve the fishing industry and the local

Several major diesel engine manufacturers now offer repair service in Unalaska/Dutch Harbor. These include Caterpillar (NC Machinery, Detroit Diesel (Alaska Detroit Diesel), and several others. In prior years it was quite common to have both parts and mechanics flown to Unalaska/Dutch Harbor from Anchorage or Seattle when boats were disabled (Centaur Associates, 1984).

Seafood processing is classified as a manufacturing standard industrial classification (SIC) code, but in the context of a support sector to the fishing industry, crab pot manufacturing and repair is the primary manufacturing activity in Unalaska/Dutch Harbor. Several small businesses build and repair pots for the crab fleet.

Some trawl nets are constructed in the community, but most new nets are shipped in from Seattle. Nor'East Trawl Systems (NETS), among others, provides trawl net repair and construction from the Delta Western facility. Local welding shops (and Walashek's drydock) also do limited metal fabrication for the processing industry and the Bering Sea fleet.

For a number of years, Chevron operated the only public fuel dock in Unalaska/Dutch Harbor, and provided fuel for the fishing fleet as well as being a depot for movement of petroleum products to western Alaska. The Chevron facility was purchased by Delta Western in April 1986 and they continue to operate the 13 million gallon facility.

Petro Marine, a subsidiary of the Seward-based Harbor Enterprises, started business in Unalaska/Dutch Harbor at the former Sea Alaska facility in December, 1984. They played a significant role in Sea Alaska's service port concept and were a major reason the concept was successful. The company expanded its presence by building 1 million gallons of storage at the OSI dock, and operating that facility in 1985 and 1986 during OCS activities. The firm has built a 2 million gallon storage facility landward of the city-owned Ballyhoo Dock to provide additional refueling services in the area.

Petro Marine's recent expansion may be due in part to the purchase of the Sea Alaska service dock and associated land by Delta Western, a competitor in the fuel supply business. Reportedly, Delta Western would prefer that Petro Marine move its refueling service from the Delta Western dock, but Petro Marine has refused to do so until its lease expires in 1990.

Crowley Maritime has added several services, including fuel, pot and gear storage, and a bunkhouse to its Captain's Bay dock. Pacific Alaska Fuel Service (PAFS), a Crowley subsidiary which operates the facility, has expanded the ATCO-style bunkhouse from its original 32 man configuration when constructed in the summer of 1986, to a 72 person facility in the fall of 1987. A local machine shop and welding company moved its business to PAFS to escape the problems of congestion and limited space at the Delta Western dock.

In addition to fish processing specific activities, Universal Seafoods owns the Unisea Mall, the Unisea Inn (which includes a hotel, restaurant, and bar), and the restaurant located at the Unalaska/Dutch Harbor airport. The Unisea Inn was built in 1976 and has been expanded from 10 rooms to its present 46 rooms (Impact Assessment, Inc., 1983). The Inn is a successful venture that caters to the fishing industry. Occupancy rates are extremely high even in off-seasons, and it is difficult to obtain a room without reservations during peak fishing periods.

The Unisea Mall was built in 1980 (Impact Assessment, Inc., 1983) and is leased to Alaska Commercial Company, Key Bank of Alaska, and World Express Travel on the first floor. The second floor is occupied by shipping agencies, state agencies, and several firms that provide services to fishermen and local businesses.

4. REFERENCES

Akutan, City of, 1982. City of Akutan Comprehensive Plan.

Akutan Coastal Management District, 1984. Coastal Management Program Second Akutan Community Survey.

Alaska Consultants, Inc., 1981. St. George Basin Petroleum Development Scenarios, Local Socioeconomic Systems Analysis. Technical Report No. 59. Prepared for Bureau of Land Management, Alaska Outer Continental Shelf Office. Anchorage.

Alaska Department of Commerce, n.d. U.S. Groundfish Operations in the Bering Sea/Aleutian Islands. Juneau.

Alaska Department of Community and Regional Affairs, various years. 1981-1985 Revenue Sharing Population Estimates.

Alaska Department of Community and Regional Affairs. 1987. Southwest Alaska Municipal Conference: Putting Resources to Work for People. Prepared for the Southwest Alaska Municipal Conference and the city of Saint Paul.

Alaska Department of Fish & Game, 1984. A Report to the Alaska Board of Fisheries, Alaska Department of Fish & Game, Commercial Fisheries Division, November 1984.

Alaska Department of Fish & Game, 1986. Pacific Herring Stocks and Fisheries in the Eastern Bering Sea, Alaska. Anchorage.

Alaska Department of Fish & Game, 1988. Commercial Harvest. Bering Sea Area Shellfish Management Report to Alaska Board of Fisheries, unpublished report by the Dutch Harbor Area office, March 1988.

Alaska Department of Fish and Game, 1989a. Alaska Peninsula Aleutian Islands Area Salmon and Herring Annual Report, unpublished management report. Kodiak.

______, 1989b. Annual Management Report for 1989: Norton Sound, Port Clarence, Kotzebue. Alaska Department of Fish & Game, Nome, Alaska

______, 1989c. 1989 Norton Sound Herring - Preliminary Report, Alaska Department of Fish & Game, Report to the Board of Fisheries, Nome, Alaska.

______, 1989d. Westward Region Shellfish Report to the Alaska Board of Fisheries. Kodiak.

Alaska Department of Fish & Game, various years. Alaska (Annual) Catch and Production Statistical Leaflet, Alaska Department of Fish & Game, Juneau, Alaska.

Alaska Department of Labor, 1986. Nonresidents Working in Alaska. Research and Analysis Section. Juneau.

Alaska Department of Labor, 1987. Nonresidents Working in Alaska in 1985. Research and Analysis Section. Juneau.

Alaska Department of Labor, 1989a. Employment files for census subareas. Computer data base provided to MMS.

Alaska Department of Labor, 1989b. An Analysis of the Residency Status of Alaska's Workers by Firm. Juneau.

Alaska Department of Labor, 1990. An Analysis of the Residency Status of Alaska's Workers by Firm, 1988. Juneau.

Alaska Department of Labor, n.d. Nonresidents working in Alaska 1988. Juneau.

Alaska Department of Transportation & Public Facilities, 1985. Cook Inlet Transportation and Resource Development Study, Phase I Report, Data Collection and Inventory. Anchorage.

Alaska Transportation Consultants. 1985. Unalakleet Airport Land Use and Development Plan. Prepared for the City of Unalakleet.

Arctic Alaska Seafoods, 1988. View from the Bridge, Volume 1, Number 3. March.

Armstrong, J. Scott, 1985. Long-Range Forecasting. John Wiley & Sons, New York.

Atkinson, Cliff, 1987. Unpublished correspondence.

Bails, Dale G. and Larry C. Peppers, 1982. Business Fluctuations, Forecasting Techniques and Applications. Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Bakkala, Richard G. and Balsinger (eds), 1989. Condition of Groundfish Resources of the Eastern Bering Sea and Aleutian Islands Region in 1986. Unpublished report, Northwest and Alaska Fisheries Center, National Marine Fisheries Center.

Bakkala, Richard G., Vidar G. Wespestad and Loh-Lee Low, 1987. Historical Trends in Abundance and Current Condition of Walleye Pollock in the Eastern Bering Sea. Fisheries Research, 5:199-215.

Baldwin, Rebecca, 1990. Alaska Fisheries Science Center, National Marine Fisheries Service. Personal Communication. February 28. Seattle.

Beeman, Ogden & Associates, Inc., 1989. Port of Dutch Harbor Ballyhoo Dock Expansion Program. Portland.

__________, 1989b. P.O.L. Facility Expansion, Port of Anchorage, Alaska. Portland.

Bohle, 1986. Report to Industry on Results of the 1986 Eastern Bering Sea Groundfish Survey. Resource Assessment and Conservation Engineering, Northwest and Alaska Fisheries Center, National Oceanic and Atmospheric Administration, Seattle.

Butcher, Walter, Joanne Buteau, Kenneth Hassenmiller, Glenn Petry, and Samih Staitieh, 1981. Economic Impacts of the Alaska Shellfish Fishery: An Input-Output Analysis. NOAA Technical Memorandum NMFS F/NWC-9. Northwest and Alaska Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

Centaur Associates, Inc., 1984. Bering Sea Commercial Fishing Industry Impact Analysis. Prepared for the Minerals Management Service. Anchorage.

Condition of Groundfish Resources of the Eastern Bering Sea and Aleutian Islands Region in 1986. NOAA Technical Memorandum NMFS F/NWC-117.

Cotten, Lamar, 1987. Personal Communication.

Crapo, Chuck, Brian Paust, and Jerry Babbitt, 1988. Recoveries and Yields from Pacific Fish and Shellfish. Marine Advisory Bulletin No. 37. Alaska Sea Grant College Program, University of Alaska. Fairbanks.

Dahlen, John, 1990. Saltwater Productions, Inc. Personal Communication, March 7.

Dames and Moore and Norgaard USA Inc. St. George Harbor, Baseline Studies, a report to the community of St. George, January 1982.

Dean, Mike, 1988. Personal Communication, March 11.

Development Planning and Research Associates, Inc. and Frank Orth & Associates, 1982. Alaska Salmon Projected 1982 Market Conditions. Prepared for Office of Commercial Fisheries Development, Alaska Department of Commerce and Economic Development. Manhattan, Kansas.

Dwight, Jim, 1990. Telephone Communication. Crowley Maritime. Seattle. March 15.

Earl R. Combs, Inc., 1982. Alaska Peninsula Socioeconomic and Sociocultural Systems Analysis. Prepared for the U. S. Department of Interior, Bureau of Land Management, Alaska Outer Continental Shelf Office. Anchorage.

Federal Reserve Bank of San Francisco, various years. Federal Reserve Bulletin, Appendix 68, International Statistics, Foreign Exchange Rates.

Fisher, Captain Barry. The Joint Venture Fishery for Yellowfin Sole: The Bering Sea, Summer 1980, A Case Study in Fishery Development. Alaska Fisheries Development Foundation and North Pacific Fishery Management Council, Anchorage, Alaska, November 1980.

Focht, Rick, Nasser Kamali, and Kurt Schelle, 1984. Employment and Gross Earnings in Alaska's Commercial Fisheries, 1977-1982. CFEC Report Number 84-11, Juneau.

Focht, Rick, 1986. Employment and Gross Earnings in Alaska's Commercial Fisheries, 1983-1984 (Draft). CFEC Report No. 86-8, Juneau.

Fried, Neal, 1990. Economist, Alaska Department of Labor. Personal Communication. February 16.

__________, 1990b. Economist, Alaska Department of Labor. Personal Communication. April 12.

Gharrett, Jessica, 1990. National Marine Fisheries Service. Personal Communication. February 2. Juneau.

Griffin, Kenneth, 1986. Bering Sea Area Shellfish Management Report to Alaska Board of Fisheries. Alaska Department of Fish and Game, Dutch Harbor Area Office.

Hanson, Jeffrey E., 1987. Bioeconomic Analysis of the Alaskan King Crab Industry. Washington State University, Department of Agricultural Economics. Pullman.

Impact Assessment, Inc. 1983. Unalaska: Ethnographic Study and Impact Analysis. Prepared for the Minerals Management Service. Anchorage.

Impact Assessment, Inc., 1987. Analysis of Aleut Institutional Response and Change: 1980 - 1985. Prepared for the Minerals Management Service. Anchorage.

International Pacific Halibut Commission, Annual Report, (various years), Seattle Washington.

Jensen, William S. and Hans D. Radtke, 1985. Fisheries Economic Assessment Model. Prepared for the West Coast Fisheries Development Foundation. Portland.

Jon Isaacs and Associates, Gary Hennigh Associates, and ResourcEcon, 1986. Sand Point Socioeconomic Forecast and Airport Demand Study. Prepared for the City of Sand Point.

Keith, Karen, Ben Muse, and Kurt Schelle, 1987. Net Returns in the Cook Inlet Salmon Drift Gill Net Fishery, 1981 through 1983 (DRAFT). Commercial Fisheries Entry Commission Report CFEC 87-6. Juneau.

Kevin Waring Associates, 1985. City of Unalakleet Comprehensive Plan. Prepared for the City of Unalakleet.

King Cove, City of, 1981. City of King Cove Community Comprehensive Plan.

Kinoshita, Richard K., 1987. Alaska Sablefish Fishery, 1986. NOAA Technical Memorandum NMFS F/NWC-120. Resource Ecology and Fisheries Management Division, Northwest and Alaska Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration. Seattle.

Knapp, Gunnar and Kathy May MarkAnthony, 1984. Sensitivity of RAM Model Projections to Key Assumptions. Institute of Social and Economic Research, University of Alaska, Anchorage. Prepared for Minerals Management Service, Alaska OCS Office, Anchorage.

Lin, Biing-Hwan, Hugh S. Richards, and Joseph M. Terry, 1988. An Analysis of the Exvessel Demand for Pacific Halibut (draft).

Lloyd, Denby, 1987. North Pacific Fisheries Management Council staff. Personal communication. December 15, 1987.

Muse, Ben and Kurt Schelle, 1986. A Fiscal Model for the Cook Inlet Salmon Drift Gill Net Fishery in 1982. Commercial Fisheries Entry Commission, CFEC Report 85-4. Juneau.

National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1987. Unpublished Computer files entitled Special report for Minerals Management Service.

National Marine Fisheries Service, Northwest and Alaska Fisheries Center, 1988. Unpublished Computer data base files.

National Marine Fisheries Service, Alaska Fisheries Science Center, 1989. Economic Status of the Groundfish Fisheries Off Alaska, 1989 (DRAFT). Seattle.

National Ocean Service, 1987. United States Coast Pilot, Volume 9. Washington, D.C.

Northern Economics, 1988. Seafood Industrial Park Economic Feasibility Study. Prepared for the City of Dillingham.

North Pacific Fishery Management Council, 1986. Newsletter #4-86. Anchorage, Alaska.

North Pacific Fishery Management Council, 1987. Newsletter #6-87.

North Pacific Fisheries Management Council, 1987. Resource Assessment Document for Groundfish in the Bering Sea-Aleutian Islands as Assessed in 1987 and Estimated Acceptable Biological Catch Levels for 1988. Anchorage, Alaska.

North Pacific Fisheries Management Council, 1989. Draft Supplemental Environmental Impact Statement for Longline and Pot Gear Sablefish Management in the Gulf of Alaska and Bering Sea/Aleutian Islands. Anchorage, Alaska.

Orth, 1967. Dictionary of Alaska Place Names. U.S. Geological Survey Professional Paper 567. U.S. Government Printing Office.

Otto. R.S. 1981. "Eastern Bering Sea Crab Fisheries". In: Hood, D.W. and J.A. Calder (eds.), The Eastern Bering Sea Shelf:Oceanography and Resources, Vol. 2:1037-1066.

Pacific Fishing, 1989. "1989 Factory Trawler Directory." Vol. XI, No. 4 (September). pp. 63-67. Seattle

Pacific Seafood Processors Association, 1985. A Strategy for the Americanization of the Groundfish Fisheries of the Northeast Pacific. Seattle.

R&M Consultants, Inc., 1986. Unalaska Boat Moorage Survey. Prepared for the U.S. Army Corps of Engineers, Alaska District.

ResourcEcon, 1987. Bulk Fuel/Port Services Survey. Prepared for the Community of Sand Point. Anchorage.

Rogers, G.W., R.F. Listowski, and J. Brakel, 1972. A Study of the Socio-Economic Impact of Changes in the Harvesting Labor Force in the Alaska Salmon Fishery. Institute of Social, Economic, and Government Research, University of Alaska.

Rogers, G.W., R. F. listowski, and D. Mayer, 1980. Measuring the Socioeconomic Impacts of Alaska's Fisheries, Institute of Social and Economic Research, University of Alaska.

Sand Point, City of, 1981. City of Sand Point Community Comprehensive Plan.

Seattle Northwest Securities Corporation. 1986. Financial Feasibility Study for the Sand Point Airport Expansion Project. Prepared for the City Sand Point.

Smith, Carol, 1990. Alaska Department of Fish & Game, Computer Services Division. Personal Communication. February 16, 1990. Juneau.

Snyder, Robin, 1989. National Marine Fisheries Service. Personal Communication. April 18. Juneau.

Stephen Braund & Associates, 1986. A Description of the Social and Economic Systems of the Aleutian/Pribilof Islands Region. Prepared for the Minerals Management Service. Anchorage.

Stephen Braund & Associates, 1986a. Effects of Renewable Resource Harvest Disruptions on Community Socioeconomic and Sociocultural Systems: King Cove. Prepared for the Minerals Management Service. Anchorage.

Stevens, B.G., R.A. MacIntosh and R.S. Otto,1987. United States Crab Research in the Eastern Bering Sea During 1987. Unpublished report, 38pp. Northwest and Alaska Fisheries Center, National Marine Fisheries Service. Seattle.

Terry, Joseph M., Roger G. Scoles, and Douglas M. Larson, 1980. Western Alaska and Bering-Norton Petroleum Development Scenarios: Commercial Fishing Industry Analysis. Alaska Sea Grant Program, University of Alaska. Prepared for Bureau of Land Management, Alaska Outer Continental Shelf Office, Alaska OCS Socioeconomic Studies Program.

Thomas, Kathleen, 1983. Alaska Fish Harvesting Employment, 1977-1982. Alaska Department of Labor, Research and Analysis Section, Juneau.

Thomas, Kathleen, 1986. Alaska Seafood Harvesting and Processing Employment. Alaska Department of Labor, Research and Analysis Section, Juneau.

Thomas, Kathy, 1986A. "Surimi Production in Alaska." In Alaska Economic Trends, January, 1986. Alaska Department of Labor, Research and Analysis Section, Juneau.

Thomas, Kathleen, 1987. Alaska Seafood Industry Employment, 1977-1984. Alaska Department of Labor, Research and Analysis Section, Juneau.

Tremaine, Dick, 1989. North Pacific Fishery Management Council. Personal Communication. March 7. Anchorage.

U. S. Army, Alaska District Corps of Engineers. 1987. Draft Letter Report Harbor Design Review: Saint Paul Island, Alaska.

U.S. Department of Commerce, Bureau of the Census, various years. 1920-1980 U.S. Census.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1989. Fisheries of the United States 1988. Washington, D.C., April 1989.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1988. Draft Supplemental Environmental Impact Statement and Regulatory Review/Initial Regulatory Flexibility Analysis for a Proposal to Increase the Optimum Yield (OY) Range in the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands. Seattle.

Utecht, Michael, 1987. Harbormaster, City of King Cove. Personal Communication. September 10.

Wespestad, Vidar, 1982. Methodology presented in St. George Harbor Baseline Study. Prepared for the City of St. George.

Wespestad, Vidar, 1989. Walleye Pollock. Unpublished manuscript. Northwest and Alaska Fisheries Center. September.

Wiese, Craig and Patrick Burden, 1988. "Investing in Alaska Groundfish". Pacific Fishing Vol IX, No. 9, September. pp. 46-57.

APPENDIX A

BERING SEA FISHING INDUSTRY MODEL

1. Introduction

The purpose of this appendix is to provide the reader with sufficient information to use the fishing industry model (FIM) developed for this project. This appendix describes major components, and the constraints and limitations of the FIM. The FIM is developed from the information and references presented in the previous sections. Output from the FIM is not used in the discussions of the industry or the communities in the report.

The objectives of this study call for a methodology to 1) forecast harvest levels by species and fishery for the Bering Sea fishing industry; and 2) estimate local harvest and processing employment in the study communities. Forecasts developed in this model will provide information on projected harvest and processing employment and income in a selected community. This information will be used in the Rural Alaska Model (RAM) to forecast direct and indirect effects on community population, employment, and income.

Ease of duplicating the methodology and modifying forecasts based on changing conditions is another objective of this study. Several forecasting methods (i.e., Box-Jenkins and autoregression) were considered before selecting linear regression analysis. Linear regression was selected for a number of reasons:

1. the longer the forecasting time frame the less valuable autoregressive (including Box-Jenkins) schemes become becasue as the time horizon lengthens, uncertainty increases, as does the need for a theoretical foundation (Bails and Peppers, 1982);

2. the cost of formulating and developing regression models is less than that of the other methods, which was very important since the resources available to develop the model account for about fifteen percent of the project;

3. regression models are less costly to update since autoregressive techniques require constant updating and experimentation to select the best parameters;

4. Regression models are easier to implement, understand, and communicate findings to decision-makers; and

4. The FIM is only one model of a set that MMS uses in its analyses and regression analysis provides the desired level of accuracy at considerable savings.

The model stresses a minimum number of variables rather than attempting to identify and employ all significant variables in the projections. The use of standard assumptions for items such as crew size, and use of regression equations with a minimum number of variables simplify use by MMS staff. The user needs to forecast a few independent variables which can be updated with relatively simple techniques.

The methodology discussed in the following sections has been formulated to meet these objectives using a microcomputer spreadsheet model with data available from NMFS, CFEC, ADF&G, ADOL, and limited survey data. Microsoft Excel was selected as the spreadsheet program since at the time the model was being developed it was the only major spreadsheet program available with the capability to link spreadsheets. Separate spreadsheets are developed for major data blocks and analytical methods, and linked to provide the entire model.

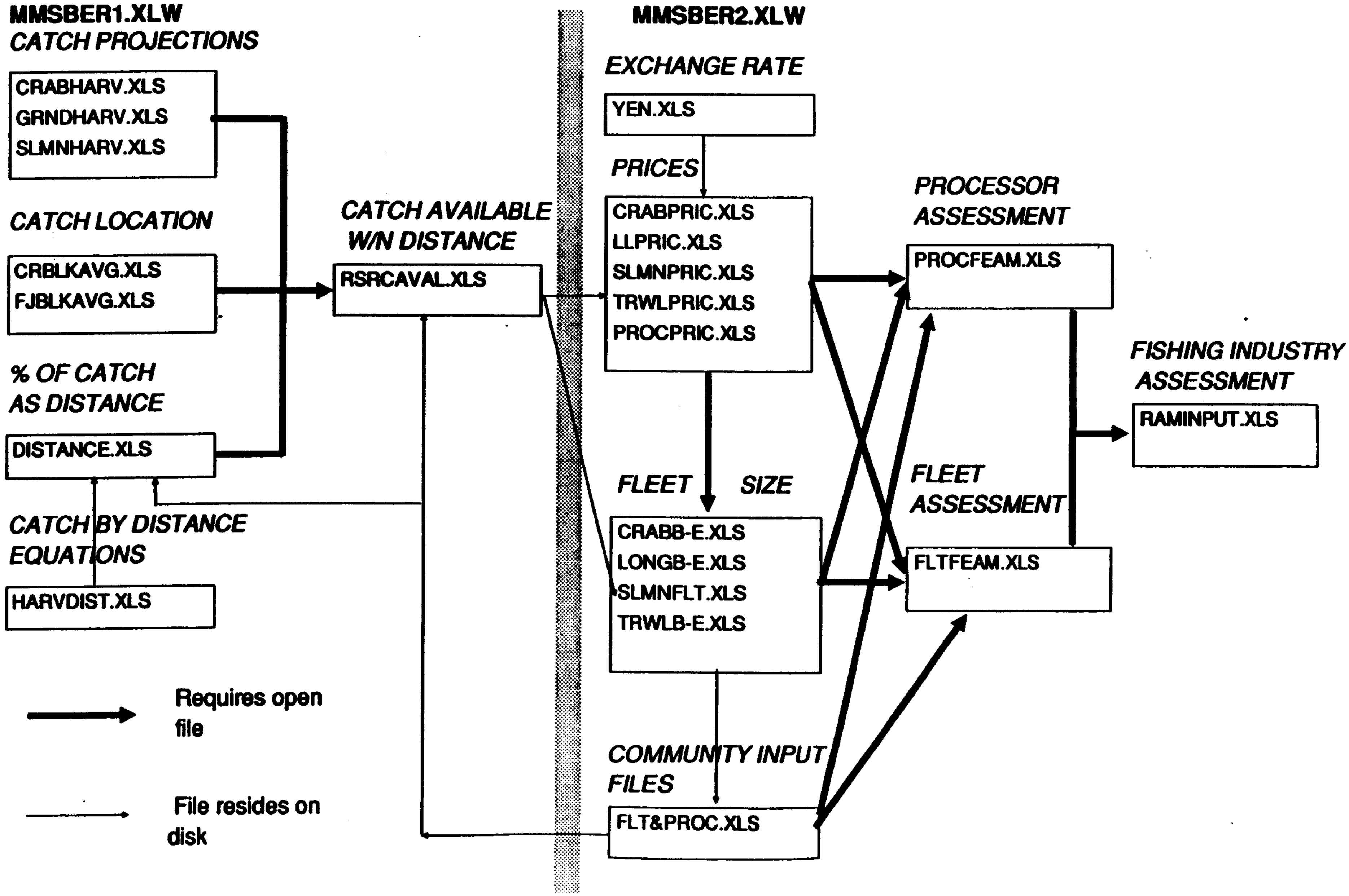
2. Model Structure

The model runs on Microsoft Excel, a microcomputer spreadsheet, under Windows 386. This combination permits Excel to use more than the 640 KB of memory standard in IBM-PC compatible microcomputers. The model was developed on an IBM Model 80, an Intel 80386 microprocessor based computer, with 8 MB of random access memory. The model can run on a 80286 based machine under Windows 2.01 but the graphics interface of Windows would result in very slow performance. It is recommended that the computer used for this model have at least 6 MB of random access memory since Excel and the complete version of Windows will require over 2 MB.

Excel employs a workspace, or group of files, concept which permits the user to start the model by opening one workspace file, which in turn will open the other linked files. Excel allows up to 15 linked files to be open, or in memory, at any given time. Certain linked files (e.g., YEN.XLS) can be available on disk if references to the file do not involve calculations. Files whose cells are used in calculations must be open and available in memory. The two workspace groups of files allow the model to fit within these constraints. If changes are made to files in either workspace group, use the Workspace Save command in Excel to save the data and linkages. Only one workspace group of files in the model can be open at a time. Figure A-1 shows the basic model structure, workspace groups, and linkages between major components.

The first workspace group uses catch by location data on fishery resources in the Bering Sea/Aleutian Islands area ,and distances traveled to fishing grounds by vessels of each gear type to estimate the resources available to the community. The second workspace

FIGURE A-1 BERING SEA FISHING INDUSTRY MODEL



group references the information contained in RSRCAVAL.XLS so that files in the first group are not required to be open. The second workspace group estimates fleet sizes and uses information on fleet and processor characteristics to arrive at income and employment in the community. In addition to the two groups of workspace files there is a set of files which is only referenced and remains on disk. The model is comprised of the following named spreadsheets, which are combined into two groups, or workspaces, and another set of files that remain on disk:

MMSBER1.XLW	Workspace 1
CRABHARV.XLS	Projections of annual crab harvest by species;
CRBLKAVG.XLS	% of crab harvest within each 1 by 1/2 degree block;
DISTANCE.XLS	% of block catch going to selected port;
FJBLKAVG.XLS	% of groundfish harvest within 1 by 1/2 degree block;
GRNDHARV.XLS	Projections of annual groundfish harvest by species;
RSRCAVAL.XLS	Total catch within travel distance envelope;
SLMNHARV.XLS	Projections of annual salmon catch by species.
MMSBER2.XLW	Workspace 2.
CRABB-E.XLS	Break-even model to estimate crab fleet size;
FLT&PROC.XLS	Select community, year, and other parameters;
FLTFEAM.XLS	Summarizes income and employment for vessels;
LONGB-E.XLS	Break-even model to estimate longline fleet size;
PROCFEAM.XLS	Summarizes income and employment for processors;
SLMNFLT.XLS	Describes revenue and expenditures for salmon fleet;
TRAWLB-E.XLS	Break-even model to estimate trawl fleet size.
Other Files	
CRABPRIC.XLS	Estimates future prices for crab by species;
HARVDIST.XLS	Estimates equations for catch by distance from port;
GEARHARV.XLS	Allocates catch by gear type;
LLPRICE.XLS	Estimates future prices for species caught by longliners;
PROCPRIC.XLS	Estimates future prices for processed products;
SLMNPRIC.XLS	Estimates future prices for salmon species;
TRWLPRIC.XLS	Estimates future prices for species caught by trawlers;
YEN.XLS	Estimates future $/Yen exchange rate.

Excel requires that linked files which are not resident in memory be specifically addressed with drive name and path. The following subdirectories and path should be established and the model files copied into the last subdirectory: C:/WIN386/EXCEL/MMSBER

The following subsections describe the files within the model, starting with those associated with the first workspace group, and the linkages that exist between files. Files which remain on disk are also discussed in the workspace group which they are associated with. Representative tables are also shown for each file. Due to the large size of many files these tables show selected parts of the file which should be sufficient to show the basic structure.

MMSBER1.XLW

This file is the workspace file for the first workspace group. It functions similar to a DOS batch (.bat) file. Opening this file results in automatic opening of the remainder of the workspace group.

CRBLKAVG.XLS and FJBLKAVG.XLS

These two files are in the first workspace group and present data on average catch by one degree latitude by 1/2 degree longitude cell in the Bering Sea/Aleutian Islands (BS/AI) area for domestic harvest of crab (CRABLKAVG.XLS) and foreign and joint-venture catch of groundfish (FJBLKAVG.XLS). The crab data are based upon average catches for each species (in pounds) by cell or block for the 1986 and 1987 calendar years from data provided by the computer services division of ADF&G. The information was provided in paper copy and keypunched by MMS staff.

Table A-1 CRBLKAVG.XLS

Block	Red	Blue	Brown	Bairdi	Opilio	Hair
160553	281	0	0	0	0	0
160563	112383	0	0	0	0	0
160570	197736	0	0	0	0	0
161560	109576.5	0	0	0	0	0
161563	843150	0	0	0	0	0
161570	437809.5	0	0	0	0	0
161573	119298	0	0	0	0	0

The first block reference is for catches that occurred in that one degree latitiude by 1/2 degree longitude area with 160 degrees latitude and 55 degrees 30 minutes longitude as its southeast corner. The figures shown under each species are the average annual catch in that block for the particular species.

Domestic groundfish catch data are not available for one degree by 1/2 degree blocks with the BS/AI area because detailed catch information was not required of the domestic groundfish fleet until January, 1990. Areas of high harvest levels are thought to remain relatively constant over time so areas of large catches by the foreign and joint-venture fleets are assumed to also be areas of high harvest levels for the domestic fleet. The groundfish data are from computer files provided by NMFS for 1981 through 1986. Catch data for 1987 and later years were not used since the domestic groundfish fleet began to significantly displace the foreign and joint-venture fleets with subsequent closures affecting time and areas fished by these fleets. These data are in metric tons (2,205 lbs).

HARVDIST.XLS

This file presents information to estimate landings in a selected community from any one degree by 1/2 degree block in the BS/AI area. CFEC and NMFS provided information on weight or percent of harvest by cell and distance to the port where it was landed for crab, trawl, and longline fisheries. This information was used to construct equations that project the percentage of harvest going to a community from any cell. This file does not need to be open for dependent worksheets to access the equations so it is not part of the first workspace group.

Table A-2: FJBLKAVG.XLS

Block	Pollock	Pacific Cod	Yellow-fin Sole	Other Flat-fish	Turbot	Sable-fish	Pacific Ocean Perch	Other Rock-fish	Atka Mack-erel	Squid	Other Fish
147590	0.45	0.2	0	0	0	0.1	5.4	0.4	0	0.1	0.5
148573	0	0	0	0	0	0.1	1.9	0.3	0	0	0.2
148580	8.7	1.9	0	0	0	0.6	16.6	5.6	0.1	0.2	1.4
148583	7.9	3.1	0	0	0	0.3	80.9	10	0	0.4	2.0
148590	0	0	0	0	0	0.1	1.6	1.4	0	0	0.1
148593	0	0.1	0	0	0	0	0	0	0	0	0.1
149540	0	0	0	0	0	0	0	0	0	0	0
149573	48.8	0.8	0	0	0	0.5	31.2	4.1	0	2.1	1.9
149580	4.9	0.8	0	0	0	0.2	2.8	0.5	0	0	0.3

The first three columns in Table A-3 are data received from NMFS for a sample of trawl landings, the percentage of the total landings at each distance, and the cumulative percentage. Subsequent columns combine the original data into 10 nautical mile increments, and establish revised percentages of total landings for each increment (e.g., percentages for distances 20, 23, and 28 are combined into the 20 to 29 mile increment), and revised cumulative percentage. An adjustment for outliers is made to arrive at the final percentages. The final cumulative percentages is regressed against distance with the Excel "linest" function, and the coefficients for the linear regression are shown on the second line of Table A-2. This file contains similar data for the longline and crab fisheries.

Table A-3: HARVDIST.XLS

			TRAWL				
			LINEST-0.00597		0.95688		
TRAWL DIST	NMFS PERLBS	NMFS CUMPER	MILES		REVISED PERLBS	REVISED CUMPER	FINAL CUMPER
19	7.3%	1	0	9	0%	100%	1.00%
20	15.3%	92.7	10	19	7.3%	100%	1.00%
23	0.1%	77.3	20	29	16.7%	91.6%	91.3%
28	1.2%	77.2	30	39	3.5%	72.3%	71.1%
35	3.5%	76.0	40	49	0.8%	68.3%	66.9%
41	0.8%	72.6	50	59	6.2%	67.3%	65.9%

Figure A-2 shows the actual data and estimated landings by distance for trawlers. There are several outliers which extend the delivery distance well beyond the normal delivery pattern for trawlers. The equation and resulting linear estimate omit several outliers. These data points were omitted to obtain the best fit for what is considered the representative data set.

Figure A-2:
Trawl Catch Distance from Port

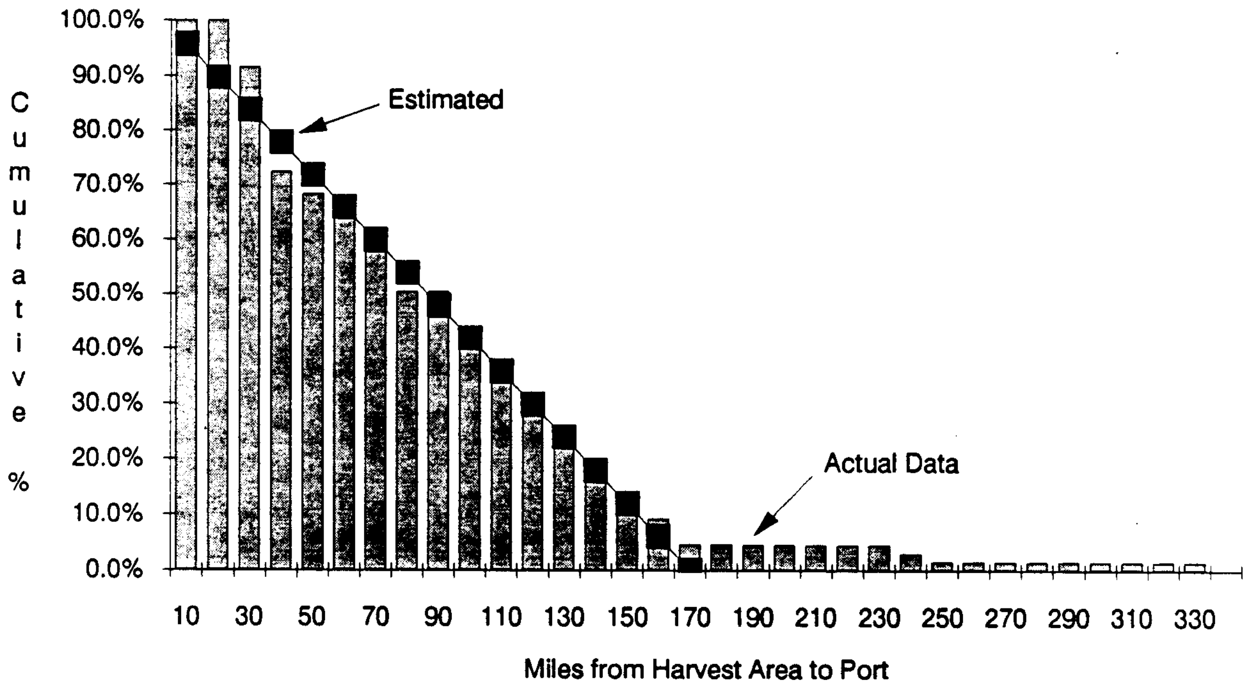


Figure A-3 shows the longline cumulative landings by distance data and a logarithmic function which was developed for the data. This estimated landings by distance curve was developed using the "logest" function in Excel. Figure A-4 shows similar information for the crab fleet.

Figure A-3:
Longline Catch Distance from Port

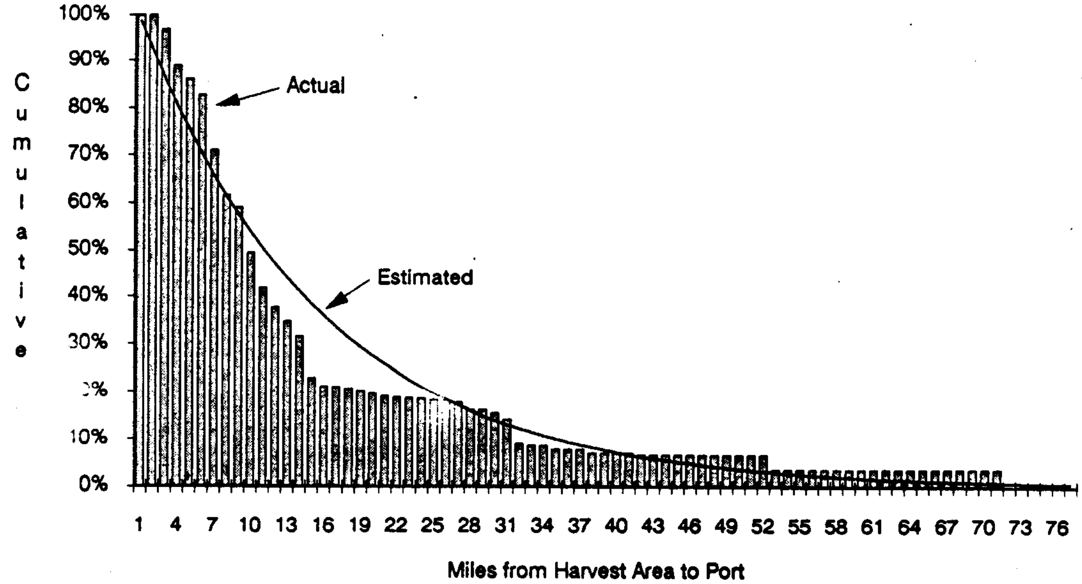
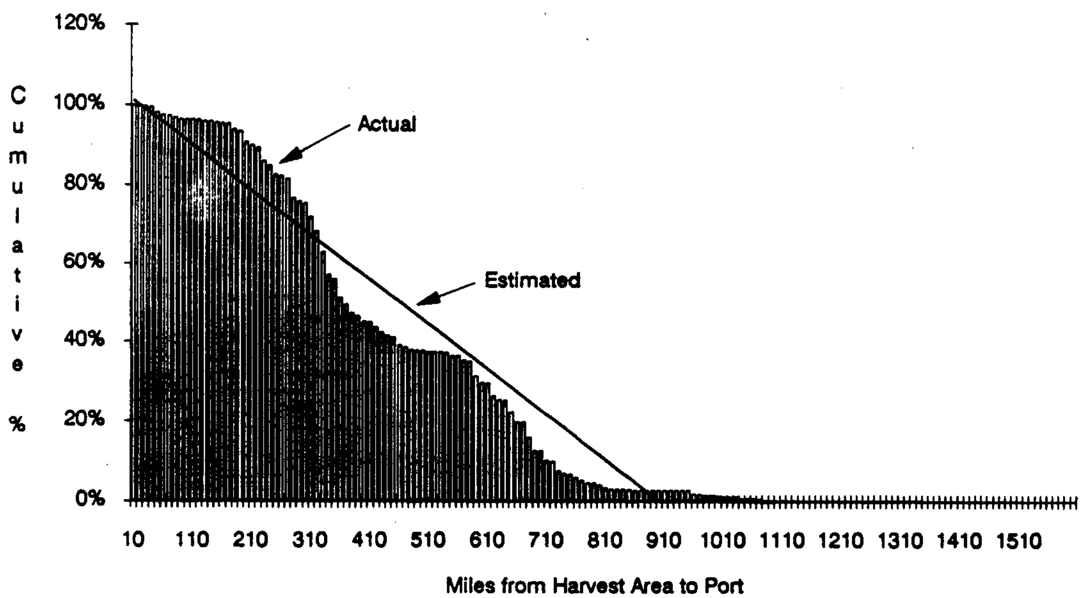


Figure A-4:
Crab Catch Distance from Port



DISTANCE

This file calculates the portion of the total crab and groundfish harvest in the Bering Sea that is within the travel distance zone (i.e., below the equation line shown in Figures A-2, A-3, or A-4) of fishing vessels operating from a selected port. The first step in the process is to calculate the distance between the selected community and each individual block. Information on the port and its location is put into FLT&PROC.XLS (part of MMSBER2.XLW). Longitude and latitude data is available from the Dictionary of Alaska Place Names (Orth, 1967). DISTANCE.XLS links to FLT&PROC.XLS for this information.

The longitude and latitude are converted from degrees and parts of degrees expressed in minutes, to degrees and percent of degrees to facilitate the calculations. Distance between the community and the southeast corner of the block is then calculated.

Two of the selected communities are located on the south side of the Alaska Peninsula and adjustments are made to ensure that the distance from these communiites reflects the transit through False Pass or Unimak Pass for vessels operating in the Bering Sea. The National Ocean Service (1989) suggests that vessels with drafts greater than 24 feet not transit False Pass. Neither King Cove or Sand Point has vessels of this size so it is assumed that boats will use False Pass. If King Cove or Sand Point are selected the worksheet calculates distance from False Pass to each block and adds the distance from the community to False Pass to arrive at total distance. Table A-4 shows the top part of the worksheet file.

The equations developed in HARVDIST.XLS are then applied to the calculated distance. The resulting column estimates the percent of the total block catch which is landed at the port. Results are provided for groundfish trawl and longline, and for crab.

Table A-4: DISTANCE.XLS

Distance Function				Rad =	57.2957795	
Port Name:	King Cove				Groundfish	
	Longitude	Latitude			Linest for Trawl =	
Actual	162.19		55.03	Dist	Dist	-0.00597752272
Calc.	162.31		55.05	to	False	0.95688249277
S.E. corner	Southeast Corner			False	Pass to	% of Block Catch
of Block	Long.	Lat.	Dist.	Pass	Community	Taken to Port
148573	148	57.50	582.01	537.01	45	0.00%
148580	148	58.00	588.36	543.36	45	0.00%
148583	148	58.50	596.25	551.25	45	0.00%
148590	148	59.00	605.63	560.63	45	0.00%

CRABHARV.XLS, GRNDHARV.XLS, AND SALMNHRV.XLS

These files contain the projected harvest levels for the major resource groups. The contents of the table are similar. The historic data and development of the equations used to project the harvests are discussed in Section 2.

Table A-5: CRABHARV.XLS

Crab Harvest Projections (pounds)

	King			Tanner		
Year	Blue	Brown	Red	Bairdi	Opilio	Other
1990	10433550	11806068	19247097	7107681	150000000	113906
1991	10622446	12206527	21752175	7337491	150000000	100000
1992	10811343	12606986	24257254	7567302	150000000	100000
1993	11000239	13007445	26762333	7797113	150000000	100000
1994	11189136	13407904	29267412	8026924	150000000	100000
1995	11378033	13808363	31772491	8256735	150000000	100000
1996	11566929	14208822	34277570	8486545	150000000	100000
1997	11755826	14609281	36782648	8716356	150000000	100000

RSRCAVAL.XLS

This worksheet uses the data contained in the resource harvest location files (i.e., CRBLKAVG.XLS and FJBLKAVG.XLS), projected catch statistics in the Bering Sea for the selected year (CRABHARV.XLS and GRNDHARV.XLS), and the calculated results in DISTANCE.XLS which estimate the percent of catch from each block, to arrive at estimates of harvest for crab and groundfish vessels operating from the community. Salmon and herring harvest is set at the projected harvest in the local management area. This file is the only link used by files in the second workspace group.

The allocation of Bering Sea groundfish between trawl and longline is based upon the average proportion of the domestic catch by species over the 1986-1989 time period. This estimate was obtained from PACFIN monthly reports (Pacific States Marine Fisheries Commission, various years). This allocation may change over time as more vessels enter the fishery, but the domestic groundfish industry is changing too rapidly to predict how it will change. In part, future harvest projections will depend on resolution of issues such as bycatch and onshore-offshore allocation, that are currently before the North Pacific Fishery Management Council.

Salmon and herrring are divided between gear types in each area according to 1980 through 1988 averages constructed from CFEC data bases.

The worksheet uses the year (from FLT&PROC.XLS) to select the appropriate row from GRNDHARV.XLS. Input of a different year in FLT&PROC.XLS will change the available catch. For salmon and herring the worksheet evaluates the area designation (linked to FLT&PROC.XLS) and selects the area which is available to local fishermen, setting other areas to zero (0).

Table A-6: RSRCAVAL.XLS

AREA: M	AVAILABLE TO VESSELS W/N TRAVEL DISTANCE OF PORT								
PORT: King Cove									
YEAR: 1990									
	POLLOCK	COD	SOLE	SABLE	TURBOT	FLAT	ROCK	MACK	HALIBUT
BSAI HARVEST(MT)	1151432	309200	243952	5270	6800	113906	10625	20285	5659
TRAWL HARVEST(MT)	1151432	299151	243952	2309	5225	113792	9661	20285	0
AVAILABLE TO TRAWL W/N TRAVEL DISTANCE	94257	26490	3395	128	65	4535	310	41	0
LONGLINE HARVEST(MT)	0	10049	0	2960	1574	113	963	0	5659
LONGLINE HARVEST(LBS)	0	22158045	0	6528312	3471111	251162	2124930	0	12478095
AVAILABLE TO LONGLINE W/N TRAVEL DISTANCE(LBS)	0	5211962	0	1339306	361562	66107	341505	0	2349243

MMSBER2.XLW

This file operates in a similar fashion to MMSBER1.XLW. This second workspace group of files only references the information contained in RSRCAVAL.XLS (i.e., the data are not directly used in calculations) so files in the first group are not required to be open. The second workspace group estimates fleet sizes and uses information on fleet and processor characteristics to arrive at income and employment in the community.

FLT&PROC.XLS

Information on the selected community is placed in this file for use by worksheets in both MMSBER1.XLW AND MMSBER2.XLW. The user puts the name of the community, its location by longitude and latitude coordinates, and the year of interest into cells in the upper left hand corner of the worksheet. The location coordinates are used by worksheets in the first workspace group to determine distance and resource availability.

The number of processors and vessels is used by subsequent worksheets which assess the employment and income of the processing and harvesting sectors. Data on the number of processors by size is based on the user's knowledge of the community, direct discussions with local management of the processing firm, or conversations with other persons in the industry, including ADF&G biologists.

Table A-7: FLT&PROC.XLS (a)

PROCESSOR CHARACTERI	AND FLEET STICS					
PORT:	King Cove		YEAR:	1990		
	LONGITUDE	LATITUDE				
LOCATION:	162.19	55.03				Local Plant
AREA:	M		No. of Plants in Community	No. of Plants in Mgmt. Area	Emp. Plant	Ownership % Residency
VERY LARGE		(250+ emp.)	0	0	300	0
LARGE		(150-250 emp.)	1	1	200	0
MEDIUM		(75-150 emp)	0	2	125	0
SMALL		(<75 emp.)	0	0	50	0
BUYING STATION			0	------------------ -		
% of Proc. Employment:		44%	1	3		
Local Res. as % of Employment		3%				

This worksheet also requires the user to provide information on the number of resident vessels by size, gear type, and residency. Some of this information is obtained from several of the data base files supplied by NMFS and CFEC. The data bases do not presently distinguish between catcher boats and catcher/processors from a certain community. If the number of catcher/processors is not known, the NMFS office in Juneau can provide the information. Local boats must also be distinguished between those fishing in local waters, and those fishing in distant waters (i.e., other areas of the state).

This worksheet is linked to the break-even models for trawl, longline, and crab so that changes in the number of local boats affect the number of non-resident boats operating in the area. Selection of a community which is in a different management area than the present option will require changing the number of permits in the local area for salmon and herring.

Table A-8: FLT&PROC.XLS (b)

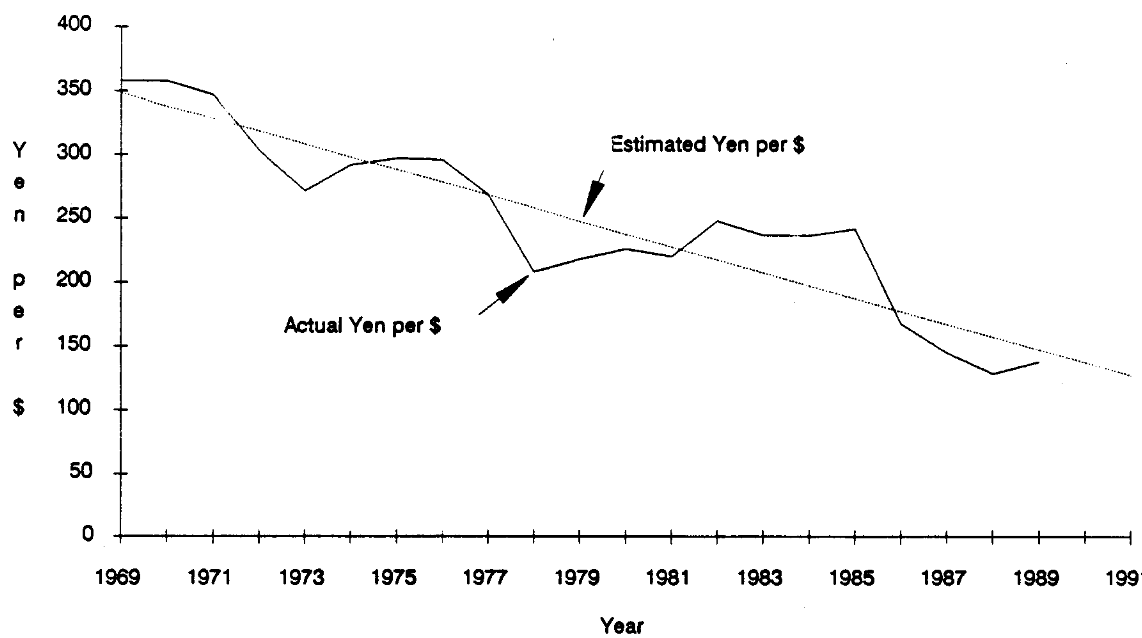
NUMBER OF VESSELS	RESIDENT LOCAL	DISTANT WATER	NONRESIDENT LOCAL AREA	OTHER BS/AI	TOTAL BS/AI
TRAWL:			15	199	213
<100' TRAWLER	0	0	5	66	70
125-200' TRAWLER	0	0	5	66	70
125-200' F/T	0	0	2	26	28
200-250' F/T	0	0	2	32	34
250'+ F/T	0	0	1	8	9
Support Base for C/P? (N=0,Y=1)	0				
LONGLINE:			9	33	42
<60' LONGLINER	10	0	0	8	18
60-100' LONGLINER	0	0	4	15	19
100'+ LONGLINER/C/P	0	0	1	4	5
CRAB:			13	203	216
<60' CATCHER	21	0	0	14	35
60-90' CATCHER	0	0	4	59	63
90-120' CATCHER	0	0	6	89	95
120'+ C/P	0	0	1	20	22
SALMON			Non-Resident	Area Resident	MGMT AREA
SEINER:	34	0	31	83	114
GILLNET:	22	1	152	73	225
SETNET:	7	3	55	74	129

YEN.XLS

This file contains historic and projected currency exchange rates between the U.S. $ and the Japanese Yen. Historic data are from the Federal Reserve Bulletin (Federal Reserve

Bank, various years). MMS can obtain forecasts of the Yen/Dollar exchange rate from commercial forecasting services or other federal agencies when updating the model. This version employs a linear regression equation for the exchange rate using time as the independent variable. The correlation coefficient (R^2) for this equation is .84. Figure A-5 shows the relationship between the actual exchange rate and that projected by the the time related equation.

Figure A-5:
Exchange Rate of U.S. $ and Japanese Yen



The model stresses a minimum number of variables rather than attempting to identify and employ all significant independent variables in the projections to increase the correlation coefficient and meet standards for various statistical tests. The user forecasts a few independent variables which can be updated with relatively simple techniques.

Table A-9: YEN.XLS

YEAR	ACTUAL	ESTIMATED
1980	226	237.82
1981	220	227.77
1982	248	217.71
1983	237	207.66
1984	237	197.61
1985	242	187.56
1986	168	177.51
1987	145	167.46
1988	128	157.40
1989	138	147.35
1990		137.30
1991		127.25
1992		117.20
1993		107.15
1994		97.09
1995		87.04
1996		76.99
1997		66.94
1998		56.89
1999		46.84
2000		36.78

SALMNPRC.XLS

The Yen/$ exchange rate is an important variable in the price projections for several fisheries resources, with salmon being one of those most affected by this relationship. Variables that might effect the ex-vessel price for various species were identified through a review of a number of sources (e.g., Terry et al., 1980; Muse, 1984; Lin, Richards, and Terry, 1988 [draft]; Kinoshita, 1987; Hanson, 1987; Butcher et al., 1981; and Development Planning and Research Associates, Inc., 1982) Stepwise multiple regression analysis was employed to determine the variables used in the forecasting equations, with a goal of using as few variables as possible; fewer variables make updating the model easier, and avert the problem of collinearity between variables. In most cases, a variable was omitted if it contributed less than three or four points to the coefficient of determination (R^2), with no substantive change in other measures. The equations for statewide ex-vessel values by species are contained in respective worksheet cells for each species for years 1990 through 2010.

Ex-vessel price forecasts for Bering Sea salmon are determined from statewide ex-vessel price estimates using regression analysis, and then adjusted for each management area (Table A-10). Statewide salmon ex-vessel prices were employed rather than management area prices since longer time series were available, and the number of ex-vessel price models was greatly reduced. Previous work by Terry et al. (1980) found that statewide and management area prices tend to change proportionately.

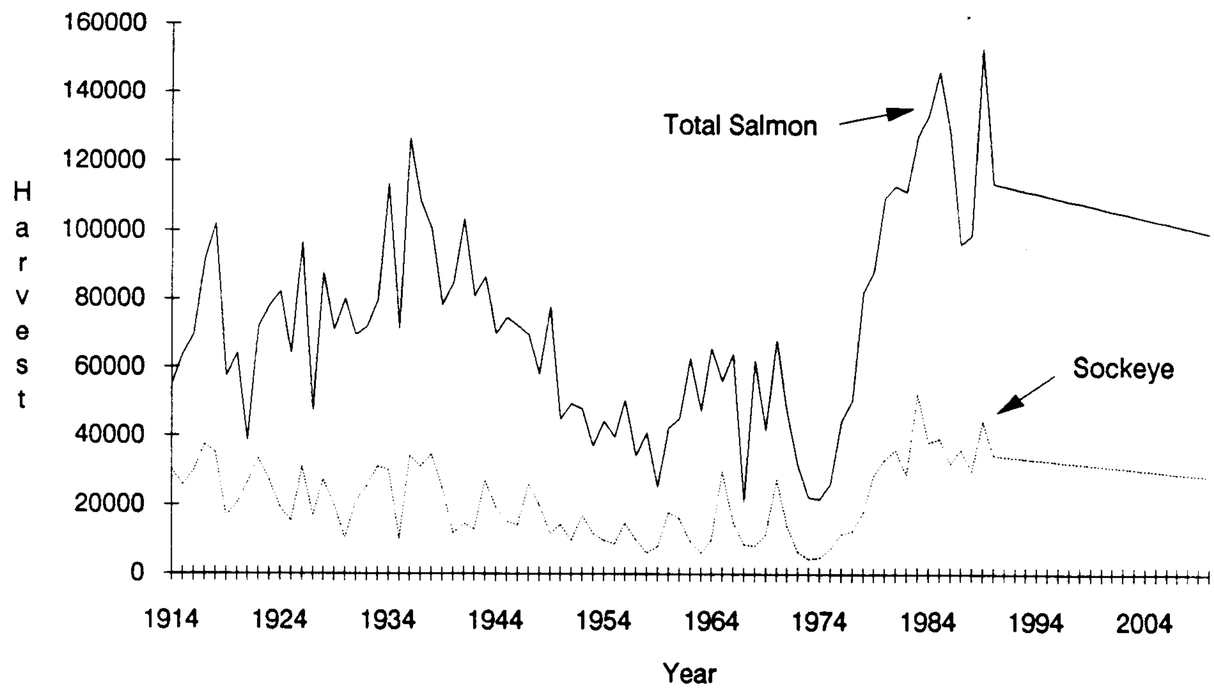
Several price equations require harvest estimates for the respective species and this worksheet contains projections of statewide harvest. These projections use the same variables as those contained in the area harvest projections contained in MMSBER1.XLW. Figure A-6 shows the historic and projected statewide catch for sockeye and total salmon over the 1914 through 2010 time frame. The equations for each species are contained in the respective cells for years 1990 through 2010 in SALMNPRC.XLS.

Ex-vessel prices are from ADF&G Annual Production publication for years to 1985. Subsequent ex-vessel information from CFEC reports on ex-vessel pricing as reported in processors annual reports (CFEC, 1990). Prices are nominal for 1969-1988. Prices are expressed in 1988 dollars for 1989-2010. Historic data on number of fish by species is from Eggers & Dean (1987), and Dean (1989). The first row in the table with price information is selected according to the year of interest noted in FLT&PROC.XLS.

Table A-10: SALMNPRC.XLS (a)

1990		$2.47	$1.80	$1.59	$0.52	$0.73
		STATEWIDE EX-VESSEL VALUE				
YEAR	Y/$	KING	REDS	COHO	PINK	CHUM
1969	358	$0.33	$0.25	$0.28	$0.15	$0.13
1970	358	$0.44	$0.25	$0.30	$0.13	$0.12
1971	347	$0.39	$0.26	$0.25	$0.16	$0.14
1972	303	$0.37	$0.31	$0.43	$0.18	$0.18
1973	271	$0.88	$0.43	$0.76	$0.32	$0.39
1974	292	$0.75	$0.69	$0.68	$0.35	$0.38
1975	297	$0.75	$0.45	$0.57	$0.32	$0.[illegible]4
1976	296	$1.02	$0.60	$0.93	$0.34	$0.41

Table A-6: Historic and Projected Statewide Salmon Harvest
(thousands of fish)

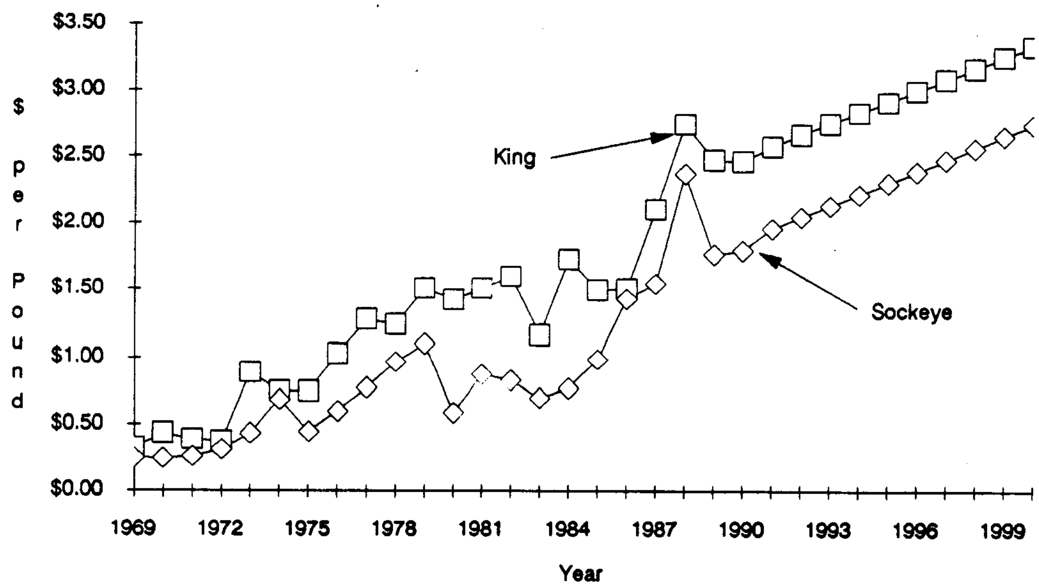


Ex-vessel price data available from CFEC and NMFS exclude bonuses and non-monetary payments (e.g., free vessel storage and haulout) that are made in addition to the stated price paid for the harvest. Based upon information from Smoker (1988), and discussions with local fishermen, omission of these indirect payments results in understating the total value received by the harvester by as much as 5 percent in some instances.

This model does not increase the ex-vessel price data to account for this omission since: 1) there is not a reliable estimate of secondary payments for the various fisheries; and, 2) non-monetary payments are generally reflected in reduced operating costs for the average harvester.

Figure A-7 shows projected statewide king and sockeye salmon prices.

Figure A-7:
Statewide King and Sockeye Salmon Ex-Vessel Prices



CRABPRIC.XLS

This worksheet estimates three different prices for crab: 1) ex-vessel prices for shoreside deliveries; 2) ex-vessel prices for at-sea deliveries; and 3) prices for processed crab. Ex-vessel shoreside prices are estimated using Eastern Aleutian and Dutch Harbor management areea price estimates for each species as contained in the annual Westward Region shellfish reports prepared by ADF&G. A substantial portion of Bering Sea crab harvest is processed by floating processors purchasing crab from catcher boats. The prices paid by these operations are typically less than shorebased processing plants. Much of the crab purchased from vessels working in these areas is obtained by local floating processors due to the large distances between these harvest areas and Bering Sea ports. Ex-vessel prices for Area R (Adak) and Western Aleutian management areas are considered to be representative of prices paid by floating processors throughout the Bering Sea. However these data series are shorter than for other management areas and incomplete for some species.

Price projections are developed for shoreside prices using Eastern Aleutian and Dutch Harbor management area prices since this data set is the longest and most complete. Historic Area R and Western Aleutian management area prices which represent at-sea ex-vessel prices are contained in CRABPRIC.XLS. Future at-sea prices are calculated in the CRABB-E.XLS worksheet by use of ratios of at-sea prices vs. shoreside prices over the 1980 through 1988 time period.

Red king crab shoreside price projections are developed using the Yen/$ exchange rate and pounds of red king crab harvested in the BS/AI area. Price projections for other species are estimated using various combinations of pounds harvested for the particular species, and prices for red king crab and other species, sometimes with a one year lag. The equations are contained in the respective cells for years 1990 through 2010. Prices are nominal for 1979 through 1989, and expressed in 1988 constant dollars for 1990 through 2010. Table A-11 shows the structure of this worksheet for the 1979 through 1985 time period. Figure A-7 presents the historic shoreside prices and projections for red king crab for the 1979 through 2010 time frame.

Table A-11: CRABPRIC.XLS

		SHORESIDE	EX-VESSEL	VALUE			
			KING CRAB		TANNER		HAIR
YEAR		RED	BLUE	BROWN	OPILIO	BAIRDI	CRAB
1990	$/Y LINEST	$4.08	$2.84	$1.89	$0.25	$2.57	$1.09
1979	0.00439	$0.90	$0.70		$0.30	$0.52	$0.75
1980	0.00459	$1.02	$0.75		$0.21	$0.52	$0.80
1981	0.00479	$2.30	$0.90	$2.05	$0.26	$0.58	$0.55
1982	0.00499	$3.43	$2.00	$3.00	$0.73	$1.25	$0.65
1983	0.00519		$3.00	$3.05	$0.52	$1.20	$1.20
1984	0.00539	$2.60	$1.50	$1.35	$0.30	$0.98	$1.60
1985	0.00559	$2.90	$1.60	$1.97	$0.30	$1.30	$1.60
1986	0.00579	$4.05	$3.20	$2.85	$0.60	$1.50	$1.15
1987	0.00599	$4.00	$2.85	$2.85	$0.72	$2.00	$1.50
1988	0.00619	$5.10	$3.10	$3.00	$0.77	$2.10	
1989	0.00639	$4.70	$3.27	$2.45	$0.70	$2.90	
1990	0.00658	$4.08	$2.84	$1.89	$0.25	$2.57	
1991	0.00678	$4.19	$2.92	$2.28	$0.60	$2.62	
1992	0.00698	$4.30	$2.99	$2.48	$0.43	$2.66	
1993	0.00718	$4.41	$3.07	$2.60	$0.61	$2.70	
1994	0.00738	$4.52	$3.15	$2.67	$0.55	$2.74	
1995	0.00758	$4.64	$3.22	$2.73	$0.65	$2.79	
1996	0.00778	$4.75	$3.30	$2.77	$0.65	$2.83	
1997	0.00798	$4.86	$3.38	$2.81	$0.71	$2.87	
1998	0.00818	$4.97	$3.45	$2.85	$0.73	$2.92	
1999	0.00838	$5.08	$3.53	$2.89	$0.78	$2.96	
2000	0.00858	$5.19	$3.60	$2.92	$0.81	$3.00	

This file also contains information on processed crab prices from the NMFS Market Newsletter (the "pink sheets"), and other industry newsletters. This data set is not long enough or complete enough to use for independent forecasting. Since raw product (live crab) represents a major part of the value of the processed product, the available processed price data were regressed with shoreside ex-vessel values to estimate a relationship that could be used to project processed crab prices. The equations for these projections are used in the CRABB-E.XLS worksheet. Table A-12 shows a representative part of the processed crab price matrix from CRABPRIC.XLS.

Figure A-8:
Red King and C. Opilio Crab Shoreside Ex-Vessel Prices

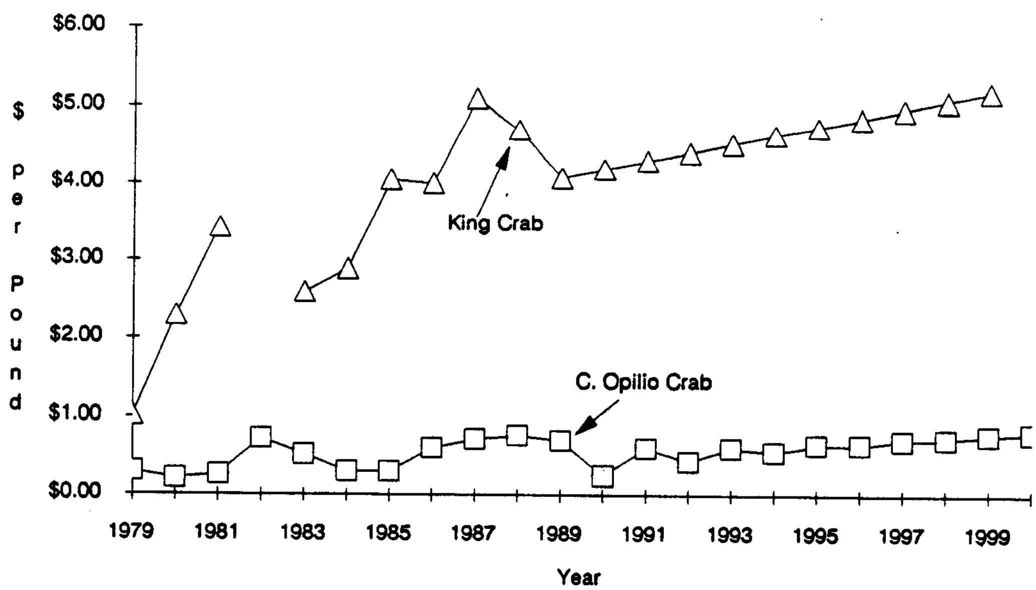


Table A-12: CRABPRIC.XLS (b)

	PROCESSED	PRODUCT (FOB PORT)				
		KING CRAB		TANNER		HAIR
	RED	BLUE	BROWN	OPILIO	BAIRDI	CRAB
AVG.	$9.51	$9.51	$7.87	$2.82	$6.27	$3.00
1983	$8.90	$8.90	$8.30			
1984	$9.06	$9.06	$7.99			
1985	$8.07	$8.07	$6.53			
1986	$8.37	$8.37	$6.69			
1987	$9.88	$9.88	$8.44			
1988	$11.06	$11.06	$8.89			
1989	11.25	11.25	8.25	$2.82	$6.27	$3.00

TRWLPRIC.XLS and LLPRIC.XLS

Domestic ex-vessel price series for groundfish are limited in duration and completeness. The PACFIN database maintained by the Pacific States Marine Fisheries Commission has a reasonable data set from 1985 through 1989, but price data for years prior to that is limited. The time series is considered too short to use regression analysis, so an average 1988 contant dollar price is calculated. There are differences in prices paid for various species caught by the two gear types so separate price tables are developed for both trawl and longline. The data sets are similar so only TRWLPRIC.XLS is presented here.

Table A-13: TRWLPRIC.XLS

DOMESTIC TRAWL VESSELS
GROUNDFISH ESTIMATED EX-VESSEL PRICES PER POUND
FOR ALEUTIAN & BERING SEA AREA

	average	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
ARROWTOOTH FLOUNDER	0.08								0.1	0.063	0.076
UNSPECIFIED TURBOTS	0.069							0.128	0.133		
TURBOTS	0.101							0.128	0.128	0.063	0.076
ALASKA PLAICE	0.179										0.188
GREENLAND TURBOT	0.164					0.1	0.134	0.202	0.202	0.202	0.1
REX SOLE	0.136			0.14	0.16	0.1	0.1	0.1	0.1	0.227	0.074
ROCK SOLE	0.146	0.08		0.11			0.302	0.109	0.066	0.126	0.139
YELLOWFIN SOLE	0.171							0.138	0.092	0.171	0.285
OTHER FLATFISH	0.074						0.078	0.077	0.061		0.068
UNSP. FLATFISH	0.090						0.192	0.061	0.063	0.058	0.053
ALL FLATFISH	0.152					0.12	0.236	0.141	0.104	0.135	0.132

PROCPRIC.XLS

Wholesale price data are generally not as complete as ex-vessel values, nor as reliable. Subsequently, independent projections are not attempted for processor prices. Groundfish prices in Table A-14 are set at averages for the available data, adjusted to 1988 dollars. The groundfish data are from Fishery Market News, published by NMFS, and Seafood Trends newsletter (Seafood Trend Associates, 1989). These prices are FOB Seattle, which will be higher than the prices received by Alaska processors, but may better reflect the price structure for major groundfish processing firms located in Alaska and headquartered in Seattle.

Available processed crab price data were regressed with shoreside ex-vessel crab values to estimate future processed crab prices. The equations for these projections are contained in the CRABB-E.XLS worksheet. Projected ex-vessel values are expressed in 1988 constant dollars so processed prices also reflect this adjustment.

Salmon processor prices are estimated by regression equations established between ex-vessel values and processed prices over the 1976 through 1985 time period. The equations were derived from catch and production statistics published annually by ADF&G through 1985. The equation uses 1988 constant dollar ex-vessel prices so processor prices are also in 1988 constant dollars. These prices are expressed in terms of first wholesale value; the value of the transaction between the initial processor and a secondary processor or wholesaler.

Table A-14: PROCPRIC.XLS

Processor Prices
Price per Pound, FOB Seattle

Average		$1.48	$0.88	$2.20	$1.30	$0.91	$0.57	$0.57	$0.86	$1.43	$2.10
		Blocks		Fillets		Other	Turbot	Atka			
							Flat		Mkrl.	POP/Rockfish	
Year	CPI	Cod	Pollock	Cod	Pollock	H&G	H&G	H&G	H&G	Fillet	Halibut
1980	0.824	$1.06	$0.67								
1981	0.909	$1.09	$0.76								
1982	0.965	$1.11	$0.70								
1983	0.996	$1.17	$0.66								
1984	1.039	$1.03	$0.68								
1985	1.076	$1.12	$0.63								
1986	1.096	$1.37	$0.71								
1987	1.136	$1.87	$1.12	$2.50	$1.47						
1988	1.183	$1.81	$0.94	$2.06	$1.22						
1989	1.24	$1.50	$0.86	$2.04	$1.20	$0.95	$0.60	$0.60	$0.90	$1.50	2.2

CRABB-E.XLS, LONGLB-E.XLS, AND TRWLB-E.XLS

These three files are discussed together since they use the same methodology to estimate fleet size.

All of the salmon fisheries of Alaska, and most of the herring fisheries, are under a limited entry program managed by the Alaska Commercial Fisheries Entry Commission (CFEC) which limits the number of individuals who may fish for salmon, and for all practical purposes, limits the number of vessels involved in fishery. The North Pacific Fisheries Management Council (NPFMC) is presently considering limited entry and related programs to control the harvest effort on certain groundfish species, principally sablefish at this time.

Regulations will determine the number of vessels involved in managed fisheries. For fisheries which do not have restrictions on the number of participants or vessels, some techniques must be employed with the model to constrain the total since extrapolation of the recent growth trend in numbers of vessels operating in the Bering Sea would reach phenomenal numbers in 20 years.

The basic approach used in the model to constrain the numbers of vessels in unmanaged fisheries is break-even analysis. This technique has recently been used to estimate the break-even fleet size for trawlers operating in the Bering Sea (Wiese and Burden, 1988) and is adapted in this model to include longliners and crabbers. The technique assumed that the number of vessels in a fishery will increase or decrease so that excess profits or losses are eliminated. The model assumes instantaneous reaction for fleet adjustments although in reality there would be lags of several years.

Calculation of the break-even fleet size involves six primary steps:

1. Estimate the resource available to harvesters operating in the Bering Sea and the local area (RSRCAVAL.XLS);

2. Estimate ex-vessel prices for catcher boats and wholesale prices for catcher/processors (various ....PRIC.XLS worksheets);

3. Use average operating cost data to estimate the break-even catch for each of different size ranges of vessels operating in the various fisheries;

4. Obtain estimates from CFEC, NMFS, or industry representatives of the percentage of each fleet that each of the vessel categories will represent in the future (e.g., 10 percent of the trawl fleet will be factory trawlers in the 125' - 200' size category);

5. Find the blended break-even catch for each class of similar vessels by dividing the gross profit margin per ton or pound of product into total indirect costs;

6. Multiply the break-even catch for each vessel category by its corresponding percentage of the fleet to calculate a blended break-even catch for the average vessel and divide that number into the available resource in the Bering Sea and the local area.

Tables A-15 and A-16 show break-even models for two of the three longline vessel categories as an example for the 14 different vessel categories. Table A-15 shows the top part of the worksheets which contain linked inputs and the break-even calculation results.

Table A-15: LONGLB-E.XLS (a)

BLENDED BREAK-EVEN CATCH FOR THE MIX OF LONGLINE VESSELS				
		% OF TOTAL	B.E. CATCH (POUNDS)	BLENDED CATCH (POUNDS)
UNDER 60 FEET LONGLINER		44%	345273	151185
60 to 100 FEET LONGLINER		45%	1297991	583712
100 FEET + FACTORY LONGLINER		11%	3382000	380225
				1115121
BREAK-EVEN FLEET SIZE (TOTAL RESOURCE DIVIDED BY BLENDED BREAK-EVEN CATCH)	YEAR:	1990	BS/AI TOTAL	
		PACIFIC COD	22158045	47.13%
		SABLEFISH	6528313	13.89%
		TURBOT	3471111	7.38%
		OTHER FLATFISH	251163	0.53%
		PACIFIC OCEAN PERCH	2124931	4.52%
CATCH		HALIBUT	12478095	26.54%
		TOTAL	47011657	
DIVIDED BY:	BLENDED BREAK-EVEN CATCH		1115121	POUNDS
BREAK-EVEN FLEET SIZE			42	VESSELS
LONGLINE EX-VESSEL PRICE PER POUND BY SPECIES				
HALIBUT		$1.30		
PACIFIC COD (H&G)		$0.25		
SABLEFISH (H&G)		$0.68		
ROCKFISH (H&G)		$0.40		
TURBOT (H&G)		$0.34		

The model assumes that the fleet of vessels for each gear type, with the exception of surimi producers, will catch the different species and species complexes (e.g., flatfish) in the same proportion as the harvest projections (e.g., GRNDHARV.XLS). Competition will cause all of these species to be targeted annually by the total fleet, although no individual vessel will catch all of them. Correspondingly, an individual catcher/processor is not expected to produce all of the fillet and head and gut products shown under the heading "projected products sold", but the catcher/processor fleet will.

The projected prices per pound (Item 10 in Table A-16) are linked from the longline prices estimated in LONGPRIC.XLS and adjusted for at-sea or shoreside delivery. The adjustment factors for price and delivery locations (Item 11) for all gear types are based upon data from a relatively small number of fishermen and the variability is quite large. Information from CFEC or NMFS should be requested to improve these estimates in the future.

The weighted price per pound matrix (Item 12) combines the projected price by location with the delivery location estimate to arrive at a weighted average price by species. These weighted average prices are multiplied by catch percentages (Item 13, derived from RSRCAVAL.XLS) to obtain a weighted average price per pound for all groundfish species harvested.

Operating cost data for the trawl-only and longline fleets are based upon several surveys of vessel owners and captains (R & M Consultants, Inc., 1986; ResourcEcon, 1987; Alaska Department of Commerce and Economic Development, 1988; Northern Economics, 1988, Wiese and Burden (1988), North Pacific Fisheries Management Council, 1989), and information from protocols developed for this project. More recent conversations with fleet managers of companies with multiple vessels, marine architects, major suppliers, and review of vessel proformas submitted with financing applications have refined these data. This large data base suggests that the number used in the break-even models are <u>representative</u> of operating costs for the Bering Sea fleet although there is a wide range in the operating characteristics for the fleet. For example, the formula of deducting food and fuel from gross revenues prior to calculating crew shares is widespread in the industry, but crew share formulas vary widely between gear types and individual vessels. In addition, a number of new vessels have recently begun operations in the Bering Sea and cost and production data for this group are subject to change since many of these vessels are still undergoing improvements in their processing and harvesting operations.

These worksheets are linked with price and resource files so that changes in the price or harvest will affect the number of boats in the fleet. Much of the operating cost data have been developed to change as vessel operating parameters change. For example, fewer days at sea result in lower costs for fuel and lower food costs for crew. The break-even models provide much of the information used in later calculations at the top of the worksheet so that the equations can be easily evaluated. The user will need to review the break-even model over time to determine possible changes in the coefficients.

Table A-16: LONGLB-E.XLS (b)

BREAK-EVEN ANALYSIS

FISHERY:LONGLINE			FISHERY:LONGLINE	
COMMENTS:UNDER 60' PARTIME LONGLINER			COMMENTS:60 to 100' LONGLINER	
BREAKEVEN CALCULATION FACTORS				
1. VESSEL COST $250,000			$750,000	
2. ANNUAL BOAT LOAN PAYMENT	$32,000 (75% @11%, 10 yrs)		$96,000(75% @11%, 10 yrs)	
3. VESSEL MARKET VALUE	$200,000		$600,000	
4. CREW SIZE (INCL. SKIPPER)	5		7	
5. CREW SHARE (%)	30		30	
6. SKIPPER'S SHARE (%)	12		12	
7. DAYS OPERATING	160		235	
8. DAYS AT SEA	125		210	
9. DAYS FISHING	85		155	
10. PROJECTED PRICE/LB	AT SEA	SHORE	AT SEA	SHORE
HALIBUT	$1.30	$1.30	$1.30	$1.30
BLACK COD (H&G)	$0.68	$0.62	$0.68	$0.62
PACIFIC COD (H&G)	$0.17	$0.25	$0.17	$0.25
ROCKFISH (H&G)	$0.26	$0.40	$0.26	$0.40
TURBOT (H&G)	$0.34	$0.34	$0.34	$0.34
11. PROJECTED DELIVERY LOCATION	% AT SEA	% SHORE	% AT SEA	% SHORE
HALIBUT	0	100	0	100
BLACK COD (H&G)	40	60	40	60
PACIFIC COD (H&G)	35	65	35	65
ROCKFISH (H&G)	50	50	50	50
TURBOT (H&G)	0	100	0	100
12. WEIGHTED PRICE/LB (BLENDED SHORE AND SEA PRICES)				
HALIBUT	$1.30			$1.30
BLACK COD (H&G)	$0.68			$0.68
PACIFIC COD (H&G)	$0.17			$0.17
ROCKFISH (H&G)	$0.26			$0.26
TURBOT (H&G)	$1.00			$1.00
13. CATCH PERCENTAGES				
HALIBUT	26%			26%
BLACK COD	13%			13%
PACIFIC COD	47%			47%
POP & OTHER ROCKFISH	4%			4%
TURBOT & OTHER FLATFISH	7%			7%
TOTAL	100%			100%
14. WEIGHTED AVG. PRICE/LB (ALL SPECIES - ITEMS 13 & 14 COMBINED)				
WEIGHTED AVERAGE PRICE/LB $0.61				$0.61
15. YIELDS FOR PRODUCT				

HALIBUT - GUTTED	88 %	88 %
SABLEFISH (H&G)	62 %	62 %
PACIFIC COD (H&G)	63 %	63 %
ROCKFISH (H&G)	53 %	53 %
TURBOT (H&G)	74 %	74 %
16. WEIGHTED AVERAGE YIELD (COMBINING ITEMS 8 AND 12)	69 %	69 %
17. DIRECT EXPENSES (RELATED TO SALES)		
CREW SHARE	30 % OF AVG. PRICE/LB	30 % OF AVG. PRICE/LB
SKIPPER'S SHARE	12 % OF AVG. PRICE/LB	12 % OF AVG. PRICE/LB
TOTAL	42 % OF AVG. PRICE/LB	42 % OF AVG. PRICE/LB
18. GROSS PROFIT MARGIN		
WEIGHTED AVERAGE PRICE/LB	$0.61	$0.61
LESS: DIRECT EXPENSES	$0.26	$0.26
GROSS MARGIN	$0.36	$0.36
19. INDIRECT OPERATING EXPENSES		
FUEL/OIL	$16,400	$60,000
GROCERIES	$12,000	$24,675
VESSEL/MACHINE MAINTENANCE	$5,333	$36,000
GEAR MAINTENANCE & REPLACEMENT	$7,650	$14,826
SUPPLIES/EQUIPMENT	$1,000	$1,500
TRANSPORTATION/FREIGHT	$1,000	$7,700
INSURANCE-HULL/MACHINERY (3.5%)	$3,111	$21,000
INSURANCE-P & I @ $250/MO/MAN	$6,666	$13,708
MANAGEMENT/PROFESSIONAL SERVICES	$1,333	$13,300
ASSOCIATION FEES	$444	$1,000
RETURN ON INVESTMENT @ 15%	$3,287	$28,125
LOAN PAYMENTS	$14,027	$96,000
BAIT & OTHER	$25,500	$40,434
SUBTOTAL	$97,753	$358,269
LESS FUEL/GROCERIES (ADJUSTMENT FOR CREW DEDUCTIONS)	$28,400	$84,675
TOTAL ADJUSTED EXPENSES	$69,353	$273,594

20. BREAK-EVEN CALCULATIONS:

B-E CATCH = $\frac{\text{ADJUSTED EXPENSES}}{\text{GROSS MARGIN}} + \frac{\text{FUEL AND FOOD}}{\text{AVG PRICE/LB}}$

	$\frac{\$69,353}{\$0.36} + \frac{\$28,400}{\$0.61}$	$\frac{\$273,594}{\$0.36} + \frac{\$84,675}{\$0.61}$
CATCH (FINISHED WEIGHT)	241,400	907,500
CATCH (ROUND WEIGHT)	345,272	1,297,991
INCOME	$148,000	$556,000
	LBS	LBS
HALIBUT =	91,644	344,520
BLACK COD =	47,947	180,247
PACIFIC COD =	162,738	611,783
ROCKFISH =	15,606	58,669
TURBOT =	27,338	102,772
TOTAL ROUND POUNDS	345,273	1,297,991

Longline and crab vessels under 60 feet (18.3 meters) are assumed to be primarily salmon fishing boats operating in these fisheries on a part time basis, and costs are allocated to these fisheries on the amount of time the fisherman is involved in them.

SLMNFLT.XLS

Limited entry controls the number of participants in the salmon fishing fleets so a break-even model is not required for this segment of the industry. This worksheet develops the information on revenues and expenditures for three vessel types needed for subsequent worksheets in the model. These worksheets are based upon information from the 1987 field work, Braund's work in King Cove (1986), CFEC information on other seine and drift fisheries throughout the state (Muse and Schelle, 1986; Keith, Muse, and Schelle, 1987), and a survey of expenditures of Bristol Bay drift and set gillnet fishermen for the City of Dillingham (Northern Economics, 1988).

Revenues per vessel are calculated as the projected catch in the management area by species multiplied by the projected species price (with an area adjustment from the statewide price), allocated between gear types according to the average 1980-1987 proportions, and divided by the number of permits for each gear type.

All operators are assumed to make boat payments or contributions to Capital Construction Funds for future boat purchases with subsequent reductions in net revenues. Information from CFEC (Dinneford and Cohen, 1989) was used to estimate the percent of permits that have been sold. For example, 28.4 percent of the Area M seine permits were sold during the 1980 through 1988 time period. All permits that were sold during this time interval are assumed to financed with payments required.

In this version of the model, crew size and the percent of gear permits financed must be manually changed if another management area is selected. Permit prices are assumed to equal average gross revenues for that gear type.

FLTFEAM.XLS

The Fisheries Economic Assessment Model (FEAM) developed by Jensen and Radtke (1987) was originally created as a spreadsheet model, but the size and complexity of incorporating the harvesting and processing sectors resulted in such a large model that it was intimidating to potential users. As a result, the model was rewritten in BASIC and compiled to make it faster and more "user-friendly."

Table A-17: SLMNFLT.XLS

SALMON FLEET MODEL			CREW SIZE	
HOME PORT:	King Cove		SEINE	5
YEAR:	1990		DRIFT	2
AREA:	M		SET	2

	Total Area Catch by Weight	% of Catch by Weight SEINE	DRIFT	SET
King	525,692	0%	67%	33%
Red	21,579,134	7%	83%	10%
Coho	2,892,699	10%	46%	44%
Pink	21,518,317	86%	13%	1%
Chum	12,882,328	63%	31%	6%

Price per Pound	STATEWIDE PRICE	Adjustment by Area/Gear ADJUSTED AREA PRICE	S01 SEINE	S03 DRIFT
King	$2.47	$1.68	$1.73	$1.65
Red	$1.80	$1.86	$1.85	$1.85
Coho	$1.59	$1.26	$1.21	$1.27
Pink	$0.52	$0.48	$0.47	$0.54
Chum	$0.73	$0.67	$0.65	$0.69

	SEINE	DRIFT	SET	TROLL
Market Value of Boat:	$400,000	$130,000	$0	$0
Crew Size (incl. owner):	5	2	2	1.75
Days Operating	90	90	90	
Days Fishing	50	50	50	
Revenues per Vessel	$149,839	$174,731	$49,941	$0
Less Expenses:				
Variable Expenses:				
Vessel & Engine Repair	$12,000	$3,900	$1,913	$0
Gear Replacement	$6,000	$1,950	$911	$0
Fuel & Lubricants	$7,250	$4,750	$1,356	$0
Food & Supplies	$6,750	$2,700	$988	$0
Bait & Ice	$0	$0	$0	$0
Dues & Fees	$1,000	$600	$100	$0
Transportation	$3,500	$1,400	$1,400	$0
Management	$0	$0	$0	$0
Miscellaneous/Packaging	$0	$0	$362	$0
Crew Shares	$38,035	$29,704	$3,495	$0
Total Variable Costs	$74,535	$45,004	$10,525	$0
Contribution Margin				
Fixed Expenses:				
Insurance	$13,255	$5,047	$0	0
Boat & Permit Payments	$56,276	$34,593	$3,755	0
Office/Accounting/Legal	$1,000	$1,000	$500	0
Miscellaneous	$2,000	$1,300	$300	0
Total Fixed Expenses	$72,531	$41,940	$4,555	$0
Net Return	$2,773	$87,786	$34,860	$0

The BASIC version of the FEAM is not in the public domain and cannot be used for this project. As a result, this file and the PROCFEAM.XLS file separate the harvest and processing sectors and thereby attempt to simplify the original FEAM spreadsheet structure.

The revenue and expenditure data shown for each vessel type are linked from the break-even worksheets or SLMNFLT.XLS for the salmon fleets, and the data are aggregated to arrive at total expenditures, crew shares, and net income for residents and nonresidents operating within the travel distance envelope for groundfish and shellfish, and management area for salmon and herring (Table A-18).

The estimates of percent of expenditures spent locally (within the community) are averages across all communities based upon field work conducted in 1987, recent conversations with fleet managers, and survey work in Bristol Bay (Northern Economics, 1988). These estimates do not differentiate between expenditure patterns of resident and nonresident vessels, nor account for different support services offered by communities. This probably understates the effect of resident vessels and overstates the impact of nonresident vessels but the data set is not large enough to differentiate between resident and nonresident for most gear types. At the present, Unalaska/Dutch Harbor is the only Bering Sea community offering services for the catcher/processor fleet. This is accommodated by selection of a cell in FLT&PROC.XLS to indicate if the community is a support facility for catcher/processors.

The top matrix in the worksheet shows total income and employment estimates for all gear types. Subsequent sections show the revenue and expenditure data for each gear type and the percent spent locally.

PROCFEAM.XLS

This file contains two distinct worksheet areas for the processing sector. The first section (Table A-19) illustrates the physical flow of product through the plant, tracing changes in the value of each species and financial contribution to the plant. This worksheet requires data input for the percent of salmon and herring harvest going to floating processors, and whether a species is processed in the community. The percentage of salmon and herring captured by floating processors is required since these species do not have a travel distance equation. This percentage should remain fairly constant throughout the Bering Sea, with the exception that floating processors capture about 50 percent of the salmon harvest from Bristol Bay and an adjustment will be required to use the model for a community in that management area.

The percent of processing employment is a surrogate for the percentage of the processing capacity within a salmon management area that is located in the community and is linked from data provided in FLT&PROC.XLS. Landings information is taken from RSRCAVAL.XLS.

Table A-18: FLTFEAM.XLS
($ in thousands)

VESSEL FEAM MODEL			RES.	NONRES.		RES.	NONRES.			
HOME PORT: King Cove		EXPEN.:	$4,849	$20,329	EMPLOY.	236	687			
YEAR:	1990	CREW $:	$2,683	$12,949	CREW:	169	433			
		NET $:	$2,957	$20,992	CAPT.:	67	253			
		TOTAL:	$7,806	$41,321						
TRAWL								Percent Spent Locally		
	Catcher		Factory Trawler			Catcher Boat		Factory Trawler		
	<100'	1-150	125-200	200-250	300<	<100	1-150	125-200	200-250	300>
Revenue	$1,150	$1,632	$5,128	$8,636	$17,294					
Less Expenses:										
Variable Expenses:										
Vessel & Engine Repair	$80	$145	$333	$410	$667	20%	20%	40%	30%	20%
Gear Replacement	$75	$103	$150	$150	$150	25%	25%	30%	30%	30%
Fuel & Lubricants	$106	$134	$324	$757	$1,382	85%	85%	85%	85%	85%
Food & Supplies	$35	$43	$182	$290	$347	50%	50%	30%	30%	30%
Packaging	$0	$0	$130	$219	$710	0%	0%	0%	0%	0%
Dues & Fees	$20	$25	$50	$50	$50	0%	0%	0%	0%	0%
Transportation	$24	$24	$181	$259	$415	0%	0%	0%	0%	0%
Management	$22	$32	$102	$172	$345	0%	0%	0%	0%	0%
Miscellaneous	$0	$0	$56	$51	$200	50%	50%	20%	20%	20%
Crew Shares	$359	$517	$1,999	$3,368	$5,620	20%	15%	25%	25%	25%
Total Variable Costs	$724	$1,025	$3,508	$5,727	$9,888					
Contribution Margin	$426	$606	$1,619	$2,908	$7,405					
Fixed Expenses:										
Insurance	$120	$140	$470	$630	$1,050	0%	0%	0%	0%	0%
Boat Payments	$233	$324	$874	$1,749	$3,935	0%	0%	10%	10%	10%
Office/Accounting/Legal	$22	$63	$24	$20	$40	20%	15%	15%	15%	15%
Miscellaneous	$10,000	$13	$43	$88	$1,412	30%	30%	20%	20%	20%
Total Fixed Expenses	$385	$540	$1,411	$2,487	$6,437					
Net Return	$41	$66	$208	$421	$968					

The amount processed by a size category of processor is dependent upon the data inputs in FLT&PROC.XLS. Price of raw and process product is linked from the various price worksheets, and yield is taken from Recoveries and Yields from Pacific Fish and shellfish (Crapo, Paust, and Babbitt, 1988). There are a number of product forms available from each species and the form and yield selection was based upon the predominant type. For species where two types may be significant, the yield was averaged between the two product form yields. Process cost data was taken from information developed by William Jensen and Hans Radtke for the Alaska Fisheries Economic Assessment Model in southcentral and southeast Alaska.

Labor requirements for species/products (in finished weight) were obtained during discussions with Bering Sea plant managers during field work in 1987 and 1990, and more recent conversations with plant managers in southcentral processing plants. This labor requirement vector is created from interviews with managers from eight processing plants and, since no plant handles all of these products, most of the estimates are based upon three or four data points; the resultant range between the high and low points is large. The worksheet calculates total number of processing line employee hours required for the volume of each species handled. This number is divided by 2080 hours per year to arrive at an annual figure.

Table A-19: PROCFEAM.XLS(a)

PROCESSOR FEAM MODEL % to Floating Processors: Salmon: 10%
Homeport: King Cove Herring: 90%
Year: 1990
% of Proc. Emp. 44%

Species Name	Species Total Annual Port Landings in Pounds	Processed in Community (0=N, 1=Y)	Landed Del. Wt. V. Large Processor	Del. Wt. Large Processor	Del. Wt. Medium Processor	Del. Wt. Small Processor	Del. Wt. Buying Stations
Gn/Ps Chinook	210,277	1	0	210277	0	0	0
Gn/Ps Sockeye	8,631,653	1	0	8631653	0	0	0
Gn/Ps Coho	1,157,079	1	0	1157079	0	0	0
Gn/Ps Pink	8,607,326	1	0	8607326	0	0	0
Gn/Ps Chum	5,152,931	1	0	5152931	0	0	0
Bait Herring	0	0	0	0	0	0	0
Roe Herring	355,555	1	0	355555	0	0	0
Pollock	0	0	0	0	0	0	0
Sablefish	2,437,647	1	0	2437647	0	0	0
Rockfish	972,079	1	0	972079	0	0	0
Pacific Cod	42,289,282	1	0	42289282	0	0	0
Yellowfin Sole	4,284,813	1	0	4284813	0	0	0
Greenland Turbot	614,441	1	0	614441	0	0	0
Other Flatfish	5,919,575	1	0	5919575	0	0	0
Pacific Halibut	3,992,309	1	0	3992309	0	0	0
Other Finfish	52,782	1	0	52782	0	0	0
King Crab	4,050,451	1	0	4050451	0	0	0
Tanner Crab	1,673,479	1	0	1673479	0	0	0
Hair Crab 0	1	0	0	0	0	0	
Other Shellfish	0	1	0	0	0	0	0

Price of Raw Product	Assumed Proc. Product	Yield of Proc. Product	Raw Product Cost	Process Labor Cost	Other Process Costs-a	Other Process Costs-b	Other Process Costs-c	Bad Debt Expense	Variable Cost of Process Product	Sales Price of Process Product	Contrib. Margin of Process Product	Quan. of Fish per Labor Hr.
$1.68	D/H- Off	72%	$2.33	$0.25	$0.31	$0.00	$0.00	$0.02	$2.91	$4.30	$1.39	100
$1.86	D/H- Off	74%	$2.51	$0.25	$0.31	$0.00	$0.00	$0.02	$3.09	$4.77	$1.67	100
$1.26	D/H- Off	75%	$1.68	$0.25	$0.31	$0.00	$0.00	$0.02	$2.26	$3.54	$1.29	100
$0.48	D/H- Off	73%	$0.65	$0.25	$0.31	$0.00	$0.00	$0.01	$1.22	$2.27	$1.04	100
$0.67	D/H- Off	74%	$0.90	$0.25	$0.31	$0.00	$0.00	$0.01	$1.47	$1.73	$0.26	200
$0.20	Frozen	100%	$0.20	$0.20	$0.19	$0.00	$0.00	$0.00	$0.00	$0.62	$0.62	250
$0.41	Frozen	100%	$0.41	$0.05	$0.19	$0.00	$0.00	$0.00	$0.66	$0.82	$0.17	250
$0.07	Surimi & Fillet	20%	$0.37	$0.30	$0.10	$0.00	$0.00	$0.01	$0.00	$1.09	$1.09	200
$0.67	Del. D/H	98%	$0.69	$0.10	$0.13	$0.00	$0.00	$0.01	$0.93	$1.62	$0.70	150
$0.35	D/H-Off & Fillet	41%	$0.84	$0.30	$0.16	$0.00	$0.00	$0.01	$1.31	$1.14	$-0.16	150
$0.20	D/H-Off , Salted & Fillet	51%	$0.39	$0.30	$0.15	$0.00	$0.00	$0.01	$0.85	$1.48	$0.63	200
$0.17	D/H-Off	69%	$0.25	$0.30	$0.11	$0.00	$0.00	$0.00	$0.66	$0.57	$-0.09	150
$0.34	D/H-Off	74%	$0.45	$0.30	$0.11	$0.00	$0.00	$0.00	$0.87	$0.91	$0.04	150
$0.16	D/H-Off	74%	$0.21	$0.30	$0.11	$0.00	$0.00	$0.00	$0.63	$0.57	$-0.05	150
$1.30	Del.D/H	98%	$1.33	$0.10	$0.18	$0.00	$0.00	$0.01	$1.62	$1.94	$0.32	200
$0.16	D/H - Off	70%	$0.23	$0.30	$0.15	$0.00	$0.00	$0.00	$0.68	$0.57	$-0.11	150
$1.89	Live	68%	$2.78	$0.18	$0.14	$0.00	$0.00	$0.04	$3.14	$7.59	$4.45	100
$0.32	Live	68%	$0.46	$0.20	$0.14	$0.00	$0.00	$0.01	$0.81	$1.12	$0.31	65
$2.13	Live	100%	$2.13	$0.20	$0.14	$0.00	$0.00	$0.01	$0.00	$2.66	$2.66	65
$0.00	N/A	64%	$0.00	$0.20	$0.14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	65

The second part of PROCFEAM.XLS (Table A-20) provides a profit and loss statement for the processing plant(s) in a community. Much of the variable revenue and cost data are derived from the information contained in the first part of the file. Fixed costs contained in this data set are based upon survey work in 1987 and 1990, additional work for the Alaska FEAM model, and an average 1989 financial statement for 226 seafood processors (SIC code 2092) in the nation with assets of $1 to $5 million compiled by Dun & Bradstreet. The percent of wages paid to local residents and expenditures made in the local community are averages across the study communities. The model user should review these coefficients and modify them where appropriate.

RAMINPUT

The last worksheet in the model (Table A-21) summarizes data from the FLTFEAM.XLS and PROCFEAM.XLS files to provide information needed for the Rural Alaska Model (RAM). The seafood processing monthly wage is the only data item in the file which is not calculated from previous worksheets.

Table A-20: PROCFEAM.XLS(b)

No. of Firms:			Mixed Large Size		
	1	3500000	Market value(1)		
Line Emp.		203	employees for avg. operation		
Support Employment:		41			Total
Total Employment		243	Net Cash Flow	Percent Resident	Community Impact Flow
Revenue			$142,715,303		$2,031,506
Less Expenses:					
Variable Expenses:					
Raw Product Cost(3)			$82,746,732		
Direct (Processing) Labor			$24,858,122	3.0%	$745,744
Other Variable-packaging (4&5)			$17,675,466	5.0%	$883,773
Other Variable Expenses			$0	0.0%	$0
Other Variable Expenses			$0	0.0%	$0
Bad Debt Expense			$1,069,776	5.0%	$53,489
Total Variable Expenses			$126,350,097		$1,683,006
Contribution Margin			$16,365,207		
Fixed Expenses:					
Administrative Salaries			$600,000	30.0%	$180,000
Maintenance and Repair			$200,000	5.0%	$10,000
Utilities			$100,000	40.0%	$40,000
Telephone			$60,000	100.0%	$60,000
Insurance			$60,000	0.0%	$0
Taxes			$35,000	50.0%	$17,500
Supplies			$55,000	20.0%	$11,000
Miscellaneous			$60,000	50.0%	$30,000
Loan Payment (2)			$230,823	0.0%	$0
Interest Expense			$789,688	0.0%	$0
Total Fixed Expenses			$2,190,511		$348,500
Operating Income			$14,174,696		$2,031,506

(1) Market value is not replacement value.

(2) Loan amounts are assumed to represent 25% of market value at 10% interest rate for 5 years. Loan payments are used rather than depreciation because the RAM input requires total income to the community which is a function of cash flow.

(3) Includes fish tax

(4) Includes general costs of processing - such as equipment rentals, can costs, and chemical additives.

(5) Costs of packaging are generally borne by the buyer. Sales price is f.o.b. processing plant.

(6) Interest expenses for pack loans are estimated at 25% of variable costs for 3 months at 10% interest rate.

Table A-21: RAMINPUT.XLS

INPUT TO RAM
Port:King Cove
Year:1990

1988 Average Seafood Processing Monthly Wage:$1,621
1988 Average Seafood Processing Annual Wage:$19,452

Estimated Output Data for RAM Model:		
Total Shoreside Employee Income:	$4,939,070	
Resident		$148,172
Non Resident	$4,790,897	
Total Processor Owner Income:	$9,007,935	
Resident		$0
Non Resident	$9,007,935	
Total Crew Income:	$15,632,847	
Resident		$2,683,376
Non Resident	$12,949,471	
Total Vessel Owner/Skipper Income:	$23,949,465	
Resident		$2,957,334
Non Resident	$20,992,130	
Estimated Employment:		
Shoreside Employees:	253	
Resident		7
Non Resident	246	
Vessel Crew:	602	
Resident		169
Non Resident	433	
Vessel Owners/Skippers:	320	
Resident		67
Non Resident	253	