THE LANDSCAPE OF COMMERCIAL FISHING IN COOS BAY, OREGON

by

RODGER P. ADAMS

A THESIS

Presented to the Department of Geography
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Master of Arts

June 1982

APPROVED: Alvin W. Urquhart

Alvin W. Urquhart

An Abstract of the Thesis of

Rodger P. Adams for the degree of Master of Arts

in the Department of Geography to be taken June 1982

Title: The Landscape of Commercial Fishing in Coos Bay, Oregon

Approved: Alvin W. Urquhart

The Coos Bay estuary supports the second largest fishery in Oregon. This thesis looks at the fish resource, the historical development of the local fishery from the 1880s to the present, the pattern and extent of contemporary fishing activity, and the resulting landscape elements that are associated with the fishing industry. Annual catch data of the commercially important species have been recorded and analyzed to explain the historical relationships between the fishery and its landscape.

Coos Bay originally developed as a fishing ground, later evolving into a harbor for offshore fishing vessels. The fishery has been characterized by several booms and busts associated with individual species. Fishing activity in the estuary has become centered in the community of Charleston, and dominates the local scene. The recent expansion of fishing activity at Charleston has depended on altering the local environment, advancing fishing technology, and enlarging markets.

VITA

NAME OF AUTHOR: Rodger P. Adams

PLACE OF BIRTH: Eureka, California

DATE OF BIRTH: May 23, 1953

UNDERGRADUATE AND GRADUATE SCHOOLS ATTENDED:

Humboldt State University
University of Oregon

DEGREES AWARDED:

Bachelor of Arts, 1975, Humboldt State University
Master of Arts, 1982, University of Oregon

AREAS OF SPECIAL INTEREST:

Cultural Geography
Land-use Planning
Energy Planning
Coastal Studies

PROFESSIONAL EXPERIENCE:

Instructor, University of Oregon Institute of Marine Biology, 1978

Graduate Teaching Fellow, Department of Geography, University of Oregon, 1978-1979

Planner, Coos-Curry Council of Governments, 1980-1981

AWARDS AND HONORS:

Research Grant, University of Oregon Foundation, 1979

VITA continued

PUBLICATIONS:

City of Bandon Wind Energy Planning Study, Coos-Curry Council of Governments, North Bend, OR, 1982

North Bay Marine Industrial Park Environmental Impact Statement, U.S. Army Corps of Engineers, Portland, OR, 1982

Urbanization in Brookings, Oregon, 1980-2000, Western Interstate Commission for Higher Education, Boulder, CO, 1980

ACKNOWLEDGMENTS

This thesis could not have been completed without the generous efforts of many people. I am indebted to the faculty and fellow graduate students of the Geography Department for their knowledge, encouragement, and interest. In particular, my advisor and friend, Al Urquhart, was instrumental in shaping my thoughts and directing my study. Also, special thanks to fellow student Jeff Wilson for his perspective and insight on the preparation of the document. Finally, I am grateful for the patience of my family and friends, especially Felice Fawcett; their continued faith in me has helped immeasurably. Special thanks to my sister, Kathy Graff, for her unselfish support. This thesis was supported in part by a grant from the University of Oregon Foundation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES continued

LIST OF FIGURES continued

CHAPTER ONE

INTRODUCTION

Whatever its nature, whether spearing a salmon with a stick, or netting tons of shrimp with electronic-laden vessels, fishing represents a primeval response to the environment--seeking out elusive quarry for sustenance. By virtue of their access to what is, in concept at least, a common good available to all who pursue it, today's commercial fishermen are members of one of the last major groups of hunter-gatherers that still exist. Local adaptations to this activity abound throughout the world, the fishery of Charleston, Oregon, located on Coos Bay, being a thriving example. Charleston's fishing industry dominates the community's landscape. How did the practice of commercial fishing develop here? What is its effect on the local scene? This study offers some answers to both questions by: (1) describing the nature and extent (both temporal and spatial) of Coos Bay's commercial fisheries; and (2) describing the elements of the fishing landscape that resulted from this activity.

Coos Bay supports the second largest fishery in Oregon; only Astoria is larger. Its fishery[1] is actually made up of five main types: groundfish, shrimp, crab, albacore, and salmon, each of which, singly or in combination with others, support a considerable number of fishermen. They range from part-timers who take day trips in boats under 30 feet long, to full-time fishermen who fish in 90-foot vessels, enabling them

to stay out for three weeks or more. In general, the fishery has grown rapidly in the last fifteen years, a trend which is expected to continue. This has primarily been a result of Coos Bay's proximity to productive shrimp and groundfish fishing grounds; these species having greatly increased in economic importance since 1965. In addition, rising fuel costs and other market factors, have increasingly induced fishermen to deliver to the closest port.

The Nature of the Resource

"The habitat of the quarry apparently is the decisive factor which sets 'fishing' apart from other forms of hunting and gathering" (Hewes, 1948:238). Certain aspects of this habitat, such as buoyancy, turbulance, solubility, refraction of light, and its three-dimensional characteristics, make it markedly different from its terrestrial counterparts. Noting this, Poggie (1974:7) states,

> Ecological relationships between humans and the ocean are, thus, in many ways unique. Because man is a terrestrial mammal, his adaptation to marine habitats has to be mediated by a fairly complex technology even to begin with, because part of the terrestrial environment has to be taken out to sea. Despite the great ingenuity brought to bear on using it, the marine habitat is one of the most challenging and in many ways the most inhospitable to man.

While fishing is pursued in environments that distinct from all land environments, differences among these aquatic environments must be considered as well. "For example, fishing . . . is limited by the depth of the water. Currents may jeopardize fishing gear, as may rock outcrops on the ocean floor" (Poggie, 1974:8). In addition, fish are found in concentrations either seasonally or in restricted habitats.

Some commercially important fish, notably, albacore and salmon, are pelagic (free-swimmers) that roam vast areas in somewhat regular patterns. Salmon, being anadromous, regularly enter coastal streams. That these species seasonally converge enables their efficient capture, in harvests akin to the crop collection of farmers. Other commercially important species, such as groundfish, shrimp, and crab concentrate over the sea floor as a function of bottom conditions and nutrient availability. They are, for the most part, found in the narrow continental shelf just offshore, where they too may be harvested efficiently. The amount of variability in fish abundance and the degree of predictability of fish movements in a given location are key factors in the development of a center of fishing activity.

Context of the Study

By nature, fishermen have broad discretion as to when or where to fish, limited only by governmental regulations in some instances. A fishery is "a cultural response to the presence of a resource, and a decision to exploit it is based on economic values" (Damron, 1975:6). Just as a farmer in Kansas decides to plant soybeans instead of sweet corn, a Pacific fisherman decides to fish for albacore instead of salmon; and in the way that the aggregation of farmers' decisions affect the activity and look of the local farmtown, the aggregation of fishermens' decisions affect the landscape of the port.

The study of man's activities in maritime environments has received little attention by geographers. The geography of fisheries on the West Coast has been especially neglected. Some work has been done on the

history of the development of West Coast fisheries, but little of it has addressed its cultural aspects. One exception is the work of Damron (1975), which looks at the emergence of salmon trolling on the Northwest Coast. However, his study focuses on the process of cultural adaptation to trolling technology, and does not concentrate on trolling's impact on harbor landscapes.

Several factors have shaped the contemporary commercial fishing landscape of Coos Bay, including: natural environments, especially the abundance and variation in the fish resource; socio-economic conditions which developed through the larger context of settlement and cultural change in the Coos Bay area; and harbor improvements and advances in technology which made possible more effective exploitation of the resource. In order to achieve an historical perspective, I have arranged this study by time periods, beginning with an overview of early commercial fishing on the West Coast and early settlement in the Coos Bay area. Since 1865, the date of the earliest commercial fishing in Coos Bay, many fisheries have come and gone. To gain a sense of the events which caused these booms and busts, I look at the factors which have shaped the Coos Bay fisheries and their landscape.

Footnotes

[1]The term "fishery" can be distinguished by place or species type, or both. In the context of this thesis, the Coos Bay salmon fishery is distinct from the Newport salmon fishery, as well as distinct from the Coos Bay shrimp fishery.

CHAPTER TWO

PHYSICAL ASPECTS OF THE STUDY AREA

To a fisherman returning to harbor from the open ocean, the coastline around Coos Bay must appear essentially the same as it did to explorers plying the coast over 150 years ago. From offshore, rocky cliffs and bluffs to the south and a long expanse of dune sand to the north, are divided by the entrance to Coos Bay. Coos Bay, the estuary of the Coos River and other small streams, drains approximately 820 square miles of Oregon's Coast Range (Fig. 1). It is 13 miles long and covers 12,000 acres, making it the largest natural harbor in Oregon south of the Columbia River.

Geologic History

The coastal area of Oregon has been characterized throughout much of geologic time by complex interaction between the adjacent oceanic and continental crustal plates. Much of this coastline remained part of the ocean floor until relatively recent times. During this long period, deposition of sea floor basalts alternated with thick accumulations of offshore and shallow-sea sediments. The source for these sediments was apparently the ancestral Klamath Mountains and thick submerged piles of volcanics.

Since the beginning of the Eocene epoch, roughly 60 million years ago, the pattern of deposition in the area became controlled by a long

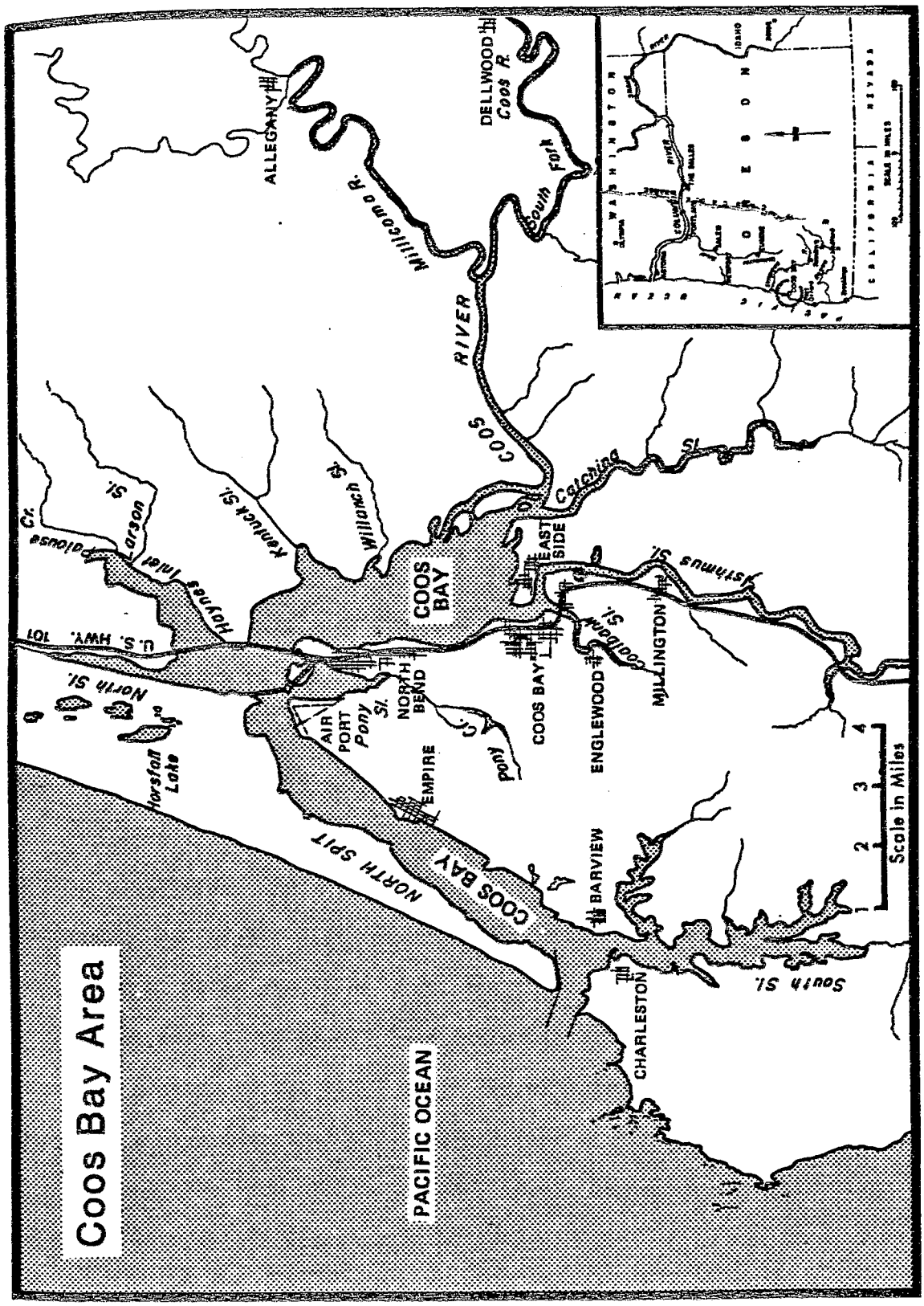

Coos Bay Area
PACIFIC OCEAN
COOS BAY
NORTH SPIT
COOS BAY
COOS RIVER
South Fork
Millicoma R.
ALLEGANY
DELLWOOD
Coos R
EAST SIDE
Catching St.
Isthmus St.
COOS BAY
NORTH BEND
AIR PORT
Pony Cr.
Pony St.
EMPIRE
Horsfall Lake
North St.
U.S. HWY. 101
Haynes Inlet
Kentuck St.
Willanch St.
Orson St.
Colouse Cr.
Coolidge St.
ENGLEWOOD
MILLINGTON
BARVIEW
CHARLESTON
South St.
Scale in Miles
1
2
3
4

FIGURE 1

sequence of regressions and progressions of the coastline. The rocks deposited during this period contain evidence of beach, lagoonal, and deltaic environments, with minor periods of folding, faulting, and erosion occurring between most of the units. This pattern continued into the Pliocene epoch, about 10 million years ago, when regional uplift caused the southern part of the Oregon coastal area to emerge from the sea. Since then, glacially-induced fluctuations in sea level have combined with continued regional uplift to create a well-preserved complement of marine terraces, which can be seen in the area at elevations from 50 to 1,500 feet, with the higher terraces representing progressively older inundations. The latest sudden rise in sea level, associated with the close of the most recent (Wisconsin) glacial period, flooded the mouths of the major coastal rivers, creating the present-day estuaries which continue to shift position and shape (U.S. Army Engineers District, 1979:2-1; CCCOG, 1980:VI-1).

The path of the Coos River near the mouth was formed by the down-warping sedimentary bedrock in the immediate area. South Slough and Charleston Channel are separated from the ocean by a 400 foot ridge consisting of shale and sandstone. The local strata, folded along a north-south axis directed the flow northward at the point which is now the upper portion of the bay. Accreting sand along the North Spit resulted in a wide fluctuation of the position of the mouth. Its present southern position, now stabilized by jetties, has given the presently inundated estuary its distinctive horseshoe shape.

The Continental Shelf

Offshore, the continental shelf is comparatively narrow (25 km), directly west of Coos Bay. North of the bay, the shelf widens to 70 km, but even this is narrow compared to the continental shelf in the Gulf of Mexico or the Atlantic Ocean where it extends several hundred kilometers (Loy, 1976:22). The break in slope occurs at a depth of about 100 fathoms, with the continental slope extending out another 50 km (Fig. 2).

Bottom sediments on the shelf are supplied to a large extent by the Columbia River and from the major southern coastal rivers such as the Rogue, Siuslaw, and Umpqua. Not all sediments are of continental origin, however. A portion of the bottom sands have been produced from the break-up of subsurface rock. Of these sediments, glauconite is the most common, and is often found on the Continental slope. In addition, biogenic sediments (from the waste and skeletons of sea creatures) have formed some of the mud deposits found on the bottom (Kulm, 1977:15-16) (Fig. 3).

Longshore currents are the major mechanism by which sand is transported along the coast. The surface currents move southward in summer and northward in winter, concurring with the prevailing winds of those seasons. The net littoral drift is to the north. During summer, when currents flow southward, strong upwelling water close to shore brings nutrients important to marine life from the bottom to the surface.

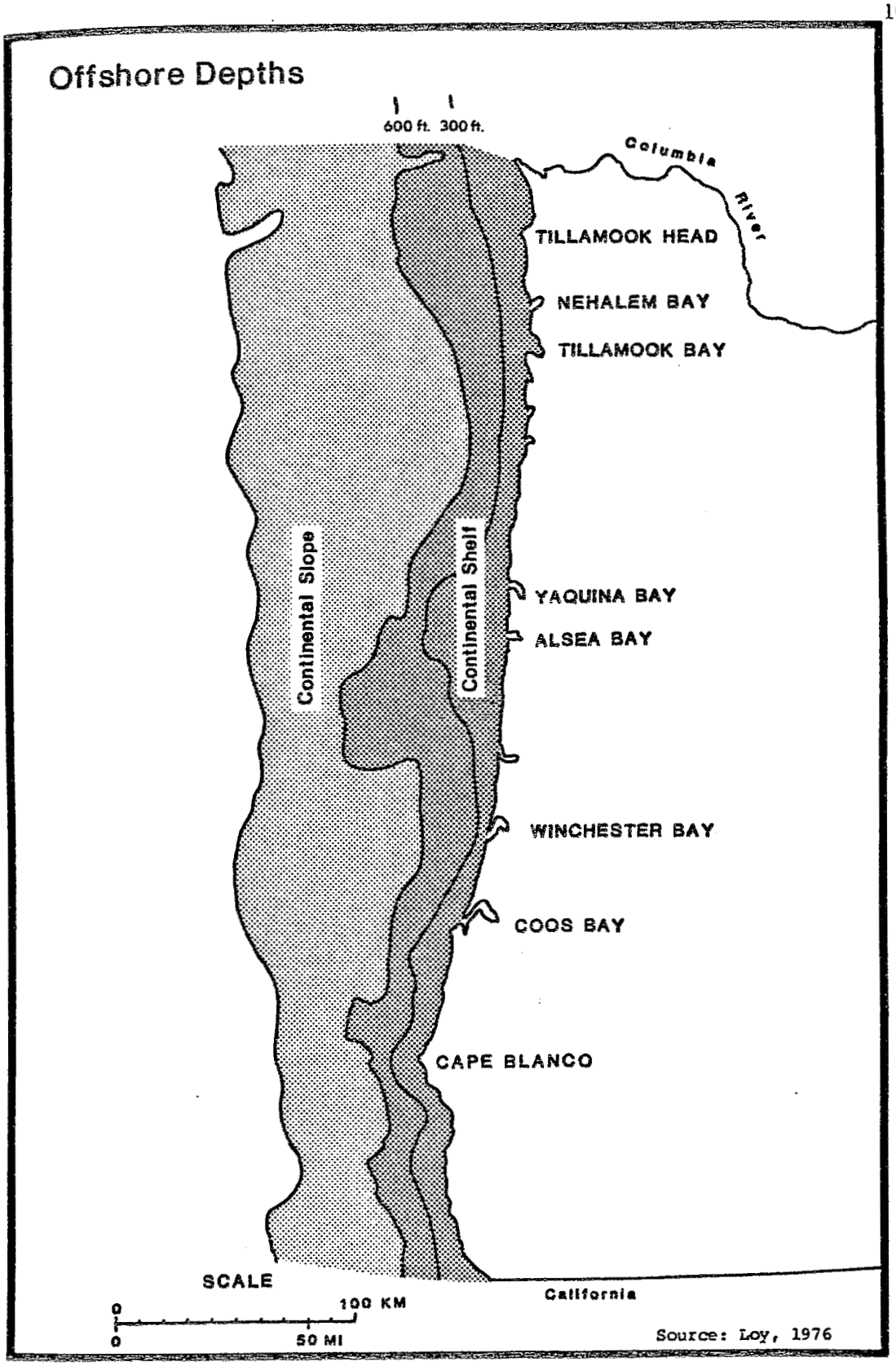

Offshore Depths
600 ft.
300 ft.
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
Continental Slope
Continental Shelf
YAQUINA BAY
ALSEA BAY
WINCHESTER BAY
COOS BAY
CAPE BLANCO
SCALE
0
100 KM
0
50 MI
California
Source: Loy, 1976

FIGURE 2

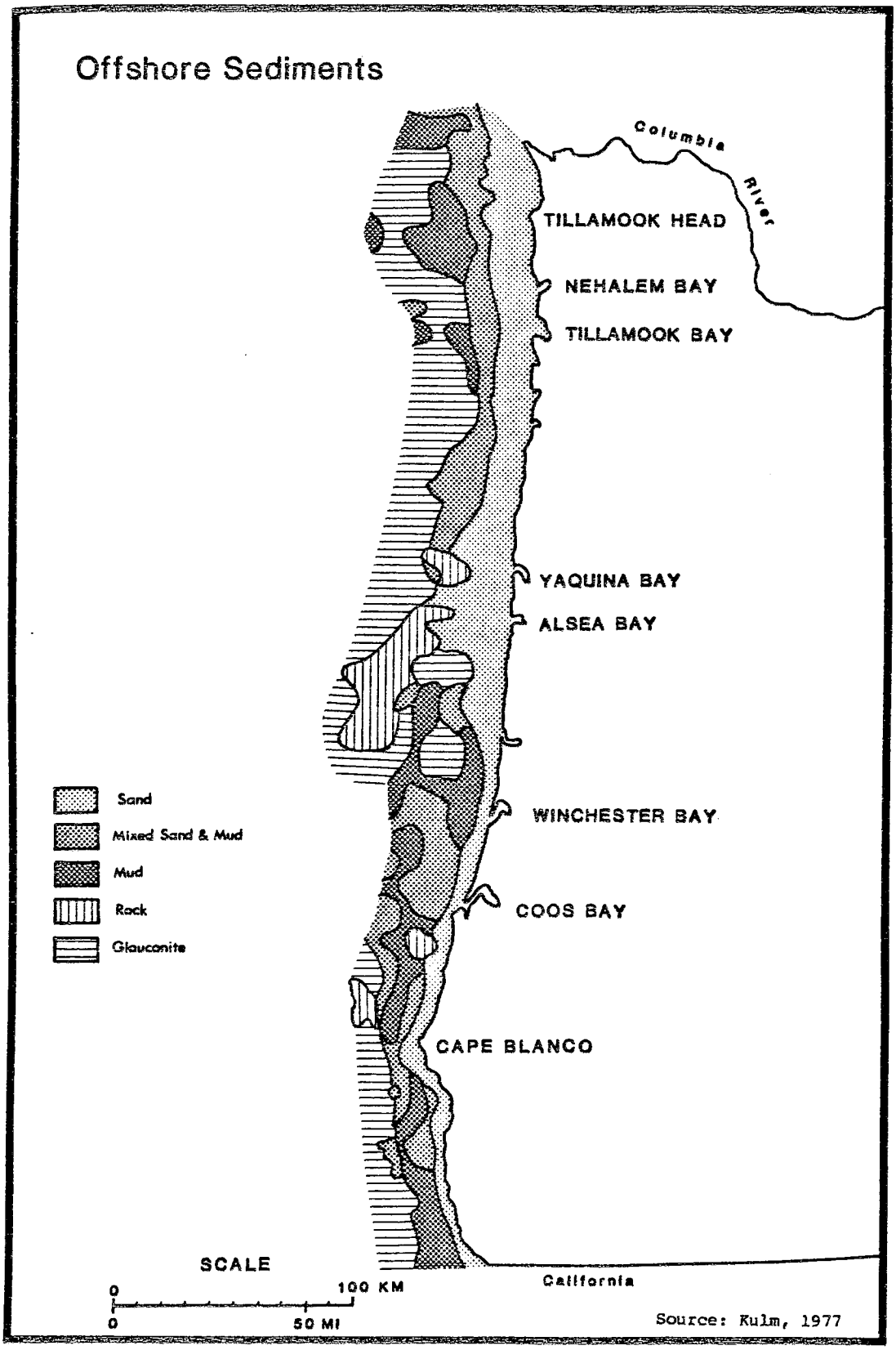

Offshore Sediments
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
YAQUINA BAY
ALSEA BAY
WINCHESTER BAY
COOS BAY
CAPE BLANCO
Sand
Mixed Sand & Mud
Mud
Rock
Glauconite
SCALE
0
100 KM
0
50 MI
California
Source: Kulm, 1977

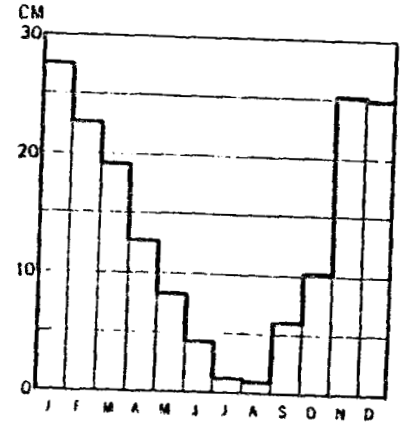
FIGURE 3

Climate and Weather

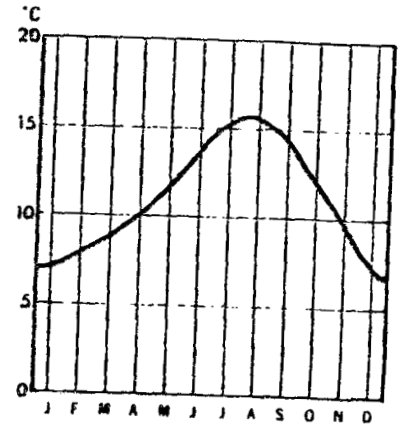
Because coastal Oregon is in the path of the Westerlies, the climate of the south coast is characterized by the mediating effects of marine weather. The U.S. Climatological station at North Bend records temperature and precipitation data throughout the year (Fig. 4).

The winter season consists of relatively mild, wet weather because low pressure systems dominate the offshore source region. Most precipitation occurs during winter cyclonic storms which swing in from offshore. These moisture-laden air masses rise and cool as they hit the rugged topography of the coast, resulting in light rain and drizzle as they pass over. Eighty percent of the average annual precipitation at North Bend occurs in the months October through March, with 50% occurring in the months November, December, and January. The average daily temperature in January (the coldest month) ranges during the day from a low of 8° C to a high of 12° C. The mean daily range of temperatures is fairly low during the winter months because of Coos Bay's proximity to the ocean and also because generally cloudy conditions keep the maximum temperature down by reflecting incoming radiation, and keep the minimum temperature up by blocking outgoing radiation. Winter winds are steady, with occasional strong gales. Average wind velocity is 15 mph. During this season, winds blow almost exclusively from the south and southwest (Fig. 4).

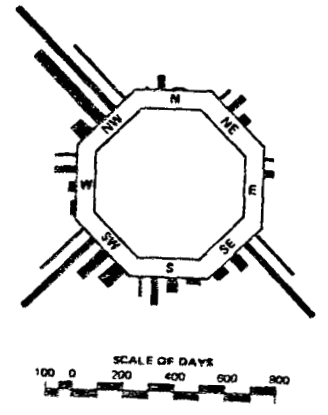
By contrast, the summer season is characterized by very stable offshore high pressure systems which bring warmer, drier weather to the south coast. Twenty percent of the annual precipitation occurs in the



Precipitation



Temperature



Wind

MEAN VELOCITY AND DURATION OF PREVAILING WINDS AT ENTRANCE OF COOS BAY OREGON FOR 10 YEAR PERIOD. DURATION IN DAYS SHOWN BY LENGTH OF LINE. VELOCITY IN MILES PER HOUR SHOWN BY WIDTH OF LINES.

- 5 TO 10 MILES
- 10 TO 20 MILES
- 20 TO 30 MILES
- 30 OR MORE MILES

Source: Schroeder, 1978
Ebert, 1981

FIGURE 4. Patterns of Precipitation, Temperature and wind in the Coos Bay Area

months April through September, with only 4% occurring in the months June, July, and August. The average daily temperature in August (the warmest month) ranges during the day from a low of 12° C to a high of 20° C. Note that the mean daily range in temperature is higher in summer than winter, because of the lack of cloud cover. But even this variation is substantially lower than inland temperature ranges because of the mediating effects of the coastal location. Summer breezes are steady and moderate, with an average velocity of 17 mph. Winds blow from the north and northwest and are usually associated with clear, sunny days (Loy, 1976:130-132, 136-138).

Tides and Waves

To fishermen, tides and tidal currents are an important component of the harbor's physical environment. Coos Bay's tides range from an extreme high of 10.5 feet above MLLW to 3 feet below MLLW (U.S. Army Engineer District, 1979:2-1). The mean tidal range is 5.2 feet with a diurnal range (from MHHW to MLLW) of 7.0 feet (Percy, 1974:50).

Tides and winds (both local and distant) form the seas and swells that occur offshore and in the bay. In the winter, seas greater than 8 feet and swells greater than 12 feet occur from the westerly directions about 20 and 30% of the time, respectively. During the summer, northerly winds produce waves in the bay that are often as high as 1 to 2 feet (U.S. Army Engineers District, 1979:2-3).

Daily Weather

The above data give a good indication of the climate of the area, but not a very good feeling for the day-to-day weather which local fishermen must cope with. Most days have some cloudiness, and high fog is often continually present for weeks at a time, especially during the winter. Summer and fall days often begin with a low fog that burns off in the early afternóon. Most of the time it seems as if rain is imminent. North Bend averages 163 days with some precipitation (Loy, 1976:137). Average daily wind velocity patterns show that mornings are relatively calm, with the wind picking up in the afternoon.

The local topography causes micro-climatic variations in weather and tidal patterns. Precipitation changes dramatically as a function of distance from the coastline. From an average of about 50 inches along the coast, the precipitation increases to 120 inches on the western slopes of the interior uplands. At the same time, local surface winds are substantially lower inland compared to areas adjacent to the ocean. Wind patterns vary widely even within the confines of the estuary itself. Consequently, wave patterns in the bay are highly variable in both a temporal and spatial sense.

CHAPTER THREE

THE RESOURCE BASE

There is no component of the physical environment that is any more important to fishermen than the fish resource itself. Consequently, assessment of commercial stocks is an important part of this study. However, no attempt is made to study exhaustively the population dynamics for the various species. Rather, the attempt here is to catalog the geographic extent and movements of commercial food species important to Coos Bay fishermen.

Categories of Marine Biomass[1]

The marine biomass can be divided into two realms: the pelagic and the benthic. Pelagic organisms float or swim in the water; benthic organisms rest on, are attached to, or burrow into the sea bottom.

Pelagic life is made up of three categories: phytoplankton, zooplankton, and nekton. Phytoplankton include free floating and drifting plants, diatoms, dinoflaggelates, and certain algae. They are the primary producers of organic matter in the sea. Production occurs through photosynthesis, using energy from solar radiation and inorganic nutrients from the seawater. The zooplankton includes all animals unable to swim effectively against the horizontal currents of the oceans. Much of the zooplankton population, meroplankton, is comprised of larval benthic and nektonic organisms. A large portion of the zooplankton are

herbivores which serve as a link between primary producers and many of the larger carnivorous nektonic organisms. The nekton include all animals able to swim against the horizontal ocean currents for prolonged periods of time. Although there is no sharp distinction, the larger size and the stronger locomotory ability differentiate the nekton from the plankton. Because of their ability to migrate, many nektonic species occupy only a small part of their possible range at any one time. The great majority of the commercially important marine fish belong to the nekton and most available spatial information relates to these.

Some nektonic species, although free swimming, utilize the bottom to such an extent (e.g. halibut) as to be classified within the benthic realm. These are known as demersal species. Most benthic animals have planktonic larvae. The primary sources of food for the benthos are the planktonic organic detritus, and in shallow water, the larger algae and flowering plants.

Distributional Factors

The geographic extent of any resource has direct impact on its pattern of exploitation. But unlike many resources used by man, one characteristic of fish is undeniable--they move around. This movement within geographic limits gives rise to variability in the location of particular species at different times of the year.

A fishing resource can be divided into two categories, riverine and marine. Anadromous fish utilize both environments and as such, must be adapted to both. Species that are exclusively riverine are not of

commercial importance to Coos Bay fishermen and are not considered here. Clearly, differences exist in the variables that affect the distribution of fish in each of these realms, and these will be described in turn.

Anadromous Distribution

Migratory behavior is an evolutionary response to seasonal variation in environmental conditions. For anadromous species, it has been shown that variables in riverine environments have the most impact on their seasonal distribution (Shalk, 1977:211-222), so the emphasis in this discussion is the relationship between the stability of riverine ecosystems, species, diversity, and productivity in a temporal and spatial context.

Shalk points out that in the Northeastern Pacific, the geographic extent of various species is dependent on latitude and drainage basin size.

> Starting at the southern extremes of anadromous fish distributions (e.g. central and southern California), precipitation is generally low, evapotranspiration high, and temperatures relatively high and equable. The obvious kind of instability most common in riparian environments of such areas is low discharge--periods when spawning is difficult or impossible due to insufficient stream flow. Excessive temperatures may also preclude spawning during the warmer portions of the year even if stream flow were sufficient. Moving northward to more central areas of anadromous fish distributions (e.g. Oregon to southeast Alaska), increased precipitation and decreased temperature and evapotranspiration probably produce the most equitable riparian conditions throughout the yearly cycle. To the north of this central zone, evapotranspiration, temperature, and precipitation all decrease but possibly the most important point is that runoff is minimal due to freezing for increasingly longer periods of the year. In terms of the conditions that anadromous fish respond to, it appears that stability in discharge of rivers diminishes both to the north and to the south of a broad intermediate zone where stability

> is highest. . . . This pattern is approximately coincident with patterns of species diversity in anadromous fishes (Shalk, 1977:217).

Shalk also notes that larger rivers tend to be more stable than smaller rivers and therefore capable of supporting more species; in addition, stability decreases in an upstream direction and is accompanied by decreased species diversity.

As a result, variations in species productivity are shown to be directly correlated with river size and inversely correlated with distance upstream. Variations in productivity along a latitudinal gradient have not been well established. However, fluctuations in productivity are also directly related to the stability of the riverine environments, therefore fluctuations are less extreme in the broad intermediate zone referred to earlier, as well as the larger watersheds.

The period of time that fish are engaged in anadromous behavior directly affects the timing and duration of their availability. This temporal context is important--it has been the basis for seasonal variability in fishing landscapes in any locale. Shalk (1977:222) describes the patterns:

> To summarize temporal patterns, it is evident that there are two major dimensions of variability. Ignoring species diversity and river size, fish migrations are more temporally compressed moving from south to north. In addition, the season during which fish move into rivers changes from all year round or throughout the winter at the southern extreme to midsummer at the northern extreme. Thus, congruency of fish migrations with the terrestrial growing season increases to the north. Ignoring latitude, the period of availability is obviously a direct function of species diversity. Thus, larger rivers, more stable rivers, and particularly the lower trunks of large and stable drainages offer longer periods of resource availability. Smaller rivers with few species or the upper tributaries of any drainage offer much shorter periods during which fish may be taken. The extreme temporal compres-

> sion of resource availability would occur in small rivers of the far north.

Marine Distribution

The comparatively low primary productivity of streams which anadromous fish utilize is precisely the characteristic they are looking for--enabling their eggs and smolts to flourish without much competition or danger from larger fish. This adaptation to riverine environments has necessarily limited their distribution in marine environments, based on tolerances to temperature, salinity, and food availability. This points out a very basic fact--a species' geographic limit in marine environments is predicated on adaptations to specific biotic and physical-chemical factors.

> . . . recent work in the Pacific has emphasized the close relationship between species limits and the limits of water masses with their characteristic temperature-salinity-circulation patterns. In the Pacific there appear to be unique faunas and probably floras in each water mass as well as in the transition regions, between water masses (Biere, 1966:686).

Each individual species has specific physical-chemical limitations that determine its geographic extent. These are discussed in more detail later. But distribution or density of a species within a particular geographic area is based on the availability of food.

> Ignoring patchiness, the average abundance of a pelagic species in a given area within its range is largely determined by available food, which is ultimately dependent on the supply of mineral nutrients to the phytoplankton. Thus the highest reported concentrations of nekton and zooplankton are in regions of upwelling of mineral nutrients along the eastern temperate sides of the oceans, in regions of marked seasonal overturn of water as in the subarctic and subantarctic, or in areas of nutrient replenishment from the land, especially in bays and estuaries (Bieri, 1966:685).

To expand on this notion, it is apparent that concentrations of fish depend on a high degree of primary production, which is dependent on photosynthesis activity, and therefore ultimately dependent on nutrient availability and the amount of solar radiation. Consequently, it is not a surprise that there are noticeable seasonal as well as geographic variations in primary production in the North Pacific.

> Because the period of light availability is compressed into a shorter summer, with longer days towards the higher latitudes, the period of photosynthetic activity must also decrease in duration, even though the magnitude of production may increase, with greater nutrient availability. The ultimate consequence of these interactions is the short biological explosion of an arctic plankton bloom (Shalk, 1978:35).

Many pelagic species respond to these changes in primary productivity by moving in huge gyres from north to south with the seasons. As expected, their movement north in the summer and south in the winter corresponds with their tolerances to water temperatures and salinity. Many demersal species also exhibit migratory behavior by moving toward shore in summer where it is more productive, returning to outer waters in the winter to spawn.

Salmon

Of the five species of Pacific Salmon native to North America, chinook (Oncorhynchus tshawtscha), coho (O. kisutch), sockeye (O. nerka), chum (O. keta), and pink (O. Gorbuscha), two are important to Coos Bay fishermen: the chinook and coho.

Salmon generally spawn in late summer or early autumn. Approximately 10% of the eggs hatched survive as fry to emerge the following

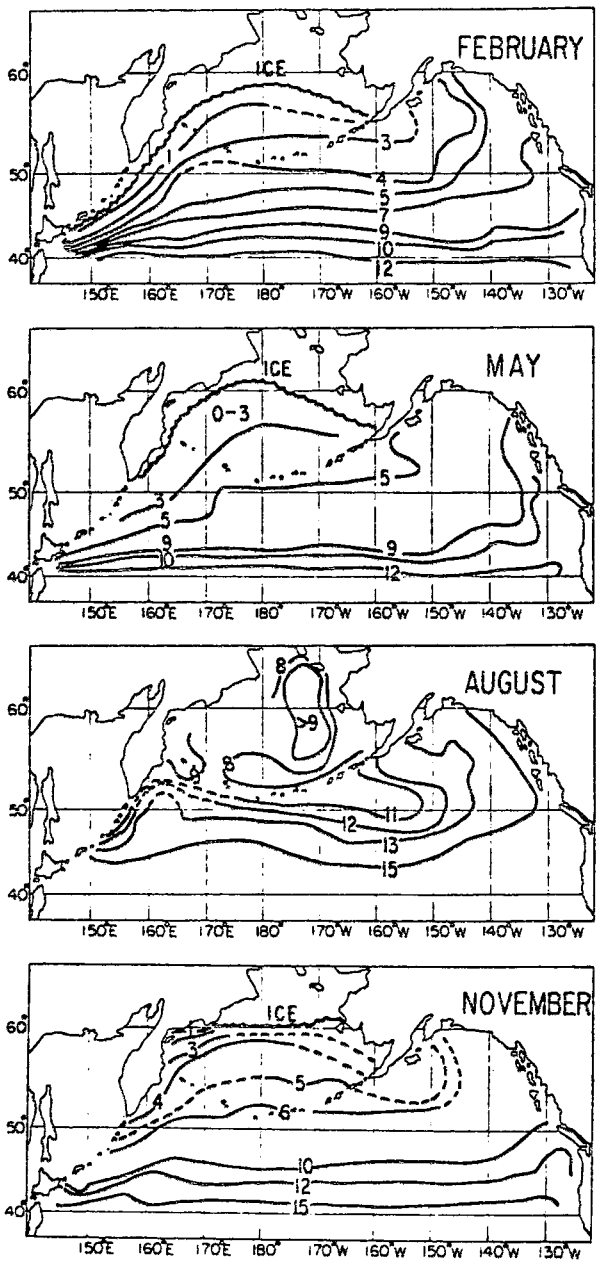
spring (McNeil, 1975:14). This emergence coincides with the increased primary and secondary production of food which occurs in streams during the spring months. Both species feed in freshwater for up to a year before going to sea. The coho feed in ocean waters for one to two years, while chinooks may feed in marine habitats for up to five years. Salmon return to their original spawning grounds using olfactory clues to recognize their home stream. Upon reaching their birth place, the adult fishes spawn in order to start the cycle anew.

The fact that salmon are anadromous, necessitates a look into both their fresh water and salt water habitats. While at sea, salmon use a pasture area which is approximately twice the size of the continental U.S. One primary indicator of the geographic limits of salmon offshore is water temperature (Fig. 5). Each of the salmon species has a range of preferred temperatures. These ranges have been loosely established by numerous research efforts.[2] Based on these studies, the geographic extent of each of the species has been extrapolated. Figure 6 shows the range of coho and chinook from all sources. The change in ocean temperatures generally causes salmon to migrate north during the summer and south during the winter. Some salmon travel in excess of 3,000 miles from their home stream.

Little is known about the offshore migration routes of salmon returning to spawn. R. L. Major (1978:6) said of the Chinook:

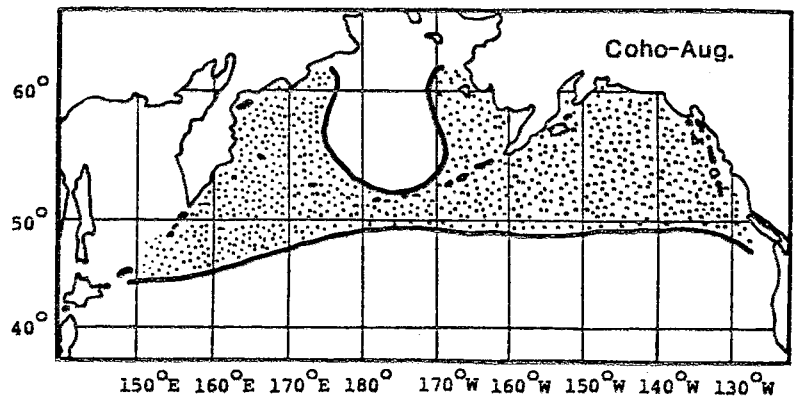
> For those populations of chinook salmon that spend a significant portion of their lives distributed on the high seas, it can be asked: "When do they begin homeward migration? What is the rate of travel? The route? When do they arrive in the waters adjacent to their spawning stream?" Despite our expanded knowledge about distribution and abundance of chinook salmon on the high seas, however, these

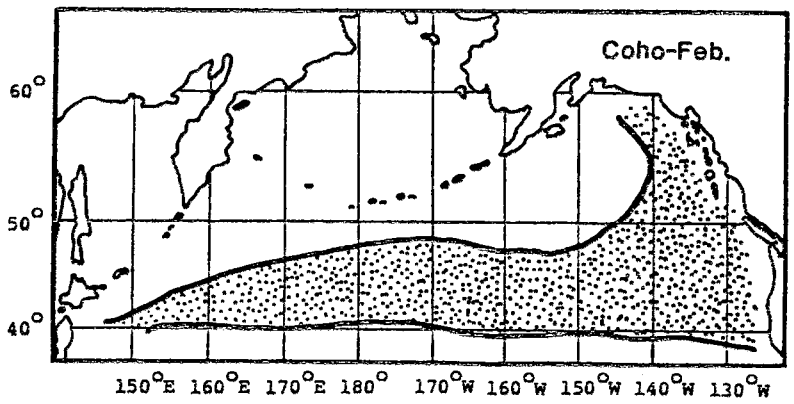
Surface Water Isotherms in the North Pacific, °C

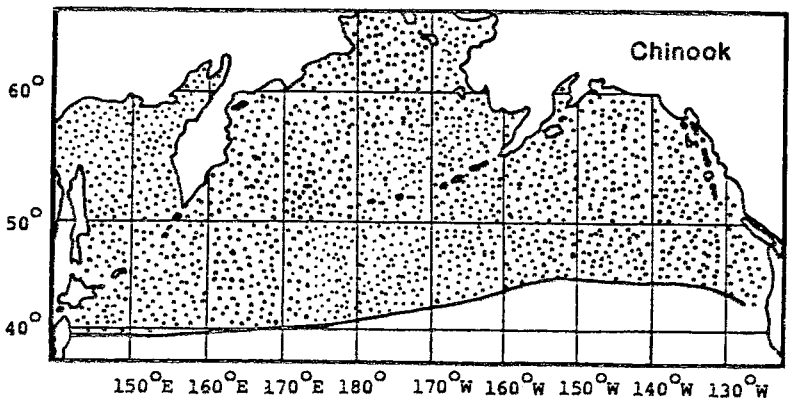


Source: Manzer, 1965

FIGURE 5







Occurrance of coho and chinook salmon from all sources in the North Pacific Ocean. Coho show definite seasonal patterns. Data from sample catches of chinook do not reveal abruptly defined limits which might suggest a preferred temperature range.

FIGURE 6

> questions remain largely unanswered . . . although tagging has fairly well established the fact that the migration route of chinook returning to southeastern Alaska, British Columbia, Washington, Oregon, and California streams is largely southeasterly.

Thus, this general pattern for chinook migration is northwestward for feeding and southeastward for maturing adults (Fig. 7), although some feeding chinook move to the south, as indicated by recoveries off Oregon and, even occasionally off California, of marked fish from the Columbia River (Loeffel, 1968:2).

Migration routes of the coho are less well understood than chinook, with both northward and southward movements from home streams occurring in varying instances. Van Hyning (1951:52), using tagging results, indicated that coho off the Oregon coast generally migrated southward to feed, returning northward to spawn.

These coastal migration routes are important in that the participating fish are those which become available to commercial trollers. Consequently, salmon originating in one country or state migrate through and are fished on in the territorial waters of another (Figs. 8 and 9), as well as in international waters.

The salmons' spawning range in North America extends from 35°N northward. Coho salmon range from streams in Northern California to the Yukon River and spawn at locations up to several miles inland. Chinook salmon extend farther south than the other species, ranging from the Sacramento River in California to the Yukon River in Alaska. Spawning dates along the coast range from late summer in the north to early winter in the south. Naturally, watersheds which encompass spawning area (even though spawning streams may not comprise the entire

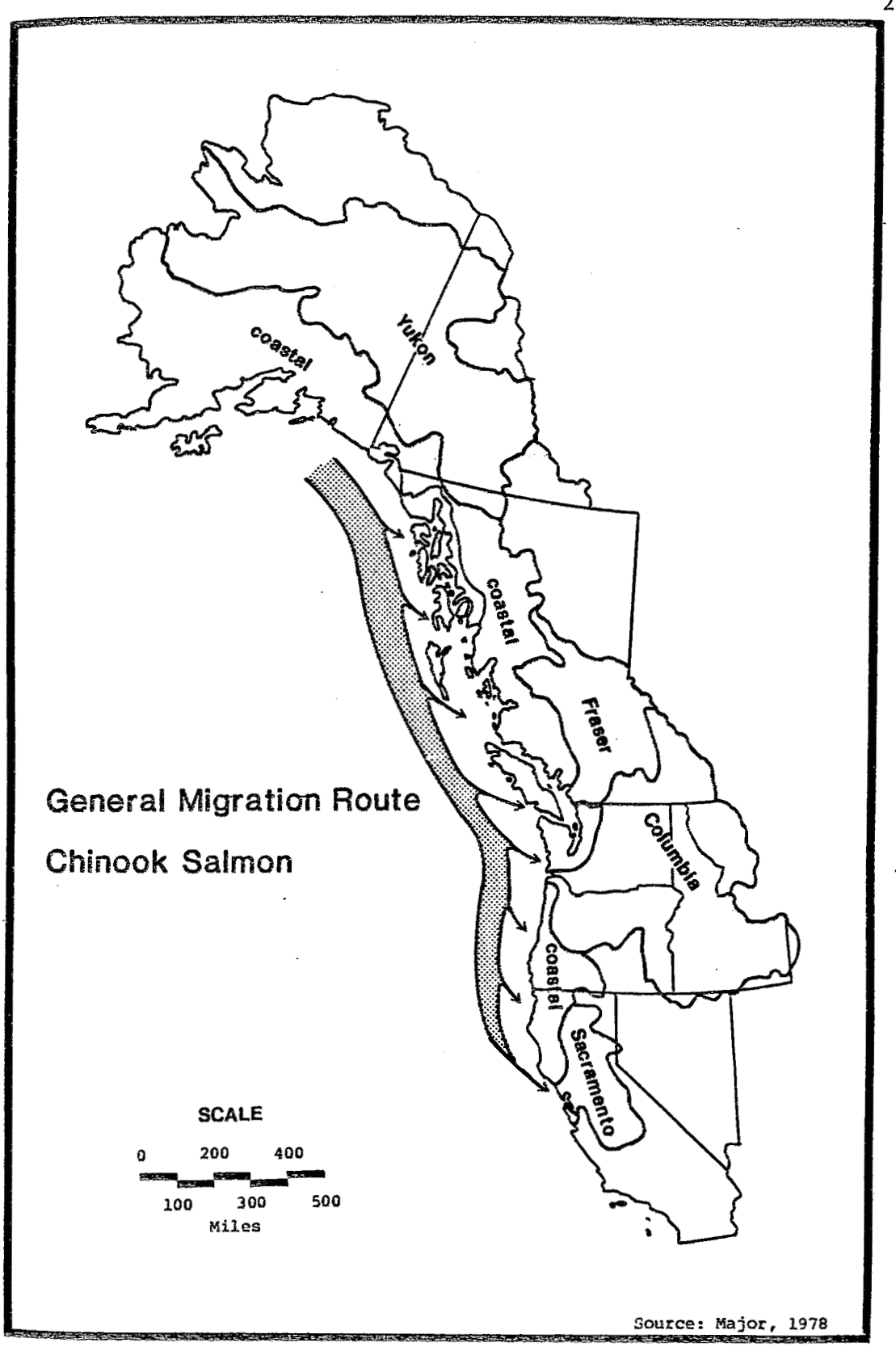

General Migration Route
Chinook Salmon
coastal
Yukon
coastal
Fraser
Columbia
coastal
Sacramento
SCALE
0 200 400
100 300 500
Miles
Source: Major, 1978

FIGURE 7

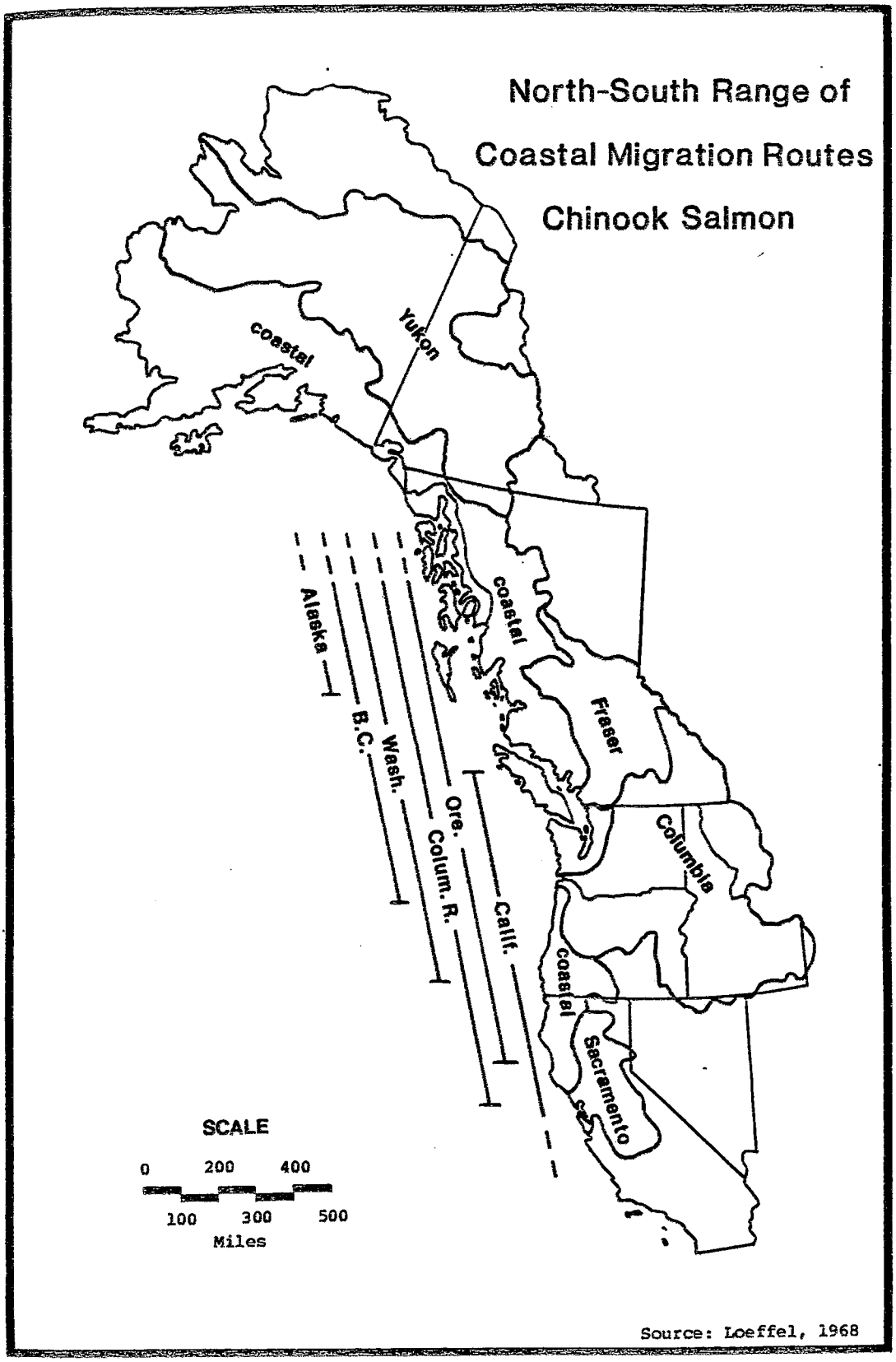

North-South Range of
Coastal Migration Routes
Chinook Salmon
coastal
Yukon
Alaska
B.C.
Wash.
Colum. R.
Ore.
Calif.
coastal
Fraser
Columbia
coastal
Sacramento
SCALE
0 200 400
100 300 500
Miles
Source: Loeffel, 1968

FIGURE 8

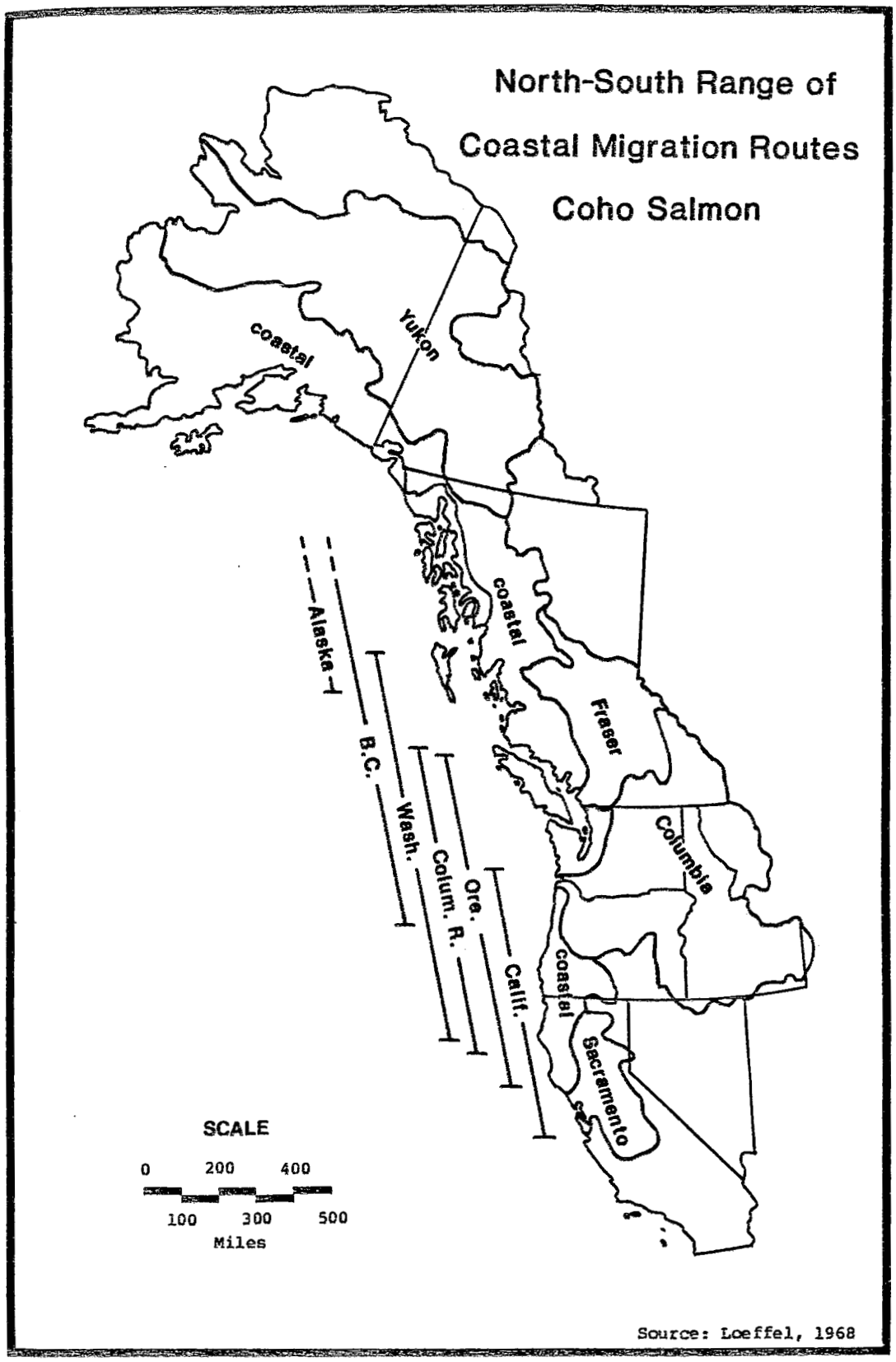

North-South Range of
Coastal Migration Routes
Coho Salmon
coastal
Yukon
coastal
Fraser
Columbia
coastal
Sacramento
Alaska
B.C.
Wash.
Colum. R.
Ore.
Calif.
SCALE
0 200 400
100 300 500
Miles
Source: Loeffel, 1968

FIGURE 9

watershed) have an impact on salmon survival. Figure 6 shows the extent of these areas.

Albacore

Another commercial fish important to Oregon fishermen, which also exhibits extensive migrating behavior is the albacore tuna (Thunnus Alalunga). The region off the Oregon and Washington coast represents the northern end of the range within which commercially harvestable concentrations of albacore are usually found. There is basically a single population of albacore in the North Pacific. This population migrates between two major fisheries--that of the U.S. West Coast and a large area east of southern Japan (FAO, 1972). The time and place of appearance of Albacore in the American fishery is determined by water temperature. Albacore prefer water between 58°F and 70°F. They usually appear somewhere off the coast of Baja California where the surface waters reach 57°. The earlier the warming influence moves north, the earlier the albacore move with it. The farther north this warming moves the farther north albacore travel (Browning, 1974:11). Therefore, fishing activity tends to move northward as the season (June-November) progresses, reaching the area of Oregon around mid-July in most years. The fishery generally peaks in August and lasts until the end of October. Because the Oregon-Washington fishery is at the northern extension of the albacore range, it tends to be more variable than regions to the south, so their appearance is more variable. Most of the fish are caught at distances from 50 to 150 miles from land (Browning, (1974:11). The map showing Albacore distribution (Figure 10)

illustrates the relationship between the Japanese fishing area and the fishing area of North America.

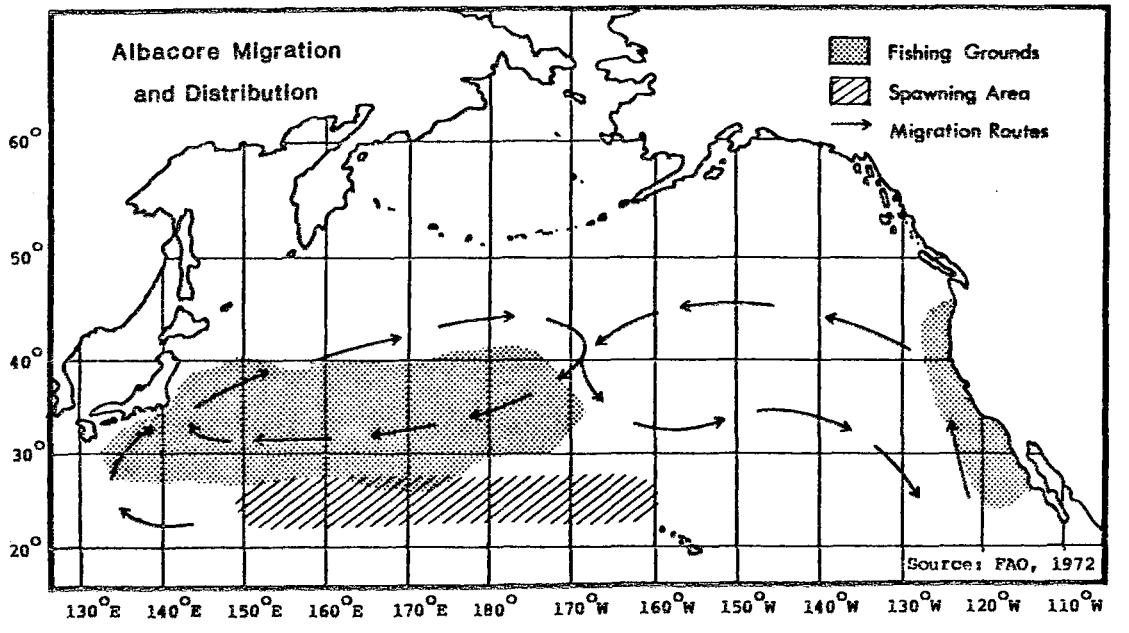


FIGURE 10

Crab

Dungeness crab (Cancer magister) is the only crab of commercial importance in Oregon. It is found from mid-California to the Aleutian Islands of Alaska. The Dungeness usually breed in May and June in shallow coastal water or estuaries. The female carries the fertilized eggs until the following winter. The crab larvae spend about 12 weeks in free-swimming form until June when they settle to the bottom. They reach sexual maturity at the end of the third year and reach harvestable size after four years. Dungeness prefer a sand bottom although they

also can be found in rock and gravel. The crabs are rarely found at depths greater than 50 fathoms, so fishing grounds are necessarily close to shore (Fig. 11).

Approximately 90% or more of all the legal size Dungeness are taken in offshore waters in Oregon each year. However, because of their high reproductive capacity the harvestable population is replaced year by year. Fluctuations in population are determined by other natural factors such as disease, temperature changes, salinity changes, and predation (Browning, 1974:20). Crabs have been found to undertake coastwise migrations of 80 miles or more. Tagged crabs have been known to move from one bay to another (Cleaver, 1951:71).

Shrimp

Of the many species of shrimp found along the Pacific Coast, only one species, a small pink shrimp (Pandalus jordani) is caught commercially off Oregon. Although they are found throughout the Pacific coast at depths of 20 to 250 fathoms, the most important concentrations are along the Oregon coast (Fig. 12). Commercial catches are made at depths from 40 to 140 fathoms, along mud or mud and sand bottoms. The shrimp become available to trawl gear when they are approximately one year old (Zirges, 1980:1).

Groundfish

Groundfish include the many species of rockfish, flatfish, and roundfish that are primarily demersal (Table 1). Depending on the

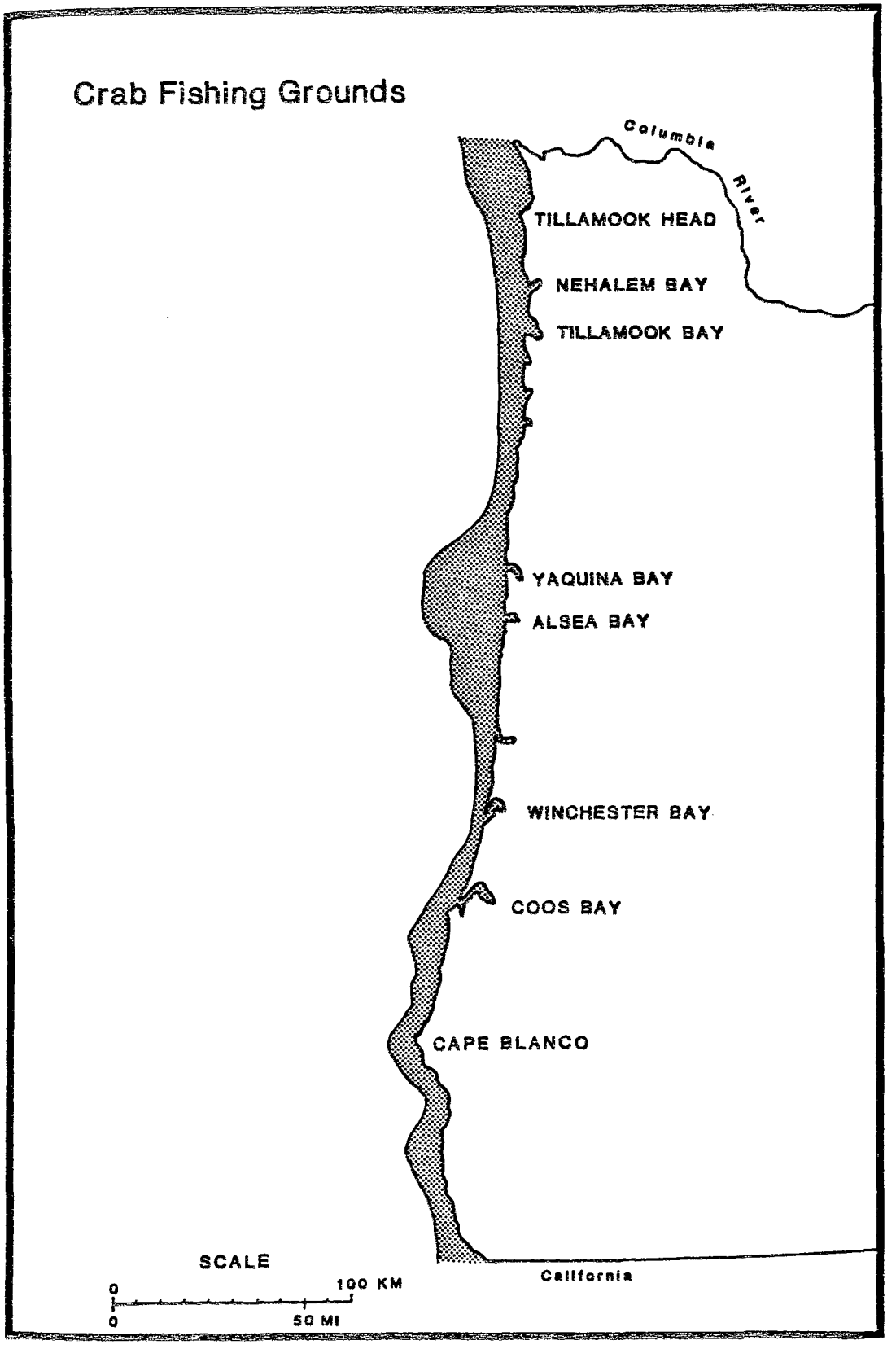

Crab Fishing Grounds
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
YAQUINA BAY
ALSEA BAY
WINCHESTER BAY
COOS BAY
CAPE BLANCO
California
SCALE
0
100 KM
0
50 MI

FIGURE 11

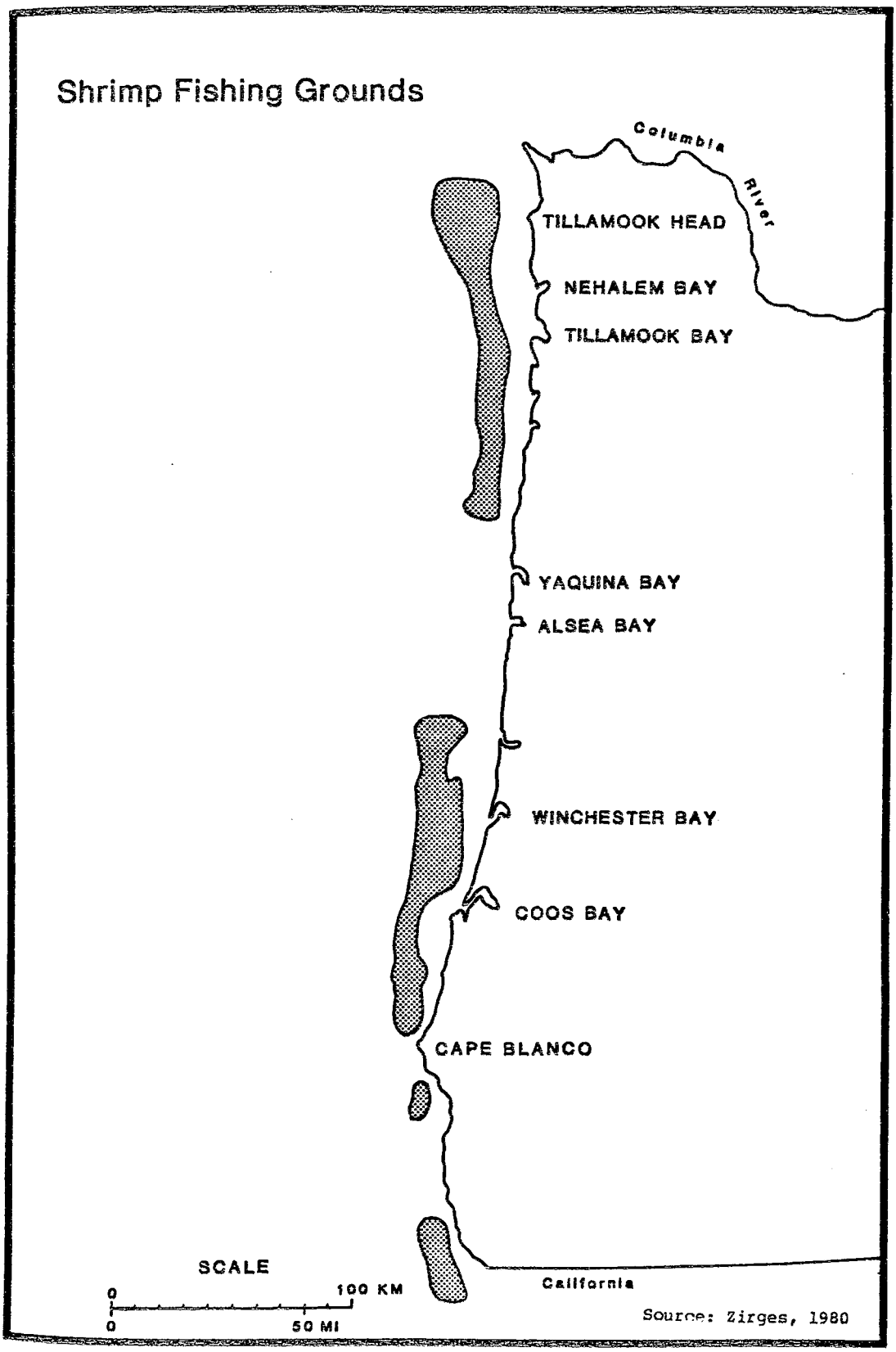

Shrimp Fishing Grounds
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
YAQUINA BAY
ALSEA BAY
WINCHESTER BAY
COOS BAY
CAPE BLANCO
California
SCALE
0
100 KM
0
50 MI
Source: Zirges, 1980

FIGURE 12

TABLE 1. Commercially Important Groundfish

Roundfishes
Sablefish (Black cod) (Anoplopoma fimbria)
Ling cod (Ophiodon elongatus)
Pacific hake (Merluccius productus)
True cod (Gadus callarias)
Rockfishes (Sebates sp.)
Pacific Ocean perch (S. alutus)
Orange rockfish (S. pinneger)
Red rockfish (Red snapper) (S. ruberrimus)
Black rockfish (Black seabass) (S. melanops)
Flatfishes
Halibut (Hippoglossus stenolepis)
Petrale sole (eopsetta jordani)
English sole (Parophys vetulus)
Dover Sole (Microstomus pacificus)
Starry flounder (Platichthys stellatus)
Rock sole (Lepidopsetta bilineata)

SOURCE: Browning (1974) and Thompson (1974).

variety, groundfish are found on mud, sand, or gravel bottoms, at depths of up to 100 fathoms. Location of the fishing grounds is a function of bottom conditions, depths, and proximity to market (Fig. 13).

Overview of the Fish Resources of Coos Bay

Because each commercially important species has its own locational and movement patterns, access to these fish varies in time and space. As a result, each port along the coast has access to a different resource configuration. What are the factors which typify Coos Bay's situation relative to the resource? The most significant are its

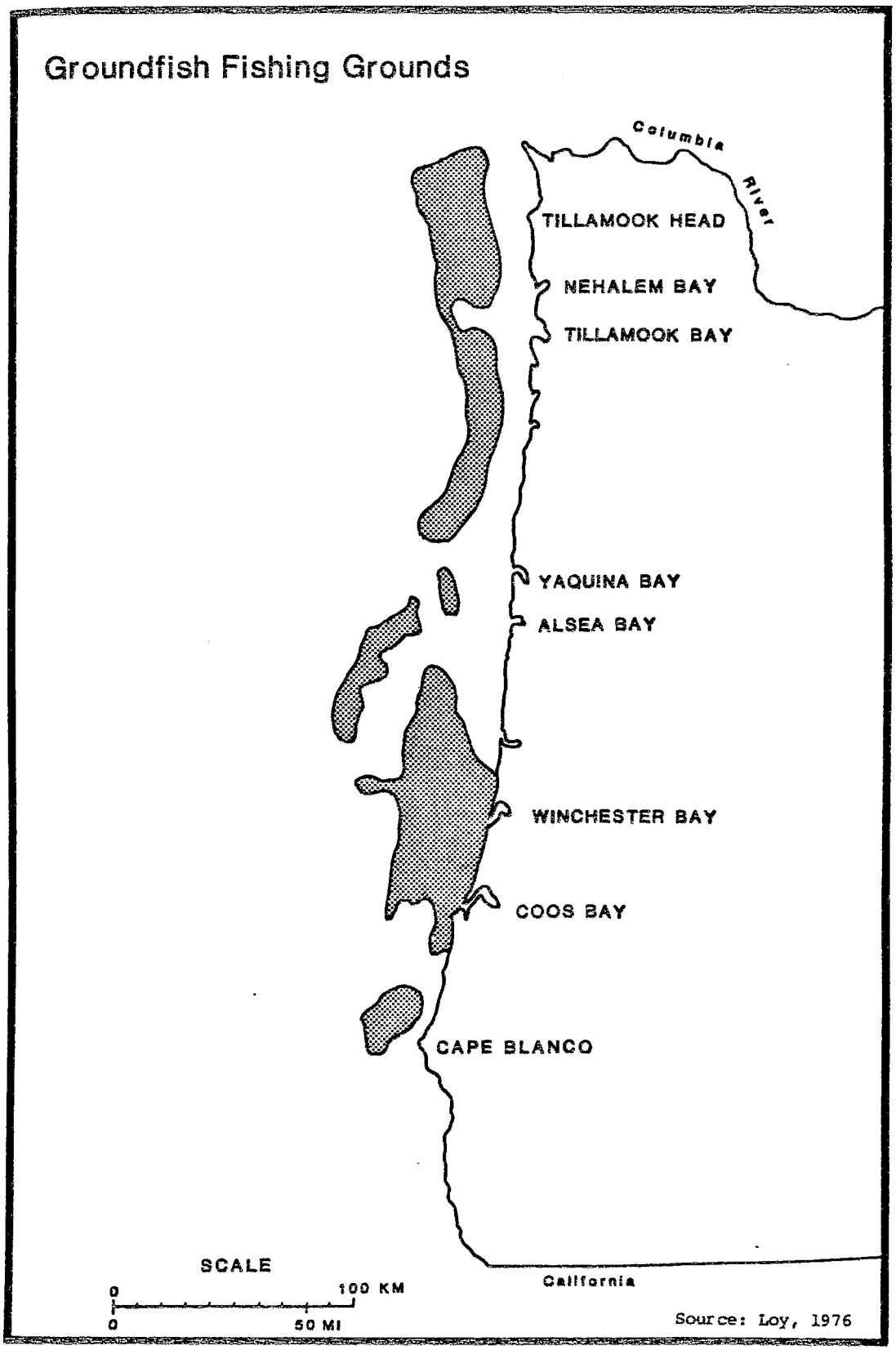

Groundfish Fishing Grounds
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
YAQUINA BAY
ALSEA BAY
WINCHESTER BAY
COOS BAY
CAPE BLANCO
California
SCALE
0
100 KM
0
50 MI
Source: Loy, 1976

FIGURE 13

latitudinal location, the relative size of its drainage basin, and the local offshore bottom characteristics.

Coos Bay's latitudinal location is of significance primarily to the pelagic species. For the salmon, Coos Bay lies at the southern end of the broad intermediate zone referred to on page 18 and the attendant characteristics of the zone apply to Coos Bay. For the albacore, the south coast of Oregon is toward the northern end of its range, and they do not appear as regularly as farther south. The crab, shrimp, and groundfish are bottom dwellers; their habitat is much more latitudinally uniform than those species which use the surface. Hence, the latitude of Coos Bay is not a particularly relevant factor with respect to these species.

The Coos River drainage basin is relatively small, compared to many other fishing areas with substantial activity. This means that the salmon runs which have occurred in the Coos River system have been less extensive than runs in many other streams such as the Columbia, the Rogue, and the Umpqua.

On the other hand, the comparatively large size of the estuary itself provides large amounts of nutrients for the production of primary and secondary biomass. Thus the estuary acts as an incubator for larval benthic, demersal, and pelagic species. Many of the species born in the estuary move offshore to contribute to the marine biomass. When the nutrients and planktons which are swept offshore become available (by upwelling) for secondary production, the result is a very productive offshore environment. In addition, the variety of offshore bottom characteristics provide for a varied habitat for many benthic species.

Coos Bay is close to prime fishing grounds for shrimp and groundfish. Crab are more evenly distributed throughout the coast.

All of these factors: relatively high variability in the local riverine environment, relatively low variability in the offshore environment, relatively high productivity offshore, shorter period of time of resource availability in the riverine environment relative to offshore, and Coos Bay's latitudinal position relative to the ocean water masses, have created a unique resource configuration. Naturally, this led to a unique pattern of exploitation.

Footnotes

[1]General information contained here is derived from articles from several authors in the Encyclopedia of Oceanography, R. W. Fairbridge, Ed. New York, 1966.

[2]For a fairly comprehensive look at salmon tagging experiments and other offshore salmon research, see the series of bulletins by the International North Pacific Fisheries Commission entitled "Salmon of the North Pacific Ocean," 1976-1981, Vols. I-IX.

CHAPTER FOUR

HISTORY OF FISHING ACTIVITY IN COOS BAY

Setting the Stage

Most of what has been written about the early history of fishing and the development of fishing communities in the Pacific Northwest has centered on the Columbia River Basin. Although the Columbia is recognized as an early node of commercial fishing activity, fishing developed concurrently adjacent to the coastal streams of Oregon. The modest beginnings of a commercial fishery which emerged in Coos Bay is best viewed within the context of the development of adequate technology and the history of settlement in the Coos Bay area.

Early Development of the Pacific Fishery

Early explorers in the Pacific Northwest noted that Native American fisheries existed all along the coast and throughout the Columbia Basin. Damron (1975:17) states that ". . . the salmon sustained the northwest coastal Indians and served as a basis of their surprisingly complex and affluent culture." Early references to Native American fishing activity in the Coos Bay area come from Jedediah Smith's trip up the coast in 1827 (Peterson, 1952:17).

Although it is not specifically known what type of gear the local aboriginals used to harvest fish, it was undoubtedly representative of one or more of the technologies found at that time elsewhere in the

Pacific Northwest. This gear included traps, weirs, baskets, spears, hook and line, seine nets, set nets, and dip nets. (Many good descriptions of Native American fishing technology and methods have been written. See Hewes [1947] and Wilkes [1845].) According to an early resident, local Indians used spears and traps to harvest salmon as well as other fish and eels (Peterson, 1952:23). Damron (1975:18) mentions that a few Indians in Oregon trolled offshore by rowing their canoes to offshore reefs, and using handlines to tow baited hooks.

Early attempts at commercial fishing were mostly centered along the Lower Columbia River. In the 1830s, the Hudson Bay Company, among others, began purchasing salmon caught by natives, cured them, then shipped them to markets throughout the world. The first known effort in establishing a fishery on the Oregon coast was along the Rogue River. As early as 1859, salmon were pickled and shipped to San Francisco (Cobb, 1930:437). However, because of poor preserving methods salmon trade in the Northwest remained small. A significant coastal salmon industry awaited improved canning techniques, which arrived in the 1860s.

In 1864, George and William Hume, with the assistance of Andrew Hapgood, a tinsmith, established a salmon cannery in Sacramento, California, using salmon caught in the River. Because of relatively ineffective canning procedures, skeptical consumers, and dwindling salmon runs, this venture was unsuccessful. Using what they had learned in California, the Humes moved to the Columbia River in 1866, where salmon canning rapidly took hold (Smith, 1977:5). In 1876, R. D. Hume built a cannery on the Rogue River which was the earliest cannery on the

Oregon Coast (Hayden, 1930:13). By 1880, there were 30 canneries on the Columbia River, and an additional 25 elsewhere in the state (Damron, 1975:19).

Early Settlement of the Coos Bay Area

Several coastal communities in the Pacific Northwest and Alaska grew around the establishment of salmon canneries and other fisheries. In Coos Bay, however, the Bay's first salmon cannery opened in the 1880s, after the establishment of several local communities. The inhabitants of Empire (founded 1853), Marshfield (now Coos Bay, founded 1854) and North Bend (founded 1855) were engaged in sawmilling and coal mining for San Francisco and Portland markets. Both of these economic activities were initiated in the 1850s and by the early 1880s had become flourishing industries. Some of the ships used in exporting coal and lumber were built locally. Prior to 1870, 14 sailing vessels and 17 steam vessels were constructed (Dodge, 1898:149). Harbor improvements began in 1880 with the construction of a stabilizing jetty in the bay, and while not of significance to early commercial fishermen in the bay, subsequent harbor improvements became important to commercial fishing activity later.

Early reports of the bay's economy indicated a boom-town atmosphere for the first 30 years. The population of Marshfield in 1884 was reported at 800 (Peterson, 1952:101). In the 1880s, however, poor market conditions for coal and lumber products led to a downturn in the local economy (Peterson, 1952:99; Dodge, 1898:157). This downturn set

the stage for economic diversification which included commercial salmon canning.

The Salmon Canning Era, 1880-1918

The beginnings of the commercial fishing in Coos Bay are obscure. Peterson (1952:107) refers to a Mr. Eckhoff, who purchased property in 1865, built a house, and "fished for salmon each autumn, salting, packing, and shipping them to San Francisco, assisted by some of his daughters." Doubtlessly a number of other early settlers in Coos Bay engaged in this activity; numerous references in the 1870s and 1880s were made to local fishermen. However, the salmon fishing industry remained a small scale venture until salmon canneries were introduced to the area. Salmon was canned in Coos Bay from the 1880s (records begin in 1887), until 1918, when the last cannery in the area closed down.

Fishing Methods

Salmon fishermen in Coos County during this period principally used gill nets. Some seining was done as well.

The two kinds of gillnets, drift and set, were generally constructed from flax or linen and hung between a rope with cork floats and a line with lead sinkers, which kept the net vertical in the water. On the coastal streams of Oregon, the nets averaged about 750 feet long and about 30 feet deep (Cobb, 1930:477).

The boat used in Coos Bay for gillnetting was undoubtedly very similar to a boat known as the Columbia River type, as this distinctive boat was used all along the Northwest Coast (Spurlock, 1939:81)

(Fig. 14). Boats with sails or oars were probably used in the early days.

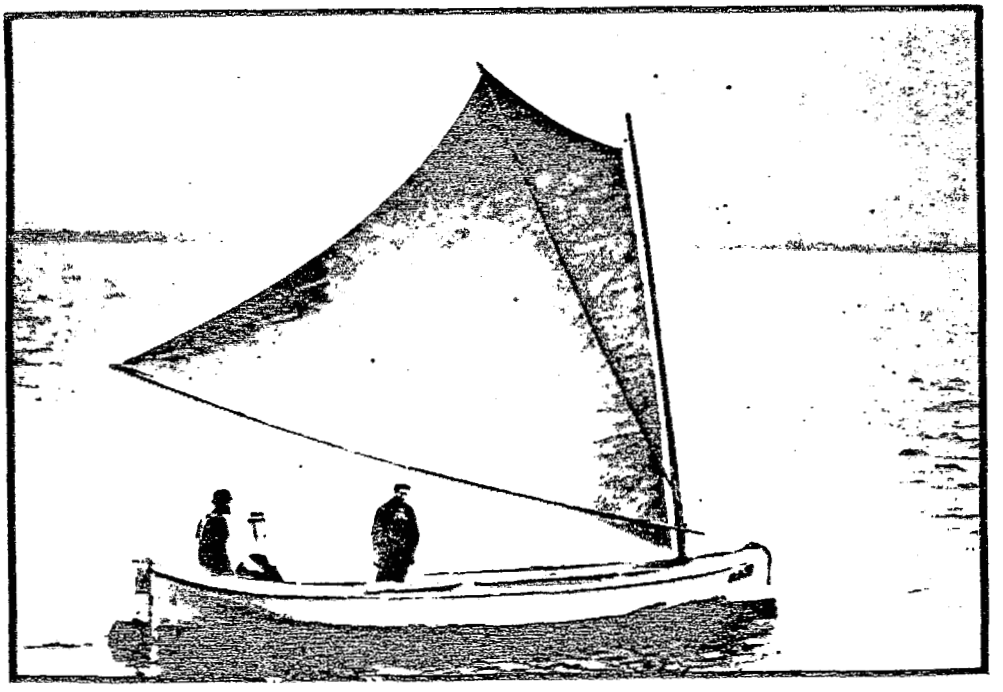


FIGURE 14. A Typical Columbia River Type Gillnet Boat, Shown with Sail. (Source: Spurlock, 1939)

Drift netting was done primarily in the bay, although some was done in the Coos River. Most fishing was done at night. When fishing in the rivers, it was necessary to work in a straight stretch of water (a "reach") of fairly uniform depth free from snags (Cobb, 1930:438).

To set the net, the boat was rowed across the stream or estuary, while the net was laid out at right angles to the current. The net was usually put out about an hour before high water slack, so that it would intercept salmon running in, and taken in about an hour after the turn of the tide. The net was hauled into the boat over a roller. The fish

which had become gilled in the mesh were removed, killed by a blow on the head, and thrown into the bottom of the boat (see Fig. 15).

FIGURE 15. Removing the Salmon from the Gillnet
(Source: Cobb, 1930)

Set nets were constructed in the same manner as drift nets, although they usually were smaller. These nets were staked, or sometimes anchored, with at least one end attached to the shore or to a stake set in the water. Set nets were generally used in Coos River, while drift nets were used in the Bay (Cobb, 1930:436). The majority of the gillnet fishermen operating in the coastal rivers had homes along the streams and supplemented their incomes by farming or logging in other seasons (Spurlock, 1939:76).

Some local fishermen used seines instead of gillnets to capture their salmon. In 1888, for example, approximately 10,000 fish, representing 20% of the total Coos Bay catch were caught using this method (Oregon State Board of Fish Commissioners, 1888:18). Seining in Coos Bay and Coos River was apparently done on a much smaller scale than that which was practiced on the Columbia, where horses and nets up to 2,000 feet long were used. In Coos Bay the relatively small nets were used to simply surround schools of salmon and quickly haul them in (see Fig. 16).

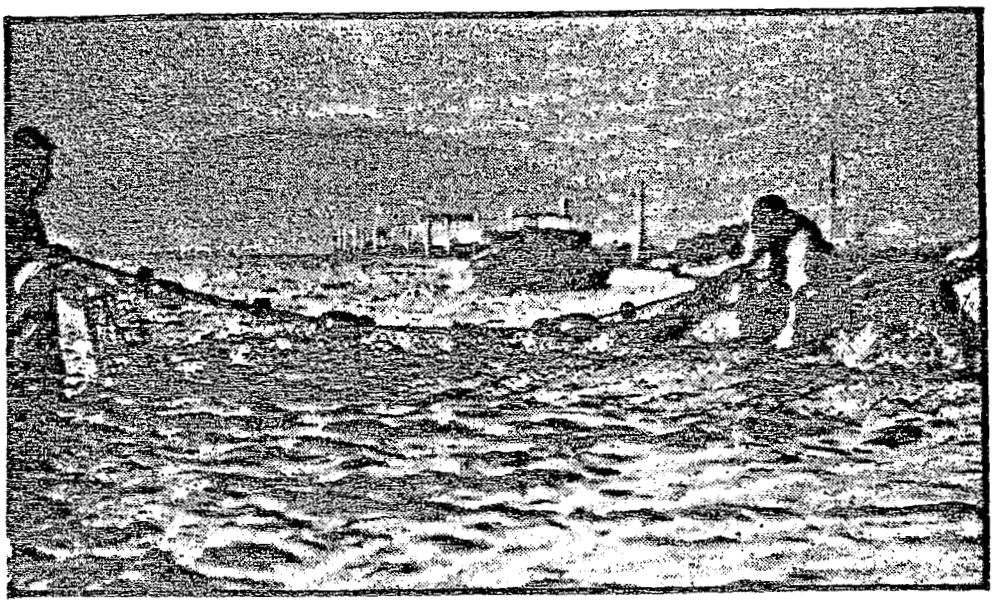


FIGURE 16. Seining for Salmon on the Coos River
(Source: Feller, n.d.)

Most fishermen were under contract by the local canneries and generally fished on company-owned boats. Deliveries were made on a daily basis.

At the turn of the century, Puget Sound, the Columbia River, and the San Francisco/Monterey area were the primary centers of fishing activity on the Pacific Coast. Coos Bay ranked with Juneau, Sitka, Ketchikan, Rogue River, Crescent City, Eureka, and Fort Bragg as secondary centers of activity. Isolated references indicate the level of fishing activity at Coos Bay. In 1892, for example, 38 men were engaged in fishing, including six men engaged in sea fishing (Oregon State Board of Fish Commissioners, 1891-92:33). In 1895, the fish apparatus used on Coos Bay consisted of 35 boats and 66 gillnets (Oregon Fish & Game Protector, 1895-96:70).

The Canneries

Some confusion exists as to the founding date of the first cannery in the Bay. Peterson (1952:439) reports that "[salmon canning] began on Coos Bay sometime in the 1880s--the first was on lower Coos River, the second at Empire, the third in the late 1890s in Marshfield." Elsewhere in his account, Peterson (1952:98) mentions that the Empire cannery was built sometime around 1883. Cobb (1930:436), however, writes that the first two canneries in Coos Bay opened for business in 1887, but he does not report their location. Dodge, on the other hand, connects the location of the first cannery with Marshfield, but does not give an exact date: "The cannery, where salmon equal to any on the coast are packed extensively, has been established during the depressing times [c. 1880s] by the cooperative action of the energetic men of the town" (Dodge, 1898:158).

While Dodge's observation does not clear up the confusion as to the date of the first cannery, it does give some indication that building a cannery was an attempt toward diversifying the local economic base. This was apparently done to help ease the dependence on the local resources which were exhibiting ailing markets.

Figure 17 shows the pack of canned salmon in Coos Bay for the period of record. During most of the years only one cannery operated, although in some years two canneries were in business. Many years show no pack. Over the course of this period salmon was also salted for export, and of course, some fresh fish was consumed locally. For example, in 1892, a year in which no cannery operated, about 1,000

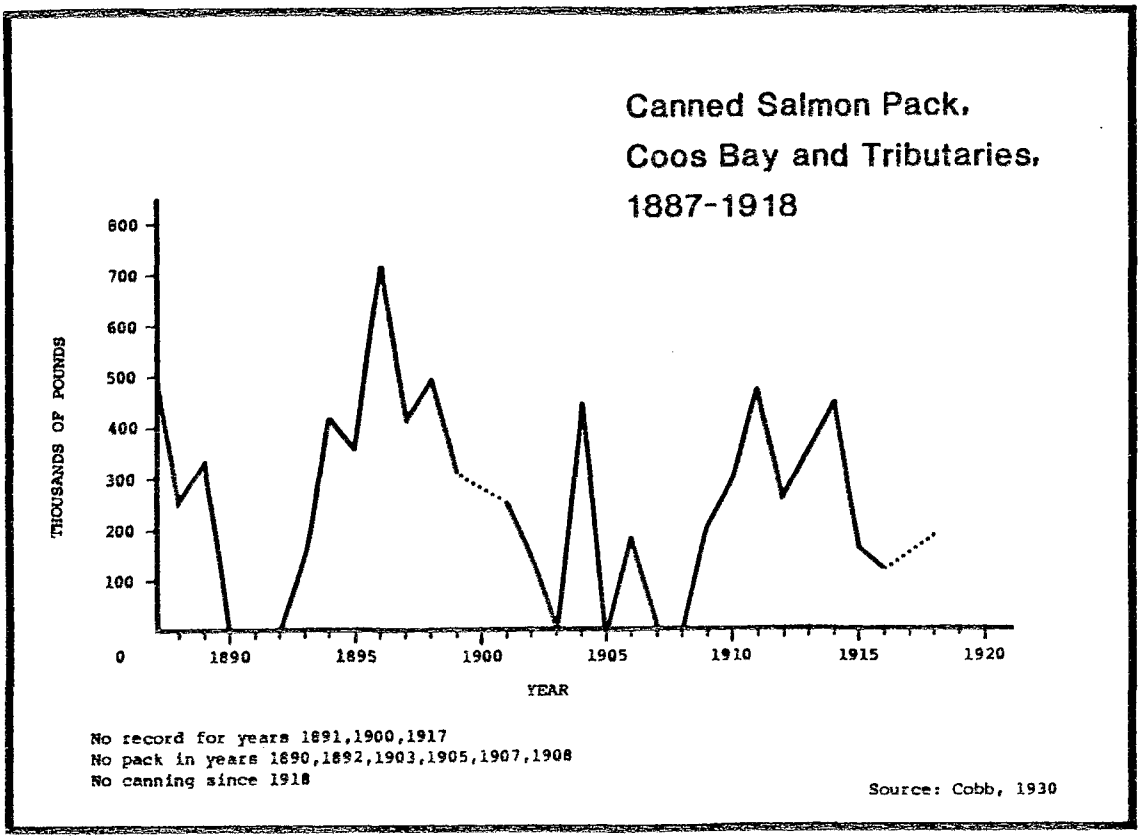


FIGURE 17

barrels of salmon were salted and about 50,000 lbs. used fresh. Unfortunately, only sporadic records exist on these other methods of consumption and production.

The figures show that the canning business fluctuated considerably during this period, apparently more because of the markets than of the abundance of the resource. A report in 1891 attributes no pack in Coos Bay for the previous year because of "oversupply at high prices" (Oregon State Board of Fish Commissioners, 1891). Many other coastal streams also reported no canning for that year.

Several owners and operators came and went, including: the Tallant-Grant Packing Company of Empire; the Southern Oregon Company in both Empire and Marshfield; and the Coos Bay Packing Company in Marshfield. None of the structures exist today.

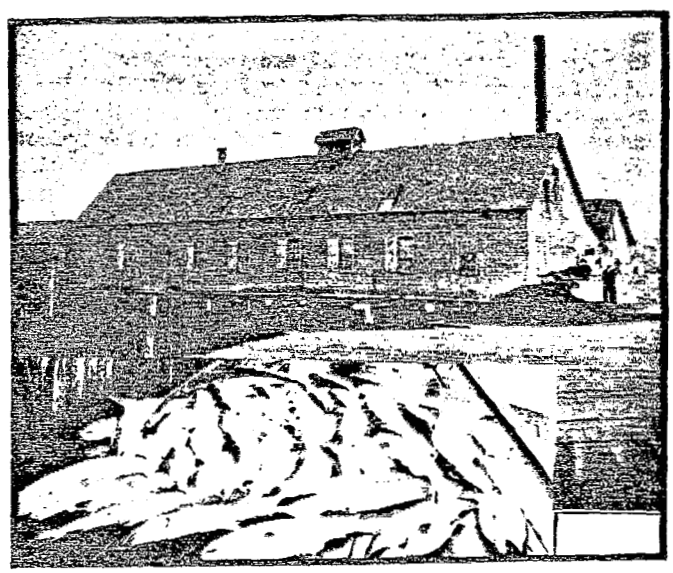


FIGURE 18. Coos Bay Packing Company's Salmon Cannery, circa 1900 (Source: Marshfield Sun, 1901)

The Decline of the Canneries

The canneries provided a means to preserve fish for the long period between processing and the time it reached the retailer's shelves. However, the introduction of cold storage and improved transportation eventually changed the desirability of preservation by canning.

Cold storage was introduced to fish processing plants on the Columbia River in the late 1880s (Cobb, 1930:540). By 1890, mechanical refrigeration was becoming common in railroad cars and ships (Spurlock, 1939:115). One processor in Coos Bay was using cold storage by at least 1907 (Polk, 1907-08:). With cold storage, processors were able to accomplish several things: (1) they could ship whole frozen salmon to eastern markets and Europe; (2) they were able to purchase fish when they were plentiful and inexpensive and then freeze and store them until the runs were over and the fish were in high demand; (3) they could use the mild-cure process which was fast becoming popular; and (4) they could cheaply manufacture ice to use for shipping fresh fish.

The development of markets for fresh and frozen salmon undoubtedly had a negative effect on cannery production in Coos Bay. The development of the mild-cure market also led to their decline. Mildcuring was first practiced in Oregon in 1902 (Cobb, 1930:533). To preserve salmon using this method, fish were dressed and packed in barrels (called "tierces") which contained a light salt brine that required refrigeration (Cobb, 1930:535). The product was marketed in Europe as well as throughout the United States, where it was particularly popular in the Jewish community (Damron, 1975:35). The

first record of mild-curing salmon in Coos Bay is for 1913 when 101 tierces (approximately 80,800 lbs.) of coho salmon were preserved (Pacific Fisherman Yearbook, 1914). Over the years, at least seven different business concerns were engaged in mild-curing until at least 1928, when nearly 500,000 lbs. of chinook and coho salmon were processed. Nineteen twenty eight was the last year the Pacific Fisherman Yearbook recorded the mild-cure pack for Coos Bay. It probably did not continue too much longer, because of the continuing development of the markets for fresh and frozen fish.

Improvement of the transportation system was an integral part of the success of the new processing methods. Before 1916, when the railroad came to Coos Bay, the region depended upon sailing vessels and steamers as the means of shipment. Initially, shipping was slow and undependable because of harbor conditions; a fact which did not affect the shipment of cans so much, but which would have had a large effect on the shipment of fresh or frozen goods. Early inhabitants complained of shoaling activity at the bar. In 1898, Dodge mentioned that, "The bar at the entrance of Coos Bay formerly was so shallow as to ordinarily prevent the passage of any but the smallest vessels" (Dodge, 1898:149). Figure 19 shows an early survey of the entrance before any improvements were made.

Beginning in 1880, improvements to the entrance were made to help navigation of the bar. Table 2 lists early improvements, which by 1900 made crossing the bar a considerably more reliable occurrence.

Figures 20-22 show three stages of improvements to the harbor entrance through 1933. By the time cold storage and mild-curing came

TABLE 2. Corps of Engineers Activities in Lower Coos Bay

1880-1899	Fossil Point Jetty built.
1891	North Spit sand dunes planted with beach grass.
1891-1894	North Jetty constructed.
1894	Dredge entrance channel to -20 feet.
1899-1900	South Jetty constructed to length of 2,700 feet.
1900-1901	Outer 3,000 feet of North Jetty repaired.
1892-1905	North Spit HWL[1] moved west 2,700 feet; south tip moved south 1,500 feet; LWL[2] moved south 2,000 feet (250 feet/year).
1914	North Spit sand dunes planted with 720 acres grass.
1917	Entrance channel dredged to -27 feet, the bar channel dredged to -30 feet, and the navigation channel dredged to -22 feet to Smith's Mill.
1924-1928	South Jetty extended.
1924-1929	North Jetty extended.
1925	Between Coos Head and Tunnel Point, LWL advanced 200 feet.
1905-1935	North Spit moved west 1,300 feet in 1905-1935; LWL moved seaward 200 feet (43 feet/year).
1937	Entrance channel dredged to 24 feet.
1939-1940	North Jetty restored.
1941-1942	South Jetty restored.
1949	Entrance channel at RM 4.5 dredged to 30 feet.
1952	Entrance dredged to 40 feet
1956	Connecting channel to Charleston dredged to -10 feet.
1956-1957	Charleston Boat Basin constructed.
1957-1958	Outer 2,940 feet of North Jetty repaired.
1960	Part of submerged jetty removed.
1963-1964	Outer 3,423 feet of South Jetty repaired.
1966	Addition to Charleston Boat Basin.
1970	Channel in South Slough to Highway Bridge dredged to -10 feet. Outer 1,940 feet of North Jetty repaired.
1978	Coos Bay entrance dredged to -45 feet, channel to -35 feet (increase of 5 feet).

[1]High water line.

[2]Low water line.

SOURCE: Army Engineer District, 1979.

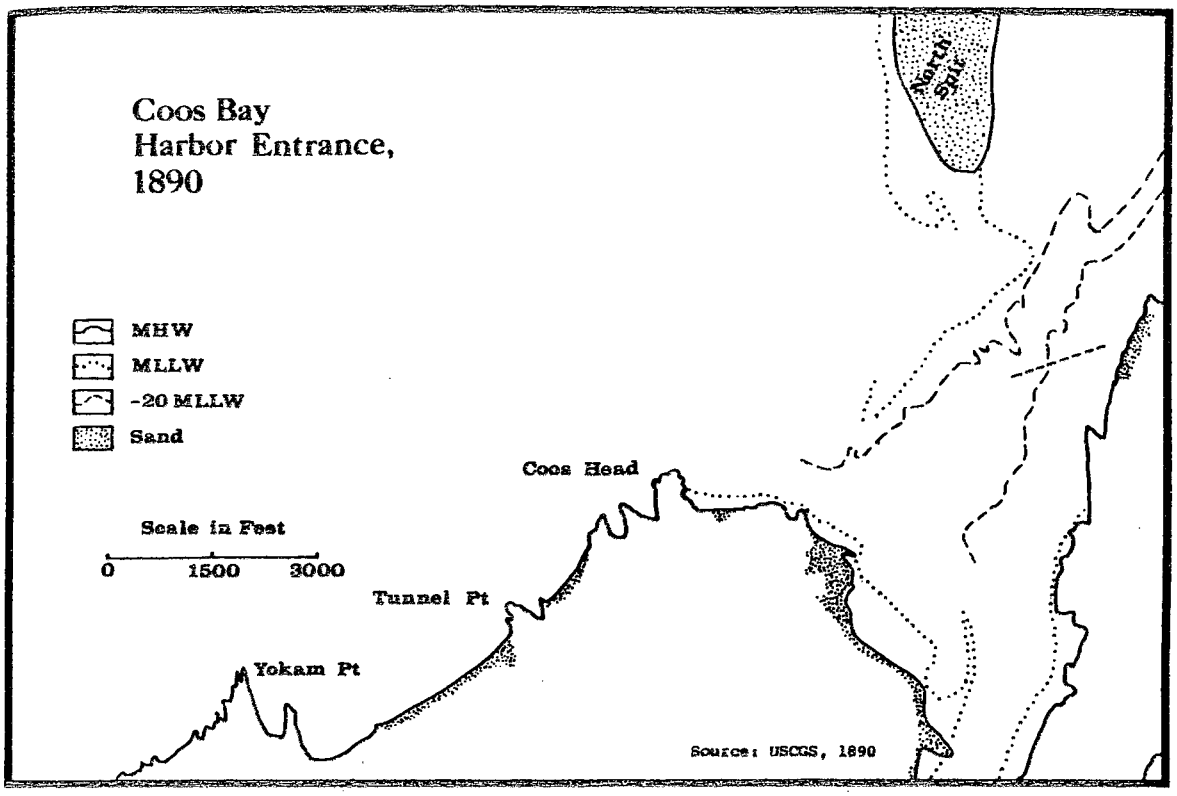


FIGURE 19

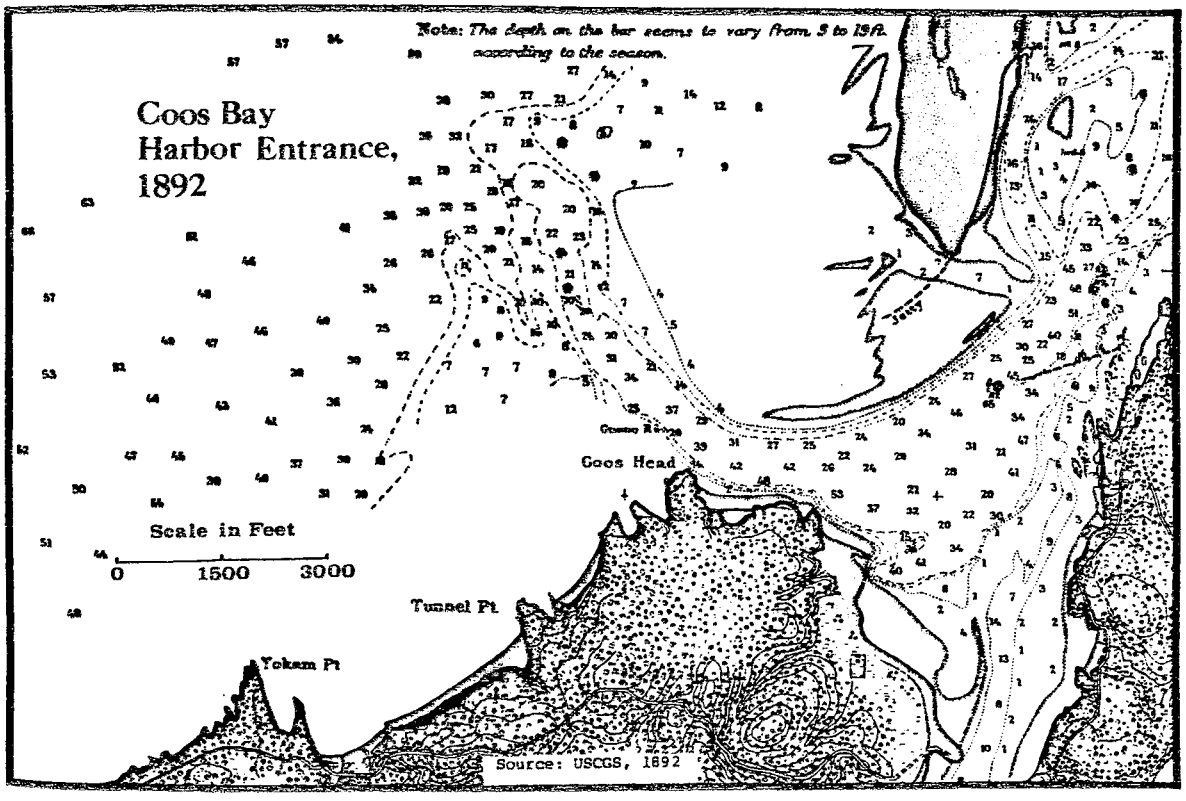


FIGURE 20

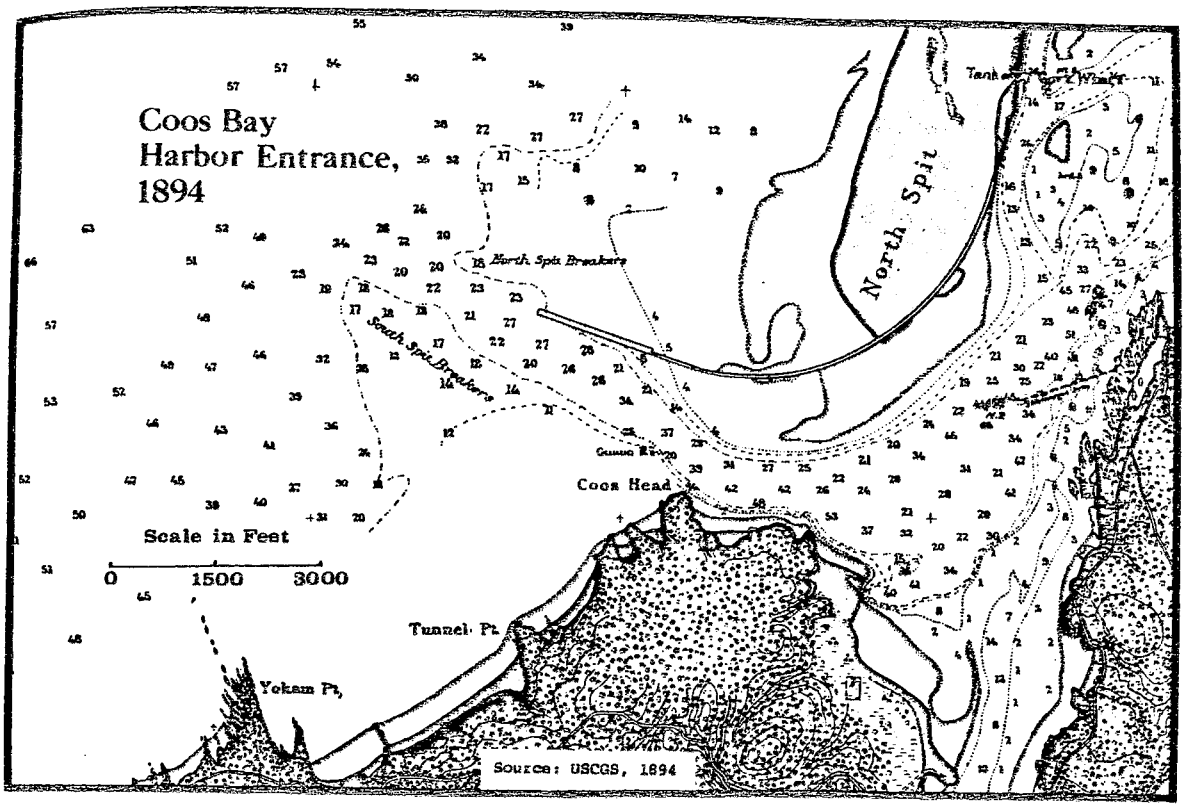


FIGURE 21

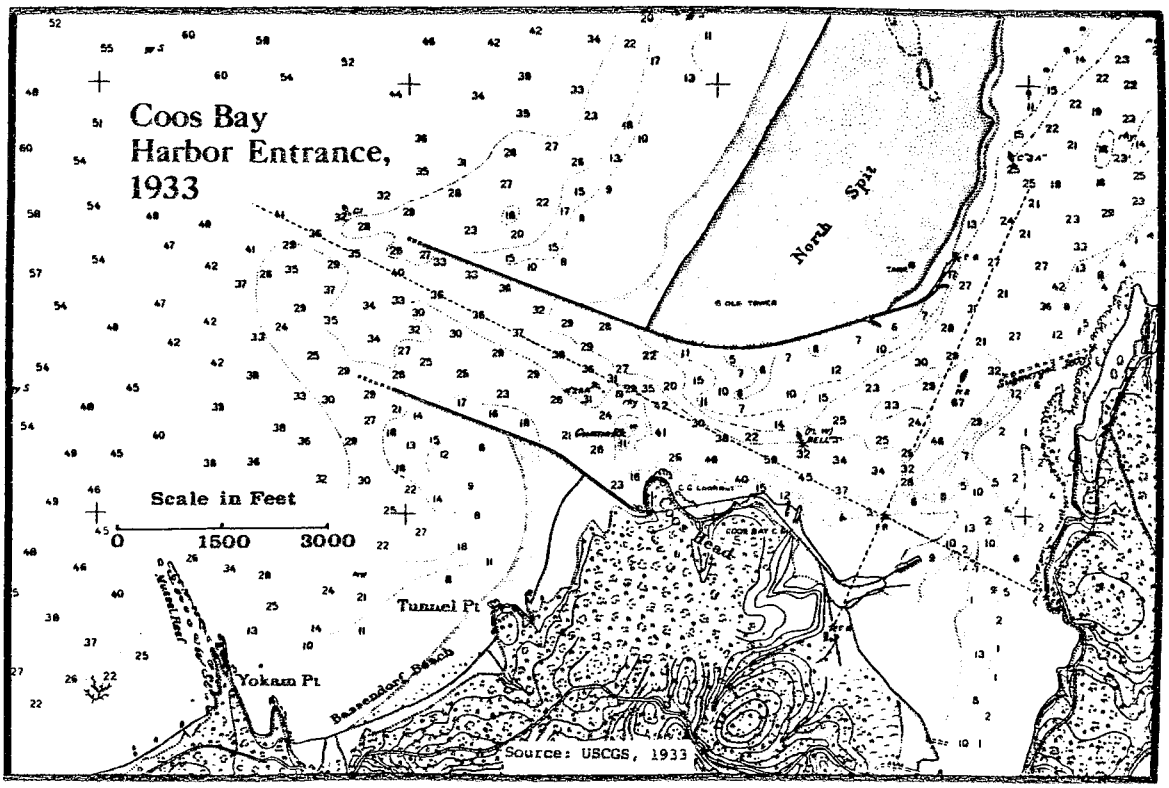


FIGURE 22

into use by the local processors, shipping was a fairly reliable source of transportation, albeit relatively slow.

It was not until 1916, when the Southern Pacific completed a line from Coos Bay to Eugene, that the marketing of mild-cure, frozen, and especially fresh salmon was able to locally flourish. The development of markets for these local products led to the emergence of salmon trolling.

The Rise of Salmon Trolling, 1919-1934

Trolling is a means of catching fish by pulling a lure through the water. It is an ocean fishery which requires fishermen to cross the bar between the estuary and the ocean. It eventually developed into the primary method of catching salmon in coastal Oregon and became the sustaining fishery in Coos Bay for at least 15 years.

Early Development of Trolling

Ocean trolling for salmon began off Monterey, California in the 1890s (Smith, 1977:9). As early as 1895, trolling was carried on in the Siuslaw River, Oregon, for chinook and coho salmon (Cobb, 1930:87). These early efforts were not commercially pursued. In Coos Bay, other hardweather[1] fishing activity had been reported as early as 1895; "[Coos Bay] fishermen also take large quantities of cultus cod, rockfish, and halibut which is sold fresh or shipped to San Francisco" (Oregon Fish and Game Protector Reports, 1895-96:70).

Three factors led to the development of salmon trolling in Coos Bay: (1) the development of the mild-cure, and fresh and frozen

markets, (2) the development of motorized boats, and (3) harbor improvements which enabled the fishermen to cross the bar with regularity.

Trollers were better suited for the mild-cure market and the fresh and frozen market which had developed. Gillnetters could provide salmon only when the fish entered the river to spawn, with runs occurring in the spring and fall. Damron explains the advantages of troll-caught salmon:

> Gillnetted fish were often damaged by the nets, which made them unsuitable for marketing as whole fresh fish. Troll-caught fish, which swallowed a hook, were undamaged. Furthermore, as the salmon entered the river, they stopped feeding and underwent progressive biological deterioration. Ocean salmon were caught before this process began, and their flesh was firmer and brighter in color, hence more appealing to the fresh and mildcure buyer. In short, the ocean-caught salmon were of higher quality than the gillnetted ones; and the canneries, because they did not need this higher quality product, were not willing to pay a price which made the less efficient trolling techniques worthwhile to the fishermen. It was not until the mild-cure market developed that the trolling method became economically practical (Damron, 1975:51).

Another necessary element for salmon trolling was a suitable boat. Gasoline engines were introduced to gillnet boats around the turn of the century. Diesel engines had had other marine applications before, but were too large for gillnet boats. The gasoline engine gave the fishermen enough power to cross the bar with some degree of safety. By 1912, fishermen of the Lower Columbia had discovered that by using these boats, salmon could be caught by trolling off the bar (Spurlock, 1939: 33). They soon found that at certain times of the year they could catch more salmon by trolling than by gillnetting (Damron, 1975:51). Thus, the fishery developed as a supplementary activity for West Coast fishermen who were primarily gillnet fishermen (Damron, 1975:9).

At about the same time, commercial trolling came into use in Puget Sound, Monterey, and San Francisco. Damron indicates that trolling diffused north and south from the Columbia River and reached Coos Bay probably by 1916 (Damron, 1975:51).

The third important element necessary for the development of a successful troll fishery at Coos Bay was a safe and reliable bar. Shifting sands and breaking waves made crossing the bar extremely difficult and dangerous for small vessels on anything but the calmest days. Thus, the inability of a fisherman to cross the bar when he wanted to, certainly had a large effect on curbing any substantial offshore fishing activity.

The harbor improvements previously discussed not only improved conditions for large boats because of increased depths, but also made the bar safer for fishing boats, enabling them to cross the bar under less than perfect conditions. By the time the trolling boat had diffused to Coos Bay, the entrance was safer than many others along the coast. Coos Bay offered natural protection from storms from the southwest (the most common in winter), when other ports in Oregon, such as Garibaldi and Newsport, might have had to close down (Damron, 1975:107).

Fishing Methods

Once offshore trolling was introduced, certain fishing methods quickly become established. The methodology adapted to new gear and boats as they were introduced, but trolling practices are still fundamentally the same today.

Trolling can conceivably occur anywhere that the water is deep enough so that the gear does not get tangled on the bottom. Upon reaching the desired offshore area, the troller is slowed to a speed of about 2½ to 4 miles per hour. Trolling poles designed to hold lines away from the boat are lowered from their upright position. The poles enable the fisherman to spread out the lures in several arrays. Weights are attached to each line to hold it vertical in the water. As many as six separate lines were used on a boat. Each line had a number of "spreads" (the leader, lure, and hook arrangement). Early on, when lines were hauled in by hand, only two spreads were used on each line. Later, when winches (called "gurdies") came into use, many more spreads per line could be handled. Figure 23 shows a typical salmon troller set-up.

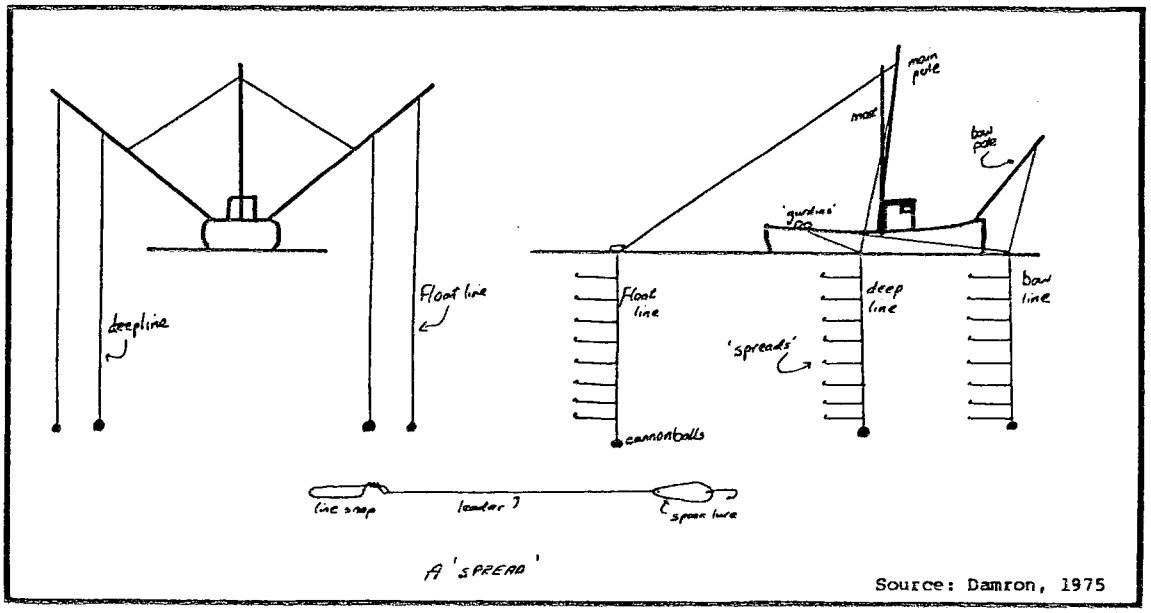


FIGURE 23. Rigging of a Typical Salmon Troller

Baited lines are watched for the jiggle which indicates a fish has been hooked. Once hooked, fish are hauled in, either gaffed or swung aboard, clubbed on the head, removed from the hook, and placed in a compartment on deck.

Boat Types

As objects of material culture, the fishing boats which evolved during the rise of salmon trolling, are important elements of the present day fishing landscape. Many of the boats built and used during this period are still used today. Originally, trollermen used boats which were adapted from other fisheries.

Two types of fishing boats were designed and used specifically for salmon trolling: the "Finn-type" and the "Norwegian-type." Finn boats originated in the Columbia and were built primarily in Astoria. They were used along the Oregon and Washington coast beginning in the early 1920s (Damron, 1975:80-85) (Fig. 24). However, the most common troller built and used during this period was the Norwegian troller (referred to by fishermen as a "double-ender" a term which denotes the canoe-shaped stern). Many of these type trollers are used today (Fig. 25). These boats were first adopted on the coast north of the Columbia River in the early 1920s and became the most numerous trolling boat by the 1930s (Damron, 1975:85). It was probably the most common type found in Coos Bay during this period. They were favored by trollermen because their design was well adapted to offshore fishing and crossing the bar. They averaged 35 feet in length and generally had more room than other boats, enabling the fishermen to take more ice and stay out longer in a trip.

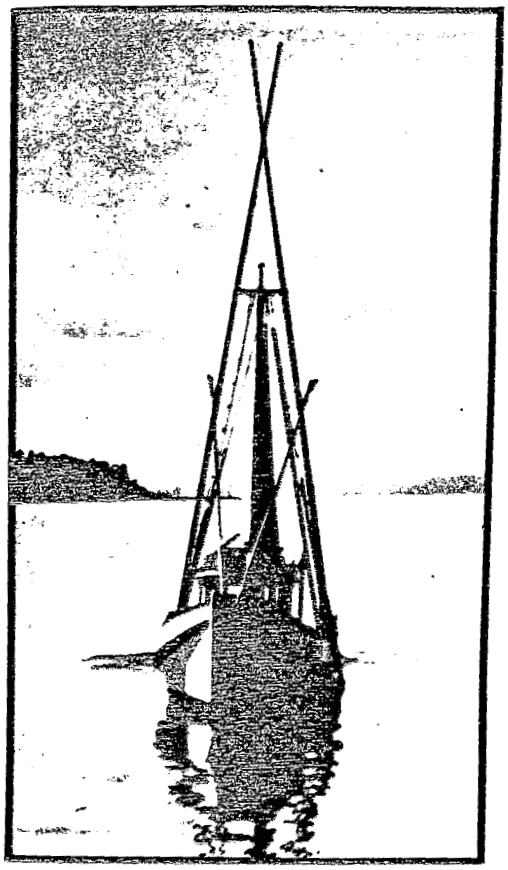


FIGURE 24. A "Finn-type" Salmon Troller (Source: Damron, 1975)

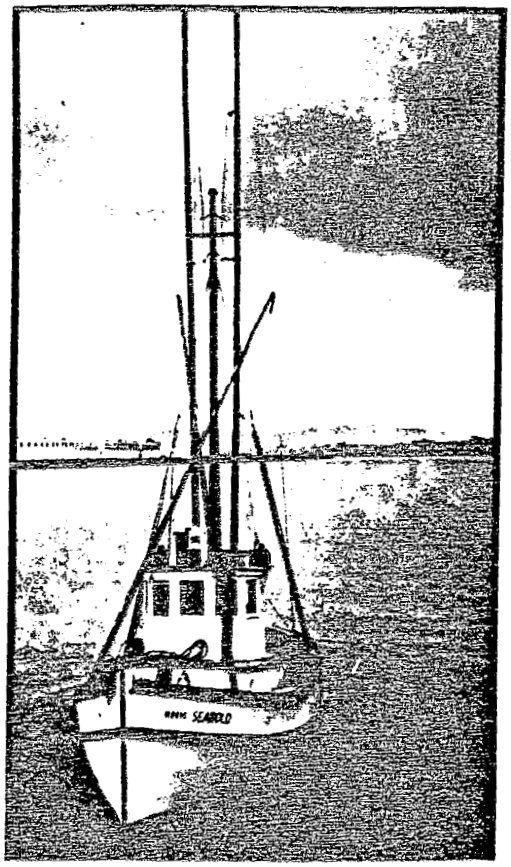


FIGURE 25. A "Norwegian" Salmon Troller (Source: Damron, 1975)

Evolution of the Fishery

Within four years, by 1920, trolling was well established in the area. Relative to gillnet fishing, which was still being carried out in the bay, trolling became continually more popular until 1926, when it became the primary fishing activity for local salmon fishermen. Figures 26 and 27 shows the relative landings for gillnet (river caught) and troll caught salmon through 1935. Unfortunately, data were not collected separately on the two types of fishing until 1925.

The decline in the river catch was caused by several factors. Migrations of salmon up the river, especially those in the spring, were

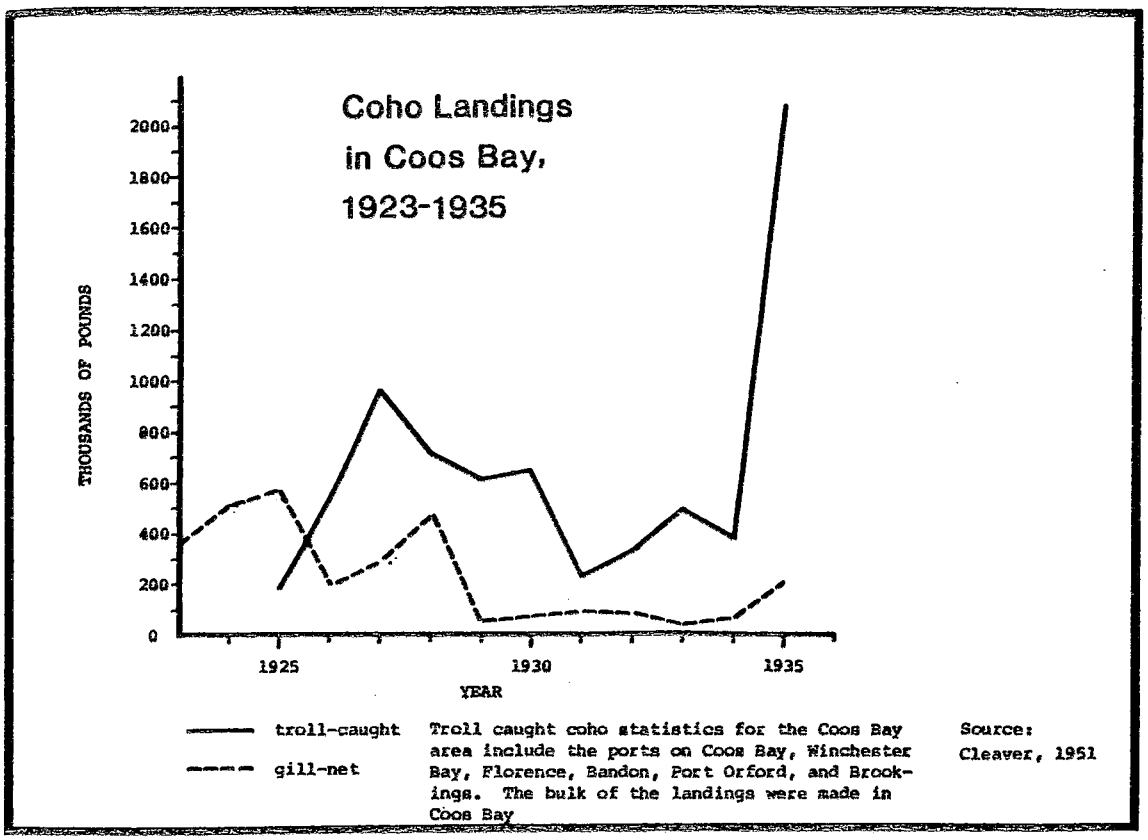


FIGURE 26

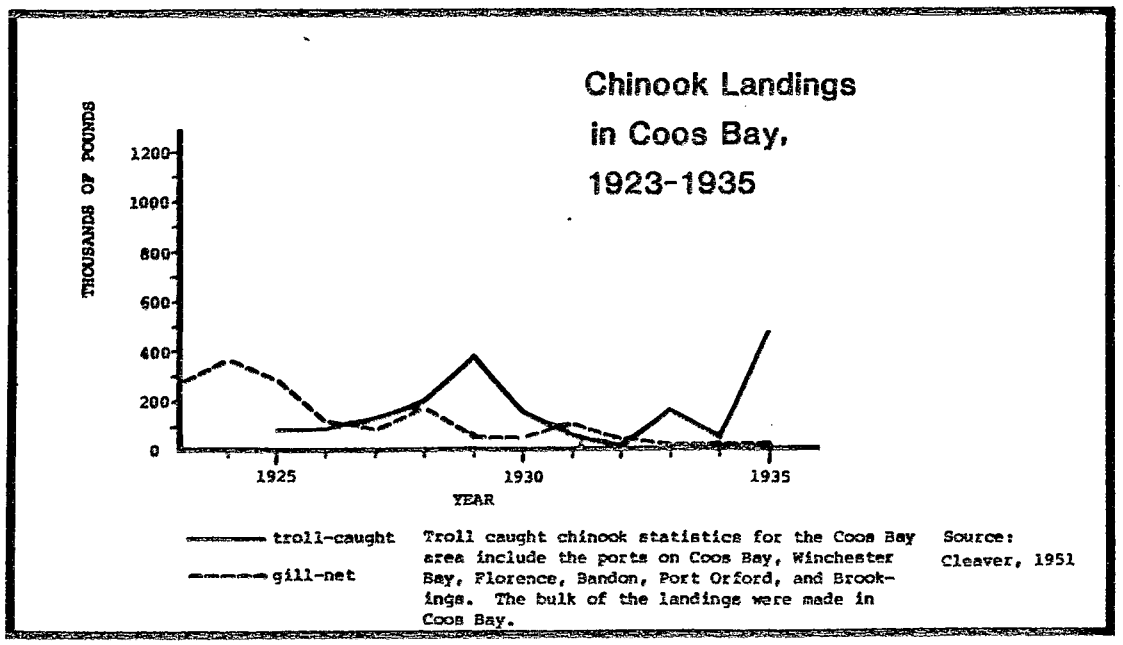


FIGURE 27

becoming more variable and were generally declining. One of the primary reasons for this was simply that salmon were caught by trollers offshore before their arrival in the estuary.

Another reason for the decline was degradation of the estuarine and riverine habitat by logging activities and urbanization. The loss of vegetative cover in the watershed reduced its ability to hold moisture. Consequently, abnormal fluctuation in stream flow scoured gravel from the stream beds, reducing spawning habitat. Log jams blocked several small streams from salmon runs. The construction and use of splash dams were particularly damaging to the salmon population. Built for the purpose of sluicing logs down the rivers, splash dams not only eliminated the production of the streams above them, but also reduced production below by washing out spawning areas (Gharret, 1950:20). The effects of water pollution from urbanization is not known, but may have also contributed to the decline.

Increasing regulations on gillnetting further decreased the opportunities for river fishing. Gillnetting for salmon in Coos Bay and Coos River continued to decline until it was outlawed in 1946.

The net effect in the decline of salmon runs in the bay and its tributaries was a shift in focus of fishing activity. As Coos Bay's attributes as a fishing ground became less important, its attributes as a harbor became more important. The shift became apparent in the local landscape and was reflected in the continuing evolution of certain landscape elements such as boat types. The new focus was to eventually cause basic changes in the location and appearance of fishing activity in the bay.

Other Fishing Activity

Although salmon fishing was the premier fishery during this period, the pursuit of other fish was occurring in the bay and offshore. The following is a brief discussion of the shad, striped bass, halibut, and crab fishing activity taking place during this period.

Shad is an anadromous fish which was first introduced to Pacific Ocean waters in 1871 in California. It was also planted in the Columbia River in 1885. The fish soon migrated to Coos Bay and considerable runs were established (Cleaver, 1951:56). Fishing was done with gillnets, and often occurred in conjunction with the striped bass and salmon fishing that took place in the bay. Variable quantities of shad were taken in the 1920s and 1930s (Fig. 28). Fish were caught from May through June when the fish enter the bay to spawn.

Commercial striped bass fishing was incidental to shad fishing, the catch being somewhat smaller, although the bass had been popular for recreational fishing since the 1930s. Like shad, striped bass were an introduced species, first planted in San Francisco Bay in 1879. The fish migrated north and the first bass was caught in Coos Bay in 1914 (Coos Bay Times, 1931:58). They were first commercially pursued in 1922 (Morgan, 1950:8). Landings were first recorded in 1928 (Fig. 28). Together with shad, striped bass helped to sustain gillnet fishing in the bay during the decline in salmon gillnetting.

Although no comprehensive statistics are available, indications are that offshore fishing for halibut fluctuated widely in Coos Bay during the years 1919-1934. One local processor, Charles Feller, shipped

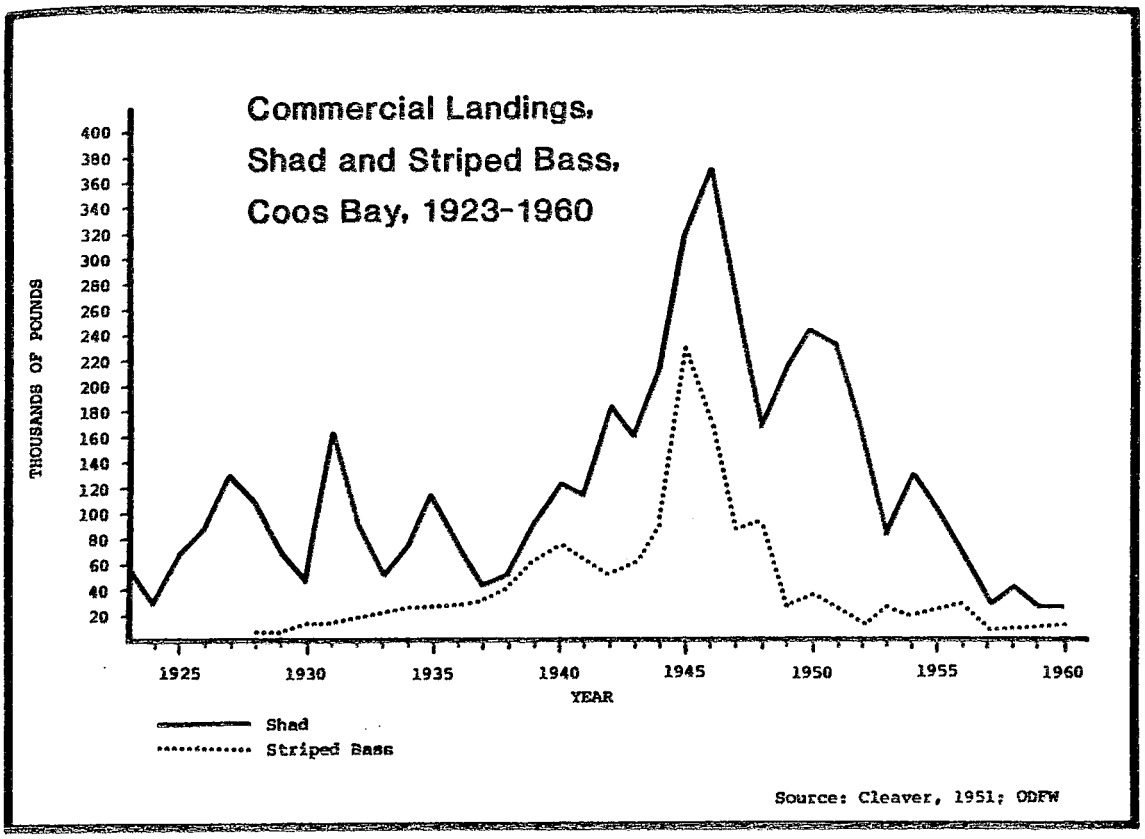


FIGURE 28

halibut throughout the country during this period. Halibut was caught with schooners using long line gear. Like salmon trolling, this fishery depended on a reliable harbor and bar.

Crab fishing enjoyed a gradual increase in landings throughout Oregon during this period. No statistics are available for Coos Bay. In the early days of the fishery, most crabbing was done in the bay. Since 1915, however, an increasing proportion of the landings were from offshore (Waldron, 1958:13).

The Fishing Landscape--1935

In the years immediately following 1935 several factors that would change the nature of fishing activity in Coos Bay came into play.

By 1935, Coos Bay had developed into a significant node of fishing activity comprised mainly of salmon trolling, gillnet fishing for salmon, shad and striped bass, and crabbing. In relation to other fishing ports in Oregon, Coos Bay was on a par with Newport, and somewhat smaller than Astoria (Damron, 1975:119).

The local fleet was made up of a variety of boats, including Norwegian trollers, gillnet boats, a few halibut schooners, and other various adaptations. Most of the boats were one or two man operations. In addition to the local fleet, transient salmon and halibut vessels would be docked in Coos Bay from time to time.

The range of fishing activity differed from fishery to fishery. Gillnet activity took place in the estuary and tributaries of Coos Bay. Shad and striped bass were mostly caught in the lower reaches of the Coos and Millicoma Rivers. Offshore trolling from Coos Bay ranged from Heceta Head in the north to the California border (Cleaver, 1951:47). Transient boats catching salmon within this area would likely land their catch at Coos Bay. Sometimes local deliveries would be made to one of the smaller ports in the area if a vessel was particularly close by (Fig. 29).

Transient boats were often found offshore Coos Bay at various times of the year. The "smoker" fleet (so-called because of their semi-diesel engines) was made up of relatively large boats that were based in Seattle. These boats ranged from Alaska in the spring to as far south as the Coos Bay area in July and August, where they fished for coho salmon (Damron, 1975:103).

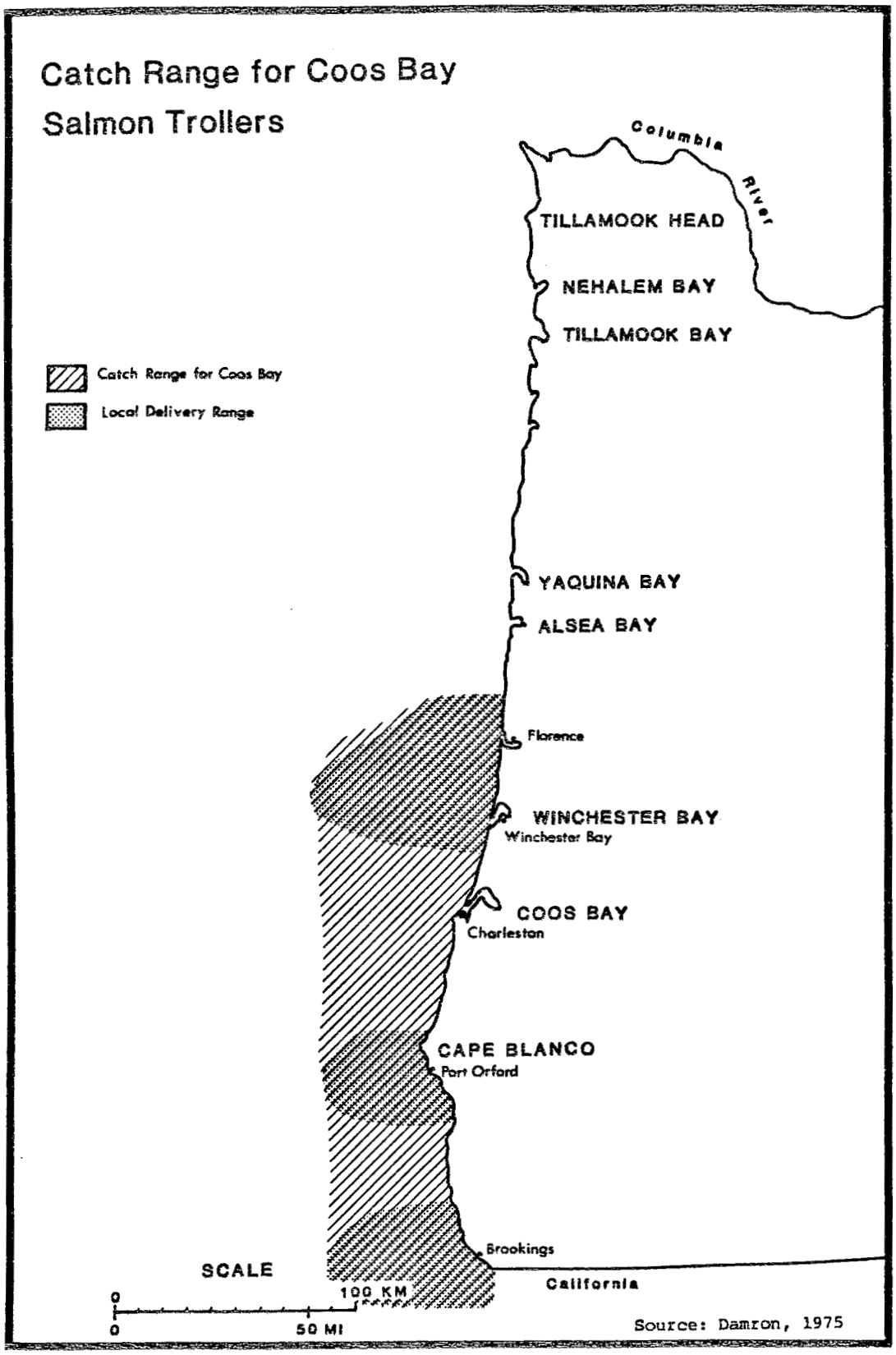

Catch Range for Coos Bay
Salmon Trollers
Columbia River
TILLAMOOK HEAD
NEHALEM BAY
TILLAMOOK BAY
Catch Range for Coos Bay
Local Delivery Range
YAQUINA BAY
ALSEA BAY
Florence
WINCHESTER BAY
Winchester Bay
COOS BAY
Charleston
CAPE BLANCO
Port Orford
Brookings
California
SCALE
0
100 KM
0
50 MI
Source: Damron, 1975

FIGURE 29

The local processors were still located in Marshfield and North Bend. Four were operating in 1935. One such processor, to use an example, was Charles Feller, Inc. Located in Marshfield, the operation was typical of processing plants of that time, although it was probably somewhat larger than other local plants. The company processed and shipped shad, shad roe, steelhead, halibut; and specialized in the catching, shipping, salting, and curing of chinook and coho salmon. According to a pamphlet the company circulated ca. 1925, their salmon was cured for the smoking trade in Europe, hardsalted for shipment to the Hawaiian Islands, and their fresh salmon was shipped by rail throughout the Pacific and Inter-mountain states (Feller, n.d.:4).

The company had several fishermen in its employ; all engaged in river fishing and perhaps halibut fishing. No salmon trollers were directly employed by the company. The plant was, of course, located on the waterfront (Fig. 30) and had docks for unloading fish and mooring boats between trips.

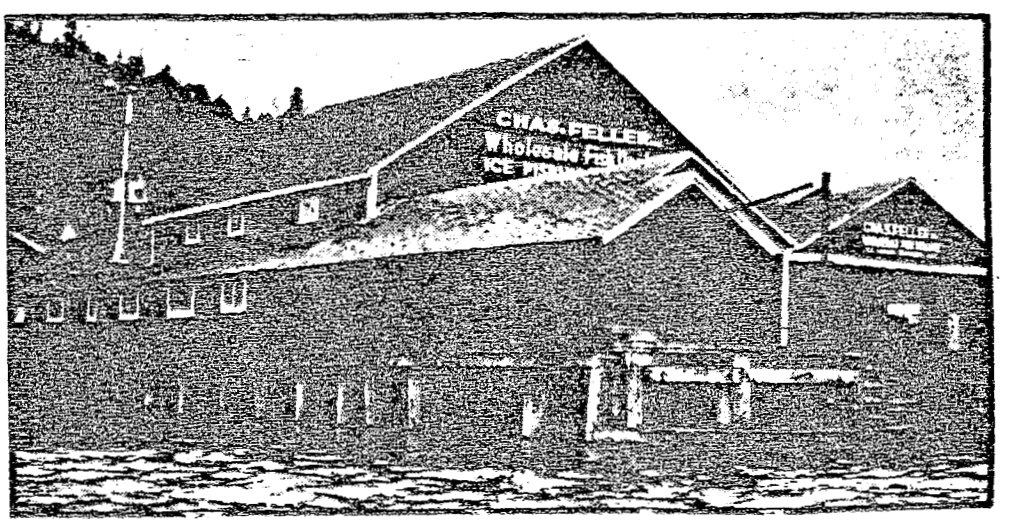


FIGURE 30. Charles Feller Plant, Marshfield, circa 1925
(Source: Feller, n.d.)

Because the other plants were dispersed along different sections of the Coos Bay waterfront, a well established fishing community had yet to develop. This was not to occur until fishing activity moved to Charleston, a process which began in 1936.

Diversification, 1936-1959

Until the mid-1930s, the premier fishery in the state was the Columbia River salmon industry. In Coos Bay, other fisheries were relatively more important to the local area than the state as a whole, but salmon was still king. However, a new era in commercial fishing began in the mid-30s that was to have a major effect on the evolution of the fishing landscape in Coos Bay. The new era was based on a diversification of fishing activity which was to strengthen Coos Bay's importance as a commercial fishing port and eventually led to the development of a fishing community in Charleston.

The period was characterized by a number of boom and bust cycles. As one fishery grew, then declined, another fishery grew to take its place. The catalyst for this new era was a strong but short-lived boom in fishing for pilchards; a fish that has absolutely no importance to commercial fishermen in Oregon today.

The Pilchard Fishery

Pilchards (Sardinops caerula, also known as the Pacific sardine), once supported the Western Hemisphere's largest fishery (Browning, 1974: 45). It supported a large number of fishermen on the Pacific coast, especially in California, from just before World War II until the 1950s

when it abruptly died. John Steinbeck is known for his stories about Cannery Row in Monterey, California, which was the center of the fishery in its heyday.

Fishing was done with purse seines and the catch was not only canned for human consumption, but a large amount was reduced to oil which was used in paints, varnishes, and toilet articles (Smith, 1977: 23). In the 1920s and early 1930s fishermen from Oregon followed the fishery, but most of their landings were made in California because of laws which prohibited the use of pilchards for reduction. In 1935, the Oregon legislature revised the commercial fishing regulations to allow reduction. Two reduction ships immediately started operations at Coos Bay, stimulating local fishing activity for the fish, which led to the establishment of four shore-based plants by the end of the year (Oregon Fish Commission, 1938:5). Three plants were also built at Astoria. Over 32 million pounds were landed at Coos Bay in 1935. The fishery didn't last long (Fig. 31). By 1939, the catch at Coos bay was insignificant, and in 1940 all reduction plants were located in Astoria. The fishery lingered in Astoria until it also died in 1948.

The failure of the fishery in Oregon was substantially due to overfishing (and also perhaps to poorly understood long term population cycles). However, the failure of the fishery in Coos Bay, in particular, as early as 1939 was apparently due to disputes between the reduction plants and the fishermen and among the fishermen themselves (Oregon Fish Commission, 1938:5). Many, if not most, of the fishermen engaged in the Oregon pilchard fishery were from California. The fishermen became discouraged with local disputes in both 1936 and 1937,

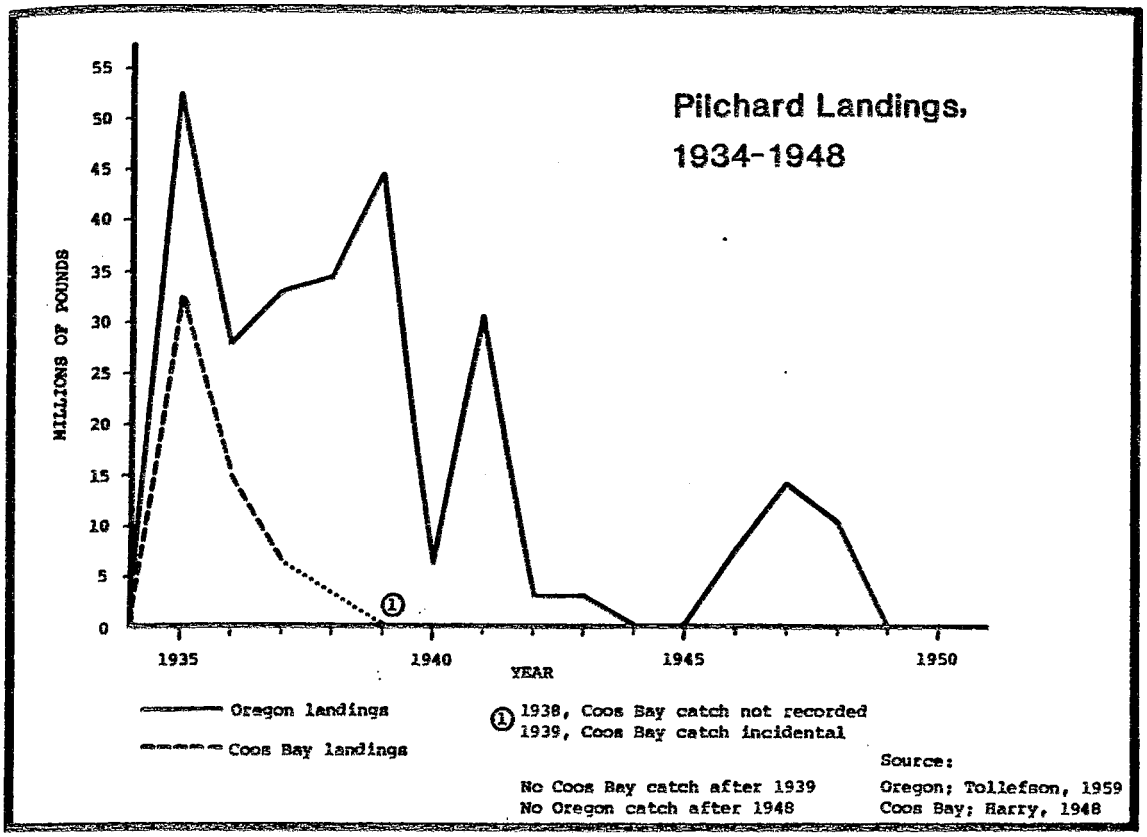


FIGURE 31

and went back to California before the best part of the season in August. Local plant owners couldn't find enough fishermen to harvest profitable numbers of pilchards, and eventually closed down.

The decline of the pilchard industry in Oregon and eventually the whole Pacific Coast is a sad chapter in the history of the Pacific fishery. A 1949 Oregon Fish Commission report explained the Oregon decline:

> Tagging experiments indicate that the pilchards gradually migrate farther to the north each year from the principal spawning grounds off Southern California until they reach the coast of Oregon usually at four years of age. Because of the intense fishery for this species in California and because of poor recruitment in recent years, the younger year classes have been depleted to such a degree that few fish survive to

> reach the Oregon coast. As a result the Oregon fishery is now dependent on that part of the older, more abundant year classes which have escaped the California fishery and on incidental spawning which takes place in certain years in the waters of the Pacific Northwest (Harry, 1949:17).

Soon after, the older fish were gone as well, and the Oregon fishery collapsed. By the early 1960s, stocks along the entire Pacific Coast were depleted.

Although short-lived, the pilchards did provide impetus to local fishermen and markets. The pilchard fishing led to the albacore and trawl fisheries which are still actively pursued today.

The Albacore Fishery

In the early 1900s the Pacific coast albacore fishery slowly became established in Southern California. This fishery was dominated by bait boats which used hook and line fishing after the fish were attracted by chumming. By the early 1920s, trolling for albacore became more popular, and it is this method which is used today.

Albacore fishing is very unpredictable, based on the vagaries of the fishes' migration patterns. As explained in Chapter Three, albacore are very sensitive to water temperature changes. The location of the Japanese Current has been identified as one possible cause of variation in their movement patterns.

In the late 1920s and early 1930s albacore were scarce in American waters. In 1934 and 1935, the fishery began a revival with the return of the albacore to more northern waters. Thus the stage was set for the beginning of albacore fishing in Oregon. In 1936, a pilchard boat encountered albacore while searching for pilchards, and landed 2,000

pounds in Coos Bay. Within a few days, five boats were engaged in albacore fishing, landing 10,000 pounds all of which were shipped south for processing (Coos Bay Times, 1942:60).

In the following two years, landings increased greatly, but records for individual ports were not kept until 1939 (Fig. 32). Landings at Coos Bay, and in the state as a whole fluctuated widely over the years depending on the location of the fish and other factors. To illustrate, a poor year in 1941 was attributed to bad weather, lack of consistent fishing, the interest in shark and salmon fishing, and difficulties in obtaining bait part of the season (Coos Bay Times, 1942:60). Landings were also made at Astoria and Newport, with Coos Bay a distant third in most years.

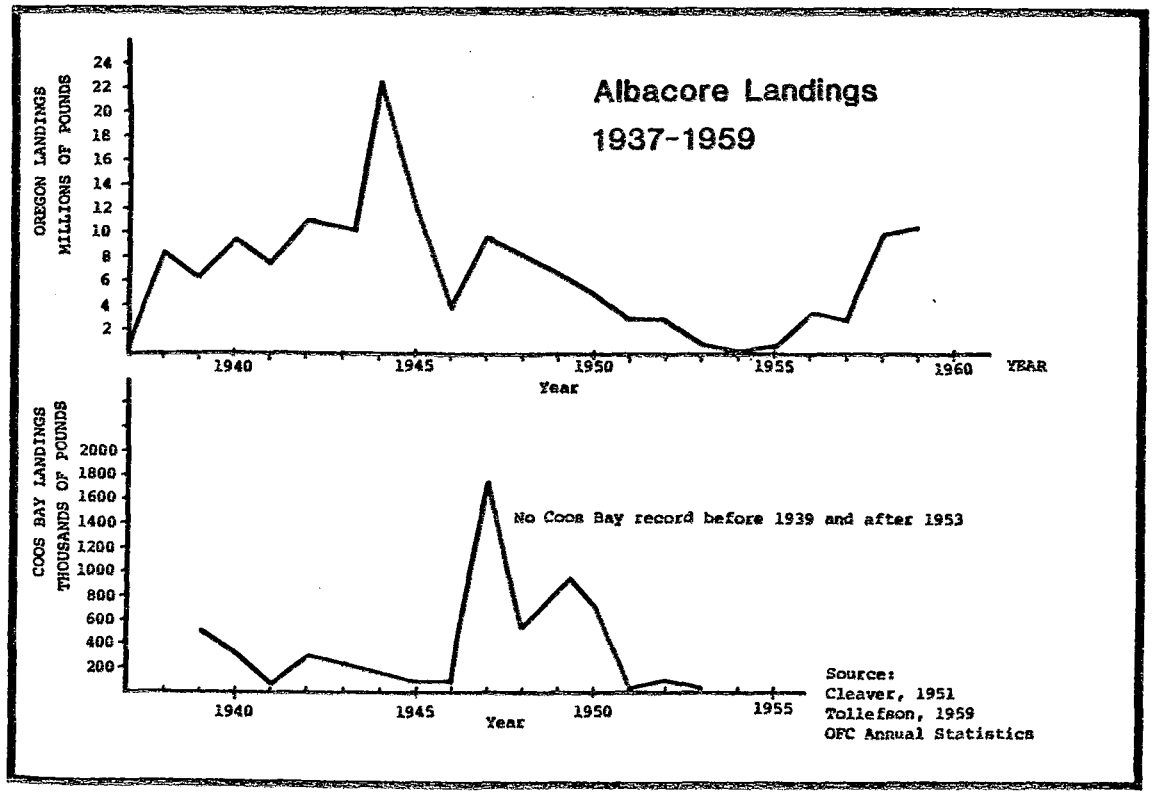


FIGURE 32

Unfortunately, data do not exist for Coos Bay for all years. The graphs show, however, that often very little correlation existed between catches at Coos Bay versus the state. For example, 1944 was a peak year for landings in Oregon, but Coos Bay did not have a particularly good season.

Extremely large albacore catches were not made in Coos Bay until the 1960s. However, the albacore fishery did play a large role in Coos Bay before that time. Owners of larger salmon trollers (over 40 feet), were attracted to the albacore fishery, because of their ability to follow them up to 300 miles offshore. The bigger boats were needed for their seaworthiness and their ability to stay out for up to two weeks. This combination effort still exists today and many of the boatowners in this class plan each year on "making their season with albacore fishing" (Browning, 1974:12). The smoker fleet described earlier fished for albacore as well as salmon as far south as the Coos Bay area after 1936. These fishermen, accustomed to ranging long distances, were the core of the Northwest's albacore fleet in the early years. Each year after albacore fishing subsided, usually in October, the smokers returned to fishing the fall run of salmon (Damron, 1975:103).

The Otter-Trawl Fishery

Early records show that between 1884 and World War II there were several isolated attempts at trawling for bottom fish, but because of lack of markets, the fishery was never firmly established until the war created a demand.

An otter-trawl is a bag shaped net pulled on or near the ocean floor. The mouth of the net is held open by the force of the current against otter boards or doors attached to each side of the net. Initially, trawlers used a beam-trawl in which the mouth was held open by a rigid frame. However, these were relatively awkward and by 1940, the otter-trawl had completely replaced it (Harry, 1963:5, 24).

Nineteen thirty seven was the first year the otter-trawl was used in Oregon. The Pacific Fisherman reported in 1939 that several trawlers delivered trawl caught bottom fish to Coos Bay in 1937 and 1938 (Harry, 1963:9). The industry rapidly expanded during World War II in order to satisfy the demand for large quantities of fish. After the war, the fishery declined, with a resurgence occurring in the late 1950s. Unfortunately, no data on landings in Coos Bay exist for the fishery during this period; thus data for Oregon is presented. Records have been kept since 1941 (Fig. 33).

Several types of bottom fish were landed at Coos Bay, depending on the demand. During the early 1940s, dogfish and soupfin sharks were caught for their livers, which were in great demand. The war had cut off this country's regular supply of cheaper foreign fish livers and liver oils, which were a source of Vitamin A, and the local fishery boomed. Synthetic Vitamin A was introduced in 1949, and the fishery immediately collapsed.

The catch of flat fish for fish fillets was also very high during the war, but declined severely afterwards. During the year 1953 to 1958, one to six trawlers were landing bottomfish at Coos Bay for transshipment to Eureka, California processors. In 1959, the Astoria Sea-

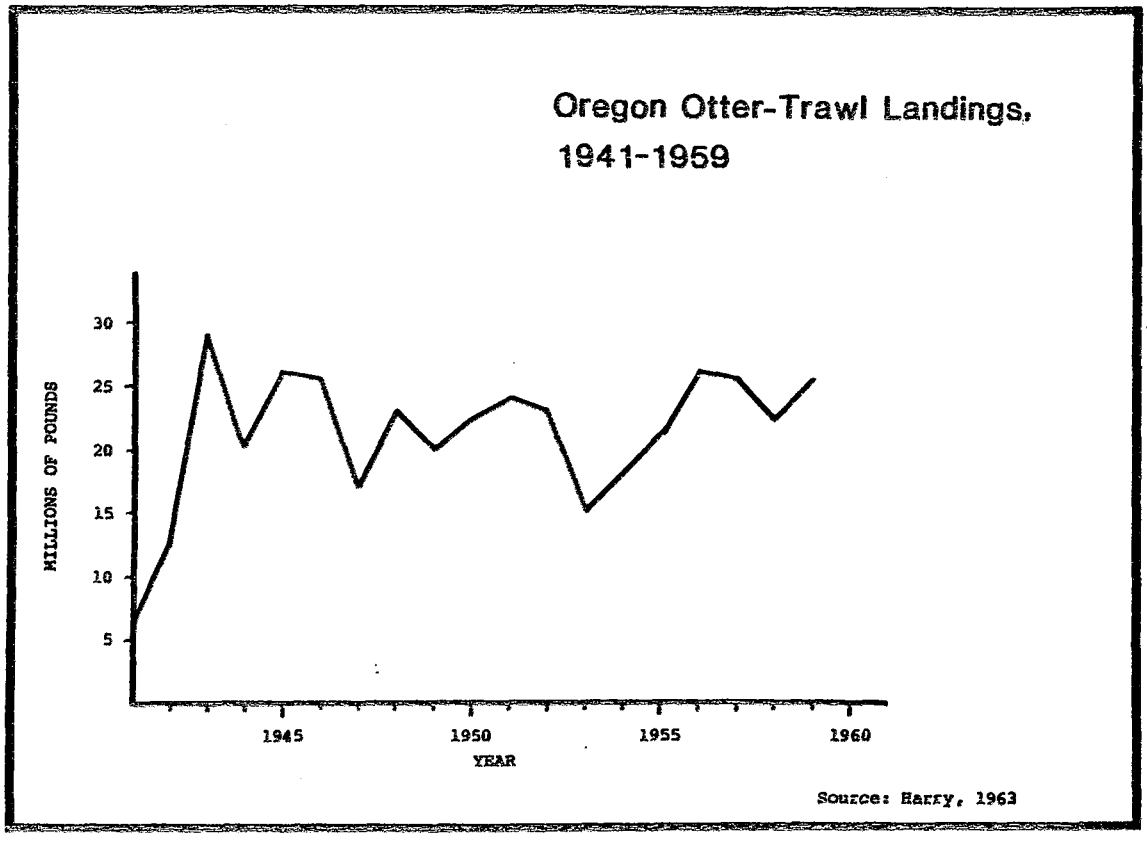


FIGURE 33

foods Co. purchased the Charles Feller plant in Coos Bay and began processing bottomfish at the Coos Bay Seafood Co. (Harry, 1963:24).

The trawl fishery for mink food was also an outgrowth of the war. The mink ranching industry in Oregon had been growing since 1925. Early ranchers relied on red meat as a source of protein, until the war caused shortages. The development of the trawl fishery during the war made an inexpensive source of protein available to the rancher in the forms of carcasses from the fillet processors. With the decline in the fillet markets, and a dramatic increase in mink ranching following the war, the demand for fillet scrap exceeded the supply. As a result, a specific fishery for whole fish for mink food was established, starting in 1953.

For the next several years, the mink food industry sustained the trawl fishery in Oregon. Coos Bay received only minor quantities of mink food until 1955, when a processing plant was opened at Winchester Bay, immediately to the north. After that, the local share of the catch continually increased until 1960 (Jones, 1961:14-26).

Overall, the Oregon trawl fishery did not recover from the decline after World War II until 1960. During that time, however, several aspects of the fishery changed. Trawlers were larger and more efficient. Boats built between 1945 and 1961 averaged 68 feet long, while boats built before 1942 averaged 57 feet long (Harry, 1963). Many gear improvements were introduced.

In the early days of trawl fishing, boats stayed relatively close to their home port, and fished in relatively shallow water between 120 and 300 feet. Gradually the boats fished deeper waters, up to 1200 feet. Boats also began to expand their range. By 1960, local boats fishing in grounds near Coos Bay were competing with trawlers from Eureka, Winchester Bay, and Newport.

Salmon Fishing

For reasons already outlined, salmon gillnetting in Coos Bay continued to decline after 1936, until the bay was closed to commercial salmon fishing in 1946. Meanwhile, ocean trolling for salmon continued as a viable fishery. Figures 34 and 35 show chinook and coho landings in the bay (gillnet) and offshore (trolling) for the Coos Bay area and Oregon in general. The Oregon landings reflect only those fish landed at Oregon ports. The catch in the Columbia River area was landed in

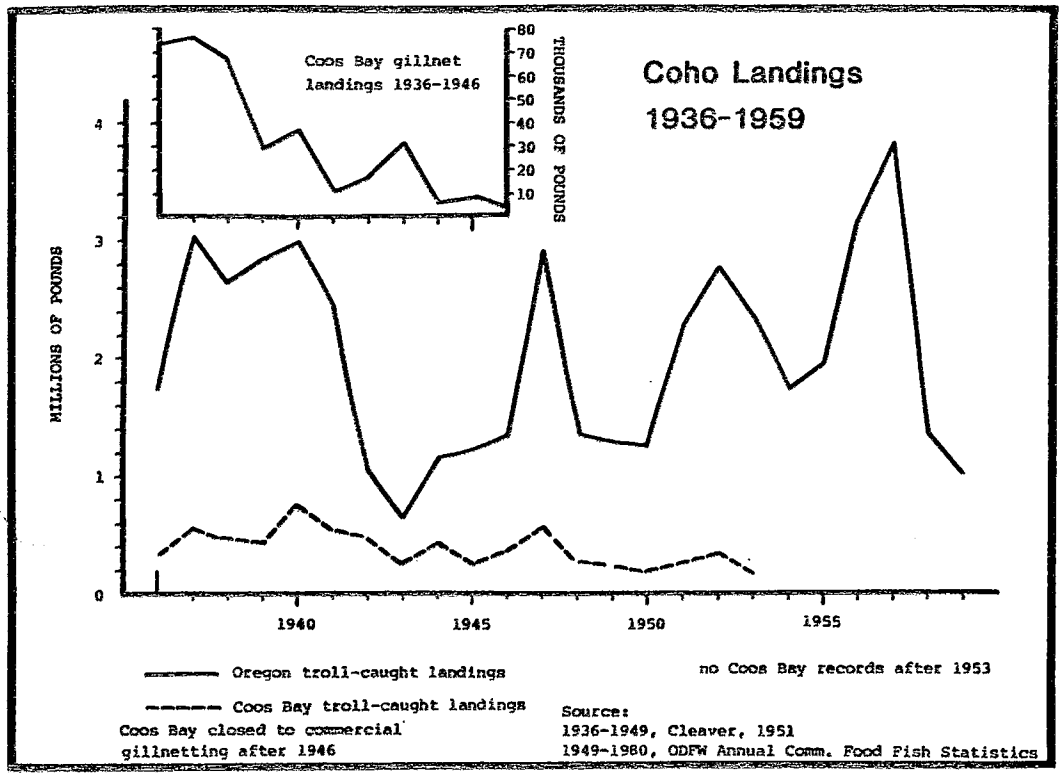


FIGURE 34

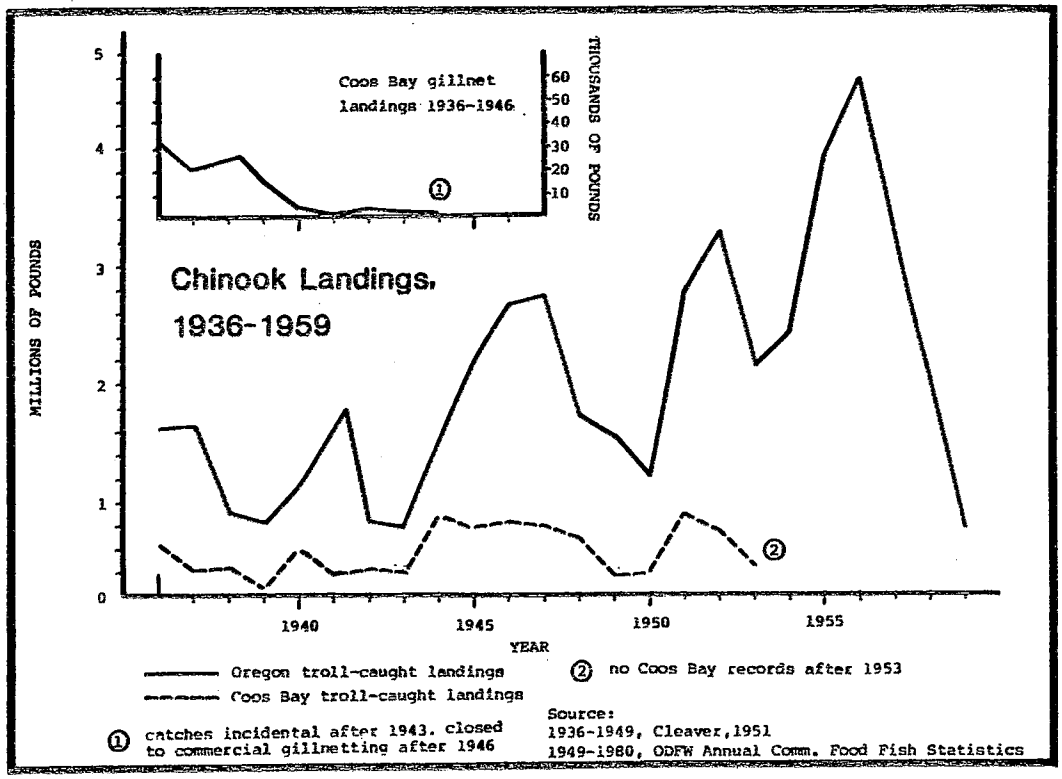


FIGURE 35

either Washington or Oregon ports depending on which buyers were offering the best price or had buying scows nearest to the fishing grounds (Cleaver, 1951). After a peak year in 1935, the Coos Bay fishery experienced peak years in 1940, 1947, and 1952, although records do not exist, based on Oregon data, another large catch probably occurred in 1957.

The rapid development of the albacore fishery after 1936 resulted in significant changes in salmon trolling. As discussed earlier, the large trollers were well suited for albacore, and they fished for them in late summer. These large trollers then did most of their salmon fishing during May and June. Thus, the height of the fishery shifted to some degree from late summer when the fish were concentrated off the rivers to earlier in the summer, when they were found on the feeding banks. Many trollers, especially the smaller boats, stayed with salmon throughout the season. The profitable tuna fishery, combined with high prices for fish during and after World War II helped many of the troll fishermen buy bigger boats. The number of boats probably decreased from the earlier years, but this was coupled with an increase in their size and efficiency (Van Hyning, 1951:46).

The advent of albacore fishing also had an effect on the range of salmon fishing activity. The bigger boats had a greater range, and local boats, while mostly fishing in proximity of Coos Bay could now follow runs of salmon from Eureka to the coast of Washington. Similarly, when salmon were reported off the Southern Oregon coast, trollers from California and various Washington and Oregon ports would fish there, competing with trollers from Coos Bay.

Beginning in 1948, regulations were imposed on the salmon troll fishery, consisting of size limits and seasonal closures (Van Hyning, 1951:47). These were the first of many editions of salmon trolling regulations that have evolved into the present-day restrictions.

Crab Fishing

The sharp increase in crab fishing in Oregon from 1933 to 1943 was most likely due to the repeal in 1933 of a variable bag limit on commercial crabbing. With the elimination of this restriction, there was an increase in the number of fishermen and probably in the amount of gear used by each fisherman, as well (Waldron, 1958:9). By 1943, the fishery had grown to the extent that the catch for the most part reflected variations in the abundance of the crabs (Cleaver, 1951:73).

In the years after 1948, Coos Bay assumed an increasingly greater proportion of the state's catch. Like the other fisheries during this period, the boats gradually got larger and fishing ranges greater.

The Fishing Landscape 1935-1959

The upsurge of offshore fishing that was taking place during this period brought with it an increased emphasis on Coos Bay as a harbor and fish processing node. Before 1935, all of the local processors were found in North Bend and Marshfield, 10 to 12 river miles from the entrance. This represented additional time and fuel for fishermen traveling to these plants. Charleston was ideally suited as a center of fishing activity because of its proximity to the entrance, and the mouth of South Slough was relatively deep and protected from incoming seas.

Activity in Charleston remained limited until substantial human modification of the area allowed increased moorage and flat land for processing and other ancillary activities.

Fishing activity in Charleston before 1935 was confined to gillnet fishermen who lived there and based their operations from small docks. When offshore fishing became more popular in the 1920s and early 1930s some moorage was found in Charleston, but this was limited, because no processing plants were located there.

The first fish processing operation in Charleston, Hallmark Fisheries, established in 1936, began as a family enterprise, with the men fishing out of Charleston and the women canning the catch (U.S. Army Engineer District, 1979:22). Fishing activity in Charleston increased dramatically during the war. By 1942, 75 boats, most of them locally owned, fished regularly for Hallmark's and included crabbers, shark fishers, and trollers. The boats moored to a long floating dock at the mouth of South Slough in front of the cannery. Forty-five to 60 people were employed at the plant during the crab canning season (Coos Bay Times, 1942:59).

Soon after the war, a local boat building industry was established, which continues today. However, the processing industry remained limited until the development of a boat basin in the late 1950s.

Impetus for the basin came from the increased number of fishermen found in Charleston during the war. A bond issue was approved in 1955, providing funds for the construction over the next two years (Fig. 36).

Construction of the basin involved dredging a channel to the entrance channel, construction of a break-water, and filling

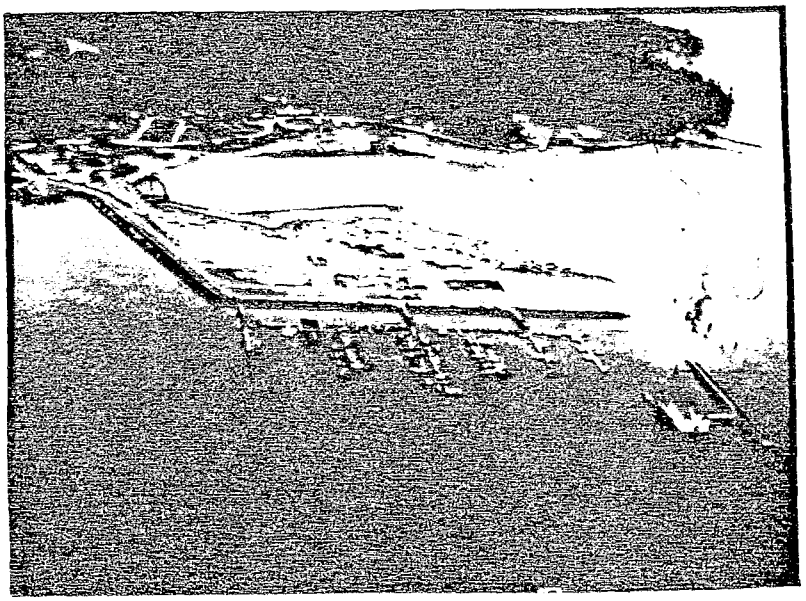


FIGURE 36. Charleston Boat Basin, circa 1964

approximately 40 acres of intertidal and subtidal area. The flat land created provided suitable acreage for processing and other ancillary operations which form the heart of the contemporary fishing landscape.

By 1958, 100 berths were available. This number doubled over the next few years until the basin was filled to capacity.

The Seattle Fishermen's Co-op, one of the many fishermen's co-ops established along the coast to help sustain the price of salmon, opened a branch in Charleston in 1958 (U.S. Army Engineer District, 1979:22). However, even with two plants in operation that year, fishing activity was such that only 40 people were locally employed in fish processing.

The fishing industry in Charleston at the close of the period 1935-1959 was poised for rapid growth. A well developed fishing community was emerging that would draw other processors, increased moorage, and hence more fishermen to the community. After the boom during the

war years, and the subsequent decline, the local fishing industry was just beginning a resurgence which was to explode in the late 1960s with the introduction of the shrimp fishery and the increasing development of the other trawl fisheries.

Recent Trends, 1960-1980

The 1960s and 1970s witnessed unparalleled growth in the local fishing industry. Expanded markets, bigger and more sophisticated boats and gear, and more processing capacity contributed to this increase. More fishing activity led to further development of Charleston's identity as a fishing community, and many of the elements of today's fishing landscape were established during this period.

The Shrimp Fishery

Prior to the 1950s, pink shrimp were known to inhabit the waters off the Oregon coast, but no attempt has been made to calculate the extent of the fishing grounds or the abundance of the species until explorations by the Oregon Fish Commission in 1951 and 1952 (Ronholt, 1961:31). Shrimp were found to be abundant in commercial quantities, but it was not until 1957 that any commercial shrimping took place.

In the summer of 1957, several California trawlers caught approximately 100,000 pounds of shrimp off Coos Bay. In 1958, two peeling machines were installed in Warrenton, Oregon and the bulk of the Oregon catch was landed there for the next three years. In 1959 and 1960, shrimp caught in southern Oregon was primarily landed in Brookings and shipped to Eureka for handpicking. Very little was landed in Coos Bay

during these two years. In 1960, interest was renewed in the grounds off Coos Bay and approximately 80,000 pounds were landed at Charleston (Ronholt, 1961:32). The shrimp were originally handpicked in Charleston, until the installation of peeling machines by some processors in the early 1960s.

The fishery rapidly expanded in Coos Bay as well as the state as a whole through the 1960s and 1970s (Fig. 37).

A number of factors were responsible for the expansion of Coos Bay: processing capabilities in Charleston continually expanded; Coos Bay is

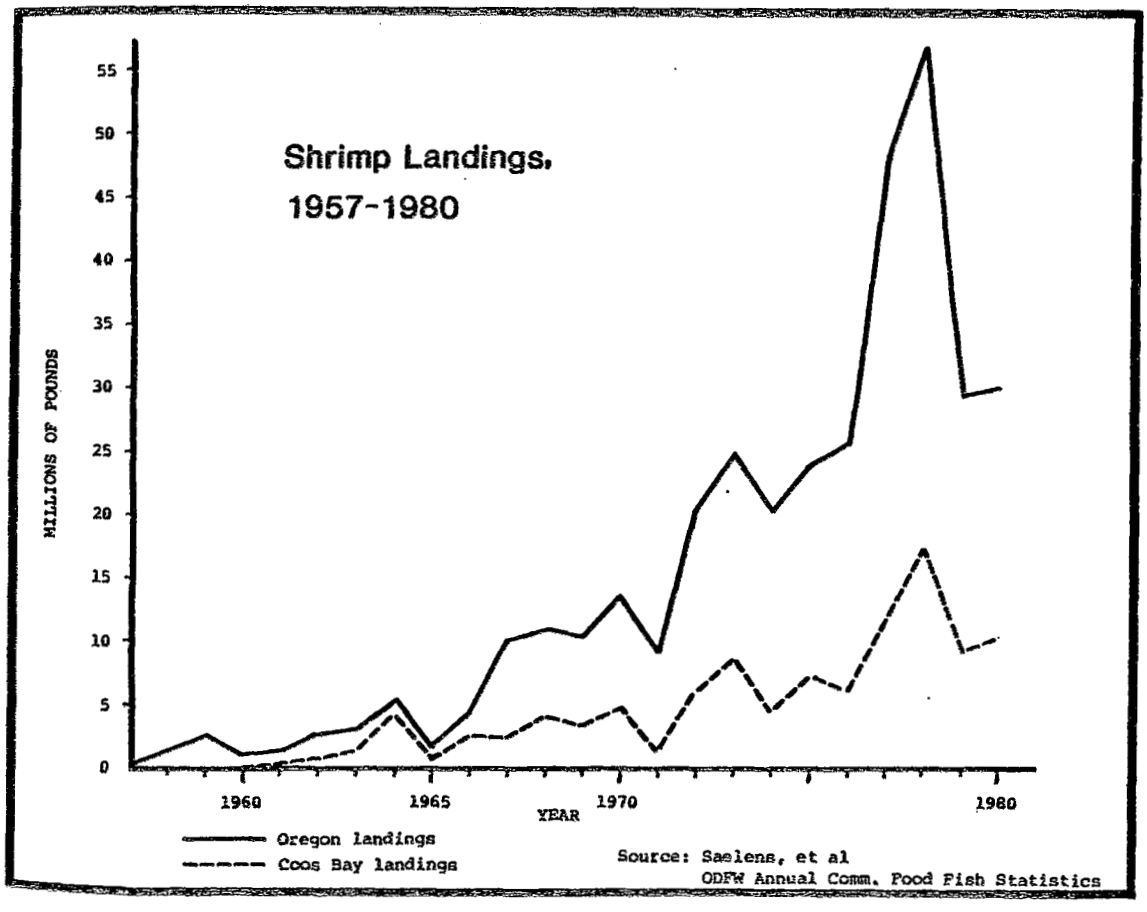


FIGURE 37

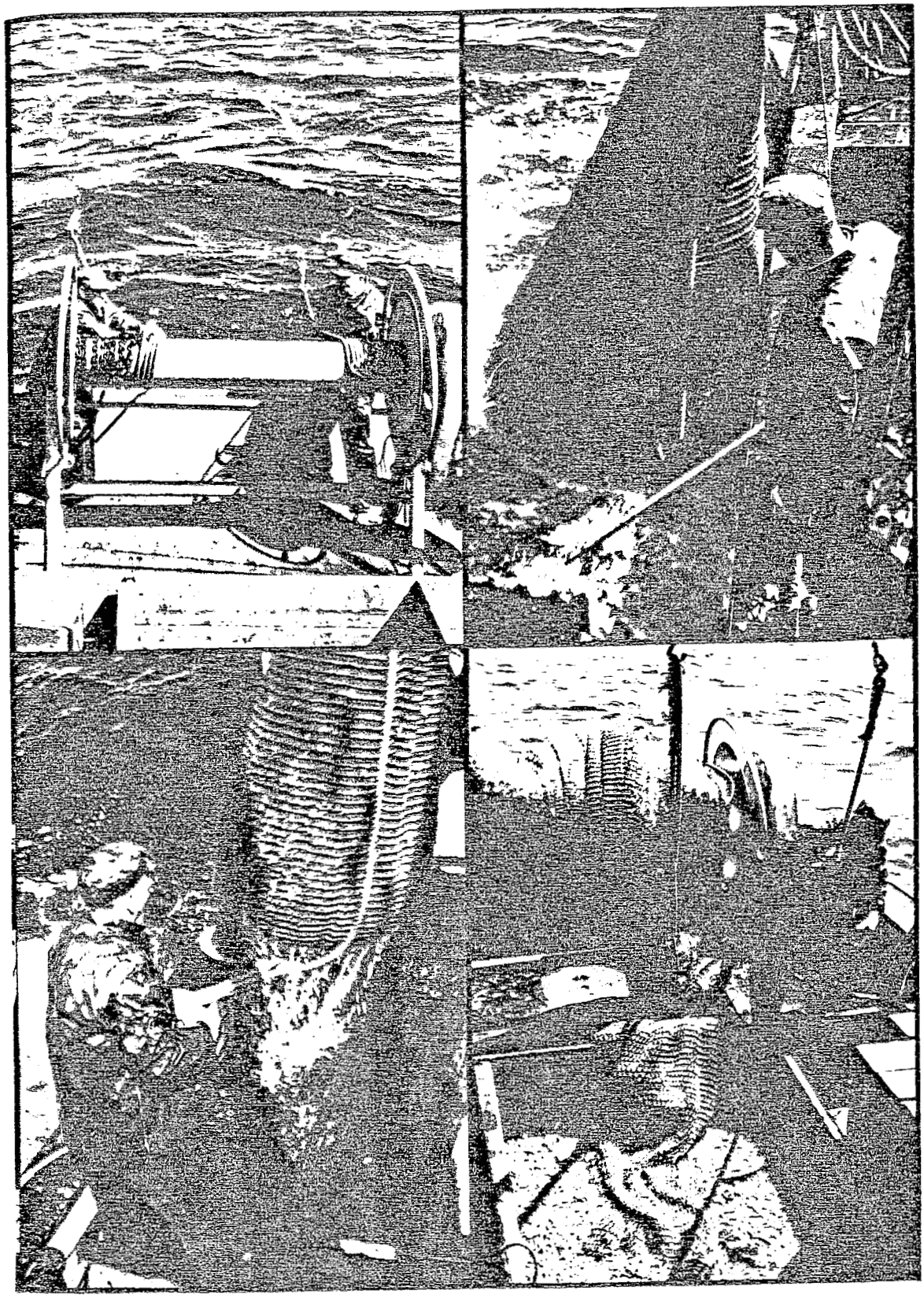


FIGURE 38. Bringing in a Shrimp Net

very close to prime fishing grounds off the coast, and bigger and more efficient boats became available to the fishermen.

Fishing methods are very similar to bottomfishing. A net which has basically the same rigging as an otter-trawl is dragged through areas where the bottom consists of green mud or green mud and sand. Trips are usually two to three days in length, but due to the close proximity of the fishing grounds off Coos Bay, some shrimpers take day trips. Double-rigged (two net assemblies) boats were introduced in 1969 and were immediately successful, which led to the conversion of many single-riggers or the importation of large, double-rigged vessels from the Gulf of Mexico where shrimp fishing had been declining.

Landings for shrimp increased dramatically in Coos Bay and throughout the state in 1977. This large harvest encouraged a large increase in the number of vessels operating from and delivering to Coos Bay (Table 3). The increased capability led to a peak in shrimp landings in 1978. Profits were extremely good these two years, and still more vessels were brought into the fishery in 1979 and 1980. Although fishing effort was higher than ever before, the catch during 1979 and 1980 declined. As a result, many shrimpers turned to bottomfish during the winter months, or converted their boats to mid-water trawling (Hosie, 1981). This shows up in the catch statistics, with a large increase in bottom-fish landings during these two years.

TABLE 3. Number of Vessels Delivering Shrimp to Coos Bay

	1977	1978	1979	1980
Home Port Vessels	27	37	54	69
Total Vessels (including transients)	33	92	104	133
Catch (million pounsa	12.1	17.5	9.1	10.5

SOURCE: ODFW, Sealens, et al., Lukas, Bruneau.

Other Fisheries

Figures 39 through 43 show the extent of landings for the salmon, albacore, bottomfish, and crab fisheries from 1960 through 1980. Unfortunately, data are not available on every fishery for every year.

The albacore landings (Fig. 39) fairly reflected variation in abundance of the fish off coastal Oregon. The year 1968 was an exceptional one for the Oregon catch and an account of it illustrates the relationship between albacore migration patterns and the catch. Browning (1974:12) notes of 1968:

> . . . the fish first were encountered just south of San Juan Seamount (off Southern California) early in June.
>
> No substantial fishery took place off California that season, however, because the economics of fishing interfered. Fishermen and their organizations held out firmly for a favorable price and on July 10 settled for $425 a ton. But by then, the offshore waters had warmed quickly and the bulk of the albacore had moved northward to the Oregon and Washington coast where California fishermen were forced to follow them.
>
> First sightings were made off Southern Oregon during the first week of July and after July 10, fishing areas ranged from Cape Blanco, Oregon, to Grays Harbor, Washington, and up to 100 miles offshore. Fishing continued good through August

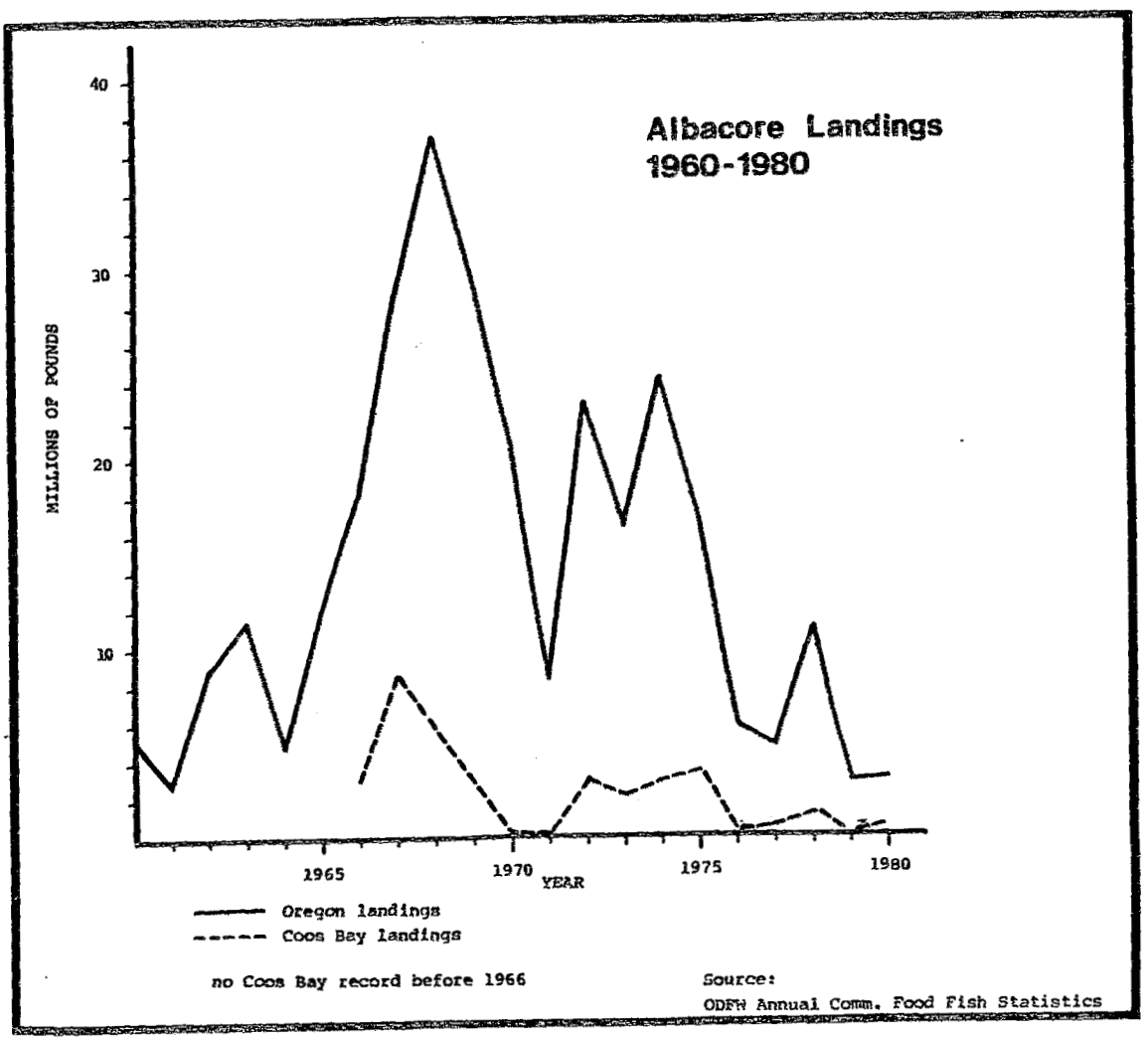

Albacore Landings
1960-1980
MILLIONS OF POUNDS
40
30
20
10
1965
1970
1975
1980
YEAR
Oregon landings
Coos Bay landings
no Coos Bay record before 1966
Source:
ODFW Annual Comm. Food Fish Statistics

FIGURE 39

but fell off rapidly in September for trollers. But during this month, bait boat catches picked up sharply. The trollers found their best fishing from 60 to 100 miles out for albacore averaging 13 pounds. Bait boats did best in the 20- to 40-mile range for fish running from 18 to 25 pounds. The fishery was over for most vessels by October 10. Landings by all vessels were chiefly in Oregon because of its proximity to the main fishery areas and because of the refusal of most Washington processors to accept albacore.

Crab landings (Fig. 40) fluctuated with abundance, per the cycles explained in Chapter Three. During poor years, crab fishermen fished for a wide variety of other species.

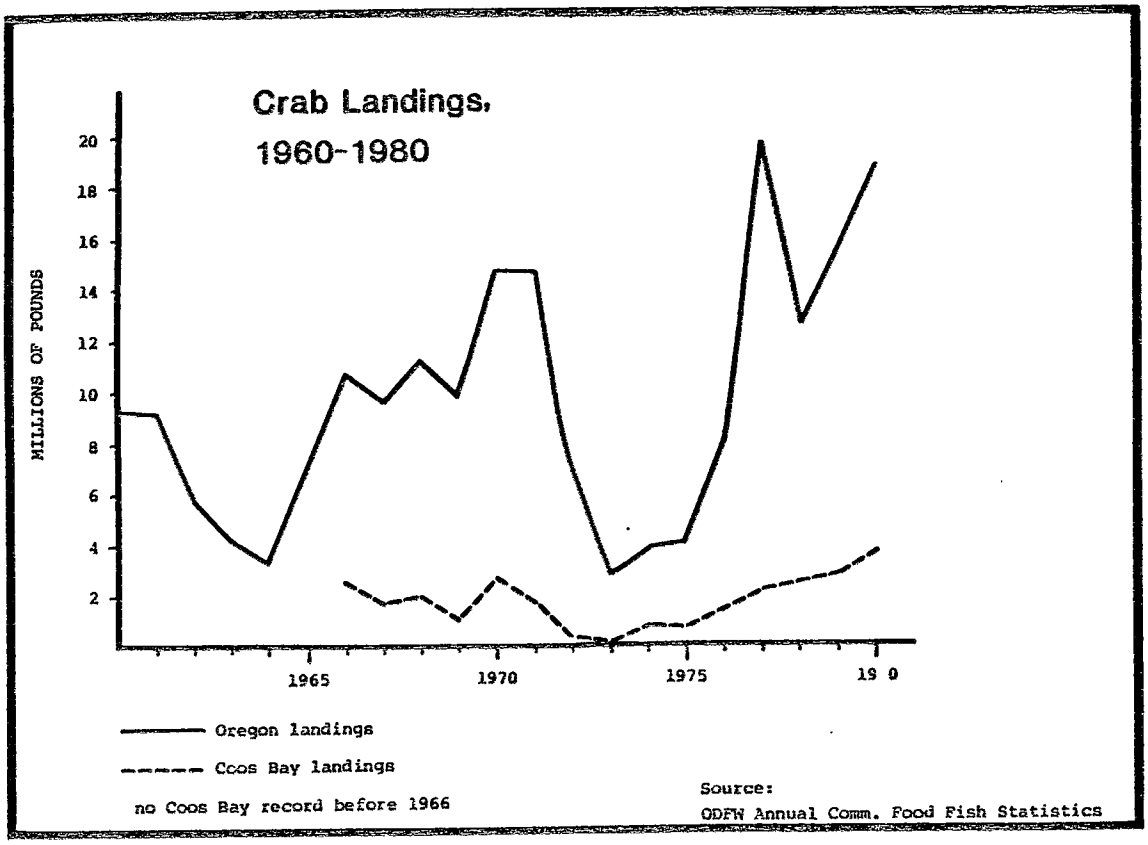


FIGURE 40

Salmon (Figs. 41 and 42) showed an overall increase during this period, although landings fluctuated widely. Variation in abundance, regulations, and change in the composition of the salmon fleet created a set of complex interactions which were reflected in the landings from year to year.

Groundfish landings (Fig. 43) showed an overall increase throughout the period. The late 1970s brought huge increases in the bottomfish catch due to a large expansion of the fishing effort, new markets, and increasing processing capability. Also, in 1977 domestic management and control of offshore fishing grounds was increased with extension of regulations to a 200 mile limit. These factors, coupled with the relatively poor shrimp harvest in 1979 which caused many shrimpers to turn to bottomfishing, led to a peak in bottomfish landings that year.

An emerging technology, mid-water trawling, contributed to the increase in importance of bottomfish in the latter half of the 1970s. By setting a net to be dragged at predetermined depths, the mid-water trawl has allowed the pursuit of new species that were previously uneconomical.

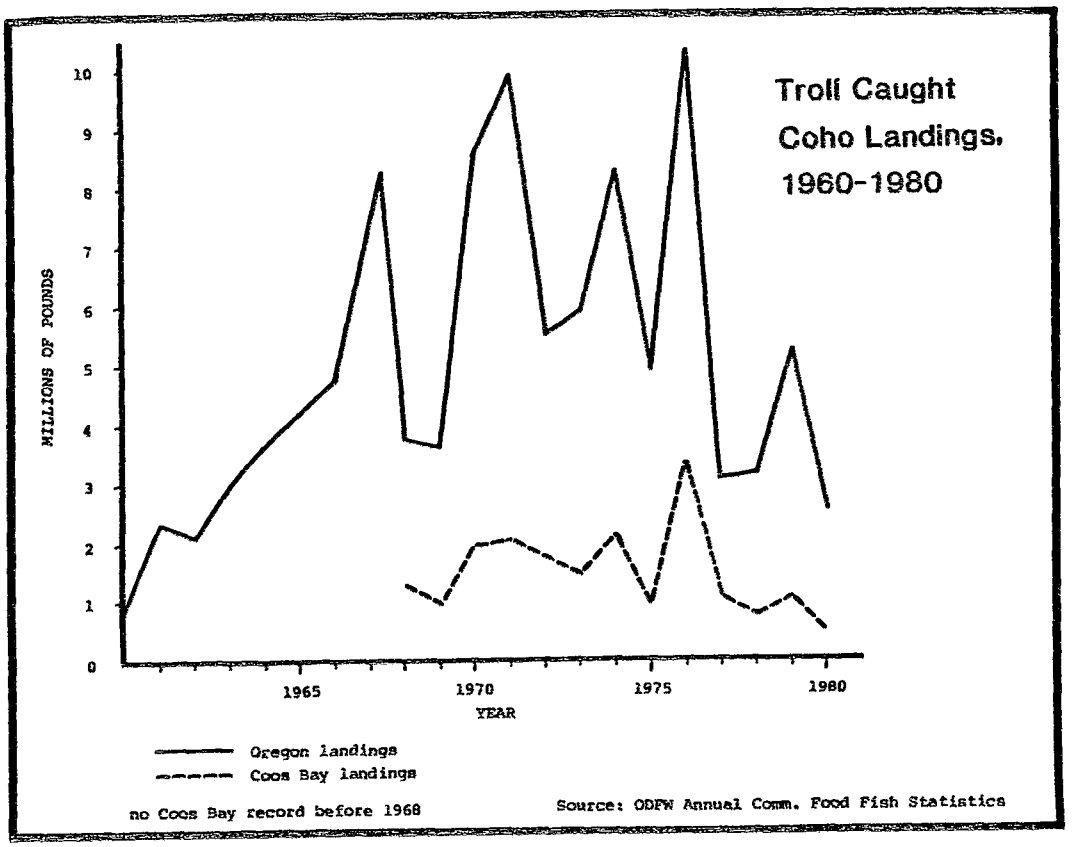


FIGURE 41

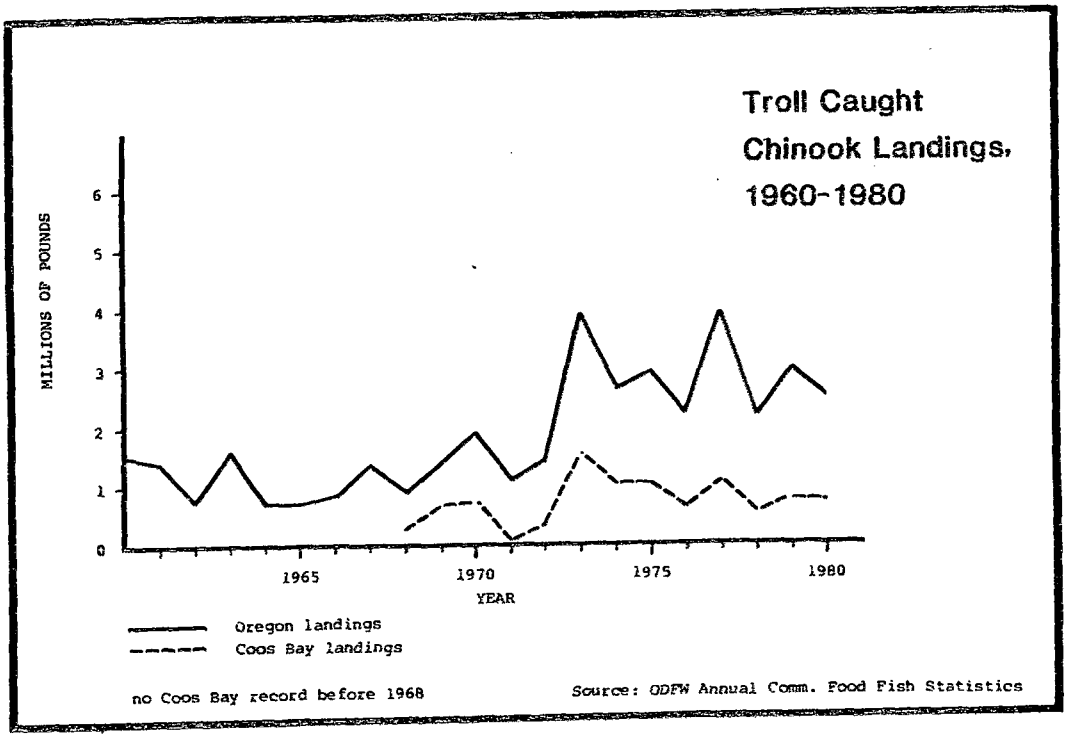


FIGURE 42

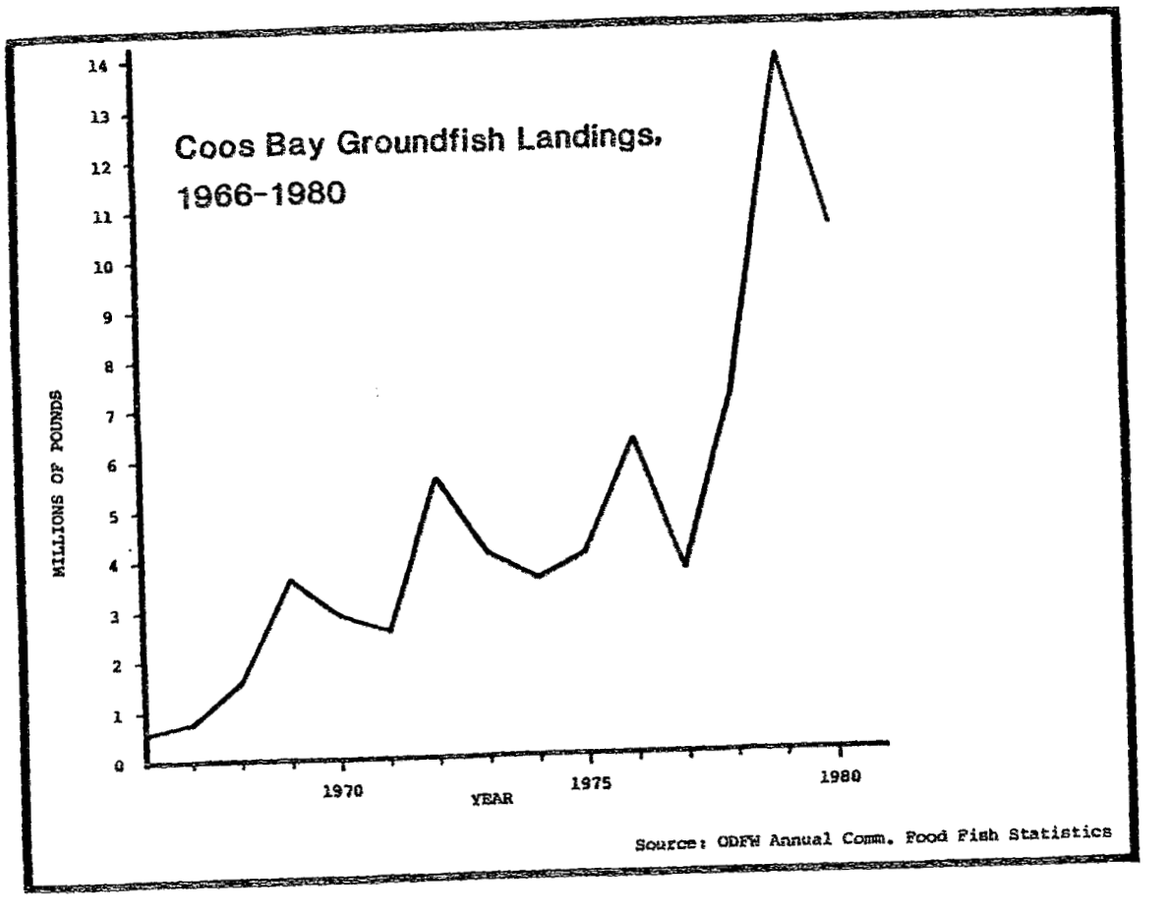

Coos Bay Groundfish Landings,
1966-1980
MILLIONS OF POUNDS
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1970
1975
1980
YEAR
Source: ODFW Annual Comm. Food Fish Statistics

FIGURE 43

The Fishing Landscape 1960-1980

Continuing alteration of the local environment directly toward improving Coos Bay's attributes as a harbor, characterized this period. By the early 1960s, the boat basin at Charleston had been filled to capacity, and an addition was made to the facility in 1966 by dredging a ten acre inner basin from previously filled land (Fig. 44). By and large, the configuration that resulted from these changes exists today.

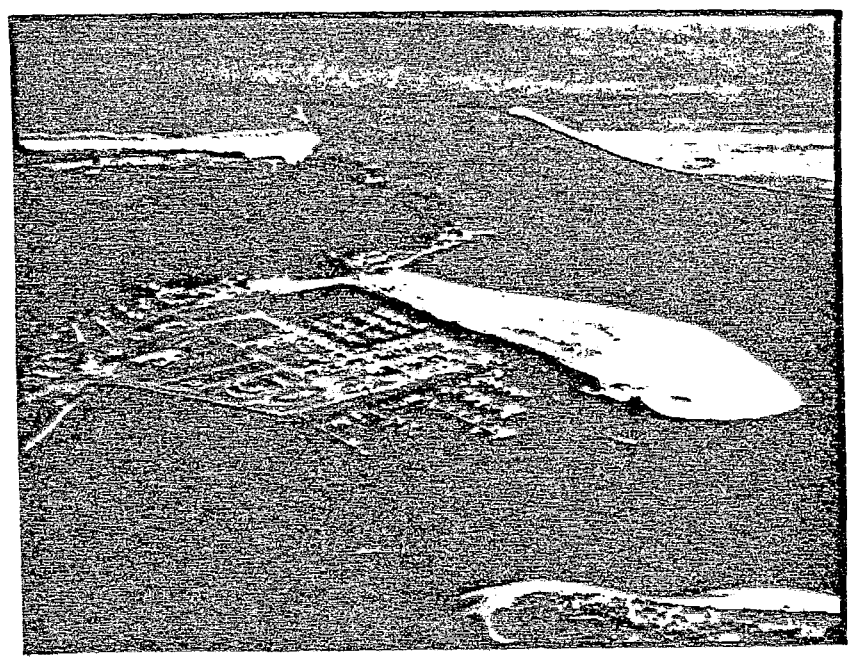


FIGURE 44. Charleston Boat Basin, 1969

Several new processing plants were established in Charleston during this period. By the middle 1960s all processing was done in Charleston, except one plant in Empire, which still operates today. Three fish receiving stations were also built in Charleston, their landings being shipped elsewhere for processing. The number of employees in the

Charleston fish processing industry reached a peak of 506 in 1969 (U.S. Army Engineer District, 1979:23). All of the plants and receiving stations built during this period are operating today, except Barbey's Seafood, which burned down in 1970. As elements of the contemporary landscape, these plants are discussed further in Chapter Five.

In the early years, the local fishing industry was characterized by a fleet of older, wooden vessels ranging in size from 20 feet to 60 feet. Several factors changed this situation in the early to mid-1970s: vessel financing became more readily available and additional tax incentives were offered to stimulate boat construction, and more efficient gear and new electronic equipment came into use. Because of the increase in demand for shrimp, several fishermen procured large boats from the Gulf of Mexico, where the shrimp fishery had collapsed. As a result, the composition of the fleet changed dramatically, with an increase in both the number and size of boats. While the largest boats during the early 1960s were 60 feet, by 1980 some boats were over 90 feet (Fig. 45).

This chapter has described the man-made changes in the physical environment and technological improvements which have led to today's pattern of commercial fishing activity in Coos Bay. The contemporary landscape that has resulted from this evolution is described in the following chapter.

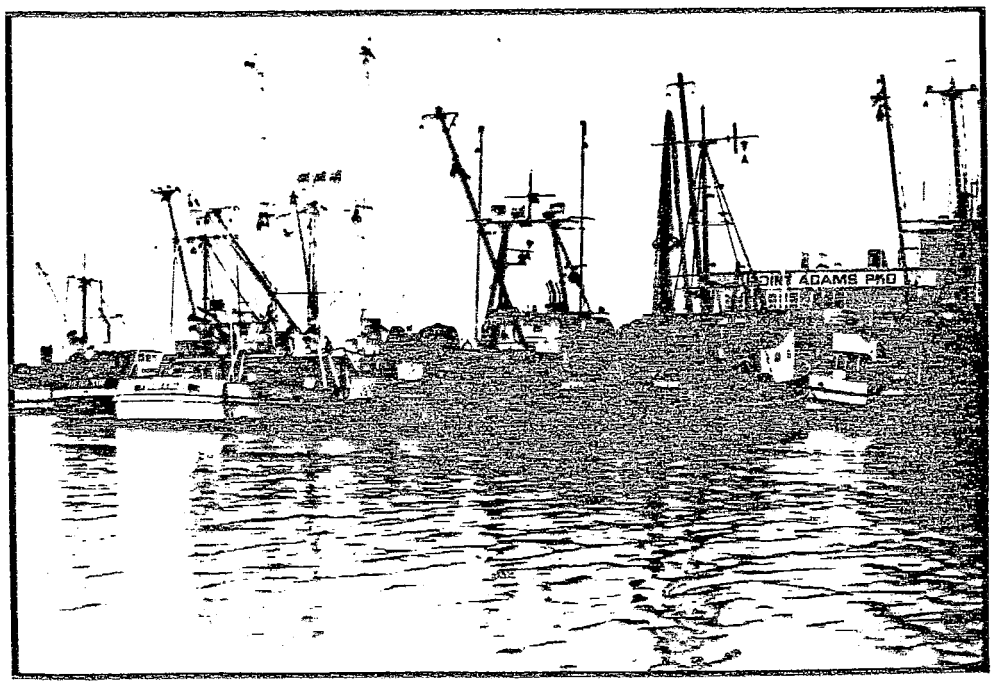


FIGURE 45. Some of the Larger Shrimpers and Trawlers in the Basin

Footnotes

[1]Hardweather fisheries are those that operate on the open ocean along the northern coast—such as halibut, tuna trolling, or salmon trolling (Damron, 1975:38).

CHAPTER FIVE

THE CONTEMPORARY FISHING LANDSCAPE

Introduction

The previous two chapters have illustrated some of the interactions between man and environment which have resulted in the contemporary pattern of commercial fishing activity in Coos Bay. While commercial fish landings and processing occurs in various locations around the bay (Fig. 46), the bulk of the activity is now concentrated in Charleston, and its physical manifestation largely defines the landscape of the local community.

This chapter attempts to describe some of the important interrelationships of the local fishing industry and its manifestations that make up the present landscape scene. This is done by cataloging the elements of the landscape which are products of fishing activity.

Contemporary Fishing Patterns

The current patterns of fishing activity constantly reflect countless individual decisions of fishermen, both local and transient. The patterns of the aggregated decisions can be described in terms of seasonal variability, geographic range, economic characteristics, and participation by fishermen.

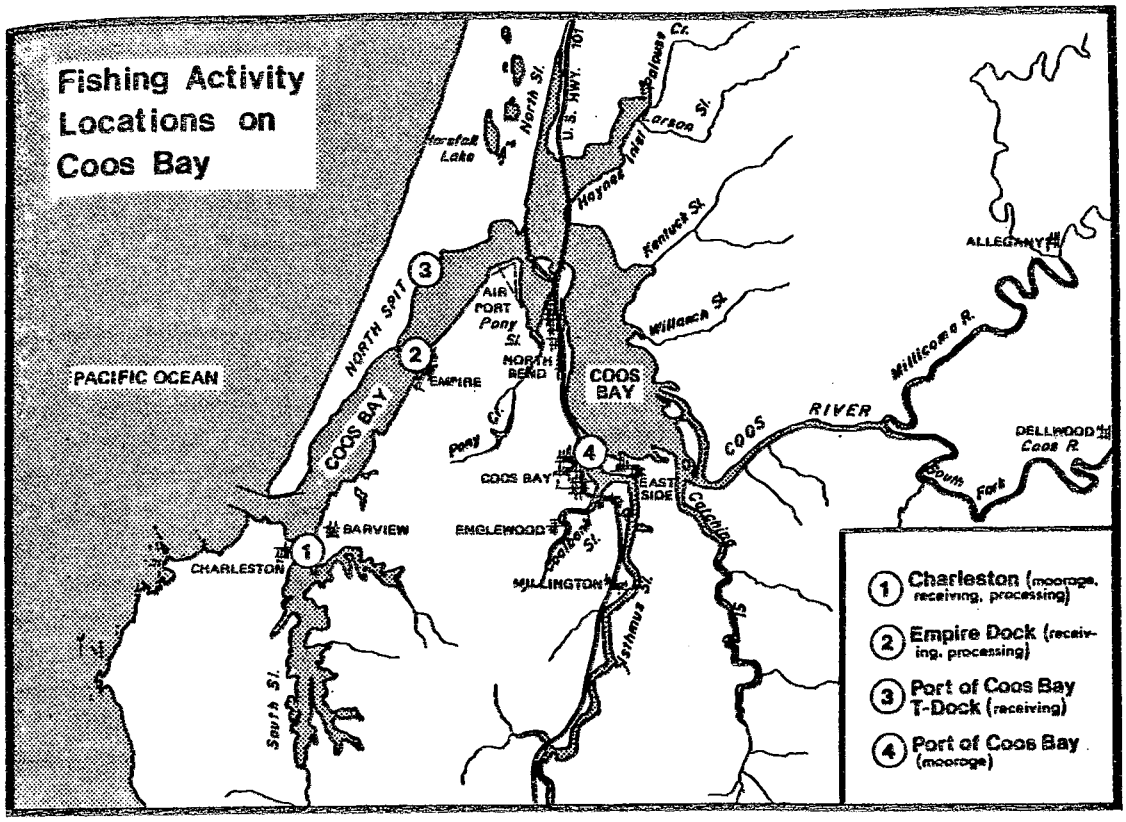


FIGURE 46

Seasonality

Fishing activity is not constant throughout the year. Figure 47 shows the fishing seasons for Coos Bay fishermen, based on current regulations. Within the season for each species, certain months produce peak landings. During an average year, crab landings peak in April or May, shrimp landings in June, coho landings in July, chinook landings in August, and albacore landings in August or September. Overall, the most active time for Coos Bay fishermen is in summer, with relatively inactive months during winter, because in summer certain species are most available and the weather is more conducive to fishing activity, with better bar conditions and calmer seas.

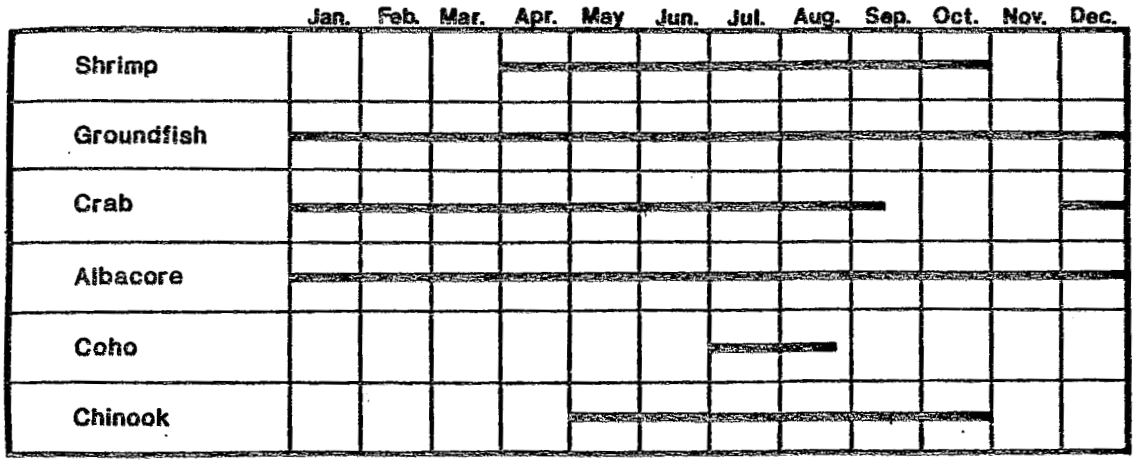


FIGURE 47. Fishing Seasons for Coos Bay Fishermen

Participation by Fishermen

No information is available on participation of Coos Bay fishermen in different fisheries. The number of statewide vessels engaging in each fishery is shown in Table 4. Informal observation of the fleet in Coos Bay indicates roughly the same configuration with perhaps a slightly higher ratio of shrimp and groundfish trawlers than the Oregon fleet. Of these vessels, those with no other significant activity in other fisheries (i.e. a "single fishery vessel"), range from 80% for salmon trollers to 24% for crab vessels.

TABLE 4. Numbers of Vessels Having Significant[a] Activities in Only One Fishery, 1979

Fishery	No. of Vessels	No. of Vessels with No Other Significant Activity in Oregon	% of Total Vessels
Groundfish Trawl	148	63	42%
Shrimp	203	64	31%
Crab	587	145	24%
Troll Salmon	3,114	2,505	80%

[a]There can be no generally agreed upon definition of "significant" activity. For the shrimp fishery, if troll salmon landings were less than 500 pounds and groundfish trawl landings were less than 2,000 pounds, such activities were not considered significant. For the groundfish trawl and crab fisheries, if troll salmon landings were less than 500 pounds, the activity was not considered significant.

SOURCE: Carter, 1981:26.

Many fishermen engage in two or more fisheries throughout the year (see Tables 5 and 6), which has the effect of increasing the total fishing effort.

TABLE 5. Two-Way Multiple Fishery Activity Chart for 1979

	Groundfish	Shrimp	Crab	Albacore	Salmon
Groundfish	148	73	27	7	41
Shrimp		203	72	11	67
Crab			587	62	449
Albacore				286	159
Salmon					3,114

SOURCE: Carter, 1981:28.

TABLE 6. Numbers of Vessels With Selected Three-Way and Four-Way Patterns of Fishery Activities, 1979

Pattern[a]	1979
G + S + C	20
G + S + A	6
G + C + A	2
S + C + A	5
G + S + C + A	2
C + A + T	56

[a]Symbols used for pattern description are:

G = Groundfish Trawl
S = Shrimp
C = Crab
A = Albacore
T = Troll Salmon

SOURCE: Carter, 1981:33.

The number of boats involved in each fishery only indicates the overall level of activity of the entire fleet. Some boats are not particularly active. For example, only 12% of the salmon trollers landed 57% of the offshore salmon catch in Oregon in 1980 (Table 7).

TABLE 7. 1980 Oregon Troll Salmon Vessel[a] Catch Distribution

Poundage Category	Number of Boats	Pounds in Category	% Total Cumulative Pounds (Dressed)	% Total Cumulative Boats
over - 13,000	6	83,875	1.95	0.15
12,001 - 13,000	7	88,522	4.01	0.33
11,001 - 12,000	3	34,964	4.83	0.41
10,001 - 11,000	5	53,565	6.08	0.54
9,001 - 10,000	14	132,218	9.16	0.90
8,001 - 9,000	21	178,205	13.31	1.45
7,001 - 8,000	24	178,226	17.46	2.07
6,001 - 7,000	42	271,963	23.80	3.15
5,001 - 6,000	69	374,797	32.53	4.94
4,001 - 5,000	101	450,427	43.03	7.56
3,001 - 4,000	167	582,299	56.60	11.88
2,001 - 3,000	254	622,890	71.11	18.46
1,501 - 2,000	171	295,550	78.00	22.88
1,001 - 1,000	248	305,874	85.13	29.31
801 - 1,000	174	156,437	88.77	33.81
601 - 800	201	140,932	92.06	39.02
401 - 600	273	134,108	95.18	46.09
201 - 400	398	115,497	97.87	56.39
101 - 200	332	48,662	99.01	64.99
51 - 100	331	22,749	99.54	73.04
21 - 50	375	12,298	99.82	82.75
1 - 20	666	7,385	100.00	100.00

[a]Includes only landings by vessels with Oregon troll permits. Includes landings reported by December 11, 1980.

Recent estimates of the number of commercial fishermen in the Coos Bay area, both full-time and part-time range from 400 to 620 persons. Records show that most of the commercial boat owners are local residents, although a significant portion live elsewhere (Table 8). No data exist on crew members' location of residence, although many are known to be local. Part-time fishermen are made up of both general Coos Bay area residents and non-local residents who fish out of Charleston on weekends and in the summer. It is likely that a higher percentage of part-time fishermen are non-local residents than full-time fishermen. Most of the part-timers either own or work on small vessels which usually fish for salmon, crab, or black cod. Many of these vessels are not equipped for extended trips and so make day trips only. Local part-timers may fish daily during part of the year, returning in the early afternoons to work a land-based job, often lumber processing in Coos Bay (Army Engineer District, 1979:25).

Larger boats, such as trawlers, shrimpers, and combination boats, are run mostly by full-time fishermen. The large capital outlay for these vessels requires year-round production.

Economic Characteristics

The increase in fish landings which have occurred since the late 1960s have had a significant impact on the local economy. The value to local fishermen for all the fisheries was $13,098,000 in 1981, a sizable portion of the state total (Table 9). Coos Bay has the second largest commercial landings in Oregon, behind Astoria.

TABLE 8. Charleston Boat Basin--Commercial Fishing Boat Owners' Place of Residence

Place of Origin	Number		Percentage of Total
Charleston		51	17%
Coos Bay		129	43%
North Bend		18	6%
Eastside		2	1%
Coos Bay Area	200		67%
Rest of Coos County	26		9%
Curry County		4	1%
Douglas County		23	8%
Lane County		22	7%
Regional	49		16%
Rest of State	15		5%
Other States	9		3%
		299	100%

TABLE 9. Estimated Value at Fishermen's Level of Commercial Food Fish Landings, 1980

	Coos Bay	Oregon
Chinook	$ 1,567,000	$ 6,723,000
Coho	487,000	3,774,000
Crab	2,514,000	12,375,000
Shrimp	5,723,000	16,683,000
Albacore	389,000	2,746,000
Groundfish	2,322,000	11,601,000
Total	$13,098,000	$55,086,000

The economic impact generated by fish landing to the entire economy are greater than any other basic industry. The economic survival of many local firms, such as ship building and repair, machine shops,

marine electronics, and fuel suppliers are dependent upon commercial fishermen. The basic income multiplier (an index of the rate at which an industry contributes to new economic activity) for the fishing industry is 2.41 (Ebert, 1981). Given the value to fishermen, this yields a total dollar value to the community of $31,563,000, when it is circulated through the local economy.

Fishing Range

A fisherman's range of activity depends on many factors, and there are nearly as many activity strategies as there are fishermen. Each strategy is dependent on equipment (size of boat and electronic gear); smaller boats may be able only to safely and practically stay out for the day, while larger boats are free for longer and wider-ranging trips. Salmon fishing regulations have been highly variable over the years, and as a result, fishermen change their strategy from year to year. Depending on the opening and closing dates of each of the Pacific states, fishermen have traveled north or south for part or all of the season. Some fish in Northern California part of the year, while others travel to Alaska for the season.

The range of albacore fishing depends mainly on the location of the fish from year to year. Some Coos Bay fishermen have been known to travel as far as the Hawaiian Islands and Midway Island for albacore (Hall, 1981).

Groundfish and shrimp fishing generally ranges from Cape Blanco in the south to Cape Perpetua in the north. A few boats may range as far north as Tillamook Bay and south of Cape Blanco.

Transient boats are numerous in Coos Bay during the height of the season. Trollers may be following albacore runs, or salmon fishing seasons. Shrimpers and trawlers have been known to come from home ports as far away as South Bend, Washington. Because of dramatic fuel increases in the last several years, the trend has been to deliver fish to close ports, rather than transporting them back to home port. As a result, the number of transient deliveries in Coos Bay has recently been increasing.

Landscape Elements

Charleston clearly reflects its character as a fishing community. Vessel moorage, processing plants, receiving docks, marine-related businesses, boat building and repair facilities, and parking and storage areas are all functionally related to the fishing industry (Fig. 48). These facilities, along with the fleet dominate the visual landscape. Therefore, to understand the local landscape, I describe both the appearance and the functioning of the features related to the fishing industry.

The Fleet

Figure 48 shows the relatively large amount of area in Charleston devoted to mooring the fleet. The hodgepodge of boats is Charleston's most distinctive feature, and is a source of local pride and a significant tourist attraction. While a sizable portion of the vessels in the basin are recreational boats, a higher percentage of boats are commercial, and these tend to be larger and visually more dominant (Fig. 49).

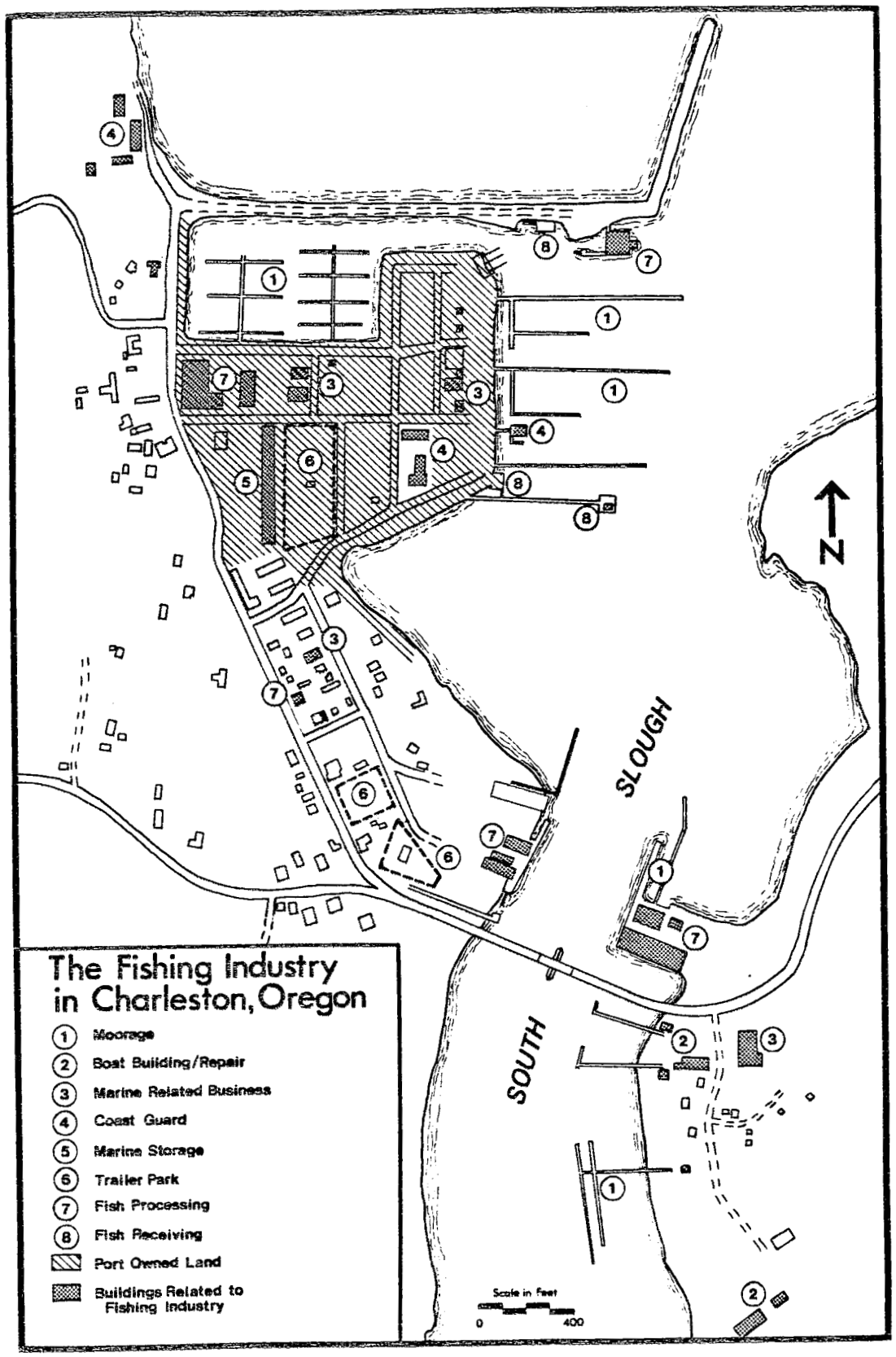

The Fishing Industry
in Charleston, Oregon
1 Moorage
2 Boat Building/Repair
3 Marine Related Business
4 Coast Guard
5 Marine Storage
6 Trailer Park
7 Fish Processing
8 Fish Receiving
Port Owned Land
Buildings Related to Fishing Industry
SLOUGH
SOUTH
N
Scale in Feet
0
400

FIGURE 48

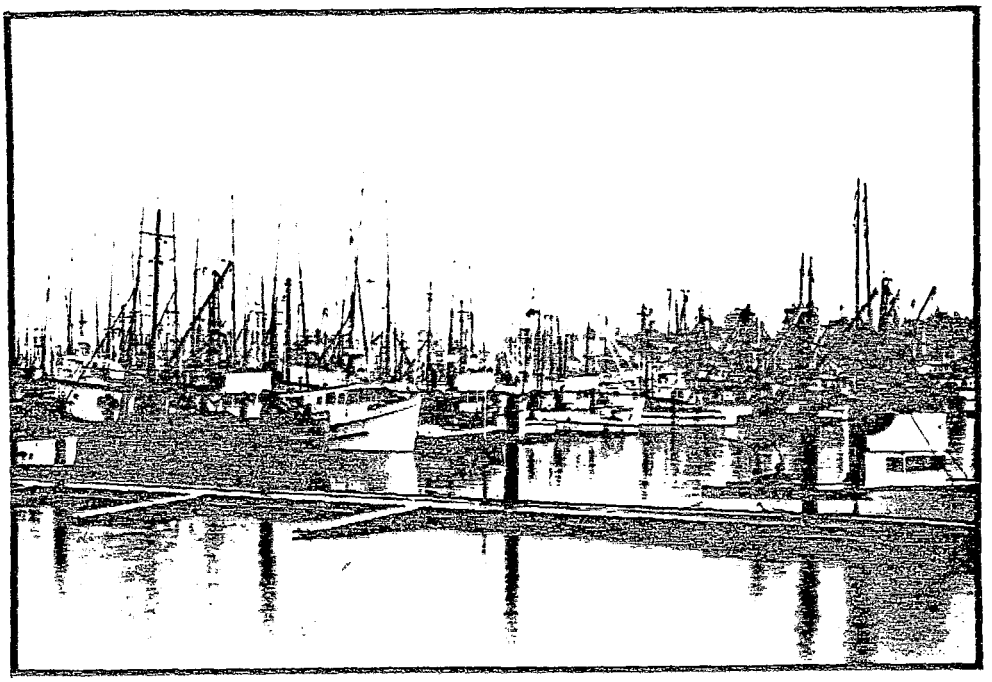


FIGURE 49. The Outer Basin

The fleet is in constant flux, because of daily and seasonal variation in the number of boats in port, and because of the evolution of its composition. As explained in Chapter Four, the fleet has continued to expand, with currently approximately 440 commercial vessels using Coos Bay as a home port. In addition, the overall size distribution of fishing boats is larger than ever before, and this trend is expected to continue (Table 10). Essentially, a commercial fishing basin can be viewed as a collection of individual "factories" each of which clearly reflects the prosperity of its owner. The more successful operations usually provide better maintenance for their boats, and these are brighter and healthier in appearance than boats which bespeak more marginal operations. Many of the trollers (as a group, older and smaller

than the rest of the fleet) display "for sale" signs, indicating the unhealthy state of the salmon fishing business.

TABLE 10. Configuration of Charleston Boat Basin Fleet, 1979

Foot Class	Commercial	Percent
20	5	2
21 - 25	40	13
26 - 30	56	18
31 - 35	59	19
36 - 40	60	20
41 - 45	23	7
46 - 50	26	9
50+	36	12
	305	100

Apart from the no-nonsense functional aspect of these "factories," each vessel embodies the hopes, dreams, and personality of its owner. The boats manifest this through individual features such as boat colors and boat names. White is a traditional color that seems to predominate, but boats painted this color are interspersed with boats from every shade of the rainbow. Generally speaking, newer, more modern boats are more often pained in the brighter shades, perhaps showing disregard for convention. Boat names are an especially direct reflection of individuality. Five categories predominate: referring to the poetic ("Kiwanda," "Windsong"), the adventurous ("Scimitar," "Wanderlust"), the humorous ("Ketch-22," "Catch-U-Later"), the exotic ("Tiki," "Quasar"), or the name of a special woman ("Shirley Dee," "Jennie K.").

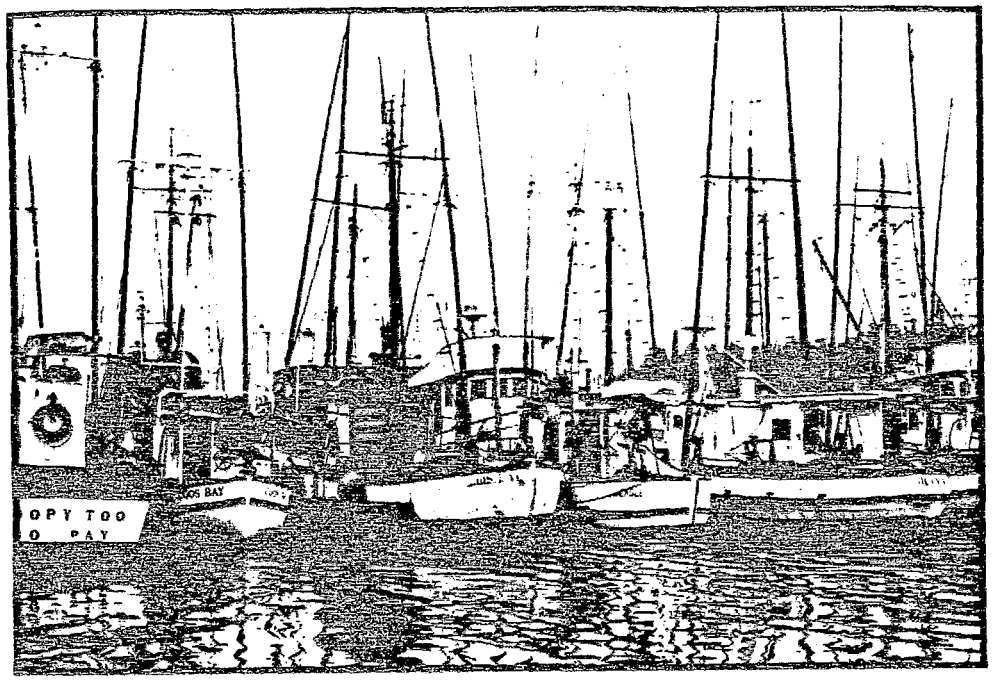


FIGURE 50. White is a Traditional Boat Color

It is the compact collection of all the individual personalities that gives the fleet its diversity. Perhaps it is in this sense that the fleet represents an idealized landscape; one which symbolizes a free life, a daily gamble, and the dream of private entrepreneurial success.

Moorage

Providers of moorage basically act as landlords for their tenants, the fleet. They sell not only physical space, but other services such as electricity, sewage and garbage disposal, and security protection. The bulk of the moorage in Charleston is in the Charleston Boat Basin, owned and operated by the Port of Coos Bay. Other moorage is provided by processors and private boat landings (see Fig. 48). The Port affects the appearance and operation of the basin in two ways: by its design of

the facilities, and by ordinances which affect the operation of boats using the basin.

Besides the public boat basin, moorage is found at two private docks in South Slough. One of these docks is adjacent to and operated by Peterson's Seafoods, which provides primarily temporary moorage for transients. The other facility, known as Hanson's Landing, provides moorage for 100-110 vessels, 60% of which are used by commercial vessels. An additional small amount of temporary moorage is provided by the Port in downtown Coos Bay (Table 11).

TABLE 11. Moorage Slips in Coos Bay

	Permanent			Seasonal/	
	Sport	Commercial	Total	Temporary	Total
Charleston Boat Basin	163	331	494	64	558
Hanson Boat Landing	24	36	60	40	100
Coos Bay Docks	9	9	18	5	23
Total	196	376	572	109	681

Moorage facilities consist basically of floating piers attached to piles. Smaller finger piers run at right angles to the main piers, forming individual "slips" for one or two boats. Fishermen are assigned slips by the harbormasters office, which attempts to appropriately match vessels with moorage spaces to maximize use of the area.

For a number of years, demand for moorage has exceeded supply. A 1980 waiting list for moorage spaces in the basin listed 99 requests for a space. This condition becomes especially apparent during the peak months of summer, when transients (many of whom would rather be per-

manently moored at Charleston) are "rafted" off the ends of the piers in threes and fours, and jockey for temporarily empty slips.

Activity in Charleston focuses on the basin. Especially during the peak months, the piers bustle with fishermen arriving and departing, making minor repairs to their boats, or preparing gear. They coexist, but do not interact much, with the tourists and recreational fishermen who come to the basin to gawk, take pictures, and fish from the pier. The larger boats tie to pilings over the opposite side of the main pier, so it is criss-crossed with ropes which pier-walkers must negotiate. Most transient fishermen, and some that are permanently moored there, live on their boats, so at night many of the vessel cabins are lit. During the winter months many fishermen leave a lighted bulb going in the cabin to keep the interior dry (Fig. 51)

FIGURE 51. A Pier in the Outer Basin

Processing Plants

Six processing plants and three receiving stations are presently located in Charleston (Fig. 48).

Before construction of the boat basin, the most desirable sites for processing plants were along the mouth of South Slough, which has channels deep enough for fishing vessels, and is close to the bar and yet protected from seas and swells coming through the entrance. Deep water access has been accomplished by building piers that extend from shore. Hallmark Fisheries and Peterson's Fisheries are now located here. Another plant adjacent to Hallmark's was destroyed by fire in 1979 and has not been rebuilt.

Construction of the boat basin provided several more sites with access to deep and protected water. Alaska Packers, located on the end of the protective jetty north of the basin, uses one of these sites. Three other sites are used as receiving docks for fish that is processed elsewhere.

The two most recently built plants in Charleston are set back from the water, evidently because no property with deep water access was functionally, politically, and economically available. Both facilities process fish trucked from other sites.

One processing plant and three receiving stations are located up the bay on the waterfront near Empire. The Port of Coos Bay also operates a receiving dock on North Spit that can accommodate vessels over 90 feet long which have too deep a draft for the channels at Charleston.

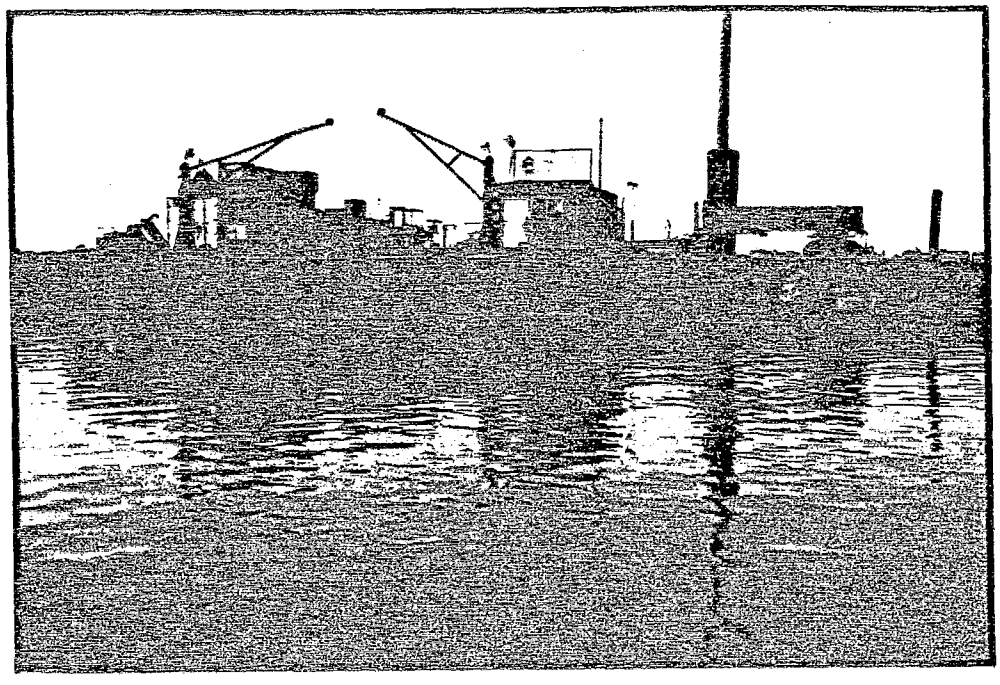


FIGURE 52. A Fish Receiving Dock

Design of the shoreside plants is straightforward, with the following general characteristics: a dock built on pilings which affords a flat working space and deep water access; unloading booms and conveyors which bring the product onto the wharf for handling by fork lifts; a building shell (sometimes partially standing on the wharf) which houses processing machinery, filleting and picking tables, and cold storage. The landward side of a plant sometimes has shipping docks designed for large trucks.

Early plants such as Hallmark Fisheries (Fig. 53) are constructed with wood, using posts, beams, and wood siding. More recently, plants have been constructed from prefabricated metal or use balloon framing with plywood siding. The plant constructed in 1979 by Charter Ocean

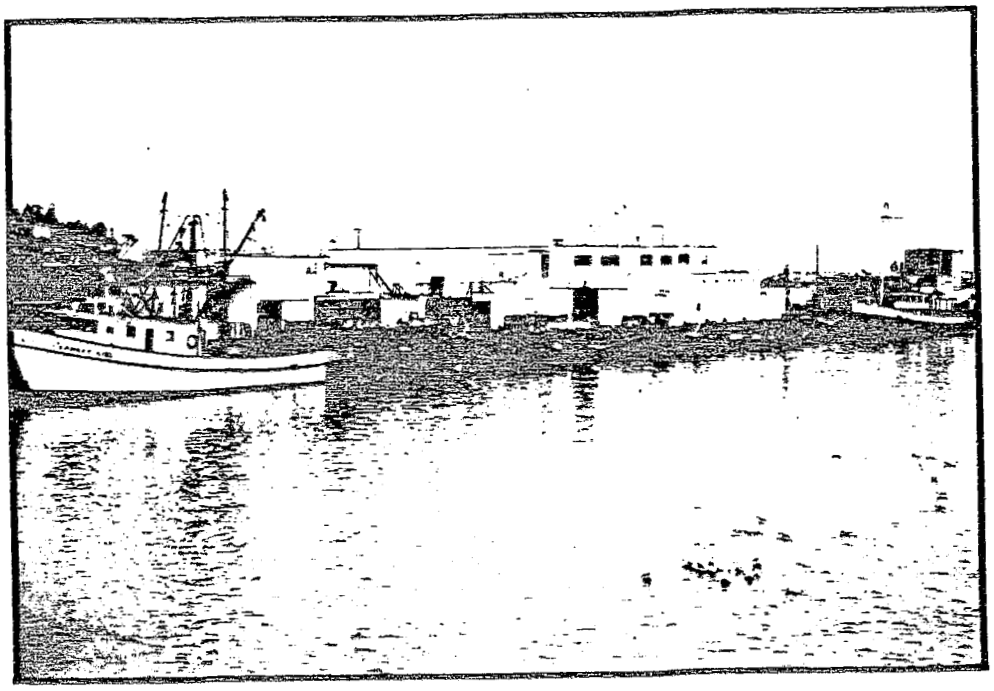


FIGURE 53. Hallmark Fisheries

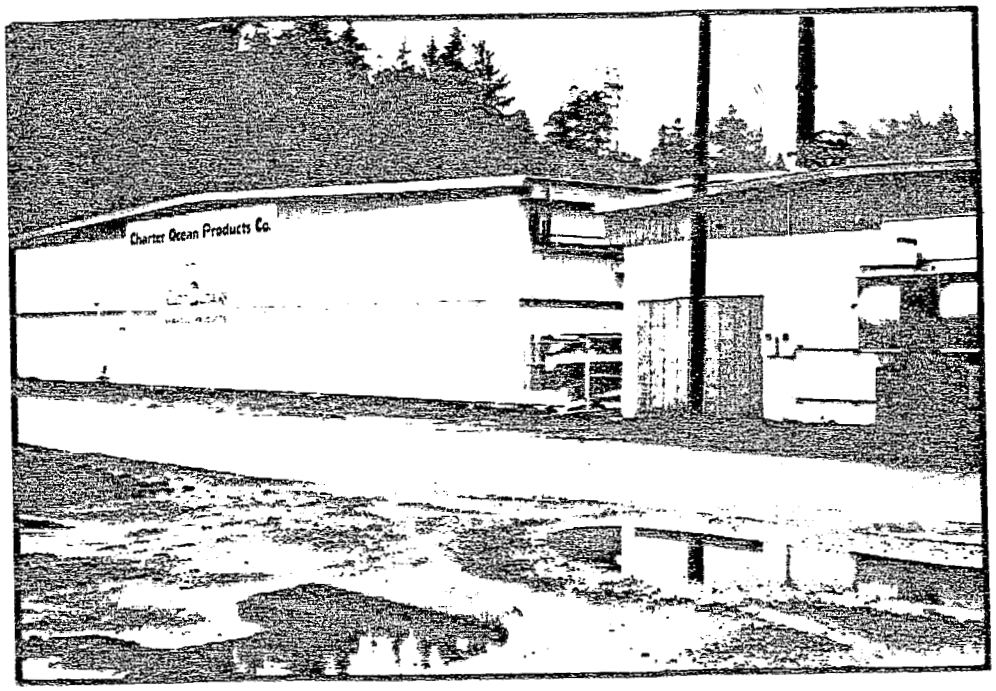


FIGURE 54. Charter Ocean Products

Products, for instance, is similar in appearance to any number of modern industrial facilities found throughout the country (Fig. 54).

Besides selling their fish, fishermen can take on fuel, ice, and buy bait. Processors typically use enticements such as showers, washing machines, and free beer, to lure fishermen to their docks.

Not all the plants process all types of fish at any given time. Whether or not a firm decides to process a particular species is an individual business decision based on complex economic factors, though naturally the plants as a group respond to seasonal cycles in fishing activity. In general, the most active time of year for processors is early summer, when fish landings peak. Coos County fish processing employment is currently estimated to range from 340 to 615 people through the season (Ebert, 1981). However, this seasonality is changing. Increased emphasis on groundfish which are caught year-round, and cold storage facilities help to levelize production throughout the year.

A portion of all the major species landed locally is exported in unprocessed form. Several dealers, including those who operate receiving docks and some processors, buy whole fish and transport it as far as Sacramento, California and Vancouver, B.C. for processing.

Boat Building and Repair Facilities

Building and repair facilities for fishing vessels first came into operation in the years immediately after World War II, in response to the expansion of the fishing industry in the bay. They eventually be-

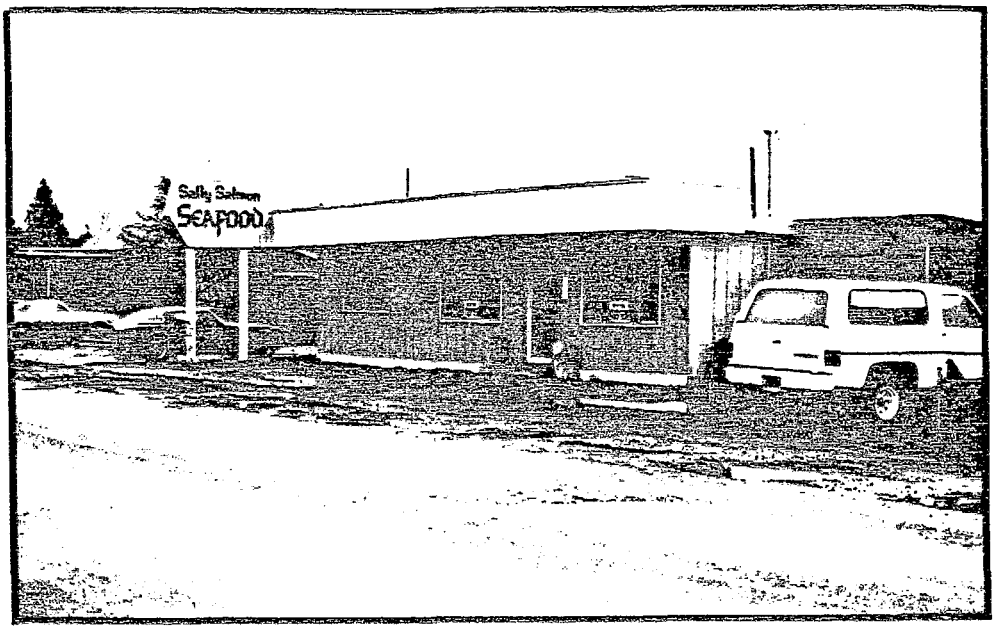


FIGURE 55. A Processing Plant with Retail Outlet

came established across South Slough from Charleston in Barview where these activities still take place.

Boat repair facilities are necessarily adjacent to the water so boats can be pulled out on "ways," as illustrated in Figure 56.

The major commercial boat building enterprises in Charleston are built close to the water, but many smaller individual boats are built in backyard operations located throughout Charleston and elsewhere throughout the Coos Bay area. Access to a boat launching ramp is a key factor in the location of these facilities, especially for large boats which are subject to roadway size restrictions.

The facilities found in Barview consist of large structures housing vessels, and construction and repair equipment. A large collection of vessels in various stages of construction and repair are also stored outside, along with miscellaneous equipment (Fig. 57).

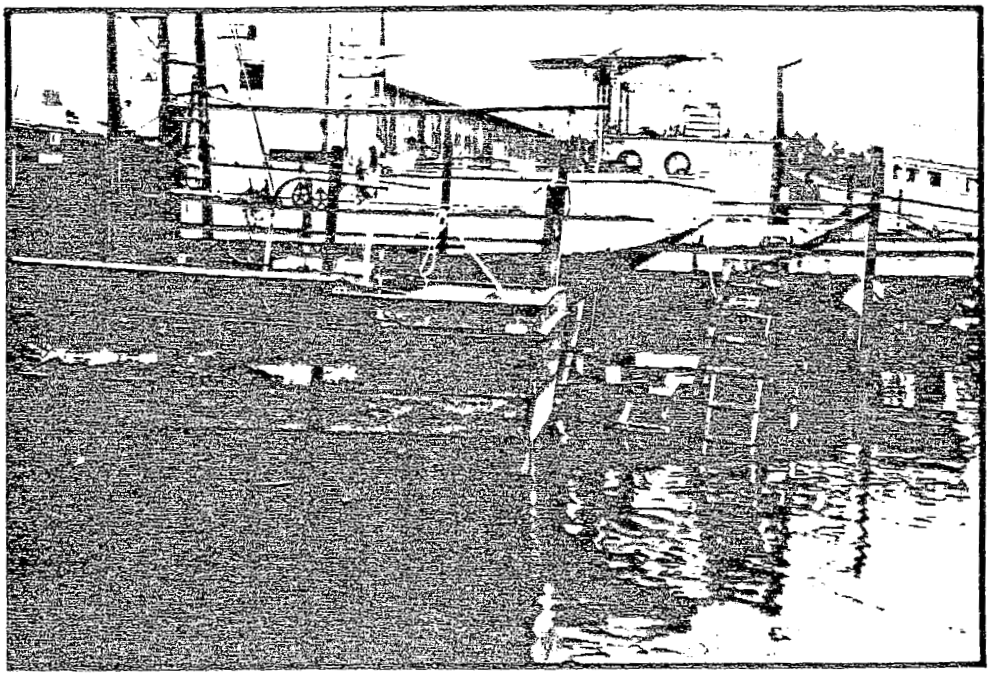


FIGURE 56. Boat Ways

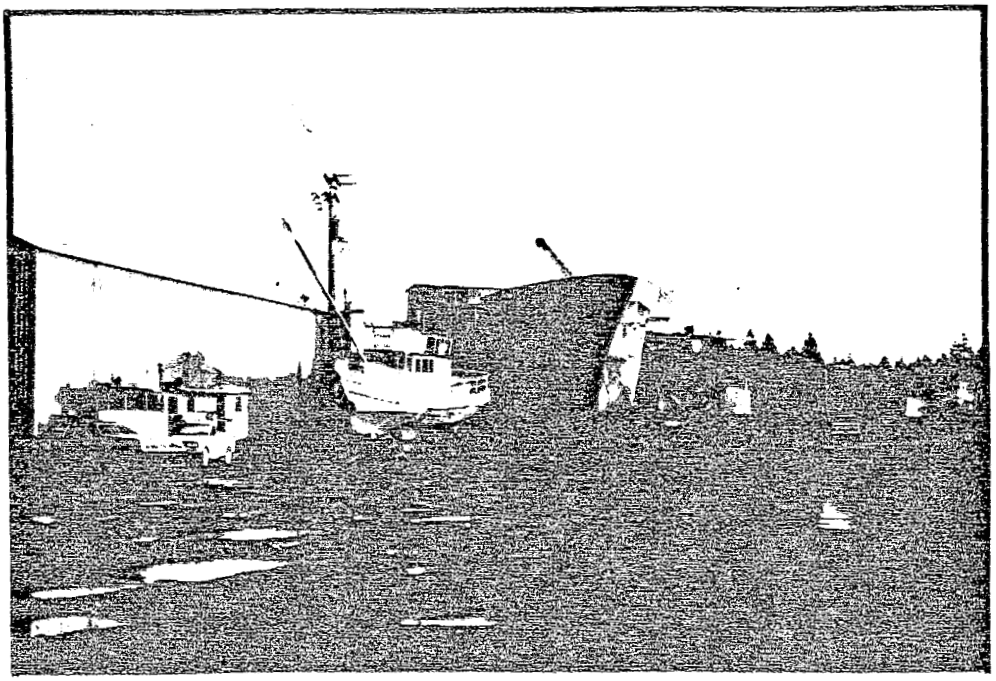


FIGURE 57. Boat Building Facilities at Barview

Marine-Related Business

Not surprisingly, the major concentration of businesses that serve commercial fishing operations is located in the Charleston area. They include dealers in marine electronics, marine hardware, marine engines, and nets. Many of these dealers serve recreational boats as well. For the most part, they are housed in buildings that are of fairly conventional design; many are constructed from prefabricated metal (Fig. 58).

Parking and Storage

Large areas of the Port's basin property are devoted to parking and storage facilities. Commercial fishermen use these areas for long- and short-term auto parking, and for temporarily storing gear such as crab

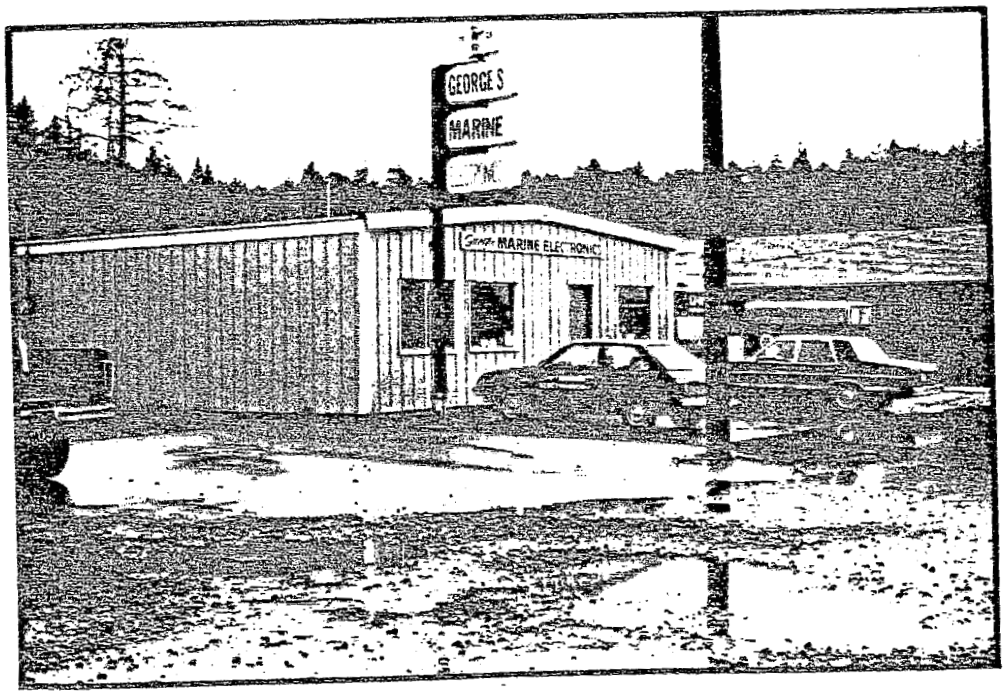


FIGURE 58. A Local Business Serving Fishermen

pots. A good portion of the area is used by recreational boaters for auto and boat trailer parking. One large boat storage garage that houses vessels is operated by the Port.

Other Facilities

A variety of public institutions directly serve the fishing industry, and many of these are physically located within close proximity to their constituents. The basin's manager's office, public showers, and restrooms, all operated by the Port, are directly adjacent to the outer basin. The U.S. Coast Guard has moorage facilities located in the outer basin and service quarters located on Port property (Fig. 59). The State of Oregon has a field office of the Department of Fish and Wildlife adjacent to the inner basin on its west side.

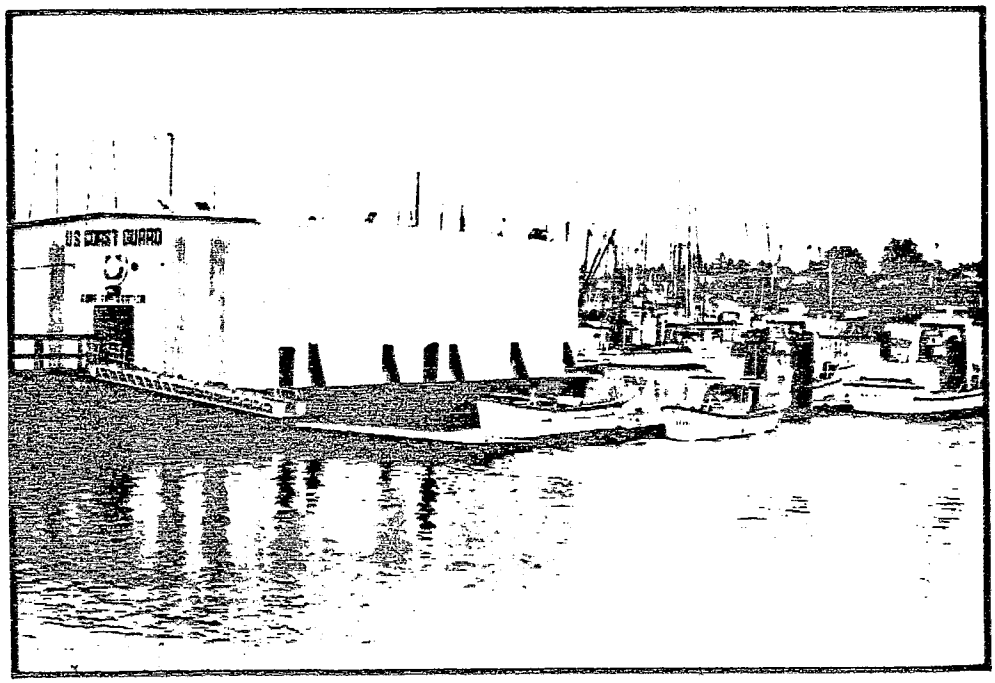


FIGURE 59. The Coast Guard Houses Vessels Ready for Rescue Work

Three trailer and recreational vehicle parks in the local area (Fig. 48) serve fishermen who live in Charleston on a seasonal basis, although some fishermen live in them year-round.

The Landscape of Charleston

The landscape of Charleston owes a great deal to America, the West, and Oregon--but it is the elements associated with the local fishing industry that are super-imposed over the generic elements of the above three that gives rise to the distinctiveness of the local scene. Gordon Hewes has noted that:

> In a literal sense, fairly homogeneous aquatic environments may cut across widely differing terrestrial environments or life zones, thus unifying one sector of the economic lives of people who inhabit otherwise diverse territories. . . . In the same way, the littoral zones of continents . . . tend to make similar the fishing activities of coastal peoples in spite of greatly differing hinterland economics (Hewes, 1948: 240-241).

Consequently, the landscape of Charleston may have more in common with other fishing ports up and down the coast, than it does with other communities in Oregon, or even other communities in the Coos Bay area.

It should be reiterated at this point that even though aquatic environments are relatively more uniform latitudinally than their terrestrial counterparts, variation does exist in aquatic habitats and resource productivity, as explained in Chapter Three. Thus the pattern of exploitation that has developed through the local fishing industry, coupled with Charleston's unique physical setting, has served to make Charleston's fishing landscape unique. Nonetheless, its morphology is similar in many respects to other Pacific fishing ports.

The two most significant physical determinants that functionally relate to the shoreside fishing industry are proximity to deep water and flat surfaces (on land or water) for work areas. Both of these are available in Charleston, although much of it has been artificially created by filling or by pilings.

The Port's filled area, though not Charleston's most visually distinctive feature, has made possible most of the other elements which make up the local fishing industry. To the observer, the area is obviously man-made, annexed to the original shoreline. The sensation of relative newness is pervasive. All structures built upon it are less than 20 years old, most less than 10 years old. Open areas are barren, largely because of the sterility of the fill material, and the Port's desire to maintain them for parking.

Other smaller fills have been made in the Charleston area, the most notable being the property on which Peterson's Fisheries is located. This fill, along with pilings that extend out into the water, gives the processor the necessary deep water access. Pilings such as these are a distinctive landscape feature found throughout Charleston (Fig. 60).

Charleston is relatively small in areal extent, so that all facilities that serve fishermen are within walking distance, an important circumstance, since transient fishermen have no access to transportation by auto. This "convenience" factor is especially evident in the location of showers, restrooms, a cafe, and a bar, all of which are within 100 yards of the boat basin, and which cater primarily to fishermen.

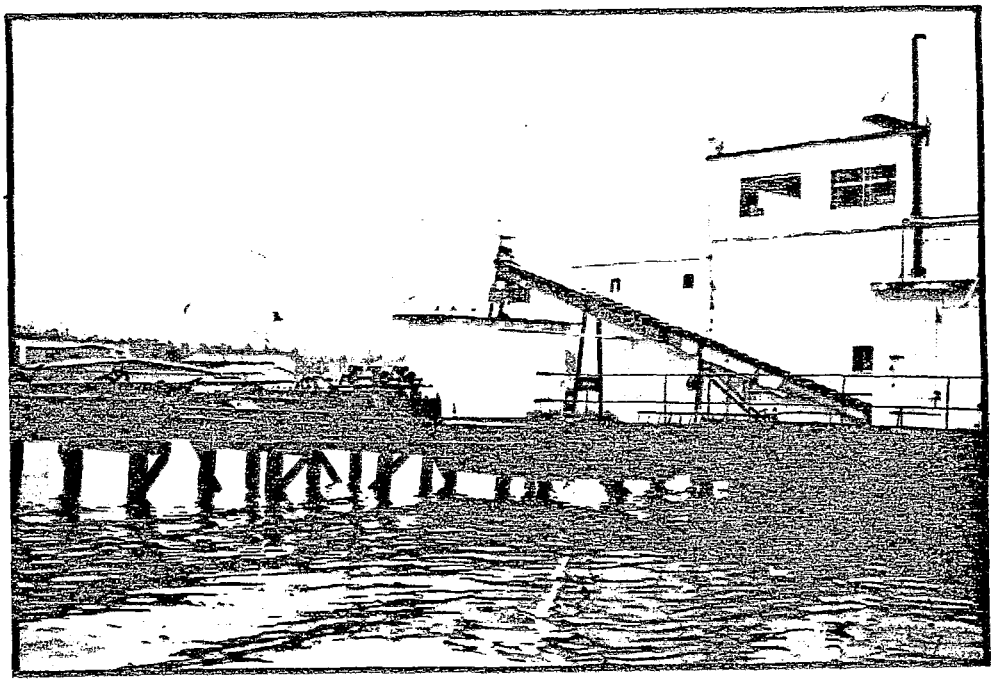


FIGURE 60. Pilings, Shown at High Tide

Because the fishing industry is given to booms and busts, the economic structure built upon it has at times been unstable. In Charleston, this has led to numerous openings, closings, and ownership changes of associated businesses. As a result, the community is replete with relic structures that have long since seen their prime. Many of these are no longer in use (Fig. 61). In addition, the marginal character of some operating businesses has produced several buildings that have fallen into various stages of disrepair. Some businesses further that image by harboring junk and relic machinery. Because of the shortage of moorage, most relic vessels are stored on land, and these can be seen throughout the community (Fig. 62). The industrial

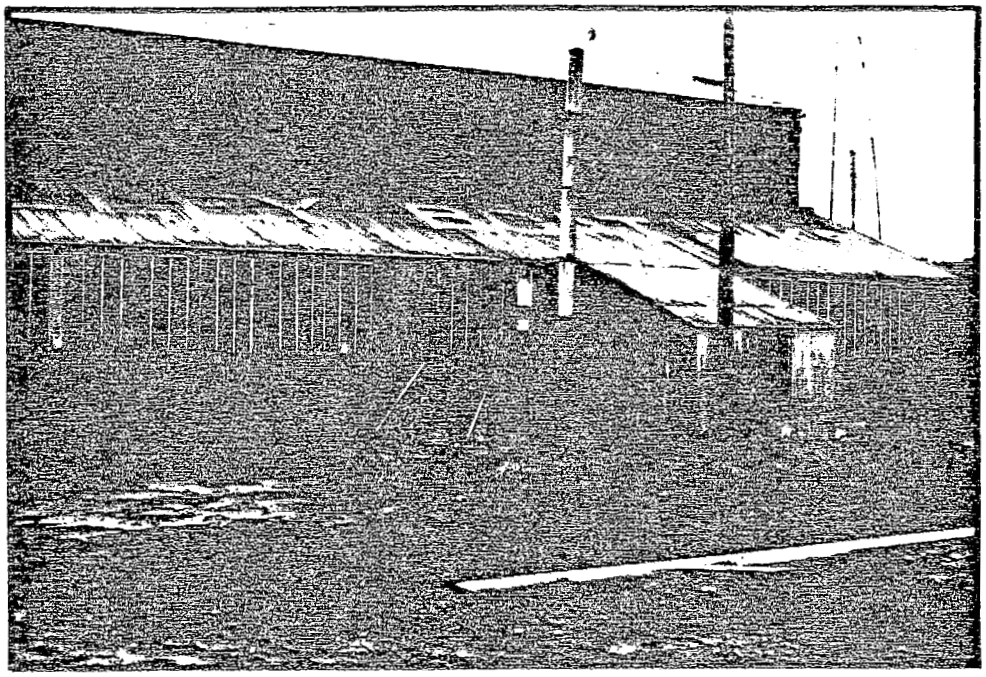


FIGURE 61. A Relic Structure, Originally a Boat Works

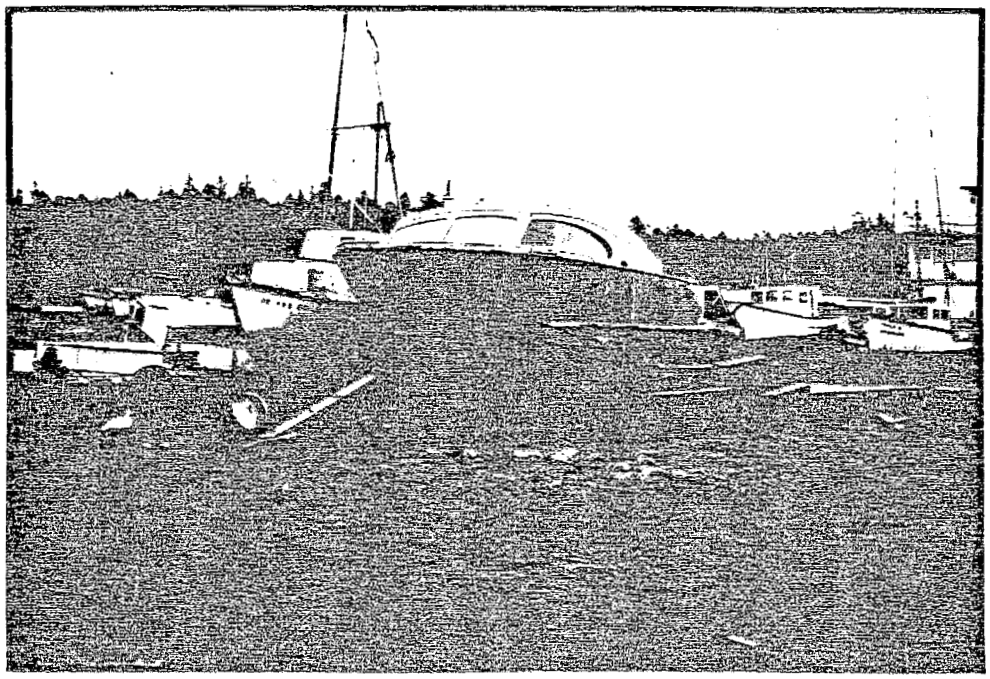


FIGURE 62. Relic Vessels, Seen Throughout the Community

nature of much of the fishing operation has resulted in a lot of marine-related equipment and parts lying around the processing and moorage areas. With the salt-air environment, rust has taken its toll on much of it (Fig. 63).

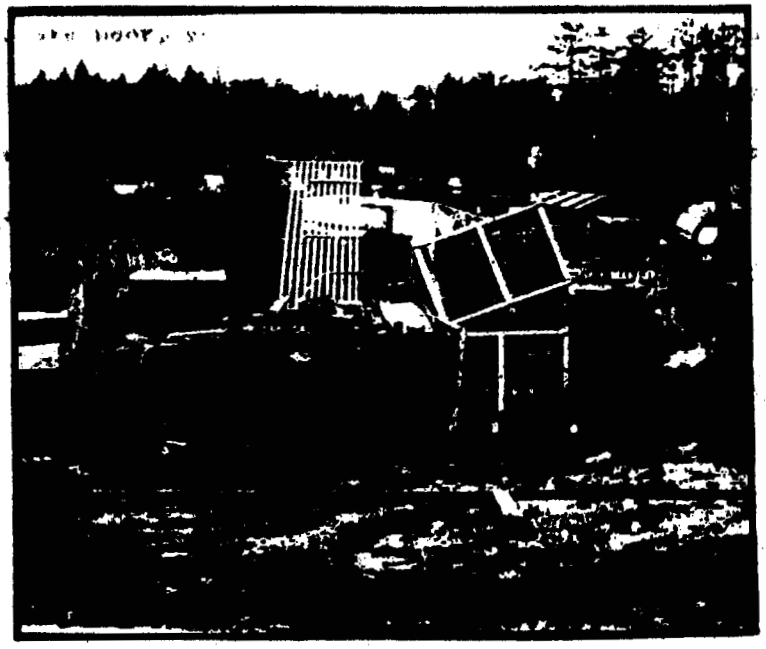


FIGURE 63. Derelict Fishing Equipment

Finally, a significant portion of the morphology of the local scene comes from the water. A great deal of the built environment in Charleston is either built over it or floats upon it. Fluctuations in water level from tidal influence cause a constant change in the exposure of much of the waterfront landscape, including tidal flats, pilings, and rip-rap. Those items which float are subject to continual vertical and horizontal movement from tides, currents, and waves. Consequently,

piers and vessels are relatively unstable work platforms, making waterfront activities more difficult and unpredictable than land based operations.

Why is a seaside community such as Charleston such a persistently attractive place? Several scholars single out coastal environments as being particularly appealing to humans. "Fishing communities in the modern world are poor, generally speaking, when compared with farming communities in the interior; and if they endure it is less for the economic rewards than for the satisfaction to be got out of an ancient and lore-drenched way of life" (Tuan, 1974:116). This "way of life" lends a great deal to the persistent appeal of Charleston. The daily life of the fishermen is inextricably tied to the morphology of the port.

Each morning throughout the year, a number of fishermen gather in the local cafe at the boat basin to decide on the day's fishing. They assess the weather, bar conditions, market prices, and fishing conditions, then weigh these factors against the condition of their boat and their financial situation. The daily gathering also gives the fishermen a chance to socialize and to find out about the latest good fishing areas and what fishing technique is working best.

Fishing involves a lot of waiting. As often as not, especially during the off-season, conditions are not right for the fisherman to risk his time, money, and safety, so he goes home leaving his boat docked in the harbor, ready for another day. Fishermen get as much fishing in as they can when the "gettin's good." Consequently, fishing activity occurs in spurts. Naturally, good weather means lots of

activity. On those days, boats are seen in the channel coming and going, and receiving docks are busy unloading fish; at times boats are backed up waiting their turn.

Thus, the functioning of the fishing landscape lends to its appeal; the activity of fishermen in the port gives a glimpse of the adventure of the sea to the land-locked viewer. But apart from its functioning, the local landscape has an aesthetic quality which is more difficult to define.

One of the most striking elements of Charleston's landscape is its smell. "Odor has the power to evoke vivid, emotionally-charged memories of past events and scenes. . . . We cannot recapture fully the essential feel of a visual world belonging to our past without the help of a sensory experience that has not changed . . ." (Tuan, 1974:10). As the farmer who grows comfortable with the smell of his cow barn, so the fisherman and local resident feels at home with the heady mixture of salt air, diesel, and fish parts. When the tide is low, the smell of decaying vegetation on the flats blends in. To returning visitors, the first whiff of these combinations can conjure a host of mixed emotions and remembrances.

But perhaps the most powerful impressions come from Charleston's visual impact. On this, Tuan has noted: "When we look at a landscape and see a church spire at the end of a tree-lined road, our eyes have automatically combined visual data to form a stereoscopic image, and our mind has integrated with little conscious effort, diverse clues and experiences to give rich meaning to that image" (Tuan, 1979:96). The boat basin's visual appeal to a wide audience is immediately apparent;

next to sunsets, it is perhaps the most photographed scene in the local area. Evidently, the composition of the fleet in terms of the language of art (its color, texture, mass, line, position, symmetry, balance, tension) (Meinig, 1979:46) strikes a responsive, personal chord in many who experience it.

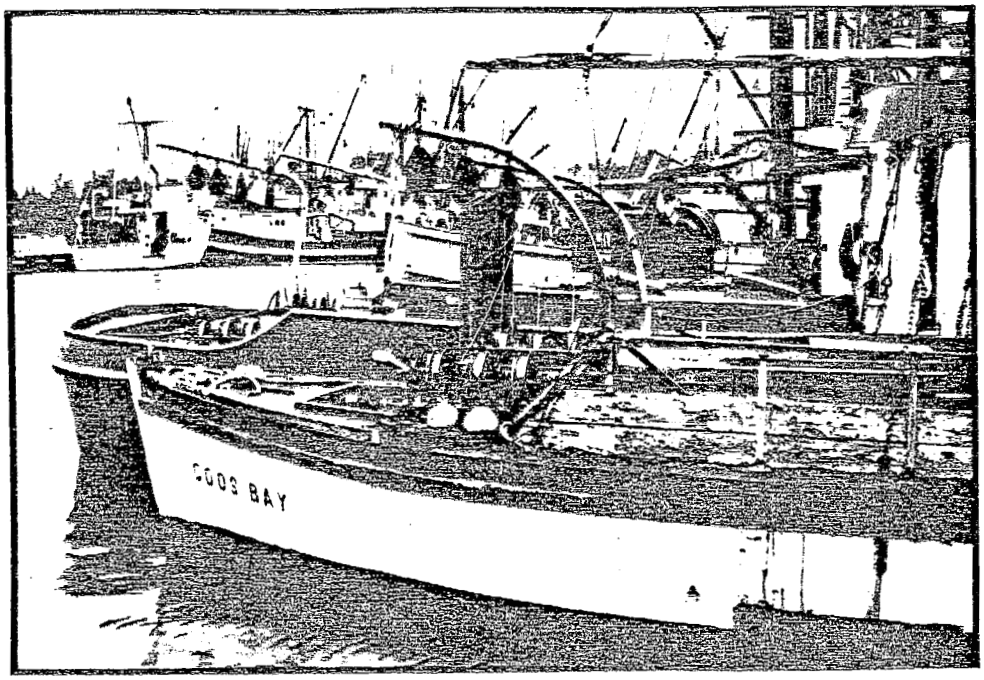


FIGURE 64. Boat Basin Scene

CHAPTER SIX

SUMMARY

The establishment of commercial fisheries in Coos Bay occurred in a context of fisheries development throughout the Northwest. Salmon fishing activity began in the 1860s on the West Coast in rivers and estuaries that showed significant salmon runs. Commercial salmon fishing in Coos Bay was initiated at a relatively late date (1880s) and its early development was modest. Other streams on the south coast of Oregon, especially the Rogue River, were more important centers of fishing activity than Coos Bay in the early days. The Rogue, for instance, had substantial fall and spring runs of salmon which enabled productive gillnetting activity. The smaller runs at Coos Bay simply could not support as large a fishery. Early development of the fishery at Coos Bay was also hindered by the area's isolation. Transportation was available only by sea, and this was unpredictable because of bar conditions.

It was not until the development of offshore fishing that Coos Bay emerged as a significant node of activity. Offshore fishing was made possible by a number of changing conditions, including the development of a suitable boat, improvements to the harbor entrance, and expansion of markets which were generated by better preserving methods and improved transportation. By 1920, offshore trolling was a well established activity in the local area. This led to what was perhaps the

major transition in the fishing landscape of the bay. Fairly suddenly the estuary was seen as a fishing harbor rather than as a fishing ground. The growth of the local fishing industry in the community of Charleston, located close to the harbor entrance, clearly reflected the new view.

Diversification after the late 1930s brought new problems and prospects. Fishermen became less dependent on the local resource. As the trollers' range expanded they became increasingly dependent on fish from other streams. In addition, access to a greater diversity of species offshore gave the local fishery increased stability. Consequently, even with the booms and busts which have occurred with particular species, the local fishery has maintained relatively steady growth. These characteristics are manifested in the local landscape with a unique accumulation of old and new elements.

Some local landscape features are remnants of activities no longer practiced at their peak levels. A notable example is the abandoned trollers locally evident. However, these features are largely obscured by the general health and diversity of contemporary activity.

A large part of the contemporary landscape in Charleston results from a conscious effort of public bodies, especially the Port of Coos Bay, which stresses economic development. Alterations of the environment, primarily through the placement of fill material to create additional flat ground and deep water access, have made possible the location of much of the local fishing industry. Future alteration of the shoreline for industrial purposes will be weighed heavily against the loss of estuarine productivity. Consequently, lack of additional space

may preclude Charleston from further industrialization. Any substantial growth in the local fishing industry will most likely occur on North Spit or elsewhere on the bay.

BIBLIOGRAPHY

Biere, R. "Pelagic Distribution." Encyclopedia of Oceanography, R. W. Fairbridge, Ed. New York: Reinholt Publishing, 1966.

Browning, R. F. Fisheries of the North Pacific. Anchorage, Alaska: Alaska Northwest Publishing Co., 1974.

Bruneau, C. "The 1979 Oregon Shrimp Fishing." Information Report 1980-81. Salem, Oregon: Oregon Department of Fish and Wildlife, 1980.

Carter, C. N. Multifishery Activity in Oregon Commercial Fleets: An Economic Analysis of Short-run Decision-making Behavior. Unpublished Ph.D. Dissertation, Oregon State University, 1981.

Cleaver, F. C. Fisheries Statistics of Oregon. Contribution No. 16. Portland, Oregon: Oregon Fish Commission, 1951.

Cobb, J. N. Pacific Salmon Fisheries, 4th ed. U.S. Bureau of Fisheries, Document 1092. Washington, D.C.: U.S. Government Printing Office, 1930.

Coos Bay Times. "Southwestern Oregon . . . A Seven League Giant." Coos Bay, Oregon, 1942.

Coos-Curry Council of Governments. Draft Coquille Estuary Plan. North Bend, Oregon, 1980.

Damron, J. E. The Emergence of Salmon Trolling on the American Northwest Coast: A Maritime Historical Geography. Unpublished Ph.D. Dissertation, University of Oregon, 1975.

Dodge, O. Pioneer History of Coos and Curry Counties, Oregon. Salem, Oregon, 1898.

Ebert, F. M., R. P. Adams, & J. Dills. North Bay Marine Industrial Park Environmental Impact Statement. Portland, Oregon: U.S. Army Engineer District, 1982.

Fairbridge, R. W. Encyclopedia of Oceanography. New York: Reinholt Publishing Co., 1966.

Feller, Charles Inc. Coos Bay Salmon. Coos Bay, Oregon, n.d.

Food and Agriculture Organization of the United Nations. Atlas of the Living Resources of the Seas. Rome, 1972.

Gharrett, J. T. & J. I. Hodges. Salmon Fisheries of the Coastal Rivers of Oregon South of the Columbia. Portland, Oregon: Oregon Fish Commission, Contribution No. 13, 1950.

Harry, G. Y. "The Pilchard Situation in Oregon." Fish Commission Research Briefs, Vo. 2, no. 1. Portland, Oregon: Fish Commission of Oregon, 1949.

Harry, G. Y. & A. R. Morgan. "History of the Oregon Trawl Fishery, 1884-1961." Fish Commission Research Briefs, Vol. 9, no. 1. Portland, Oregon: Fish Commission of Oregon, 1963.

Hall, Leonard, retired fisherman. Personal interview, January 1982.

Hayden, M. V. History of the Salmon Industry in Oregon. Unpublished Master's Thesis, University of Oregon, 1930.

Hewes, G. W. "The Rubric 'Fishing and Fisheries.'" American Anthropologist, Vol. 50, 1948.

Hewes, G. W. Aboriginal Use of Fishing Resources in Northwestern North America. Ph.D. Dissertation, University of California, Berkeley, 1947.

Hosie, Michael, Oregon Department of Fish and Wildlife. Personal interview, January 1982.

International North Pacific Fisheries Commission. Salmon of the North Pacific Ocean, Vols. I-IX. Vancouver, B.C.: 1976-81.

Jones, W. G. & G. Y. Harry. "The Oregon Trawl Fishery for Mink Food--1948-1957." Fish Commission Research Briefs, Vol. 8, no. 1. Portland, Oregon: 1961.

Kulm, L. D. "Morphology and Geology of the Ocean Bottom--The Oregon Region." The Marine Plant Biomass of the Pacific Northwest Coast, R. W. Krauss (ed.). Corvallis, Oregon: Oregon State University Press, 1977.

Loeffel, R. E. & H. O. Wendler. "Review of the Pacific Coast Chinook and Coho Salmon Resources with Special Emphasis on the Troll Fishery." Reports by the United States and Canada on the Oregon Mitration and Exploitation of Northeast Pacific Stocks of Chinook and Coho Salmon, to 1964. Informal Committee on Chinook and Coho, 1969.

Loy, W. G. Atlas of Oregon. Eugene, Oregon: University of Oregon Books, 1976.

Lukas, J. "1978 Oregon Shrimp Fishery." Informational Report 79-1. Portland, Oregon: Oregon Department of Fish and Wildlife, 1979.

Major, R. L. "Distribution and Origin of Chinook (Onchorynchus tshawtscha in Offshore Waters of the North Pacific Ocean." International North Pacific Fisheries Commission Bulletin No. 38. Vancouver, B.C.: 1978.

Manzer, J. I., et al. "Offshore Distribution of Salmon." Bulletin No. 15. Vancouver, B.C.: International North Pacific Fisheries Commission, 1965.

Marshfield Sun. Special Edition, January 1901. Marshfield, Oregon: Sun Publishing Co., 1901.

McNeil, W. J. & J. E. Bailey. Salmon Ranchers Manual. Seattle, Washington: Northwest Fisheries Center, National Marine Fisheries Service, 1975.

Meinig, D. W. "The Beholding Eye." The Interpretation of Ordinary Landscapes, D. W. Meinig (ed.). New York: Oxford University Press, 1979.

Morgan, A. R. & A. R. Gerlach. Striped Bass Studies on Coos Bay, Oregon in 1949 and 1950. Contribution No. 14. Portland, Oregon: Oregon Fish Commission, 1950.

Oregon Department of Fish and Wildlife. Unpublished commercial food fish landings. Portland, Oregon, 1975-1980.

Oregon Department of Fish and Wildlife. Unpublished table, "1980 Oregon Troll Salmon Lessel Catch Distribution." Portland, Oregon: 1981.

Oregon Fish and Game Protector. Annual Reports, First-Sixth. Salem, Oregon, 1893-1898.

Oregon Fish Commission. Unpublished commercial food fish landings. Portland, Oregon, 1953-1974.

Oregon Fish Commission. Report on the Pilchard Fishery of Oregon. Portland, Oregon: 1938.

Oregon State Board of Fish Commissioners. Annual Reports, First-Sixth. Salmon, Oregon: 1887-1892.

Pacific Fisherman Yearbook, 1913-1923. Seattle, Washington.

Percy, K. L., et al. Descriptions and Information Sources for Oregon Estuaries. Sea Grant College Program. Corvallis, Oregon: Oregon State University, 1974.

Peterson, E. & A. Powers. A Century of Coos and Curry. Coquille, Oregon: Coos-Curry Pioneer and Historical Association, 1952.

Poggie, J. J. & C. Gersuny. Fishermen of Galilee: The Human Ecology of a New England Coastal Community. Sea Grant, University of Rhode Island Marine Bulletin Series No. 17. Kingston, Rhode Island: 1974.

Polk, R. L. Coos County Directory 1907-08. Portland, Oregon: 1907.

Ronholt, L. L. & A. R. Magill. "Biological Observations and Results of the 1960 John N. Cobb Exploratory Shrimp Cruise Off the Central Oregon Coast." Fish Commission Research Briefs, Vol. 8, no. 1. Portland, Oregon: Fish Commission of Oregon, 1961.

Saelens, M., et al. "1980 Oregon Shrimp Fishery." Informational Report 81-1. Portland, Oregon: Oregon Department of Fish and Wildlife, 81-1.

Schroeder, D. F. Some Effects of European Beachgrass Ammophila Arenaria (L.) Link, in the Oregon Dunes National Recreation Area. Unpublished Master's Thesis, University of Oregon, 1978.

Shalk, R. F. Foragers of Northwest Coast of North America: The Ecology of Aboriginal Land Use Systems. Unpublished Ph.D. Dissertation, University of Arizona, 1978.

Shalk, R. F. "The Structure of an Anadromous Fish Resource." For Theory Building in Archeology, L. Binford (ed.). New York: 1977.

Smith, C. L. Fish or Cut Bait. Sea Grant. Corvallis, Oregon: Oregon State University, 1977.

Smith, H. S. Fisheries Statistics of Oregon, 1950-1953. Contribution No. 22. Portland, Oregon: Oregon Fish Commission, 1956.

Spurlock, C. History of the Salmon Fishing Industry in Oregon. Unpublished Master's Thesis, University of Oregon, 1939.

Thompson, K. E. & D. Snow. Fish and Wildlife Resources--Oregon Coastal Zone. Newport, Oregon: Oregon Coastal Conservation and Development Commission, 1974.

Tollefson, R., et al. A Summary of Fishery Statistics of the Pacific Coast. Northwest Pulp and Paper Association, 1959.

Tuan, Yi Fu. "Thoughts and Landscape--The Eye and the Minds Eye." In The Interpretation of Ordinary Landscapes, D. W. Meining (ed.). New York: Oxford University Press, 1979.

Tuan, Yi Fu. Topophilia A Study of Environmental Perception, Attitudes and Values. Englewood Cliffs, New Jersey: Prentice-Hall, 1974.

U.S. Army Engineer District. Charleston Breakwaters Extension and Grain Structure Environmental Impact Statement Supplement No. 1. Portland, Oregon: 1979.

U.S. Coast and Geodetic Survey. Coos Bay, Oregon Navigation Chart, 1890.

U.S. Coast and Geodetic Survey. Coos Bay, Oregon Navigation Chart, 1892.

U.S. Coast and Geodetic Survey. Coos Bay, Oregon Navigation Chart, 1894.

U.S. Coast and Geodetic Survey. Coos Bay, Oregon Navigation Chart, 1933.

Van Hyning, J. M. The Ocean Salmon Troll Fishery of Oregon. Oregon Fish Commission Contribution No. 15. Portland, Oregon: Oregon Fish Commission, 1951.

Waldron, K. D. The Fishery and Biology of the Dungeness Crab (Cancer Magister Dana) in Oregon Waters. Oregon Fish Commission Contribution No. 24. Portland, Oregon: Oregon Fish Commission, 1958.

Wilkes, C. Narrative of the United States Exploring Expedition, Vol. IV. Philadelphia, PA: Lea and Blanchard, 1845.

Zirges, M. H. & J. G. Robinson. "The Oregon Pink Shrimp Fishery, Management History and Research Activities." Informational Report 80-1. Portland, Oregon: Oregon Department of Fish and Wildlife, 1980.