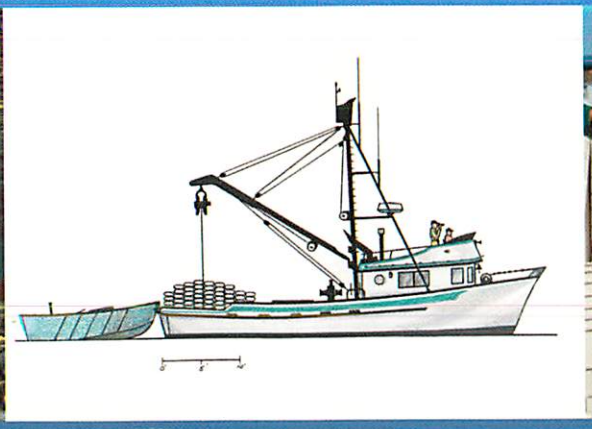
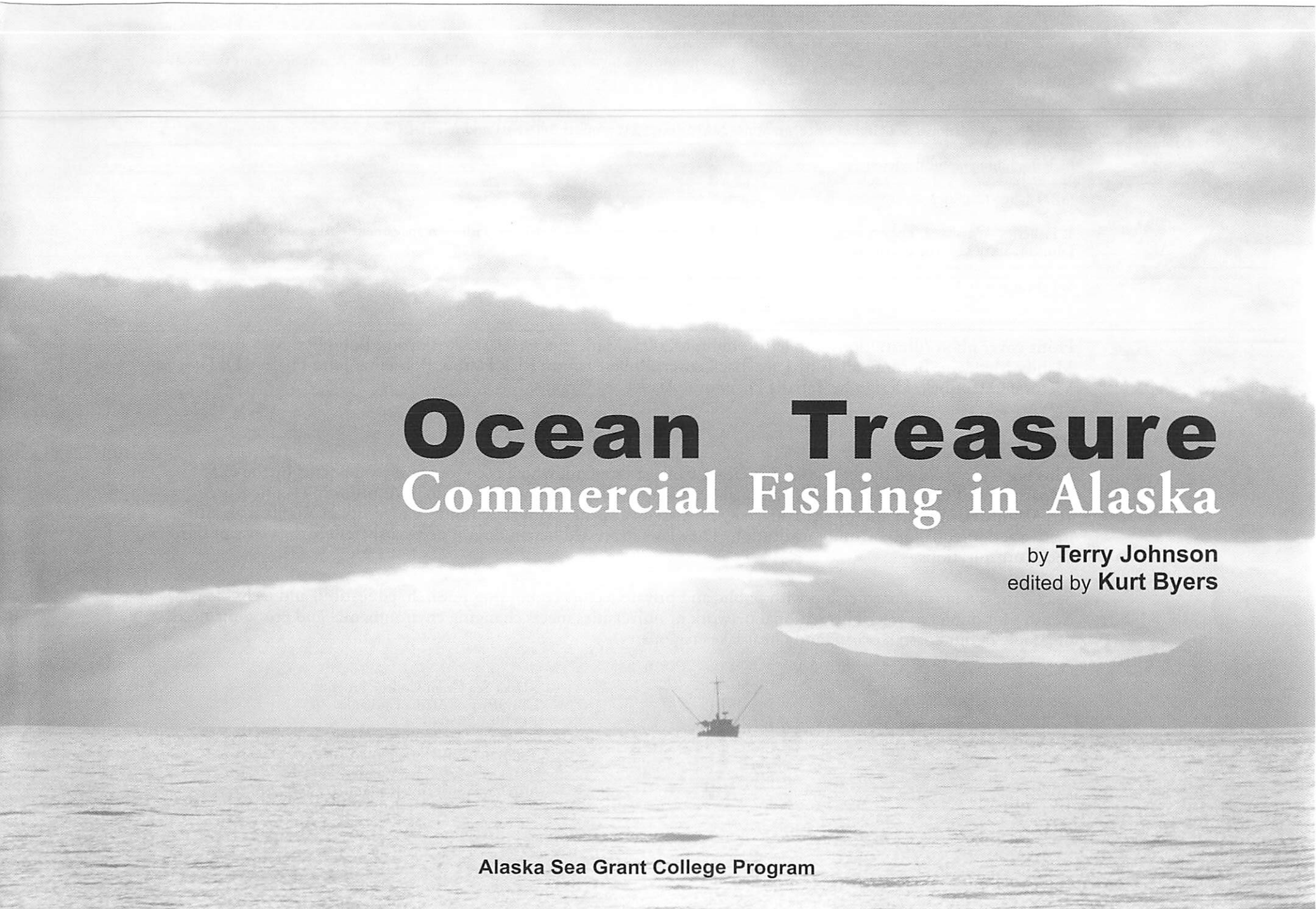


Ocean Treasure

Commercial Fishing in Alaska

by **Terry Johnson**
edited by **Kurt Byers**



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Commercial Fishing in Alaska

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Alaska Sea Grant College Program

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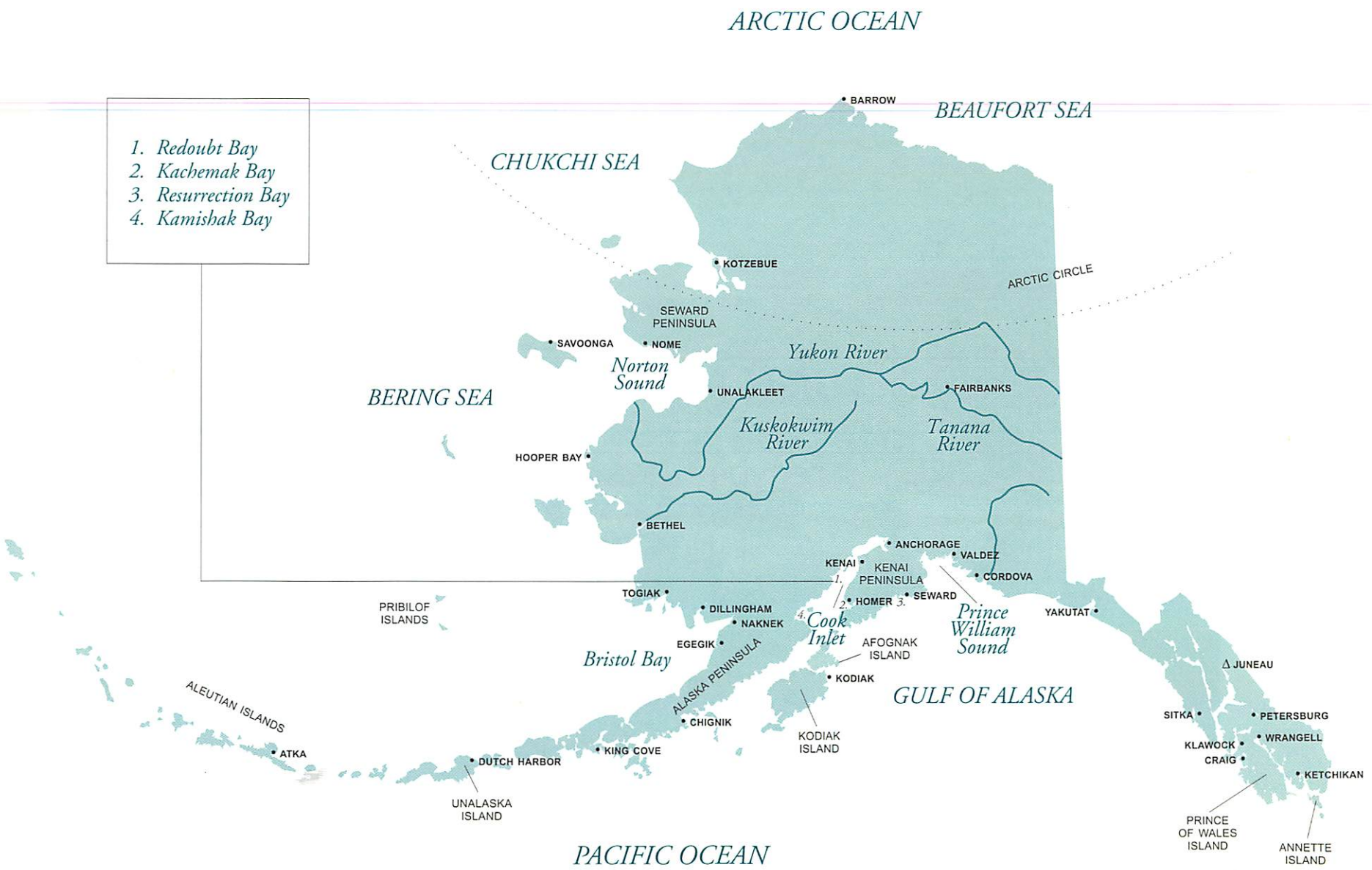
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UNALAKLEET
FAIRBANKS
Kuskokwim River
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Bristol Bay
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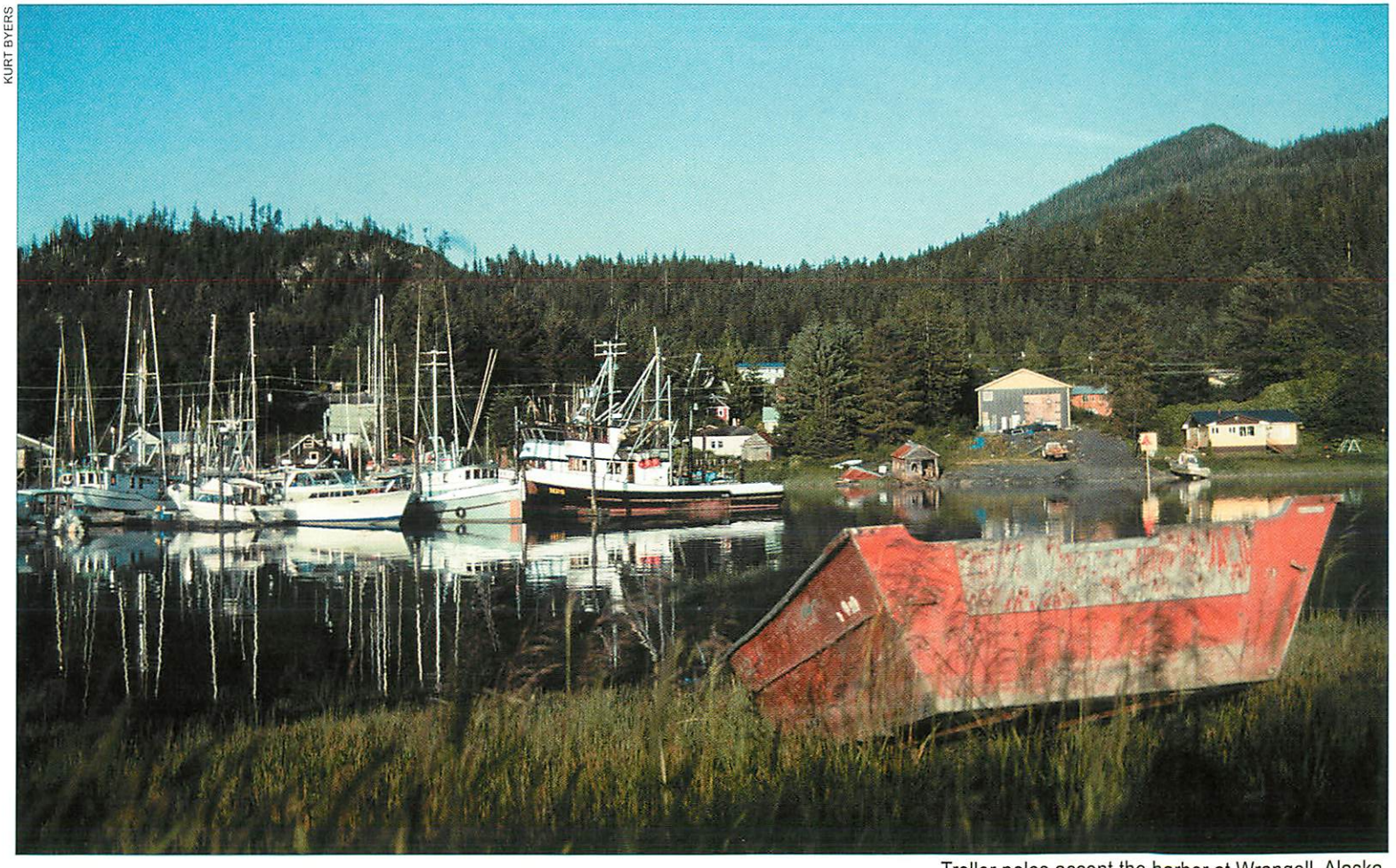
KURT BYERS



Troller poles accent the harbor at Wrangell, Alaska.

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Foreword

KURT BYERS

Senator Ted Stevens addresses Sea Grant staff and supporters at Sea Grant's 30th anniversary reception at the U.S. Capitol in Washington, D.C.

Long before Alaska was a United States territory, our people were fishing for their livelihood. Fish were essential in the lives of Native Alaskans, providing a valuable food source and needed materials. After the Russians came to Alaskan soil they built salteries to preserve their catch so that they would have enough food to get them through the harsh winter. Then, in 1878, the first canneries were established at Sitka and Klawock, marking the beginning of our commercial fishing industry. For Alaskans, fishing is more than just an industry; it is intertwined with our way of life.

Today, that tradition continues. Our waters are home to large numbers of salmon and other fish species. Native Alaskans have relied upon this resource for thousands of years and fishing continues to be a key part of our culture and commitment to subsistence living.

Fishing also represents an enormous piece of the Alaskan economy. Every year thousands of recreational fishermen take to Alaska's waterways and another generation learns about this integral part of our heritage. To truly understand the impact of the commercial fishing industry in Alaska you need only to look to the great people of our state. Thousands of Alaskans derive income or benefits from the commercial fishing industry. We understand better than anyone the importance of sustainable fisheries and a healthy and vibrant ecosystem in the North Pacific.

Personally, I am committed to preserving this essential part of our culture. As an original author of the Magnuson-Stevens Fishery Conservation and Management Act, I am dedicated to exploring measures that will improve the management of our fisheries. My interest in this industry extends beyond policy; as a recreational fisherman and a father of a former commercial fisherman, my goal is to ensure that this resource is available to future generations. Fishing is Alaska's greatest pastime and this book aims to preserve this part of our heritage.

Terry Johnson has depicted well the fishing industry's importance to our state and our nation. While he looks back to uncover the history of fishing in our state, this book also looks forward to some of our key challenges. My hope is that it will educate readers, Native Alaskan and newcomer alike, about fishing in our state and the brave Alaskans who take to the sea to keep this industry thriving.

The Honorable Ted Stevens
United States Senate

Preface

Alaska's seafood harvesting and processing industry is the state's second largest private industry and is the foundation for much of Alaska's social structure. Without productive marine and aquatic ecosystems, this and many other ocean-dependent industries and cultures in Alaska cannot survive.

For Alaska's marine resources to remain robust, we must understand how our actions combine with natural factors to affect the environment. Then we should prudently apply our knowledge as we interact with the marine and coastal environments in ways that will not irreversibly diminish them.

A well-informed public is one of the keys to keeping the globe's marine resources in good shape into the foreseeable future. This book is the final component in a three-part public awareness project begun by Alaska Sea Grant in 1991 to help Alaskans and non-Alaskans alike better understand Alaska's commercial fishing industry (see Anatomy of a Public Information Project in the back of this book). Our intent is to provide easy-to-digest, authoritative information about the history, fishing techniques, species harvested, and management of this colorful, complicated, controversial, and fascinating business.

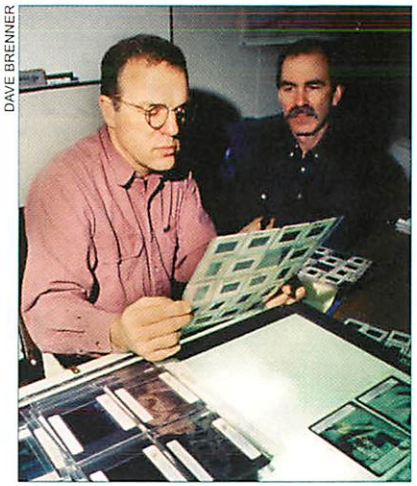
The fishing industry and the regulatory and natural environments in which it operates are constantly in flux. One of the challenges in creating this book was to include information that accurately describes the industry at the beginning of the twenty-first century without including a lot of detail that may become outdated or irrelevant soon after publication. Still, in order to make essential points about key aspects of the industry, we included some information—such as ex-vessel prices, harvest totals, and other content—that will likely be outdated soon after this book is published. Readers seeking current statistical data on the industry should contact the Commercial Fisheries Division of the Alaska Department of Fish and Game or the National Marine Fisheries Service.

Throughout this book, we point out some of the most critical challenges facing the industry and describe how fishermen, policy makers, resource managers, and other concerned parties are addressing the problems. While we expect this book to have a long useful life, we hope the problems described will not share the same longevity.

Our ultimate goal is that this publication will lead to a better understanding of the Alaska commercial fishing industry and the role it plays in the state, national, and international communities. If this document helps inform a constructive dialogue among people who are waging the same battle on often different fronts to maintain the vitality and integrity of the North Pacific ecosystem, then it will have done its job.

—Kurt Byers
Editor

Acknowledgments



DAVE BRENNER

Terry Johnson and Kurt Byers look over a few transparencies for use in this book.

The primary author of this publication is Terry Johnson, University of Alaska Fairbanks (UAF) associate professor of fisheries and Marine Advisory Program (MAP) agent in Homer, Alaska. Johnson fished commercially in Alaska from 1978 to 1995, in Southeast Alaska, Yakutat, Bristol Bay, Yukon River, and Norton Sound. He has written another book about the Alaska commercial fishing industry, titled *Alaska Fisheries Handbook*, published by Seatic Publishing in Sitka, Alaska. Johnson is a regular contributor to the commercial fishing trade press and has authored several Alaska Sea Grant publications about the business of commercial fishing.

Johnson is an advisor to the Alaska commissioners of the Pacific States Marine Fisheries Commission. He also runs an ecotour charter business in Bristol Bay, Alaska, and is a charter member of the Alaska Marine Conservation Council board of directors. Johnson, a U.S. Marine Corps veteran, holds a B.A. in communications and an M.A. in marine resource management, both from the University of Washington, Seattle.

Contributing authors include Mike Banks, Kurt Byers, Paula Cullenberg, Charlie Ess, Lesley Leyland Fields, Dolly Garza, Tony Lara, Rich Mattson, Ray RaLonde, and Doug Schneider.

Mike Banks is a dive harvest and Tanner crab fisherman in Petersburg, Alaska. He contributed information on dive harvest techniques.

Kurt Byers is communications manager, writer/editor, and photographer with the Alaska Sea Grant College Pprogram (ASG). He conceived, compiled, and edited the book, assembled and selected photographs and information graphics; wrote photo captions and the sidebars on the oil spill, bycatch, seafood pricing, underwater deforestation, and the "humpy dump."

Paula Cullenberg is former director of the North Pacific Fisheries Observer Training Center at the University of Alaska Anchorage (UAA) and current MAP leader in Anchorage. A former groundfish observer and setnet and driftnet fisherman, she wrote the sidebar about the federal observer program.

Charlie Ess is a writer and photographer based in Wasilla, Alaska who specializes in the Alaskan commercial fishing industry. He helped with the jigging and clamming sections.

Lesley Leyland Fields is professor and chair of the English Department at UAA on Kodiak Island. She is a setnet fisherman and author of *The Entangling Net*, a book about women in Alaska fisheries, and *The Water Under Fish*, a book of poetry about life with Alaska seas.

Dolly Garza is UAF professor of fisheries and MAP agent in Ketchikan, Alaska. A Tlingit/Haida Indian, Garza contributed to the subsistence chapter.

Tony Lara is a former Bering Sea crab and longline fisherman and photographer who lives in Kodiak, Alaska. He reviewed the text and wrote parts of the longline and crab fisheries sections, and his photos appear throughout the book.

Rich Mattson is a fisheries biologist and director of the Douglas Island Pink and Chum Hatchery in Juneau, Alaska. A non-formal fisheries historian, he provided the information about fish wheels.

Ray RaLonde is UAF professor of fisheries and MAP aquaculture specialist, located in Anchorage. RaLonde wrote most of the section on shellfish mariculture.

Doug Schneider is public information officer and producer of the Arctic Science Journeys radio program at ASG. He contributed the information in the sidebar on electronic technology in commercial fishing and wrote the sidebar on fish stock assessment.

We also gratefully acknowledge critical review of the text provided by many experts in various fields of the Alaska seafood industry, management bodies, and conservation groups. For review of the original manuscript, our thanks go to Bob King, special assistant to former Alaska Governor Tony Knowles, journalist, and commercial fisheries historian; Robert Larsen, herring and dive fisheries project leader with the Alaska Department of Fish and Game (ADFG) in Petersburg; Denby Lloyd, ADFG Westward Region supervisor; Brad Matsen, author and past West Coast editor of *National Fisherman*; Bob Mikol, a commercial fisherman, author of the book *Temperature Directed Fishing*, published by ASG, and formerly a member of the board of directors of the Alaska Marine Conservation Council; Doug Schneider, ASG; Leigh Selig, enforcement officer with the National Marine Fisheries Service (NMFS); and John van Amerongen, editor of *Alaska Fisherman's Journal.*

UAF scientists Gerry Plumley and John French reviewed the information on paralytic shellfish poisoning. Terrance Quinn, former co-chair of the Scientific and Statistical Committee of the North Pacific Fishery Management Council and UAF professor of fisheries, reviewed the sidebar on bycatch. Stephen Jewett and Brenda Konar, scientists with UAF, contributed information about the life history of crabs (Jewett) and kelp forest ecosystem dynamics (Jewett and Konar).

Gunnar Knapp, UAA Institute of Social and Economic Research, and Chris McDowell of the McDowell Group in Juneau, provided information on salmon pricing and distribution. Tim Ryan of Sitka Sound Seafoods also helped with the salmon pricing section. Chuck Crapo, MAP seafood quality specialist, reviewed the chapter on processing and marketing. Rodger Painter, executive director of the Alaska Shellfish Growers Association, reviewed text on shellfish mariculture. Al Burch, president of the Alaska Draggers Association, and Steve Patterson of New England Trawl Systems, provided information about trawling techniques. Jerry Dzugan, executive director of the Alaska Marine Safety Education Association, and Greg Switlik, president of Switlik Parachute Co., reviewed the information on marine safety

and survival. Guy Hoppen, tender operator, reviewed and provided information on purse seining and tendering.

A.J. Paul, crab biologist and UAF professor emeritus, provided information about crab nomenclature and life history and reviewed the accuracy of the crab illustrations. Robert Larsen, ADFG, provided information about sea urchins, sea cucumbers, and geoducks. Tim Koeneman and Michael Ruccio, ADFG, provided catch statistics and other information about shrimp and crab fishing. Victoria O'Connell, Jeff Barnhart, Doug Woodby, and Jim Blackburn, all of ADFG, contributed range and other information on shellfish and finfishes. Joan Forsberg, biologist with the International Pacific Halibut Commission (IPHC), provided range information for halibut, and Heather Gilroy, biologist with IPHC, provided catch statistics. Thomas Kong, biologist with IPHC, helped locate halibut photos. Andrew Trites, University of British Columbia, and Kate Wynne, MAP marine mammal specialist, reviewed the information on Steller sea lion population change.

A special thanks goes to Herman Savikko, statistician with ADFG, for his manuscript review and assistance providing fisheries catch statistics. Savikko was extraordinarily responsive to many requests for statistics, text review, and other information.

David Sutherland, fishery biologist with NMFS, Fishery Statistics and Economics Division, provided statistics on five-year average catch volumes (1994-1998) found in the Sources and Useful References chapter. Mike Plotnick, research analyst with ADFG, provided statistics on harvest value. Elizabeth Logerwell, biologist at the NOAA Alaska Fisheries Science Center in Seattle, helped locate groundfish photographs. Tracey Lignau, biologist with ADFG, provided information about fishing activity in Hooper Bay.

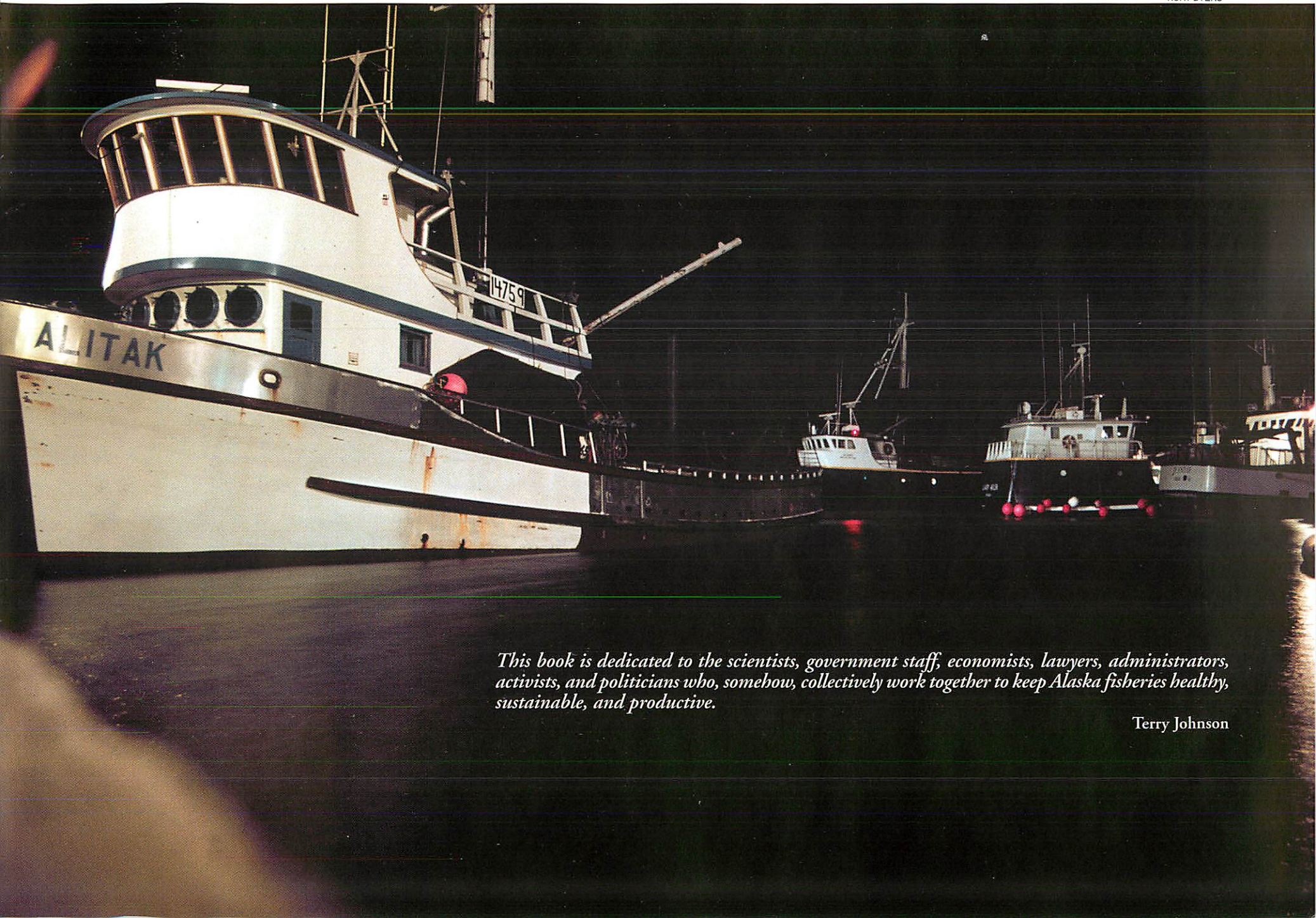
Thanks also to the honorable U.S. Senator Ted Stevens and his staff for providing the foreword to this publication.

Pre-press review of the book was provided by Jim Branson, former director of the North Pacific Fishery Management Council, Brian Paust, UAF professor emeritus and former MAP agent in Petersburg, and Paula Cullenberg, MAP.

Thanks also to Dave Gordon, Washington Sea Grant; and the late Richard Carlson, NMFS, for tips on finding photographers whose work appears in this book. Thanks to Angela Linn, anthropologist with the University of Alaska Museum, for directing the editor to Native artifacts in the museum's collection, photos of which appear in the Subsistence Fishing chapter.

Book design, cover, and information graphics are by Tatiana Piatanova, ASG graphics manager, assisted by Kurt Byers. Gear illustrations are by Bob Hitz. Pen-and-ink illustrations of fish and shellfish are by Sandra Noel and Lisa Peñalver. Colorization of the drawings is by Lisa Peñalver. Sue Keller, ASG publications manager, proofread the text, oversaw printing, and provided editorial advice. The index was done by Nanette Cardon.

KURT BYERS



This book is dedicated to the scientists, government staff, economists, lawyers, administrators, activists, and politicians who, somehow, collectively work together to keep Alaska fisheries healthy, sustainable, and productive.

Terry Johnson

KURT BYERS

Kodiak Harbor

INTRODUCTION

KURT BYERS

Commercial fishing in Alaska is a diverse, colorful, tough, dangerous, thriving, and—with skill and luck—lucrative enterprise. This bounty makes the 49th state with its 34,000 miles of shoreline the most important fishing state in the nation.

Alaska's nearshore and offshore waters produce about half the U.S. seafood harvest every year, with an average dockside value of about $1.4 billion. Not only does the Alaska seafood harvest outrank in quantity and value the harvest of the rest of the United States combined, this bounty also outranks the individual harvests of Norway, Denmark, Iceland, and Canada—each a well-known fishing nation.

Dutch Harbor and Kodiak usually rank among the top five fishing ports in the country. In recent years, the huge offshore groundfish fishery has elevated Dutch Harbor in the Aleutian Islands to the nation's number one port city in quantity landed.

The seafood industry has long been Alaska's largest private industry employer, currently providing full- and part-time jobs for some 70,000 men and women. And unlike industries that depend on nonrenewable resources, the seafood industry has excellent long-term prospects. Given the massive volume and value of Alaska fisheries and the prospect that the resource, if managed well, should be around for a long time, seafood harvesting and processing represents one of Alaska's best hopes for long-term economic health.

This book will give you an overview of the commercially important fish and shellfish that thrive in Alaska waters, and insight into the tools, techniques, and management structure used to harvest and maintain Alaska's vast ocean bounty.

The Great Divide

Although there is some overlap in species harvested and gear types used in nearshore and offshore Alaska waters, the terms nearshore and offshore generally distinguish the two fundamental segments of Alaska's $1.4 billion (dockside value) fishing industry.

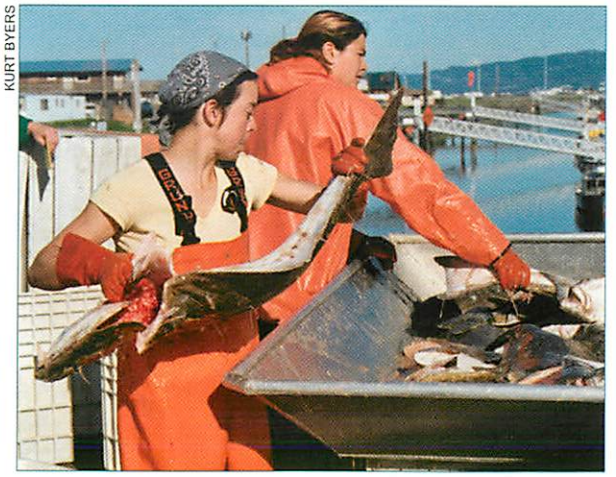
The offshore fishing industry, which operates in federally managed waters from three to 200 miles from shore, is composed primarily of large crabbers, longliners, and trawlers based in southcentral Alaska or Washington state. They harvest crab, pollock, cod, and other groundfish, which account for just over half the total annual value of the Alaska harvest.

Alaska's nearshore fishery is conducted mostly by smaller operators who fish primarily in waters managed by the State of Alaska, which extend three miles out from shore. These fishermen harvest salmon, herring, halibut, blackcod, crab, and shrimp, among other species.

Alaska Fishery Fuels Local, State, and National Economies

Alaska's commercial fishing industry has four key elements: harvesting, processing, support services, and marketing. Approximately 40,000 men and women help harvest Alaska's fish and shellfish each season, mostly on board the nearly 18,000 fishing boats which ply waters off Alaska shores. Another 30,000 people work in processing, mainly in cannery and cold storage facilities. The number of workers in the service sector is difficult to estimate, but includes people who work in fuel delivery, vessel repair, air freight, food service, law, insurance, banking, and other occupations. The seasonal nature of the industry makes it convenient summer employment for college students.

KURT BYERS



Adventurous college students can find unique summer employment in Alaska's seafood processing plants, such as these women who are helping offload halibut from a longline vessel in Homer.

Most Alaska seafood is exported, with Japan the top destination. These exports are an important factor in reducing America's trade deficit. Much of the revenue generated by the seafood industry is recycled through the state economy in the form of goods and services purchased from local vendors, raw-fish taxes, local sales taxes, property taxes on equipment and facilities, and personal income spent within the state. However, because about forty percent of fishing vessel crew members are non-residents, and because the majority of the processing capacity is owned by non-resident and foreign

KURT BYERS

Halibut longliners take a well-earned breather after offloading their catch at a Cordova processing plant.

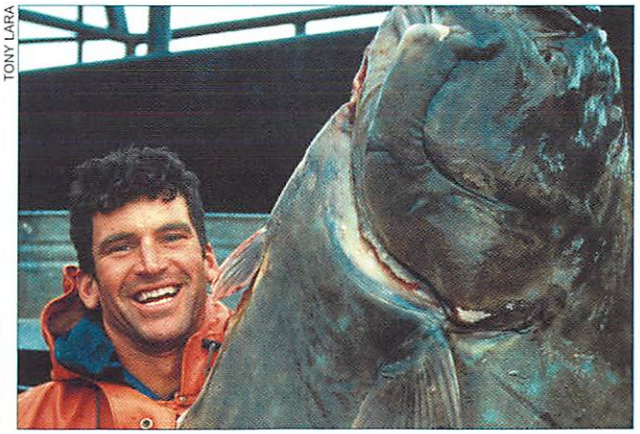
corporations, a large portion of Alaska's seafood industry revenue is exported from the state.

Almost all of Alaska's 600,000 citizens live near the sea or a major river. This makes fishing—and the industries that support fishing—a key source of income for the great majority of Alaska communities, from Ketchikan at the southern end of the panhandle to Kotzebue above the Arctic Circle.

Anchorage, Alaska's biggest city, has the state's largest population of commercial fishermen, even though the city is not home to a resident fishing fleet and does not have facilities to receive direct delivery of fish from vessels. Fairbanks, located in the central interior of Alaska more than 350 miles from the nearest saltwater, counts scores of commercial fishermen among its residents. And people in many other communities far inland along the Yukon and Kuskokwim rivers, in the Bristol Bay region, and elsewhere heavily depend on fish for food and income.

Fishermen Are Versatile and Mobile

Alaska fishermen tend to be mobile, diversified, and drawn to the industry by its unique appeal. It is not uncommon for an Alaska fisherman to participate in three or more fisheries in one year. A fisherman may fish blackcod in April, herring in May, halibut in June, salmon in July and August, crab in the fall, and groundfish in the winter. Others may log an intensive three weeks chasing Bristol Bay sockeyes in July and kick back and relax the rest of the year. Another group of enterprising fishermen may put in short seasons in California or Washington.



TONY LARA

A longline fisherman seems pleased with a 350-plus pound halibut, taken off Kodiak Island.

Some fishermen own two or more boats located in different parts of the state, and fly from one to another depending on what fishery is open at a given place and time. Other fishermen own a single boat worth $2 million and spend 40 weeks a year running it. Still others simply fish from open skiffs, pulling their nets and lines by hand, or set and pick their nets on mud flats between tides.

In recent decades many fishermen have earned sizable incomes. The lure of fast money has drawn many people from other professions. Fleets have former attorneys, physicians, psychologists, professors, secretaries, airline pilots, teachers, homemakers, salesmen, and politicians who have responded to the call of adventure, big bucks, and independence. Many

GUY HOPPEN

Purse seine crew from the fishing vessel *Mermaid II* takes a break.

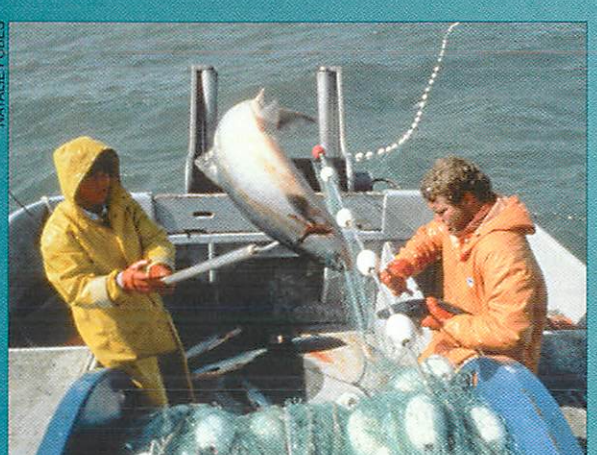
have permanently left their former occupations. Others have found they can put in a short season and return to their regular jobs. Still others test the waters for a year or more, decide fishing isn't for them, and return to their former lives with an experience of a lifetime.

The dawn of the new century, however, has seen a downturn in the fortunes of some of Alaska's fisheries. Diminished stocks are the cause in a few cases, such as king crab, while market competition or reduced consumer demand which is driving down prices paid to fishermen is the culprit in others, like salmon and herring. Lower financial returns are driving some fishermen out of the business and forcing others to find supplementary income.

DAVID F. KAPLAN

Salmon setnetting and drift gillnetting sometimes involve whole families. These kids help out in the family setnet business in Kodiak.

Alaska's Fishing Women: From Dock to Deck



NATALIE FOBES

These days, male and female fishermen routinely work together on fishing vessels. Here a woman and a man haul in a nice sockeye salmon aboard a sternpicker in Bristol Bay. Nearly all female fishermen who responded to a survey conducted in the 1990s by the Kodiak, Alaska, newspaper said that they want to be referred to as "fishermen," not "fisher" or "fisherwoman" or any other term.

The Alaska commercial fishing industry is populated mostly by men, but women work in every part of the industry. No one knows for sure, but a good estimate is that women make up about five percent of the workforce, not including women in seafood processing plants.

Historically, Native women were an active part of commercial fishing. Indeed, in some regions and fisheries, such as the Yukon River and Bristol Bay, commercial and subsistence setnet fishing was considered women's work. However, as the industry modernized and became intensely competitive, Native women became less visible in commercial fishing, and now men handle most of the commercial fishing chores in Native communities.

In the non-Native world, as women began breaking gender barriers in other professions in the 1970s, a wave of adventure-seeking women migrated north and worked their way into what had become an almost exclusively male occupation.

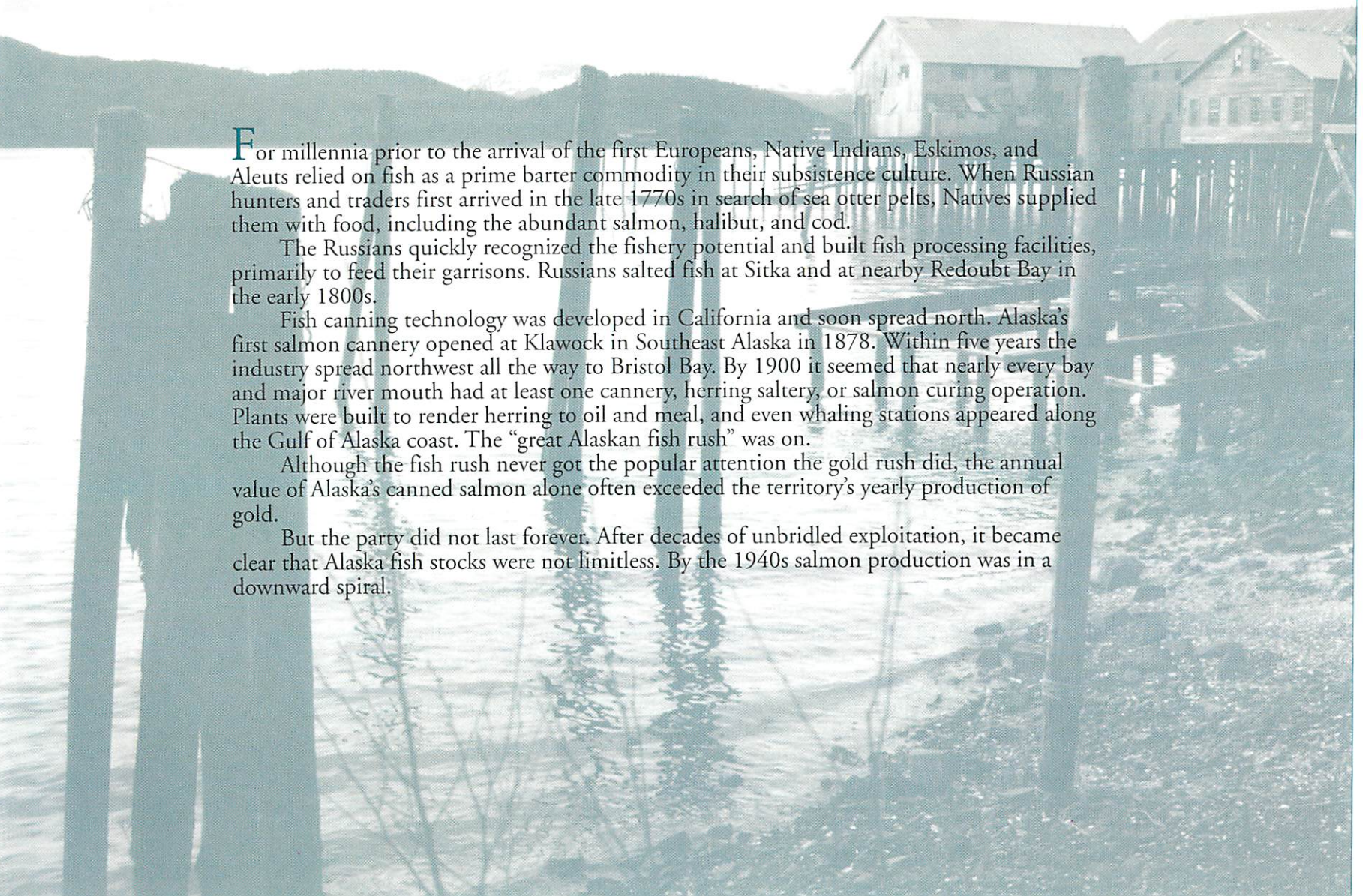
For some the transition was eased by partnerships with boyfriends and husbands. For others who traveled and worked alone, the step from dock to deck was difficult, sometimes even dangerous. Men who resisted women's sudden presence greeted the women with varying degrees of discrimination and harassment, while other fishermen were supportive and encouraging.

Many female Alaska fishermen got their start by mending nets and building crab pots between countless hours walking the docks trying to coax, cajole, and otherwise convince male fishermen they could do the job. Today women are often seen setting seines, hauling and picking gillnets, and doing everything else necessary to succeed on the fishing grounds.

WILSON ERSKINE,
ALASKA STATE LIBRARY

Beach seiners are geared up for a salmon run somewhere in Alaska around 1890.

A SHORT HISTORY



KURT BYERS

For millennia prior to the arrival of the first Europeans, Native Indians, Eskimos, and Aleuts relied on fish as a prime barter commodity in their subsistence culture. When Russian hunters and traders first arrived in the late 1770s in search of sea otter pelts, Natives supplied them with food, including the abundant salmon, halibut, and cod.

The Russians quickly recognized the fishery potential and built fish processing facilities, primarily to feed their garrisons. Russians salted fish at Sitka and at nearby Redoubt Bay in the early 1800s.

Fish canning technology was developed in California and soon spread north. Alaska's first salmon cannery opened at Klawock in Southeast Alaska in 1878. Within five years the industry spread northwest all the way to Bristol Bay. By 1900 it seemed that nearly every bay and major river mouth had at least one cannery, herring saltery, or salmon curing operation. Plants were built to render herring to oil and meal, and even whaling stations appeared along the Gulf of Alaska coast. The "great Alaskan fish rush" was on.

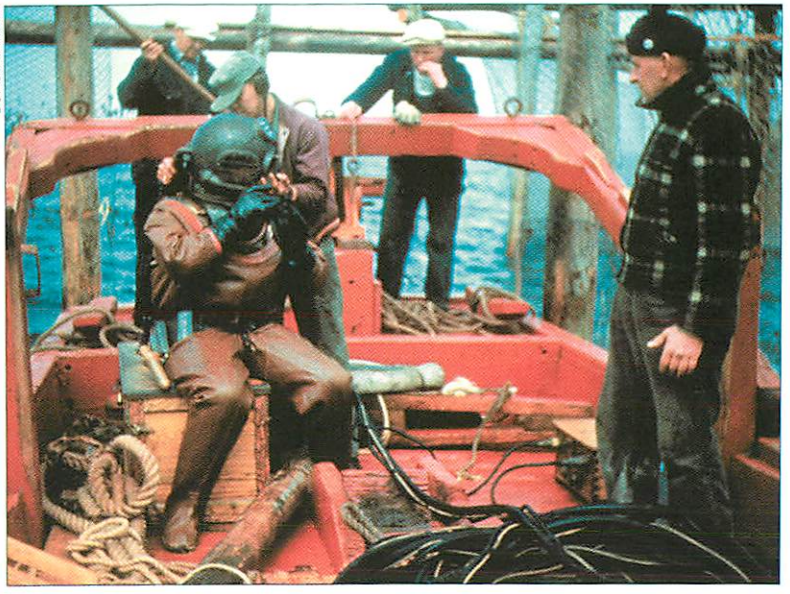
Although the fish rush never got the popular attention the gold rush did, the annual value of Alaska's canned salmon alone often exceeded the territory's yearly production of gold.

But the party did not last forever. After decades of unbridled exploitation, it became clear that Alaska fish stocks were not limitless. By the 1940s salmon production was in a downward spiral.

Enlightened Management Saves the Fishery

Many people blamed the salmon decline on highly efficient fish traps. Alaskans saw the devices as symbolic of oppression by out-of-territory economic interests because they gave the canneries virtual ownership of the salmon resource. Opposition to salmon traps was so intense that it became one of the driving forces behind the statehood movement. When Alaska became a state in 1959, fish traps were immediately banned by the new state legislature.

BORGE LARSEN



A diver prepares to unclog a chicken wire salmon trap at False Pass, circa 1950.

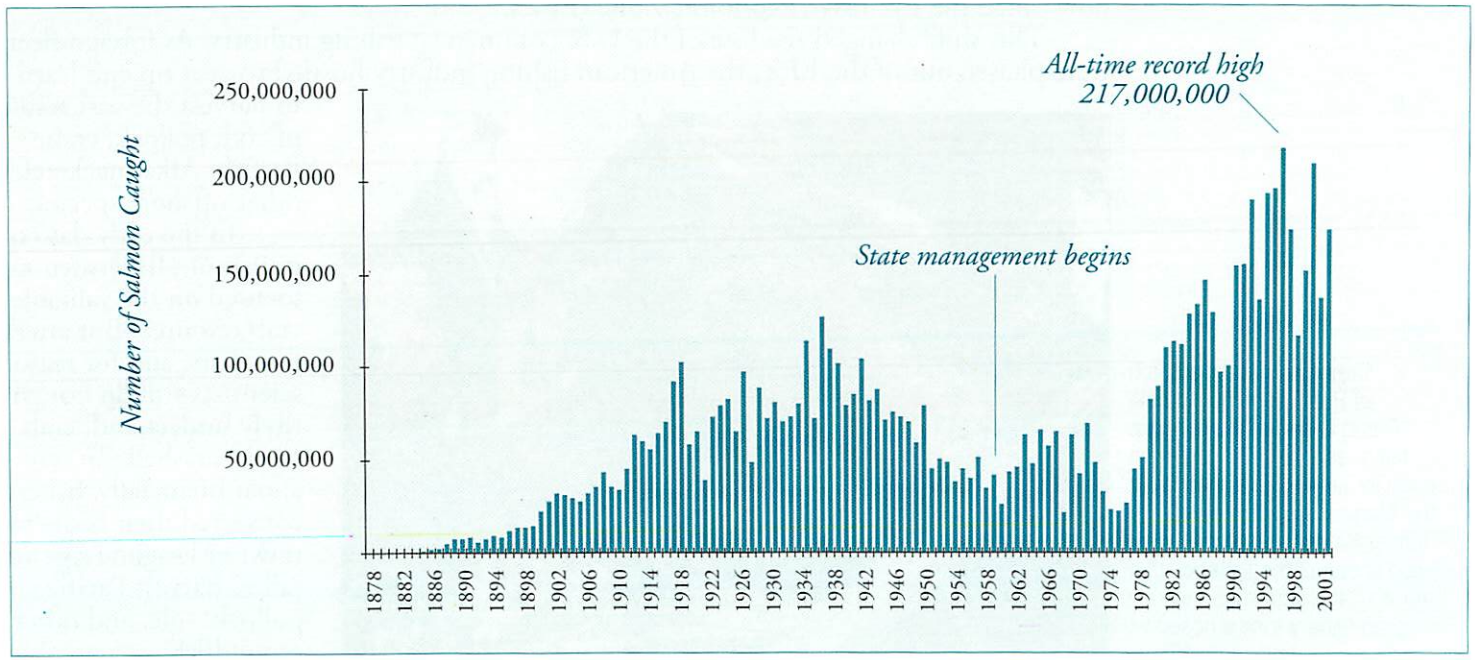
But just banning traps was not enough to save the salmon. State managers also took an aggressive approach to monitoring and regulating the fishery. Over time a system of managing fisheries was developed based on the concepts of "harvestable surplus" and "maximum sustainable yield." This approach meant that fishermen would be allowed to catch only those fish which biologists determined were surplus to the total number of fish necessary to sustain the fish population at its most productive level.

This was accomplished, in part, by limiting fishermen's gear, fishing time and areas, and eventually by limiting the number of fishermen. Commonly known as "limited entry," the system initiated by the Alaska legislature in 1974 limits the number of fishing permits for salmon, herring, and other fisheries. Permits were originally awarded to fishermen based on their past participation and economic dependence on the fishery. The law allows the sale and trade of permits, which has become an industry in itself. During the peak value years of the 1980s and early 1990s, individual permit values in some fisheries were as high as $400,000.

Limited entry—combined with hatchery production, habitat enhancement, elimination of certain offshore fisheries, and the assistance of favorable environmental conditions—has helped Alaska's salmon resource bounce back to record levels of production.

As of 2000, Alaska had limited entry in some herring, blackcod, and crab fisheries and all salmon fisheries. Federally managed halibut and groundfish fisheries are under individual fishing quotas or other limited access management systems.

People, Nature Affect Fish Stocks



Alaska's fisheries dramatically fluctuate due to human influences and environmental change. Near cataclysmic declines in salmon stocks between World War II and the mid-1970s were mostly due to human action—overharvest. Likewise, the subsequent recovery of salmon primarily was due to human action—ban of fish traps, limited entry to fisheries, enhancement of wild stocks via salmon ranching, and habitat rehabilitation.

By 2002, some salmon stocks began to decline again. This time scientists attributed it to a routine cyclical warming and cooling of the North Pacific Ocean, part of a "regime shift."

Scientists point to a regime shift as a likely explanation for the explosion of walleye pollock in the North Pacific in the 1960s.

Likewise, the extreme drop in the king crab stock in the 1980s may have been mostly a result of a change in water temperature rather than overharvest, although fishing activity probably contributed too.

Scientists have only recently begun to examine how the combination of regime shifts and human activity together affect marine ecosystems. Their discoveries will further aid fishery managers in their quest to make the right calls at the right time.

United States Takes Over Huge Offshore Fishery

While the salmon stock recovery was under way, the U.S. government took an interest in fisheries farther out to sea. Huge vessels from Japan, Korea, Poland, the Soviet Union, and other countries had dominated the waters off Alaska's shores, in some cases right up to three miles from the beach. But in 1976 Congress passed the Fisheries Conservation and Management Act, which gave the United States authority to manage resources between three and 200 miles off our shores. This region, originally dubbed the Fishery Conservation Zone, is now called the Exclusive Economic Zone (EEZ).

This shift changed the face of the U.S. commercial fishing industry. As foreign fleets were phased out of the EEZ, the American fishing industry hustled to gear up and learn how to harvest the vast resources of cod, pollock, crab, flatfish, Atka mackerel, and other offshore species.

MARION OWEN

Crewmen haul in a catch of Pacific cod off Kodiak. P-cod is one of the offshore fisheries that U.S. fishermen began to harvest in earnest after the Magnuson Act passed. The timing was good, too, because P-cod is one of the fisheries that helped fill the gap when the king crab fishery took a nosedive in the late 1980s.

In the early days of the transition, fishermen mostly focused on the valuable king crab resource. But after a few years, and for reasons scientists still do not entirely understand, crab stocks crashed. To stay afloat financially, fishermen converted their boats to trawl or longline rigs and set sail to harvest Pacific cod, pollock, sole, and other groundfish.

Expanding world demand for these so-called "white fish" products stimulated development of an American fleet of catcher-processors which harvest and process fish. By 1993 there were some 70 big factory trawlers, most based in Seattle, operating off Alaska, some longer than a football field and employing upwards of 100 crew members. Federal legislation passed at the end of the twentieth century reduced the offshore trawl fleet by more than two-thirds.

The remaining trawlers supply much of the fish you eat in fast food restaurants. The catch also is processed into surimi, which is a fish paste used to make artificial crab and other products known in the industry as "seafood analogs."

TONY LARA

Catcher-processor ships based in Seattle are docked at Captains Bay, Unalaska Island.

Technology Advances

While government management has played an important part in the development of Alaska fisheries, technological development has had at least as big a role. Huge stocks of king and Tanner crab were largely ignored by American fishermen until after World War II when freezing technology improved. Mechanical refrigeration, coupled with declining salmon runs, also prompted owners to shut down remote canneries and consolidate operations in central locations where they could be served by tenders carrying fish chilled by flake ice or refrigerated seawater.

Today, large freezing operations and improved air and sea transportation facilitate the processing, storage, and distribution of high-quality frozen fish, products much higher in value than fish that have undergone traditional methods of preservation such as salting and canning. Improved preservation and transportation help satisfy U.S. and foreign demand for highly valued fresh seafood.

KURT BYERS

Huge container ships like this one at Kodiak call on major Alaska fishing ports to load freezer vans full of seafood processed in those towns, and to deliver empty vans.

Scientists are finding ways to get still more value from the sea by developing new uses for fish and shellfish and their byproducts, which used to be discarded as waste. Nearly 85,000 metric tons of top-quality fish meal was produced in 2002 from fish tissues previously discarded as waste. Much of that is purchased at premium prices by eel farmers in Asian countries. Fertilizers are another product now being produced from what used to be considered fish processing waste.

Fish have long been known to be a healthful food. But researchers are discovering and developing new seafood products from fish and invertebrates that can help bolster human nutrition and health. For example, seafood scientists expect greatly increased production of high quality fish oil containing omega-3 fatty acids, which are known to help prevent heart disease and other ailments. This oil is derived from the liver of white fish (cod and pollock) and from fatty fish (salmon) species.

Legacy of a Disaster

DOUGLAS SCHNEIDER

While millions of dollars and thousands of hours were spent trying to clean up the 1989 *Exxon Valdez* oil spill, it was ultimately left to nature to restore the ecosystem, a process that is still under way. Scientists found that some cleanup methods did more harm than good. The widely used method of spraying oiled rocky beaches with hot water to loosen the oil resulted in killing organisms that survived the oil, further delaying ecosystem recovery.

The economy and social structure of most coastal towns in Alaska center on commercial fishing. In Southcentral Alaska people took a hard hit from the Exxon Valdez *oil spill, which occurred in March 1989.*

Nearly every herring and salmon fishery in the region was canceled that summer because of fears the oil would contaminate seafood, which it did to a limited extent. The spill also caused major societal conflicts to fester in communities affected by the spill and caused upheaval in Native communities dependent on sea life.

Since 1989, there has been one spill-related district-wide commercial fishing closure, the Prince William Sound herring fishery. That lucrative fishery was closed in 1993 and has not re-opened due to the collapse of the herring population. Viral disease and a fungus were the probable reasons for the herring population crash, but scientists cannot absolutely attribute those afflictions to oil contamination.

In 1991, Exxon agreed to pay a $25 million criminal fine, $100 million criminal restitution, and a $900 million civil settlement. The agreement stipulated that the $900 million must be used to help recovery of the natural resources and the subsistence, recreational, and commercial fisheries. Court cases also have awarded monetary damages to some fishermen in a class action suit.

Settlement money bought hundreds of miles of anadromous waterways, providing basic protection for spawning and rearing sockeye, chum, pink, coho, and king salmon. Many state and federal research projects were funded aimed at improving the health of commercial fish species and providing new tools for better fisheries management. Native subsistence users were consulted to help scientists gain a first-hand historical perspective on how the marine ecosystem hit by the spill had flourished prior to the spill.

Commercial fishermen are now an integral part of the government's spill response strategy. They proved after the 1989 spill that they have the knowledge, experience, and technical skills critical to marshal an effective response to oil spills. A cadre of fishermen is now trained and ready to help deploy oil containment boom. They also will be consulted when urgent decisions must be made about what places most need to be protected from the onslaught of the next killer oil slick.

Tough Challenges Remain

Alaska's fishing industry will always face complex challenges. Currently, fisheries experts and other concerned people are working hard to find ways to use previously ignored species such as arrowtooth flounder and sea cucumbers; develop more sophisticated and effective resource management strategies; find ways to mediate conflicts among fishermen using different gear types and of different nationalities; and find ways for fishermen to coexist with marine mammals and seabirds.

Some Alaskan commercial fisheries experience conflicts over resource allocation with sport fishermen and subsistence users. Some fisheries unintentionally capture and intentionally throw away non-target fish or shellfish (called bycatch) which lack economic value because they are the wrong size or species (economic discards). And in some fisheries, state and federal regulations require that specific non-target species be discarded when caught (regulatory discards). Reduction of this wasted bycatch is one of the biggest fisheries issues of the new century. Disruption or even destruction of key marine habitats also looms large as a problem in need of rational assessment and resolution.

Commercial fishing is an exciting yet troubled industry. About the only thing to be said for sure about its future is that it will continue to change.

TONY LARA

Floating processors in operation at Bristol Bay.

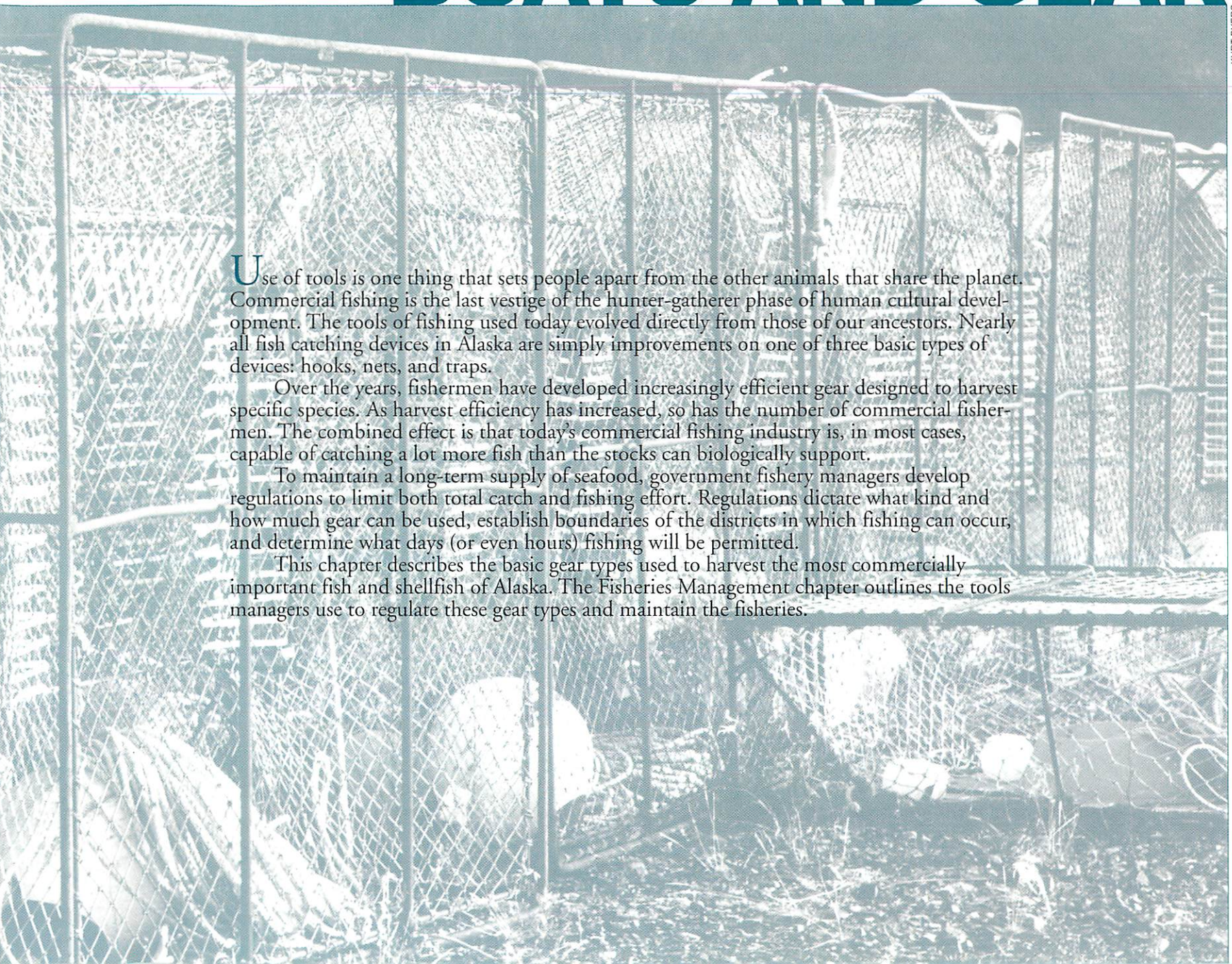
MARION OWEN

A crab boat bucks choppy seas in the Gulf of Alaska.

TOM EVANS

Gillnetters scramble to get their share of the Bristol Bay sockeye harvest.

BOATS AND GEAR



KURT BYERS

Use of tools is one thing that sets people apart from the other animals that share the planet. Commercial fishing is the last vestige of the hunter-gatherer phase of human cultural development. The tools of fishing used today evolved directly from those of our ancestors. Nearly all fish catching devices in Alaska are simply improvements on one of three basic types of devices: hooks, nets, and traps.

Over the years, fishermen have developed increasingly efficient gear designed to harvest specific species. As harvest efficiency has increased, so has the number of commercial fishermen. The combined effect is that today's commercial fishing industry is, in most cases, capable of catching a lot more fish than the stocks can biologically support.

To maintain a long-term supply of seafood, government fishery managers develop regulations to limit both total catch and fishing effort. Regulations dictate what kind and how much gear can be used, establish boundaries of the districts in which fishing can occur, and determine what days (or even hours) fishing will be permitted.

This chapter describes the basic gear types used to harvest the most commercially important fish and shellfish of Alaska. The Fisheries Management chapter outlines the tools managers use to regulate these gear types and maintain the fisheries.

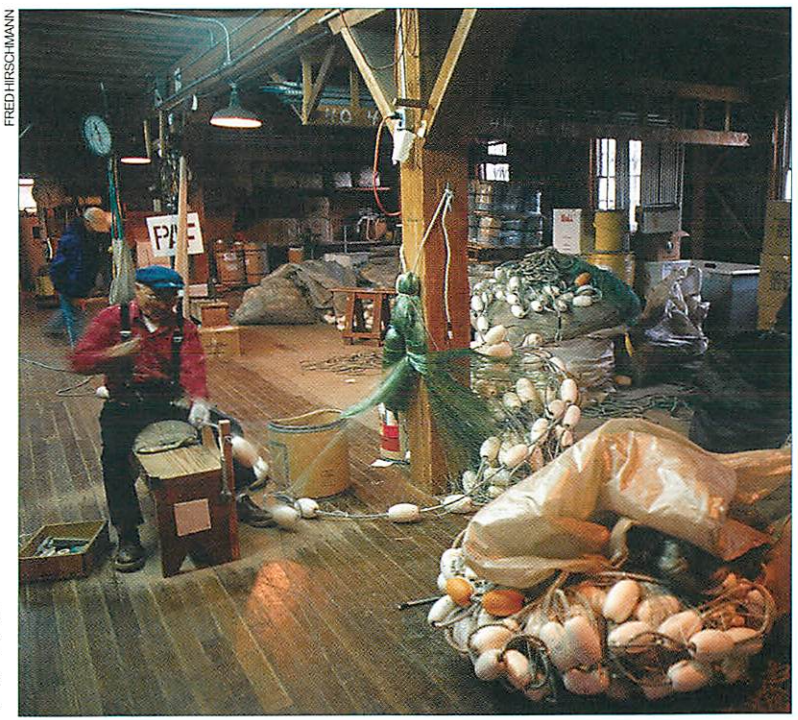
Salmon Fishing Gear

Gillnetting, seining, and trolling are the three primary methods used to harvest salmon in the Alaska commercial fishery. A salmon fisherman may select any of several types of fishing gear, depending on area and species to be harvested and the amount of money available to invest.

Gillnets

The most common type of commercial fishing gear used in Alaska is an entangling net called the drift gillnet. Gillnet fishermen take all species of salmon, although most target sockeye, coho, and chums. These inshore gillnets are highly selective gear which in Alaska rarely catch non-target fish and birds. They must not be confused with miles-long high-seas driftnets which, until they were banned in the early 1990s, were used by some foreign fleets. High seas driftnets were notorious for excessive bycatch of fish, marine mammals, and birds.

FRED HIRSCHMANN

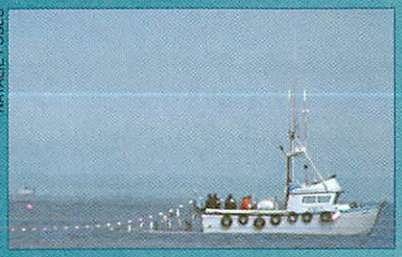


A fisherman in Southwest Alaska mends a gillnet. Gillnets are used in nearshore ocean waters and in rivers, primarily to catch herring and salmon.

Gillnets are made of tough, lightweight twine woven into panels of mesh. The top edge of the net is held near the surface of the water by a line rigged with a series of plastic floats. The bottom edge of the net is attached to a weighted line. This float and weight setup causes the net to deploy like an underwater curtain 10 to 100 feet deep and 300 to 1,800 feet long, depending on water depth and the area fished. Fishermen place the net where they think schools of salmon will pass. The fish swim into the almost invisible net and become entangled by the gills and fins.

Nets are deployed from small boats, called gillnetters. If the gillnetter is set up to deploy the net from the front end, it is known as a bowpicker. If the net is deployed from the rear of the vessel, the boat is called a sternpicker.

Gillnetter


NATALIE FOBES

Sternpicker.


TONY LARA

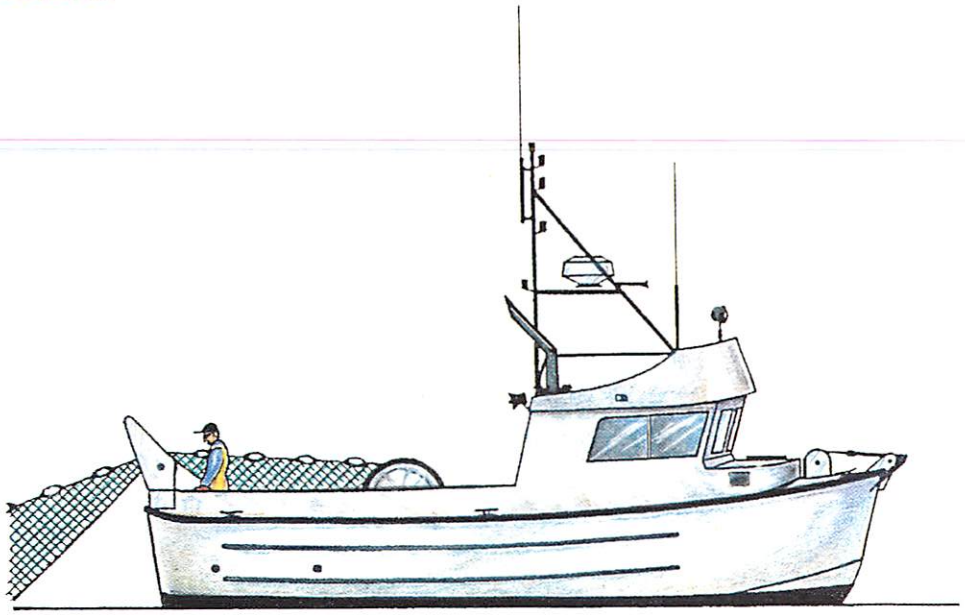
Sternpicker.


MANDY MERKLEIN

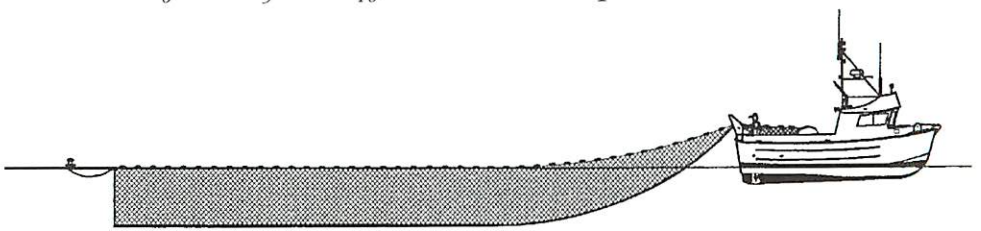
Bowpicker.

JOHN VAN AMERONGEN

Bowpicker.



Sternpicker



King Salmon

Pink Salmon

Coho Salmon

Herring

Chum Salmon

Sockeye Salmon

The fisherman clips a colorful numbered buoy to the end of the net, which is then paid out from the boat, usually perpendicular to the tide or current. The boat with net attached drifts with the tide, usually for an hour or more, depending on how many fish are hitting the net. A single drift may catch only a few fish or as many as a thousand fish.

Salmon gillnetters pick their fish one-by-one out of the net. Herring gillnetters remove their catch by vigorously shaking the net, usually with a power shaker or beater.

TONY LARA

A gillnet is hauled in with a good catch of sockeye salmon in Bristol Bay. Because salmon gillnets are deployed in the path of known schools of migrating salmon, there is little or no bycatch of non-target species.

Gillnetting is an efficient, relatively inexpensive way to fish. Many gillnet operations are husband and wife teams or whole families. The technique is attractive to both full-time fishermen and others, such as school teachers, who have time off from their regular jobs. Permits greatly vary in cost, depending on the area. For example, drift gillnetting from an open skiff in the Yukon and Kuskokwim rivers is much less expensive than gillnetting in less remote areas of Alaska.

Setnetting

Setnets are anchored gillnets used mostly in bays and near river mouths. One end of the net is anchored at or near the beach, and the other end is anchored 120 to 1,200 feet offshore perpendicular to the current.

Some setnetters deploy and retrieve their nets from small skiffs. Others simply wait for low tide and walk their nets out on the tidal flats and anchor them perpendicular to shore. At the next low tide, they walk back out and pluck the salmon out of their nets which are lying on the tidal flat. Then they load the catch into trucks or trailers pulled by all-terrain vehicles, and transport the fish to a processor.

In a few locations, like Cook Inlet, some setnets are connected to pulleys rigged like a clothesline. A truck, tractor, or power winch is used to drag the net onto the beach, where the fisherman picks out the salmon.

MANDY MERKLEIN

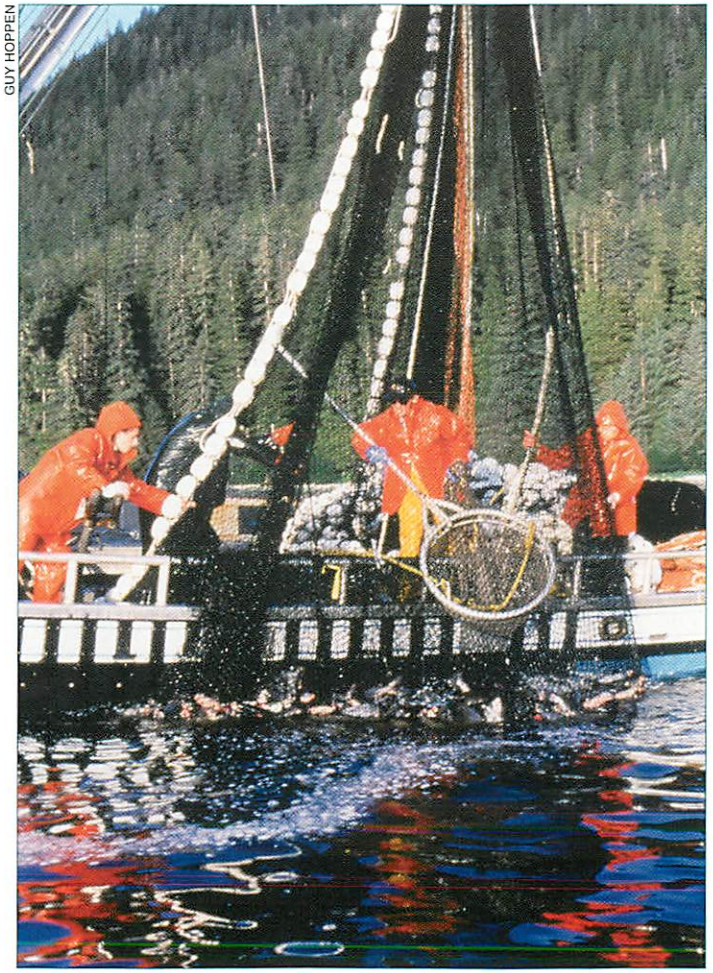
A setnet fisherman takes sockeyes from his net in the Yakataga River.

Seining

The purse seine is another popular method of catching fish, primarily for catching schooling species, especially pink salmon and herring. Most seining occurs within a mile of shore. The boats usually are crewed by six people. The technique involves encircling a school of fish with a curtain-like net, then trapping the fish inside by closing the bottom of the net.

The first gasoline powered purse seine boat appeared in Alaska in 1910. From then until 1960, seiners and gillnetters competed with fish trap operations for a share of the Alaska salmon resource.

GUY HOPPEN



A purse seine crew brails chum salmon from a seine net at Hidden Falls in Southeast Alaska.

After the 1959 fish trap ban went into effect in 1960, people flocked to gillnetting and seining. By 1965, the purse seine fleet grew by 45 percent. Between the seine and gillnet fleets, in those five years about 6,000 new "mobile gear" (boat) fisherman entered the salmon fishery.

Purse seine fishermen may use sonar, a spotter plane or helicopter, or their own eyes to locate a school of migrating salmon or herring. When fish are found, the seine net is deployed and the fun begins.

The net, usually about 1,200 feet long, is deployed off the stern of the boat. Like a gillnet, the top of the seine net is attached to plastic floats and the bottom is weighted.

The skiff operator holds one end of the net as the seine boat makes a circle to surround a school of fish. When all the net is pulled off the seine boat and the circle is complete, the skiff operator passes the end of the net to crewmates on the seiner, closing the circle.

A set is usually held open for 30 minutes. Then a winch on the seiner pulls in a line which is strung

MANDY MERKLEIN

Purse seiner.

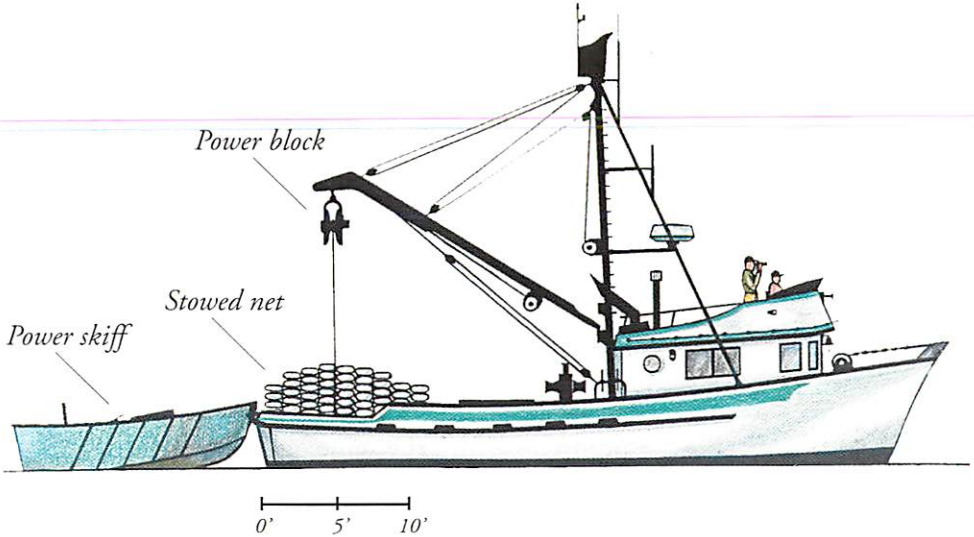
MANDY MERKLEIN

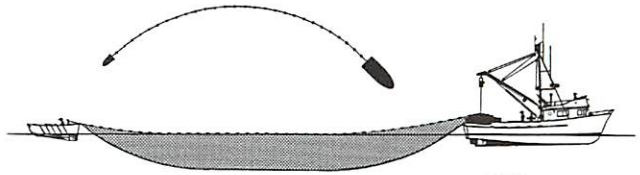
Purse seiner with net deployed.

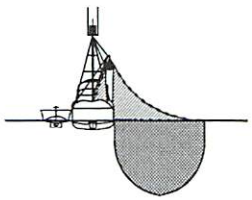
MANDY MERKLEIN

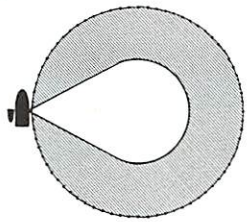
Pink salmon from a seine net.

Seiner









Pink Salmon

Herring

Chum Salmon

Coho Salmon

Sockeye Salmon

through metal rings attached to the bottom of the net. This closes the bottom of the net like a drawstring on a purse (thus the name "purse" seine), capturing the fish above.

Next the net is pulled aboard the seiner by a motorized winch, called a power block, which is mounted overhead on the seiner's boom. As the net is pulled in, the fish are massed in the last portion of the net, called the bunt or, more fondly, "money bag."

If it is a small haul, the bunt is hoisted aboard and the fish are dumped onto the deck or straight into the hold. If it is a big haul, the crewmen use a big dipnet, called a brailer, to dip the fish out of the seine net a few hundred pounds at a time.

Variations on purse seining include the hand seiner and beach seiner. A hand seiner is a smaller seine boat which uses the fisherman's muscle power instead of a motorized winch to purse and retrieve the net. Beach seiners make sets from the beach in very shallow water and do not use a purse line. Neither of these seine techniques is very common in Alaska and they account for a small fraction of the catch made by seiners.

Some seiners use smaller-mesh nets to fish for herring. Herring seiners usually do not take their fish on board the boat. Instead, a tender boat pulls alongside and lowers a suction pump hose into the seine net and sucks the fish into the tender's refrigerated hold.

CHARLIE ESS

A herring spotter plane taxis past seiners and tenders at Togiak.

JOHN VAN AMERONGEN, ALASKA FISHERMAN'S JOURNAL

Crewmen bring up the rings, closing the bottom of a seine net that holds sockeye salmon at Cape Alitak, Kodiak Island.

Trolling

In Southeast Alaska salmon also are caught by trollers (not to be confused with "trawlers," described later in this chapter) on baited hooks or artificial lures. Clear water and the presence of feeding salmon migrating through the region make trolling feasible there.

Like gillnetters, trollers are often family businesses. They usually enjoy long seasons and the freedom to roam great distances up and down the Southeast Alaska coast. Trollers catch and handle fish individually, and they dress and ice or freeze them onboard. Because of this careful handling and because the feeding fish are in top condition, trollers are renowned for producing the highest quality salmon.

Trolling is confined to Southeast Alaska by state regulation, but compared with other Alaska salmon fisheries, this gear type is relatively unregulated. However, in recent years even trollers have been subjected to curtailed seasons through provisions of a salmon management treaty with Canada.

Two salmon trollers sit at anchor in one of the many bays on Baranof Island near Sitka.

A troller usually is a 25- to 50-foot boat rigged with one or two pairs of poles, each nearly as long as the boat itself. When not fishing, these poles are parked in a vertical position. When fishing starts, they are lowered to a 45-degree angle from the sides of the boat.

A set of hand- or hydraulic-powered reels, called gurdies, is mounted on the stern of the boat. The gurdies contain spools of long, fine, stainless steel wire. The line runs off the spool of the gurdy, over a block or pulley, and down into the water. While the wire is going out, the fisherman clips on the "spreads," which consist of a lure or baited hook, a leader, and a stainless steel snap. Lines extending from the tips of the poles, called taglines, are clipped to the wire after it is paid out, causing the wire to swing away from the boat, which prevents tangling. Sometimes a brass bell is attached to the top end of the tagline, which rings when a fish is hooked on a lure attached to the wire.

With the boat moving about two miles per hour, the wire is pulled under water to the proper depth by a lead ball weighing 15 to 60 pounds. After one set of wires is paid out, another set is deployed. Large foam plastic floats are clipped on in such a way that the second

STEPHEN JEWETT

Southeast Alaska troller.

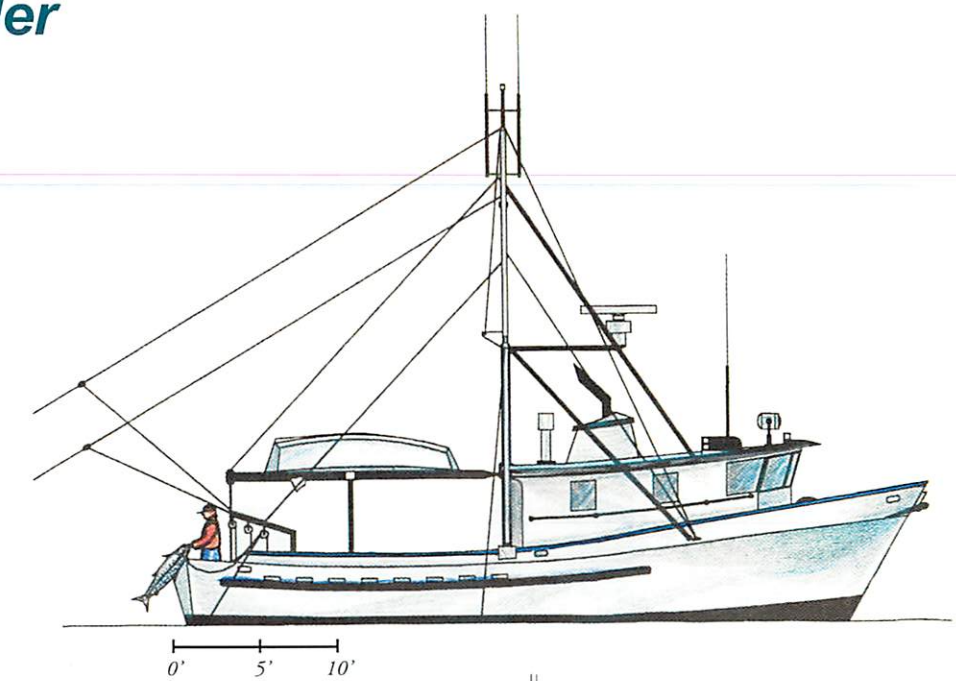
CHARLIE ESS

A troll fisherman heads and guts a freshly caught king salmon.

CHARLIE ESS

Troll-caught king salmon.

Troller



King Salmon

Pink Salmon

Sockeye Salmon

Chum Salmon

Coho Salmon

set of wires clears the first set and trails behind.

Using this system of poles, taglines, and floats, a power troller may set four lines in state waters and six lines in federal waters, towing 20 to 40 lures at once. Hand trollers are allowed to deploy two lines.

When a salmon hits one of the lures and becomes hooked, it yanks on the spread, which tugs the wire, which jiggles the tagline, which wiggles the pole or another small line called a tattletale, which runs to the bow of the boat.

Then a crew member engages the appropriate gurdy to bring in the wire and unclips each spread until the one with the fish appears. The fisherman stops the gurdy, pulls the fish up to the side of the boat with the leader, conks the fish on the head, gaffs it, and pulls it into the boat.

After the gear is reset, the fish is carefully gutted, washed, and laid in a bed of ice or slush (mixture of ice and water) in the fish hold, a prime fish ready for the seafood market, smokehouse, or fine restaurant.

JANA M. SUCHY

A Southeast Alaska troll fisherman uses a hand-whittled gaff to land a 45-pound king salmon off Whale Island.

KURT BYERS

A long-in-the-tooth troller at Wrangell sports a well-equipped business end.

Tenders

In many fisheries, the catcher boats do not run to town to deliver their catch directly to a processing plant. Instead they deliver to transport vessels, called tenders. Tenders, some of which can carry more than 100 tons of fish, may take deliveries from a dozen or more catcher boats before heading to the processing plant. In addition to delivering fish to the processor, the tender also brings fuel, drinking water, groceries, and other supplies to the fishermen. Some tenders offer hot meals and showers, cold drinks, and ice cream to fishing boat crew members.

Decades ago most tenders were sturdy wooden vessels, 60-100 feet long. They had large bunkers below deck where fish were hand-layered in bins and covered with crushed ice. But others were little more than flat scows or barges. Fish were dumped on deck without benefit

GUY HOPPEN

Two gillnetters enjoy a tender moment in Southeast Alaska.

MANDY MERKLEIN

Salmon tender.

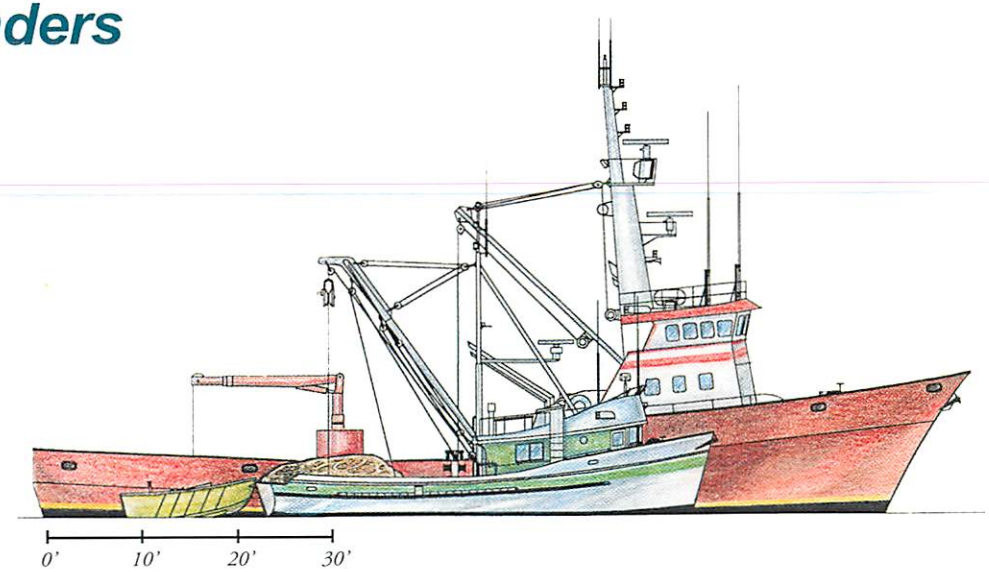
TONY LARA

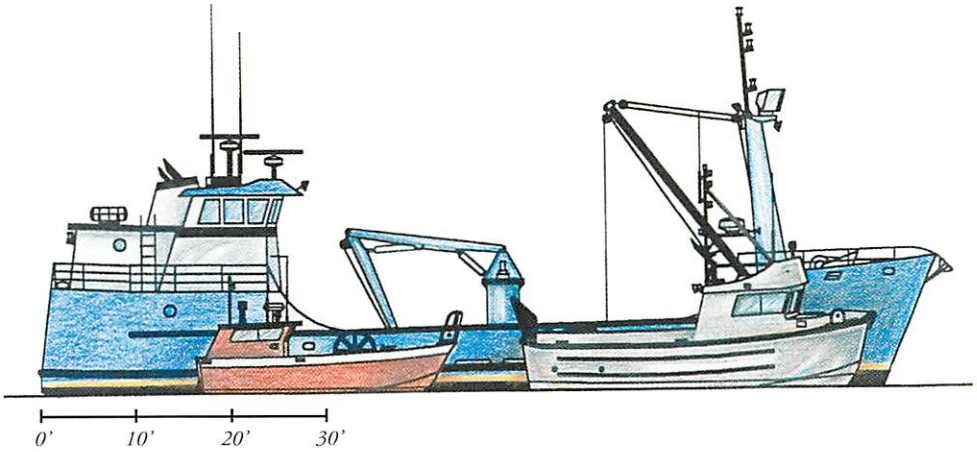
Crabber converted to herring tender.

GUY HOPPEN

Sorting salmon aboard a tender.

Tenders



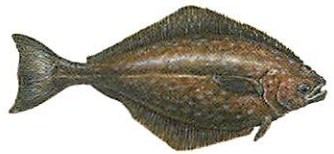


King Salmon

Herring

Pacific Cod

Coho Salmon



Halibut

Chum Salmon

Pink Salmon

Sockeye Salmon

of either shade or ice. These unchilled tenders, or "dry scows," are now a thing of the past.

While some wooden tenders still operate, most modern tenders are fiberglass or steel. Their holds are sealed, insulated, and refrigerated. Most common are seawater tank holds chilled by mechanical cooling, called refrigerated seawater systems (RSW), or by addition of crushed ice, called chilled seawater systems (CSW). Systems also are used that spray refrigerated seawater (spray brine) over the catch in the hold, or simply layer the fish in crushed ice.

GUY HOPPEN

Pink salmon on the deck of a purse seine boat are sucked into a ten-inch hose by a fish pump onboard a tender tied up to the seine boat.

Herring tenders take on their loads by extending hoses connected to large diesel-powered vacuum pumps into the fish holds of gillnet boats or into the pursed-up nets of seine boats. The fish are sucked directly into the tender's refrigerated tanks.

Vacuum pumps and hoses likewise are used to transfer salmon from seine vessel holds into tender holds.

Tenders usually take salmon from gillnet vessels in mesh bags, called brailers. The brailers are hoisted aboard the tender by articulating booms mounted on the tenders.

An electronic scale is attached between the end of the boom and the bag. Each bag is weighed as it is lifted aboard. A "tallyman" records on a "fish ticket" the weight and species composition of the catch. A copy of the fish ticket is given to the fishing vessel's skipper at conclusion of the delivery. The fish ticket is used for calculating payment to the fishermen, which usually occurs at the end of the season, and for reporting the catch to the Alaska Department of Fish and Game.

Many tenders are fishing vessels—usually longliners, trawlers, and crabbers—temporarily converted for tendering during salmon and herring seasons. When salmon or herring openings are finished, pumps and scales are removed and the boats return to their primary fishing operations.

Tenders may work a circuit of fisheries which can use up the majority of a year. Fishing

KURT BYERS

A seiner offloads pink salmon to a tender at Kodiak.

vessels converted for tendering can spend more of the year tendering than fishing. A boat can start in April and May to tender the herring fishery in Southeast Alaska, Prince William Sound, Togiak, and Norton Sound; switch in June and July to tender Bristol Bay salmon; move to Southeast Alaska in August to tender pink salmon; head farther south to Puget Sound to tender a fall chum salmon opening; and finally refit for fishing operations in late fall and winter and head to the Gulf of Alaska or Bering Sea to harvest crab or bottomfish.

Halibut and Cod Fishing Gear

Longlining with baited hooks is the primary method used to harvest halibut, sablefish (blackcod), rockfish, Pacific cod (P-cod), and turbot. Blackcod and Pacific cod also are harvested with pots (traps), and some Pacific cod are taken with trawl gear. For an explanation of pot fishing, read the Crab Fishing Gear description that follows this section.

TONY LARA

A longline fisherman plays tag with a wave as he stretches to gaff a halibut near Kodiak.

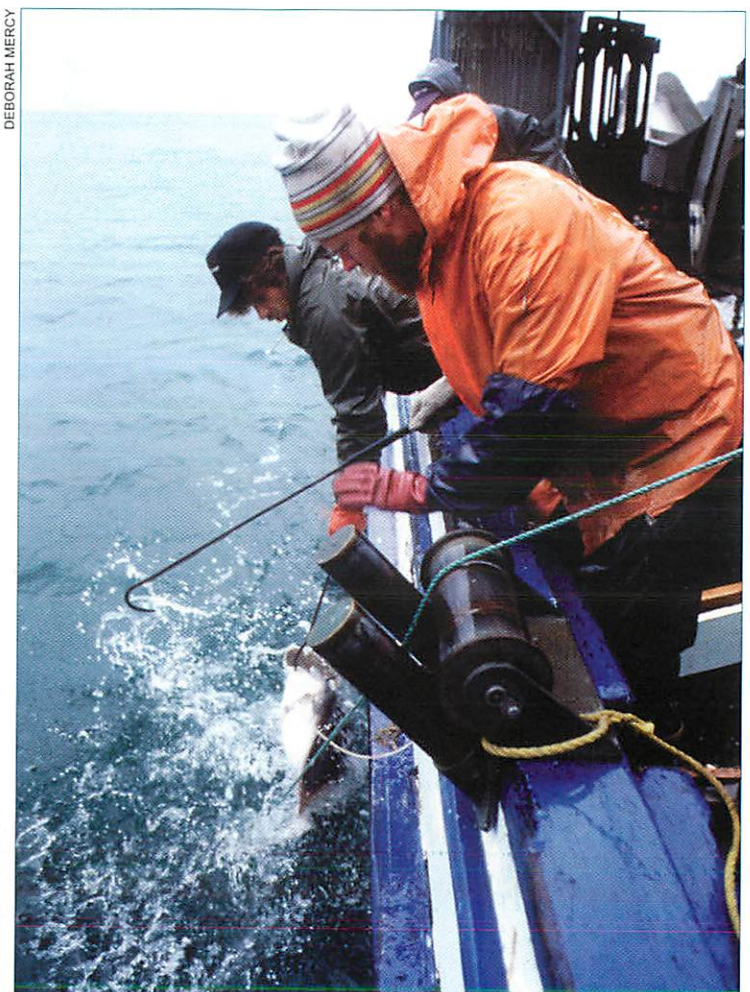
DONALD KRAMER

A longline fisherman hauls in a Pacific cod in the Aleutian Islands. Pots also are used to harvest P-cod.

Longlining

A longline setup is built around a length of strong, thin rope called a groundline. The groundline comes in lengths of 1,800 feet, called a skate. Attached to each skate are up to two hundred stout leaders, called gangions (pronounced "GAN-yuns"), each with a baited hook. Spacing and size of the hooks depend on the target species. Blackcod gear uses smaller hooks spaced closer together than halibut gear. Hooks are baited with herring, octopus, or chunks of salmon. Several skates are tied together to make a string. The number of skates in a string varies with the type of fishing, depth, and size of the fishing vessel.

DEBORAH MERCY



Fishermen haul up a halibut on the starboard side of a seiner that was temporarily converted for longlining in Prince William Sound during one of the now-defunct 24-hour halibut openers.

Each end of the string is held on the bottom by an anchor. A line runs from each anchor to the surface where brightly colored buoys are tied to mark the line for easy retrieval. To further increase visibility at sea, a bamboo or aluminum pole with a small flag, and a radar reflector or light, is added to the buoy rigs.

To set the gear, the fisherman first throws the flag into the sea off the stern of the boat. Then the buoy and the buoy line are paid out. When the buoy line is trailing straight behind the boat, the string anchor is dropped. Then the boat moves away in a straight line, which pulls the baited string into the water. As the end of the string is reached, the boat slows and the other anchor and buoy are set, leaving on the seafloor a string of baited hooks, anchored at each end.

Two kinds of bottom

DARYL BINNEY

A typical longline vessel.

TONY LARA

Longline crew members deploy groundline over the chute.

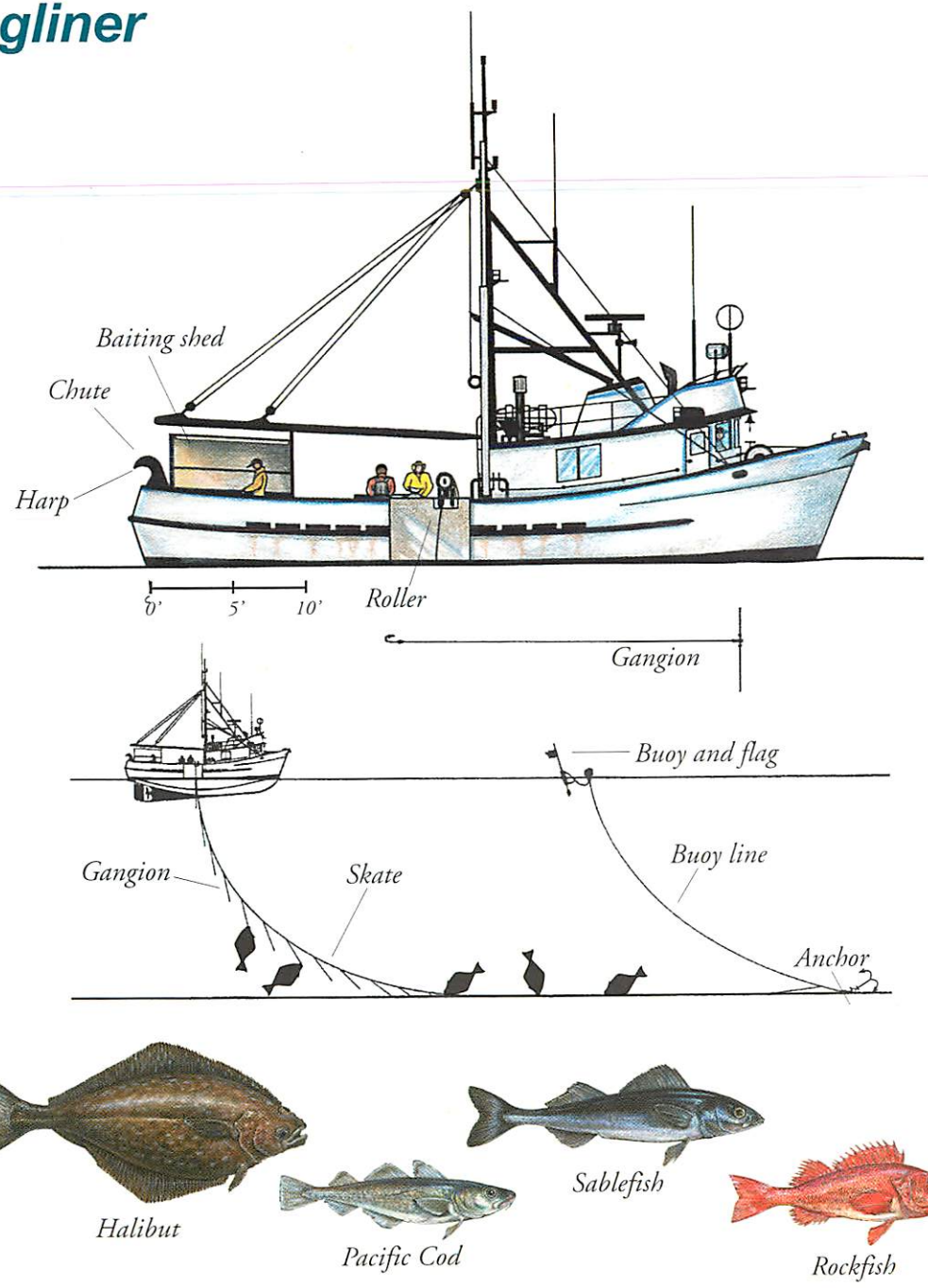
KURT BYERS

Halibut are taken from a longline vessel's refrigerated hold at Cordova.

KURT BYERS

A 256-pound halibut ready for processing at a Cordova plant.

Longliner



(demersal) longline gear are used in Alaska fisheries: stuck and snap-on gear. Surface gear is used elsewhere, but not in Alaska fisheries.

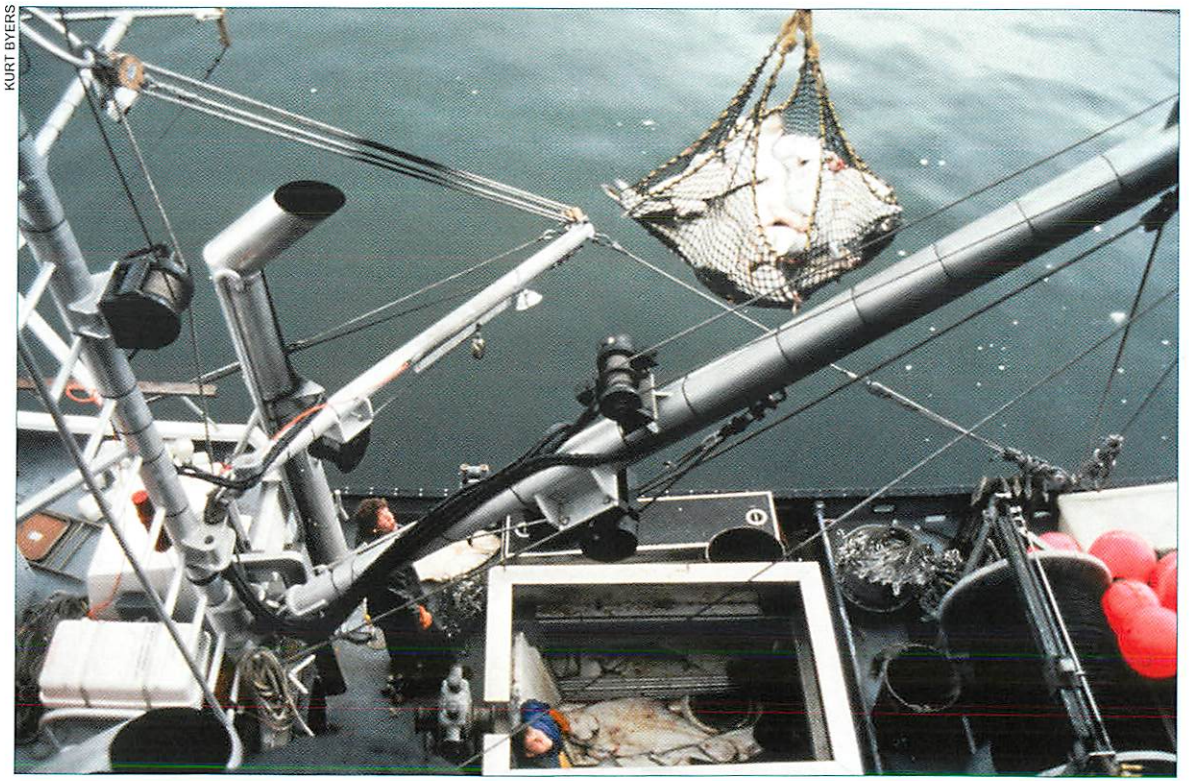
Stuck gear has gangions permanently tied to the groundline, and is stored in tubs on deck ("tub gear") or coiled on square canvas sheets called skate bottoms, or diapers.

Snap-on gear incorporates stainless steel snaps to connect gangions to the groundline, which is stored on and retrieved by a hydraulically activated drum or reel. Hooks are baited in advance, then quickly snapped onto the groundline as it is paid out behind the boat.

Some of the larger longliners use automated systems, which consist of rack storage for the hooks on stuck gear and some type of automatic hook baiter. A good automated system requires fewer crew members and largely eliminates the tedious and time-consuming gear overhaul, the work of manually stripping old bait off the hooks, storing the hooks, and rebaiting them before they are set.

After all the gear is set, the vessel returns to the first string to start retrieving the gear. When it is time to haul back the gear, the captain steers the boat alongside one of the buoys

KURT BYERS



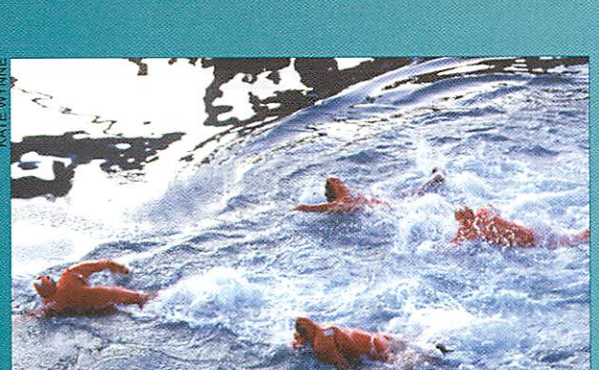
A longline vessel delivers its catch to a processing plant at Cordova. Halibut are cleaned, bled, and iced soon after they are taken aboard.

Gumby Suits and Satellites

KURT BYERS

The life-saving orange-red "Gumby" suit is made of closed-cell foam rubber.

KATE WYNNE



Contestants swim to a life raft in a survival suit race at Kodiak.

Technology has provided new ways to escape otherwise fatal situations at sea. Next to radio (for calling help), the three inventions that have done the most to save fishermen from doom in the unforgiving northern ocean are the covered life raft, immersion suit, and the Emergency Position Indicating Radio Beacon (EPIRB).

The life raft has come a long way from its humble beginnings. Today, a well-appointed auto-inflating life raft has a waterproof canopy equipped with a locator light and rain catcher for drinking water, insulating floor for added warmth, boarding ramp, and a sea anchor and ballast pockets for stability in rough seas. They also include a survival equipment packet, which may contain flares, signal mirror, whistle, knife, fishing hooks and line, and other potentially life-saving goodies.

In Alaska's frigid waters, most people who fall overboard without protection against the cold water will die in less than an hour, even if they aren't injured or overcome by seas. Many unfortunate souls could have been rescued had killer cold not gotten there first. Even a well-equipped life raft may not be enough to prevent death by hypothermia. Enter the immersion suit.

The development in the 1970s of the immersion suit, also known as the "survival suit," put the odds back in the fisherman's favor. The bulky one-piece body suits are awkward to wear on deck, but have saved the lives of hundreds of fishermen who were forced to enter the water from a sinking, capsized, or burning vessel. A correctly fitted and worn immersion suit keeps the wearer afloat and prevents heat loss from all parts of the body.

Commercial fishing festivals sometimes feature races wherein contestants don immersion suits on a dock or shore, dive into the water, and swim to a life raft. The races are an effective way to highlight the use and lifesaving value of immersion suits and how to get into a life raft.

While the immersion suit keeps the fisherman alive while he is bobbing in the sea or sitting in a life raft awaiting rescue, the EPIRB makes rescue possible. EPIRBs are small radio transmitters about the size of a large flashlight. When activated, they transmit skyward an electronic beacon that retransmits off an orbiting satellite, down to a receiving station on earth. The signal alerts emergency responders that there is a problem, and guides U.S. Coast Guard search-and-rescue aircraft and vessels to the trouble spot.

and crew members pull the flagpole and buoy aboard. The buoy line is then fed through the powerful hydraulic hauler (or onto the drum in the case of snap gear), which pulls the anchor and groundline off the seafloor and onto the boat. The line usually is hauled in near the midpoint of the starboard (right) side of the boat.

As the line comes aboard, crew members gaff the fish and unhook or unsnap them from the groundline. Immediately they gut and wash the fish, and put them on ice or in slush in the boat's hold.

Crab Fishing Gear

Pot Fishing

Crab, Pacific cod, and blackcod are caught in cage-like fish traps, called pots. A pot consists of a welded steel frame covered with polyester or stainless steel mesh. A bait jar or sack full of chopped herring is hung inside to attract the crab or fish. If the fisherman is targeting crab, he also hangs a whole fish inside the pot to keep the crab busy until the fisherman has a chance to return and haul in the gear.

TONY LARA

Crew haul in a pot of snow crab from the Bering Sea.

Lured by the bait, the fish or crabs find their way into the pot, but then either cannot find their way back out or can't get past the spring-loaded gate, called a "trigger," that allows passage in but blocks exit.

The size and style of pots vary quite a bit depending on the area to be fished and the species targeted. For example, Dungeness crab pots generally are cylindrical, about three feet in diameter and a foot high. A typical Dungeness pot weighs about 80 pounds and is covered with stainless steel

TONY LARA

Dungeness crabber at Kodiak.

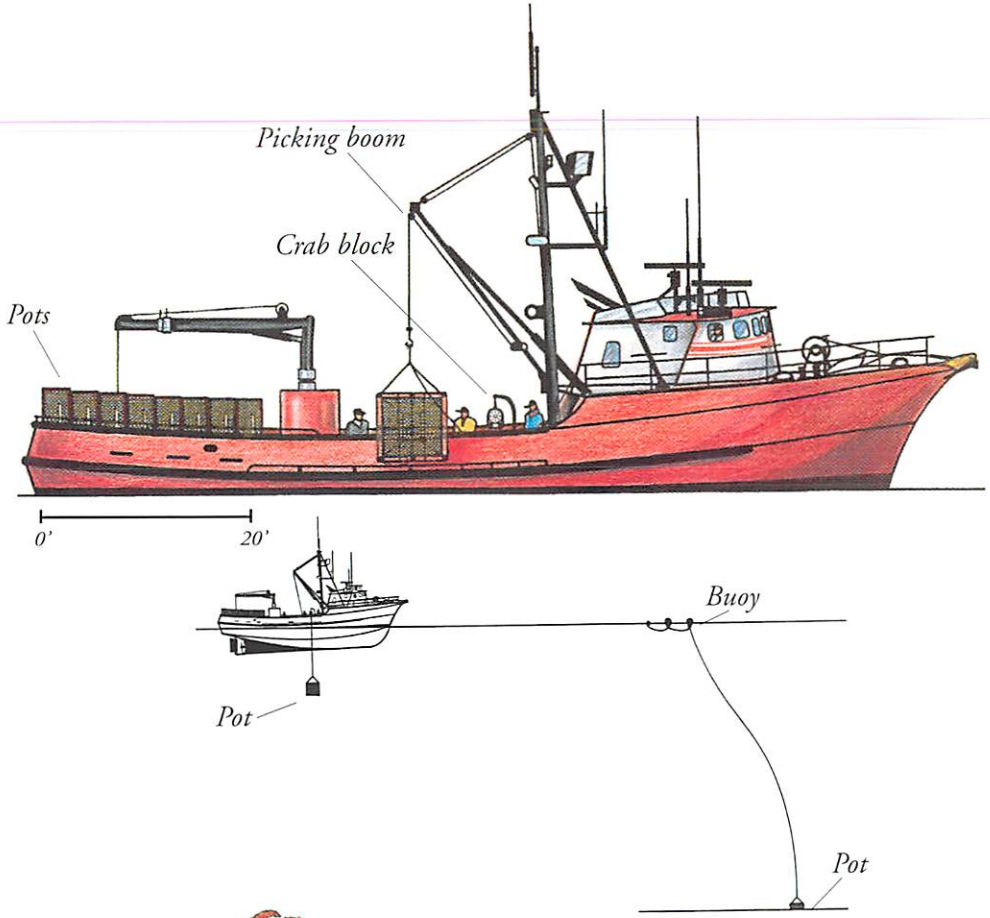
TONY LARA

Dungeness crab pot.

TONY LARA

A fisherman measures a red king crab from Bristol Bay.

Crabber



Red King Crab

Dungeness Crab

Tanner Crab

Snow Crab

Golden (Brown) King Crab

mesh. They are set individually and are marked with a buoy setup which consists of one or two large bullet-shaped corks. Dungeness crab are usually found close to shore and in protected bays, so look for Dungeness buoys in shallow water within three miles of shore. The typical Dungeness crab boat is 36-60 feet long which allows them to maneuver and operate safely in shallow water and small bays and channels. Dungeness seasons run from summer into late fall.

Snow crab, king crab, Tanner crab, and Pacific cod are fished with large, cube-shaped pots. The typical pot is 6.5 to 8 feet wide and 3 feet high. An empty pot weighs around 700 pounds and must be brought aboard the crabber with a powerful hydraulic winch and crane. Each pot is marked with two or three large colored buoys attached to a line connected to the pot on the seafloor.

An exception to this is golden king crab (also known as brown king crab), which are fished along the Aleutian Island chain in water as deep as 3,600 feet. To increase efficiency on a region of the seafloor which is exceptionally rough and irregular, fishermen use a single line with about 40—but sometimes up to 75—pots attached at 600-foot intervals. The idea is much like longlining. Instead of hooks, steel pots are attached to a 1.5 inch groundline, and no anchors are needed. The pots are unhooked from the groundline when they are hoisted aboard the vessel.

TONY LARA

Just another day at the office as Bering Sea crab fishermen haul in a pot full of snow crab.

There are several other styles and variations of the longline/pot rigs. Hair crabbers, for example, use small pots spaced about 60 feet apart. The big cubical pots and cone-shaped Tanner pots are the ones most commonly rigged this way.

In most crab fishing, pots are set out individually, each marked with a buoy. Depending on the type of fishing, the average soak time is about 24 hours. After the desired soak, the captain steers the boat so the crew can snag the buoys with a grappling hook. The buoys are pulled aboard and the pot line is fed into the hydraulic-powered block. A crab block uses the same principle as a longline hauler, except it handles larger line and reels the line in much faster.

When the pot breaks the surface, the block is stopped and a crew member hooks the pot to a cable connected to a crane-like mechanism (called the picking boom) which lifts the

Beating the Odds

TONY LARA

Crab fishing in the Bering Sea is tough and often dangerous work.

For decades commercial fishing in Alaska has been the most dangerous occupation in the United States. A fatality rate of 140 people per 100,000 workers per year was 20 times the national average.

In the late 1970s, the high casualty rate caused liability insurance rates to soar and forced the fishing industry to get serious about finding ways to reduce risk. In 1983 the Marine Advisory Program of the University of Alaska developed a commercial fishing safety outreach program. An outgrowth of that effort was formation of the Alaska Marine Safety Education Association (AMSEA) in 1985. AMSEA provides marine safety training and safety instructor certification.

Also in 1985, the North Pacific Fishing Vessel Owners' Association (NPFVOA) started a vessel safety program for their members.

In addition, the U.S. Coast Guard instituted voluntary safety guidelines, but most fishermen ignored them. It would take a personal disaster and the crusade of a bereaved and angry woman to give the safety movement the boost it needed.

In 1985 a college student named Peter Barry drowned when a seiner he was working on sank off Kodiak. His mother, Peggy Barry, went to Congress on a personal mission, determined to improve safety aboard fishing vessels.

In 1988, Congress—thanks in part to Peggy Barry—passed the Commercial Fishing Industry Vessel Safety Act. The law mandated that vessel owners get survival suits, life rafts, and institute safety training. AMSEA, NPFVOA, the Coast Guard, and other entities were ready to provide help.

The combined efforts are paying off. While the number of vessels lost in the Alaska fishery remained pretty steady through the 1990s, the fatality rate dropped by more than half.

Some segments of the industry—notably the offshore crabbing and trawl fisheries—are still dangerous places to work. But safety awareness, knowledge, and skills are now more widespread and prospects are good for further improvement.

pot over the rail and onto a hydraulic rack (pot launcher). From here, the pot door is opened and the crab are dumped into plastic bins (crab totes) or onto a sorting table. Crew members sort the crab, returning undersize crab and females to the sea and putting the "keepers" into the boat's hold. Meanwhile, the pot is rebaited and put back in the water, or the lines and buoys are tied up and stored in the pot which is then stacked on deck.

Once aboard the fishing vessel, the crab are kept alive in flooded holds, which are large tanks, until just minutes before they are cooked by the processor. Seawater is pumped through the tanks to keep the water clean and oxygenated.

TONY LARA

A couple of fishermen show off a big red king crab taken from the Bering Sea.

The majority of king, snow, and Tanner crab fishing in Alaska takes place during the winter far offshore in the Bering Sea. This is the time of year when crabs are most able to withstand being caught and tossed back into the sea if they do not meet harvest size and sex requirements. To safely operate in frigid, often stormy conditions, the average Bering Sea crabber today is 100- to 180-feet long, with some large catcher-processors in the 250-foot range.

Newer, larger boats, coupled with increased safety awareness, have made crab fishing much safer than it was in the late 1970s and early 1980s. A new quota share management system diminishes the dangers related to a competitive fishery, and openings now can be delayed to avoid fishing during bad storms. Still, crab fishing remains one of the most dangerous occupations in the United States due to frequently adverse weather and the heavy, cumbersome gear that stressed crew must manipulate on pitching, slippery decks.

Pots are one of the "cleanest" (little bycatch mortality) fishing devices because the fish or shellfish are brought aboard the boat alive, and undersized crabs and other bycatch can be returned to the sea with little or no harm.

However, lost pots can continue to catch fish and crabs, a problem dubbed "ghost fishing." Regulations call for pots to be constructed with sections made of rapidly biodegradable or corrodible materials so that lost pots do not continue to capture animals indefinitely.

KAREN DUCEY

A crewman, known as a "stack monkey," ties down snow crab pots aboard the F/V *Reliance*. Four boats sank in four days and one fisherman died during this 1994 winter storm on the Bering Sea.

Groundfish Fishing Gear

Trawling

Most cod, pollock, sole, and other bottomfish—also known as white fish or groundfish—are harvested by trawlers. Trawlers are large (60 to more than 300 feet), powerful vessels which tow funnel-shaped nets along the bottom (bottom trawlers) or up in the water column (midwater trawlers). These two trawl fisheries are generally considered to be separate fisheries. A third kind of trawl fishing is used to harvest shrimp. (See "Shrimp Fishing Gear" in this chapter.)

Until the early 1970s, only a small number of American trawlers fished Alaskan waters, delivering to shore-based processing plants. But in 1976, sweeping changes in U.S. law forced foreign fishing vessels out of the 200-mile U.S. fishery zone (see Fisheries Management chapter). By the late 1970s, the only foreign fishing vessels allowed into the zone were

FRED HIRSCHMANN

A trawler heads from Frederick Sound to Wrangell Narrows in the Inside Passage of Southeast Alaska.

MARK KELLEY

A typical trawler.

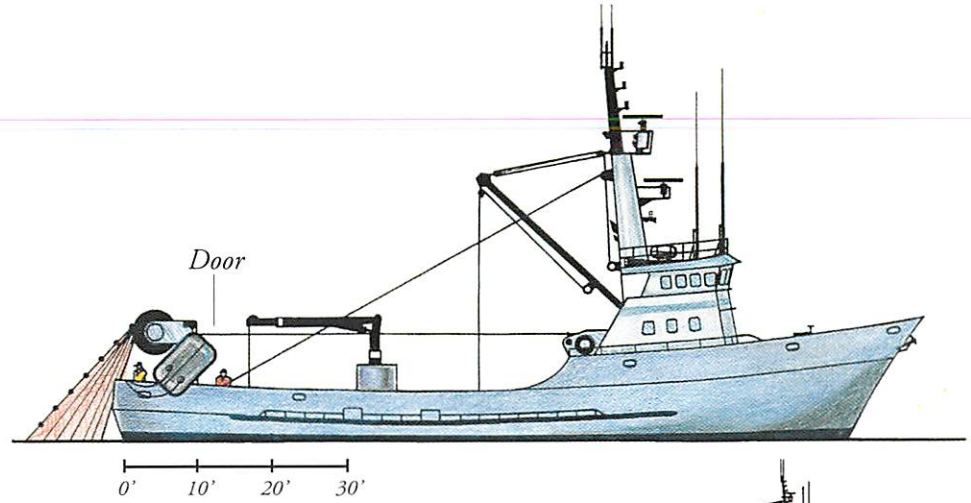
KURT BYERS

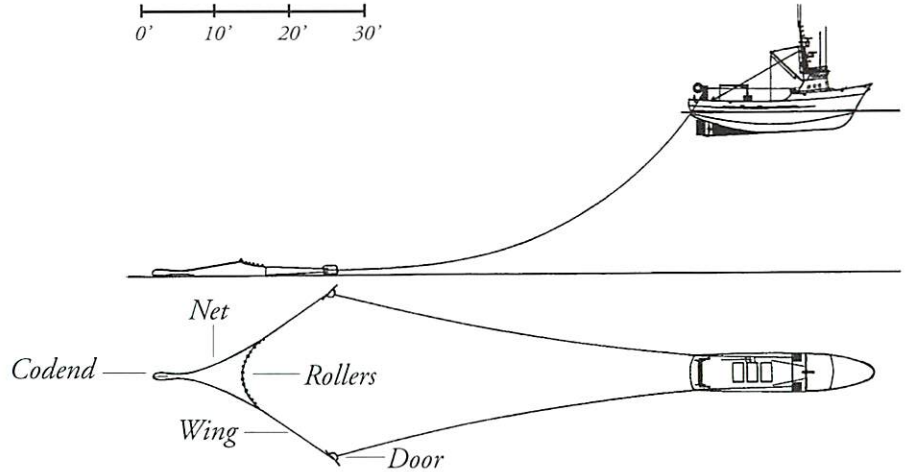
A small trawler underway at Kodiak.

KURT BYERS

Trawl net drum and door.

Bottom Trawler





Pollock

Pacific Cod

Atka Mackerel

Starry Flounder

Pink Shrimp

Yellowfin Sole

processors, which purchased fish caught by American boats. Eventually the U.S. processing industry built enough capacity to handle the catch, and foreign processors were displaced.

Now the harvest is processed by a mix of shore plants, floating processors, and factory trawlers—also known as catcher-processors—which are equipped to both catch and process groundfish. As of 2000, about 20 American-flagged catcher-processor trawlers fished Alaska waters. Most of them are about 140 to 200 feet long and employ up to 50 people onboard at a time.

Trawl nets are rigged to the fishing vessel with heavy steel cables, and may span from 100 feet to 400 feet at their opening, depending on the size and power of the vessel. Crew members pay out the trawl net and cable over the stern until the net is at the proper depth. The vessel's skipper monitors sophisticated electronic devices which show him where the fish are in front of and under the boat and in relation to position of the net. Sensing equipment also indicates the vessel's speed and the amount of fish in the net.

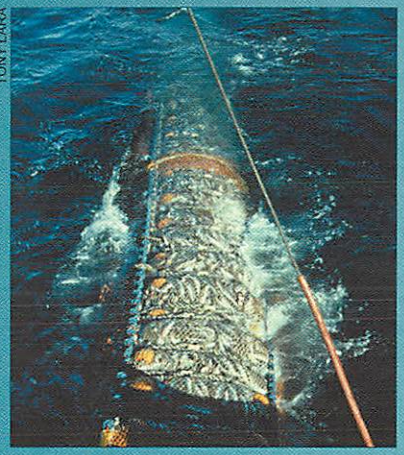
Fish trapped in the net soon succumb to exhaustion and drift to the narrow rear end of the net, called the codend. When enough fish are packed into the codend, the skipper orders

KURT BYERS

Trawlers tied up at Kodiak await the next trip. Notice the Steller sea lion hauled out on the stern ramp. Although the big animals can be a nuisance to fishermen, federal law prohibits harassment of this endangered species.

NATALIE FOBES

Midwater trawler.



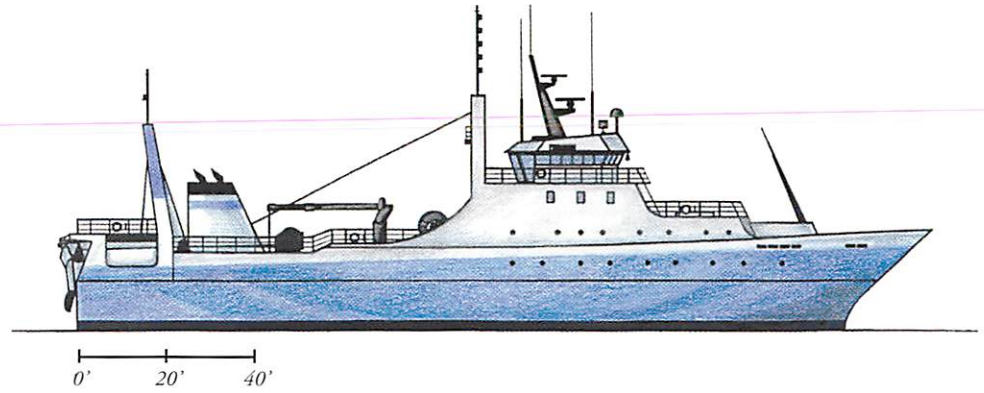
TONY LARA

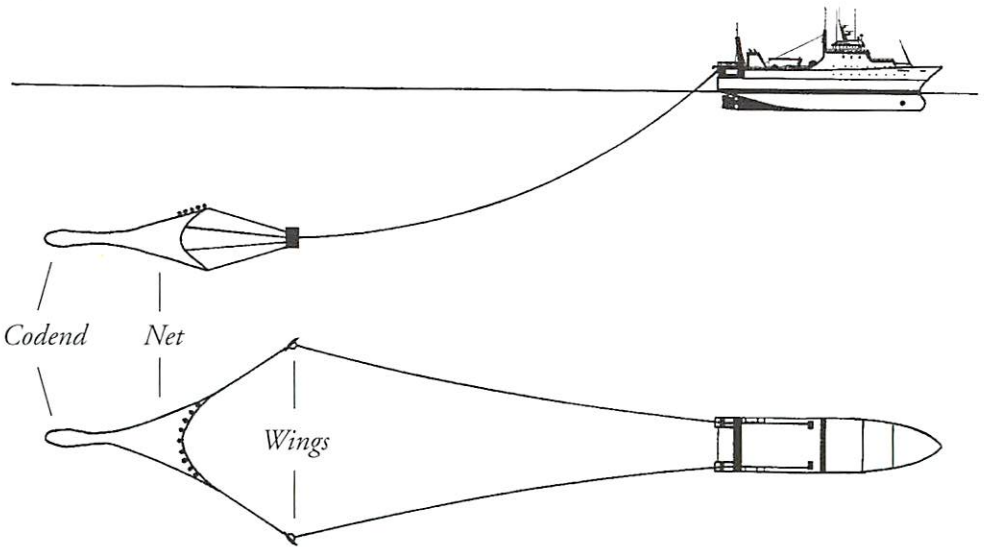
A codend full of pollock rises from the Bering Sea.

TONY LARA

A crewman washes pollock into the holding tank aboard a Bering Sea trawler.

Midwater Trawler





Pollock

Pacific Cod

the crew to engage winches which retrieve the cable and slide the net up the stern ramp.

Bigger boats use nets that can catch over 100 tons of fish in a single tow. On some vessels the codend is opened on deck and the fish are shoveled into holds below deck for delivery to shoreside processing plants. On others the codend is towed to a nearby mothership or other factory trawler where the fish are winched aboard the second ship and processed on the spot.

NATALIE FOBES

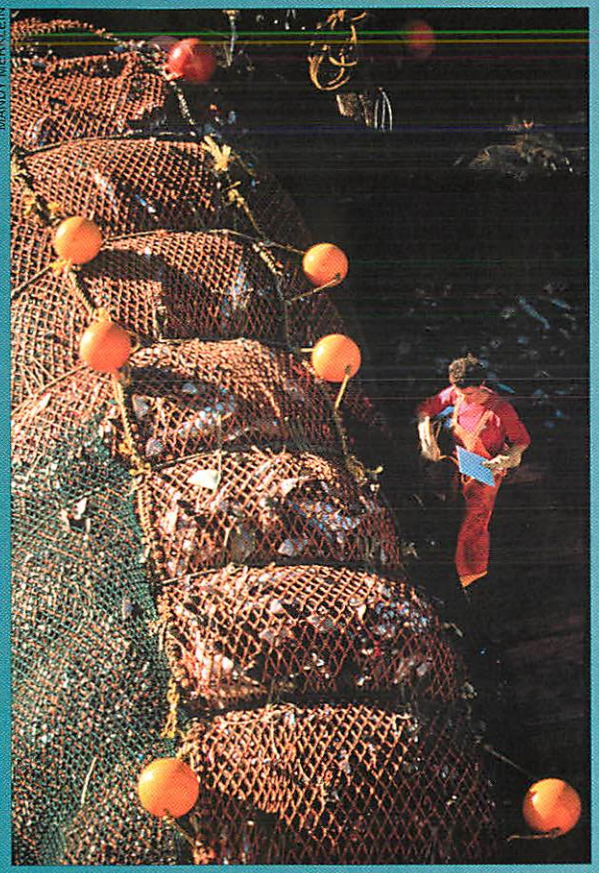
A midwater trawl net opens to discharge thousands of pollock from the Bering Sea.

Bottom trawl gear targets flatfishes and other species that hug the bottom. Foot ropes, sometimes made of chain, attached to the net travel along the seafloor. In some cases, hard rubber rollers are used to protect the net and help it pass over rocks and other obstacles.

"Chafing gear," made of heavy rope matting, protects the codend from abrasion as it passes over the seafloor. Steel panels, called doors, are attached at either side of the net opening. As the boat pulls the net through the water, the force of the water on the doors pushes them outward, spreading the net open. The turbulence caused by the doors on the seafloor stirs up sediment clouds as the net travels through the water, herding fish into the net. A big bottom trawl net spans about 200 feet in width with an opening about 12 feet high.

Midwater trawl nets are much larger. They do not run on the seafloor so they exert less drag on the vessel, allowing the boat to tow a larger net with the

Goodbye Bycatch?



MANDY MERKLEIN

A federal fisheries observer estimates the volume of pollock in the codend of a trawl net.

In most Alaska fisheries, technology and personal knowledge allow fishermen to efficiently find and harvest from large, concentrated single-species populations—resulting in what's called "clean" fisheries. But no matter how carefully fishermen fish or how advanced harvest technology becomes, there will always be some bycatch taken from the sea—fish, invertebrates, birds, and mammals that are not the intended target. The trick is to minimize bycatch while maintaining the economic viability of the fishing industry.

Bycatch in the groundfish fishery is an ongoing challenge. Each year fishermen sweep more than 3 billion pounds of pollock from the Gulf of Alaska and Bering Sea. In 1996, a typical pollock harvest year, 96 percent of the catch was pollock. That's the good news. The bad news is, the remaining 4 percent bycatch still amounted to about 132 million pounds of fish, a lot of wasted protein.

To make matters worse, fishermen used to be required by law to throw away certain species of bycatch (called "prohibited species"), dead and wasted. Finally, in 1999, after years of heated debate a regulation was adopted which requires trawlers to keep and process a certain amount of non-target species.

Longliners sometimes hook seabirds when they flock around lines to snatch an easy meal off hooks before the baited hooks sink out of reach into the sea. Field trials by scientists working with foreign and U.S. longline fishermen have succeeded in developing new techniques to scare birds away from longlines and to get the baited lines to sink faster. Efforts continue to find still better techniques to avoid catching seabirds.

In the crab fishery, thousands of lost crab pots are believed to "ghost fish," continuing to trap and kill crabs and fish on the seafloor. Crab pots are required by law to be constructed with biodegradable panels. But they may not break down fast enough to release alive all bycatch.

These are a few of the bycatch problems concerned parties are grappling with. While excellent progress has been made through better laws and fishing techniques, intensive work continues by fishermen, scientists, technicians, conservationists, and managers to reach their elusive goal—to avoid catching non-target and undersized species in the first place.

same power. A 1,800 horsepower midwater trawler might tow a net with a rectangular opening 240 feet wide and 180 feet high. A net with an opening that size can be up to 1,000 feet long, including the codend.

Some trawlers are propelled by as much as 4,000 horsepower, although their nets are not necessarily proportionally larger than those of medium-power vessels.

Midwater nets are equipped with doors but don't funnel fish into the net like bottom trawl nets. They have huge openings and large-mesh "wings" at the outside corners of the opening. The wings herd free-swimming fish into the net's gaping maw.

New high-density polyethylene ropes, which are extremely light, thin, and strong, are used to make the nets because the ropes reduce the drag of wings and nets in the water, allowing a vessel to sweep a larger volume of water.

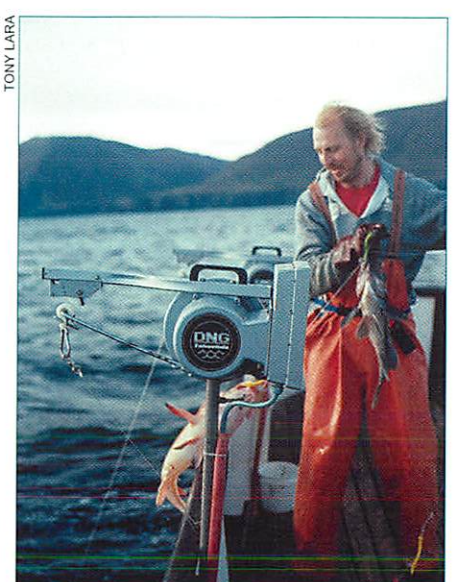
Some huge midwater nets include a detachable codend that allows the vessel to tow its catch to a shore plant, mothership, or factory trawler without taking the fish on board.

Jigging

One of the oldest forms of fishing in the world, jigging, became one of the newest in Alaska when the state opened a quota-regulated nearshore jig fishery for Pacific cod in 1997. The season opens January 1. Most fishing occurs in the spring and summer until quotas are filled.

Jigs are used on small boats from 20 to 58 feet long to catch Pacific cod, rockfish, and other groundfish. The technique involves lowering one or more artificial lures on a line and rapidly jerking the line up and down, either manually or mechanically, to impart motion to the lures and induce fish to strike.

TONY LARA



A Kodiak fisherman using an electric jigging machine pulls in some rockfishes.

Traditionally jigging was done by hand. But now semi-automated jigging machines have revolutionized small-boat bottom fishing. Reels are powered by electric or hydraulic motors controlled by a small computer. The computer finds the proper depth, makes the reel jig the lures up and down the right distance and speed, alerts the fisherman when there are fish on the line, and on the fisherman's command instructs the reel to bring them up. A small boat with one or two crew members is allowed to operate up to five machines at once.

Jigging machines are particularly effective for catching spawning and feeding aggregations of Pacific cod and rockfish. Permits cost only $50. A computerized jigging rig costs anywhere from about $1,000 to $5,000.