Conserving Alaska's Oceans

The "Alaska Model" is a renowned paragon of successful fishery management. Is it up to the challenge ahead?



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TABLE OF CONTENTS

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Prepared under contract for Marine Conservation Alliance, Juneau, Alaska, 2006.

Introduction

Alaska's seas provide more than half the U.S. seafood catch, annually yielding harvests that exceed 5 billion pounds of fish and shellfish. Not coincidentally, these waters are also home to 26 species of marine mammals, 38 species of seabirds, and billions of other organisms that collectively constitute one of the planet's most prolific marine ecosystems.[1]

At a time of justifiable anxiety about overfishing worldwide, it is understandable that some people question the wisdom of Alaska's vast annual seafood harvest. Are fisheries in these waters taking too much? Is it possible that fishing is unbalancing the ecosystems of the North Pacific? These are important questions to ask. The fact that they are vigorously studied, debated, and answered in open public meetings—by scientists, fishermen, managers, and environmentalists—is a good indicator of the quality of management in Alaska's fisheries. In fact, dozens of fisheries scientists and managers are probing the same questions continuously.

They have good reason to do so. Significant changes have occurred recently in the seas that lap Alaska's rocky shores, and more may be coming. Fishery managers and scientists are keenly aware that fishing fleets have grown more powerful over time, and they have instituted rules and monitoring systems to prevent overfishing, halt any overfishing that does occur, and minimize impacts to the rest of the ocean. Yet even with some of the world's most advanced conservation practices, fisheries in Alaska operate in an immense natural system that humans cannot control. We are guests at this table.

And the table is undeniably changing. Ocean temperatures are rising. On the bottom of the Bering Sea, scientists have documented a steady increase in ocean temperatures that has continued for more than three decades. During this time two regime shifts (one in the late 1970s, another in the late 1990s) have occurred in the North Pacific's regional ocean climate. These regional climate cycles correlate with profound changes in the abundance and distribution of many marine species. Pollock, cod, salmon, and many other fish have proliferated. Some important forage fish species have dwindled dramatically, although there are indications that the latest regime shift may be aiding their return. Marine mammal, seabird, and fish species that rely on those diminished forage species have declined sharply. Yet many of the vital signs of these waters are strong, and scientists assessing the ecosystem have concluded that, so far, the food web off Alaska's shores is far from being "fished down." When scientists compared the total ecosystem burden imposed by modern fisheries to that of intensive whaling that occurred in the Bering Sea during the 1950s, they found that fishing takes a far lighter toll on the food web. By the 1980s, whaling was over and the fishing industry—roughly similar in scale to today's industry—was indirectly consuming only about 6.1% of primary production. Whaling had taken about 47%.[1]

Groundfish make up the vast majority of the known swimming biomass in the U.S. waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska—the region colloquially known as the North Pacific. This group includes pollock, cod, flounders, and many other important food fish. For now, federal scientists reckon that not a single groundfish stock is being overfished in waters off Alaska. In fact, today most surveyed groundfish species in the North Pacific are at or near record abundance, although there are indications that biomass may have peaked for some of these species. It is also true that Alaska's salmon returns have sustained an almost uninterrupted growth streak for three decades; the salmon resource now supports catches that today are usually eight to 10 times larger than when Alaska became a state in 1959. The region's Pacific halibut population has been rebuilt after a period of overfishing during the early 20th century. And despite long declines, populations of seabirds, northern fur seals, and Steller sea lions are apparently rebounding in several areas off Alaska, according to recent surveys.

FACT: Scientists have concluded that, so far, the food web off Alaska's shores is far from being "fished down."

But we cannot afford to be complacent. Major gaps in our understanding of the North Pacific and its fish populations mean we are still vulnerable—both to errors in fishery management and to effects of climate change. Several stocks of crab in the Bering Sea have failed to recover despite complete closure of fisheries targeting them; scientists are still not sure why, but many believe that climate-driven changes are hampering their growth. Declines in some pinniped and seabird populations are also poorly understood, although studies have found no evidence linking seabird declines to fishery removals of pollock, a suggestion favored by some critics of the trawl fisheries. And for many species that are not currently harvested, even basic abundance data is spotty at best. Identifying the most urgent gaps and filling them is a major priority.

There are powerful climatic shifts at work in the North Pacific, and fishery managers have only recently begun to recognize some of their effects. For decades these forces have set the table for both humans and the wild creatures that feed in these waters. But the same forces are equally capable of impoverishing harvests or dramatically changing the mix of species that live in the North Pacific.

Our place at the feast is not guaranteed. We can wear out our welcome if we overindulge, as fisheries in many parts of the world sadly have demonstrated. If we fail to recognize how the sea is changing around us, we run a grave risk of exceeding the limits of sustainability when conditions become less favorable to the species we harvest.

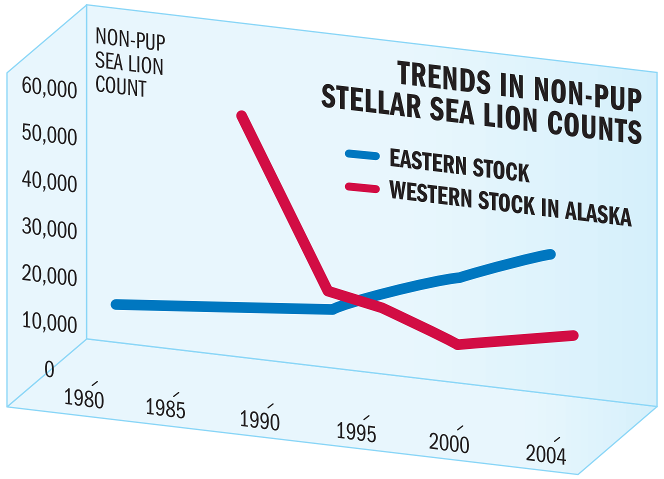
As America's most productive ocean, the North Pacific off Alaska attracts plenty of passion and intense scrutiny. Arguably, it should. These waters encompass 70% of the U.S. continental shelf—the most fertile part of the ocean. Their continued health directly affects the welfare of human seafood consumers around the world, as well as many marine species that depend upon these waters.

This paper makes no pretense of settling all questions about the health of the oceans off Alaska. But any serious examination of the evidence reveals that overfishing and heedless management are not the major issues in the North Pacific. On the contrary, the "Alaska model" of fishery management represents a standard that managers in other regions are striving to emulate. A more useful question is whether this justly celebrated management system can be further improved to make it even more robust, particularly at a time when climate change may present new challenges to fisheries.

This paper offers a review of the current condition of the region's living marine resources and its fisheries governance. It concludes with recommended actions to help assure the continued success of fishery management in the North Pacific.

Steller sea lion numbers in Southeast Alaska have been rising steadily since the 1980s. They also appear to be recovering in the state's western waters (see graph below).

BRAD WARREN



Alaska's western stock of Steller Sea lions is apparently bouncing back.

SOURCE: 2005 Stock Assessment Report, NMFS

Management Performance

Are fishery managers doing enough to conserve fish stocks and ecosystems in the oceans off Alaska? It's a fair question and a useful one to ask. At a time of chronic overfishing in many of the world's oceans, the health of Alaska's prolific marine waters cannot be taken for granted. Fortunately, the record so far is an exceptionally strong one.

Six questions can be used to evaluate the quality of stewardship in most fisheries, and they are applicable in Alaska:

1. Do fishery managers effectively sustain the stocks being fished?
2. Do they follow scientific advice, even when it requires painful fishing restrictions?
3. Do fishery managers safeguard non-target species and ecosystems from potential fishery impacts?
4. Are fisheries, fish stocks, and relevant environmental conditions monitored and understood well enough to permit reasonable judgments about the risks and effects of management decisions?
5. Is the decision process transparent, open to the public, and rigorous?
6. Are effective access controls in place to prevent unrestrained fleet growth and permit accurate predictions of harvest rates?

Stock Conservation

The first test of fishery management is to sustain the stocks being fished. It should be clear that abundance fluctuates naturally no matter how carefully a

1 Do fishery managers effectively sustain the stocks being fished?

fishery is managed. The job of managers is not to force nature into a flat line of unvarying catches; it is to ensure that catches are well enough controlled to prevent fisheries from pushing natural fluctuations into stock collapses. In this task, fishery managers in Alaska have earned international recognition among their peers, who generally consider the "Alaska model" to be a gold standard in the field. Many conservation organizations, though fiercely critical of fishery management on certain issues, have come to the same conclusion about this region. The Ocean Conservancy, a national environmental organization, rated the North Pacific the most successful region in the United States in preventing and reversing overfishing.[1] Among fisheries currently overseen by the North Pacific Fishery Management Council, none are considered to be experiencing overfishing, and only one group of stocks (encompassing several Being Sea crab populations) is designated as "overfished," a term referring to depletion which, in this case, is believed to persist because of inhospitable ocean conditions, not fishing pressure. When stocks decline, the Council has shown repeatedly that it is willing and able to cut harvest rates in order to make certain that fishing remains within sustainable limits.

2 Do they follow scientific advice, even when it requires painful fishing restrictions?

Sticking to Science

One of the most widely accepted criteria for evaluating the performance of fishery managers is whether they follow scientific advice, even when it calls for cutting harvests. This requires both determination and political skill, since reducing harvests is usually unpopular. Not surprisingly, in many parts of the world fishery managers have repeatedly failed this test. The North Pacific Fishery Management Council, however, has never authorized catch quotas that exceed the recommendations of its scientific advisors. In fact, due to complex regulations that further limit catches in order to control bycatch and spread out fishing effort spatially and temporally, actual harvests consistently fall well below the "acceptable biological catch" (ABC), which represents the level of harvest that scientists consider to be sustainable for individual stocks.

In Alaska, response to potential overfishing has been swift and decisive. For example, in the mid-1990s, when one rogue scallop vessel exploited a loophole to defy the State of Alaska's catch limits by moving into federal waters off Alaska, the Council closed those waters to all scallop fishing for 17 months while new regulations were developed to prevent this abuse from recurring. When Gulf of Alaska pollock stocks declined during the early 2000s, the Council followed advice from scientists and ratcheted down harvest rates; by 2005, it had eliminated any risk that overfishing might occur, according to federal scientists.[2]

Managing Ecosystem Impacts

A third test of fishery managers' performance is whether they safeguard non-target species and ecosystems from potential damage by fishing. The Pew Oceans Commission concluded in 2003 that the North Pacific represents "arguably, the best managed single-species fisheries in the country. With rare exceptions, the managers there have a record of not exceeding acceptable catch limits set by scientists. In addition, Alaskans have done more to control bycatch and protect habitat from fishing gear than any other region in the nation."[3]

By design, in the North Pacific harvest limits are set lower than required for single-species sustainability in order to ensure that enough fish are left in the water for other creatures to eat. In fact, one analysis of exploitation rates for cod and similar species worldwide (pollock, hake, whiting, etc.) found that North Pacific fishery managers have maintained the lowest harvest rates among fisheries studied by ICES (International Council for Exploration).[4] This conservative approach to catch limits both strengthens conservation of target stocks and reduces any potential for harming ecosystems where fishing occurs.

In complying with the Endangered Species Act, the Council has enacted additional precautionary policies:

3 Do fishery managers safeguard non-target species and ecosystems from potential fishery impacts?

regulations restrict fishing from nearshore zones that provide a 10-nautical-mile buffer around rookeries and haulouts where endangered Steller sea lions gather most of their food. These rules were

Like many Alaska fishing vessels, the longliner, crabber and salmon tender Shuyak is equipped for multiple fisheries. This helps both fishermen and fish—enabling fleets to focus on abundant stocks while reducing harvests on vulnerable ones.

SUSAN CHAMBERS

designed mainly to constrain removals that might cause localized depletion of the animals' prey; this precautionary step was taken even though such depletion was still (and largely remains) an unproven hypothesis.

In 1997, federal fishery managers enacted a ban on targeted fishing for key forage species in order to avoid undercutting prey supplies for seabirds and other predators. This prohibition covers capelin, smelt, lanternfish, deep-sea smelts, sand lance, bristlemouths, pricklebacks, gunnels, Pacific sandfish, and euphausiids.[5]

COURTESY OF SUE PAULSEN

During decades of volunteer service on fisheries boards, Petersburg halibut fisherman Gordon Jensen became an icon of conservation-minded management. He zealously restricted catches to protect Alaska's fisheries from depletion.

An independent biological observer scrutinizes fish caught aboard the catcher-processor Northern Jaeger, a pollock factory ship. Every ship in this fleet carries two observers, who verify catch data to make certain the harvest stays within sustainable limits.

SUSAN CHAMBERS

North Pacific managers have established a clear leadership position in the development of ecosystem-based approaches to fishery management. Over the years, the North Pacific Fishery Management Council and NOAA Fisheries in Alaska have created a network of marine-protected areas larger than Texas, Louisiana, Maine, and Maryland combined. Nearly 400,000 square nautical miles in the North Pacific off Alaska are now closed to bottom trawling in order to protect marine habitat. In February 2005, the Council barred bottom trawling in all but 4% of the Aleutian Islands management area, shutting 277,100 square miles to this gear as a precaution against harm to essential fish habitat. Regulations and industry efforts also have sharply reduced bycatch through a combination of carefully designed incentives, data sharing at sea, and regulations. Additional rules have greatly reduced entanglement of marine mammals and seabirds.

To safeguard the wider marine ecosystems where fishing occurs, far-reaching research and conservation measures are in place—and they are continually evolving. These efforts address potential fishery impacts on prey and predator populations, effects of climatic change, population trends for numerous species, and many other matters.

Monitoring, Data Collection, and Analysis

A fourth key test for fishery management is whether it is adequately supported by monitoring and analysis of stocks, fishing activities, and relevant environmental conditions.

As the source of more than half the nation's catch, Alaska's oceans represent one of the most intensively monitored marine ecosystems on Earth. Scientists track total fishery removals—including fish caught incidentally as well those taken deliberately—using on-board observers, mandatory catch reports, and delivery and production records from processors. They regularly survey and assess the abundance of dozens of species of fish and shellfish, whales, seals, otters, and sea lions. They sample stomachs of predators, gather scat from sea creatures to analyze their diets, tag animals to discover where they forage, conduct molecular assays to determine the origins of their food, and carefully evaluate the potential for fishing fleets to deprive them of prey. They study outbreaks of disease and parasites and monitor levels of pollutants and related symptoms in sealife. They study the seafloor in submersibles and analyze the effects of fishing gear on the habitat of benthic creatures. They assess survival rates of fish that escape from fishing gear. They measure the efficacy of the methods used by fishermen to avoid entangling birds, mammals, and non-target species of crabs and fish. They monitor sea temperature, salinity, currents, ice movements, wind, barometric pressure, and ocean climate cycles that affect population levels among marine creatures. They document changes in the distribution and abundance of marine species and scour records for possible links to fishing activities or to climate factors.

One cornerstone of this information-intensive management practice is the use of regular surveys to assess abundance of groundfish and other species off Alaska. A 2004 environmental impact statement for Alaska groundfish fisheries judged this to be

4 Are fisheries, fish stocks, and relevant environmental conditions monitored and understood well enough to permit reasonable judgments about the costs and consequences of management decisions?

"probably the most extensive survey effort implemented by a single government agency anywhere in the world." Even so, the surveys were (and are) still undergoing improvements. The report continues: "The survey strategy currently is being expanded to an annual/biennial cycle, which will greatly increase the pollock stock monitoring in the groundfish

Lessons from History

The character of Alaska fisheries management is rooted in hard experience—not merely in the luxury of "virgin" fishery resources that make it economically easy for fishermen and communities to accept catch restrictions. Indeed, the institutions that govern fisheries in Alaska today were created by fishermen and managers who were determined to halt overfishing that threatened their livelihoods. These historic struggles have fostered an enduring conservation ethic in the political culture of the region's fishing industry.

By the early 1920s, halibut fishermen's concern about the future of their resource—dwindling under uncontrolled international fishing pressure—resulted in a U.S.-Canadian treaty to conserve and manage the fishery. Working together through a new commission, the two nations limited fishing and rebuilt the resource.

At mid-century, Alaskans' struggle for statehood was largely a struggle for the right to conserve and prosper from their own salmon resources. These stocks had been so badly plundered—mainly by "outside" companies—that President Eisenhower declared them a national disaster in 1959.

The need to halt overfishing by foreign distant-water fleets, off Alaska and other U.S. states, was one of the main forces that led to passage of the Magnuson Fishery Conservation and Management Act in 1976. This law created today's system of fishery management for federal waters extending 200 miles offshore.

Despite the North Pacific region's success in rebuilding depleted groundfish stocks, the crab crash of the early 1980s delivered a humbling reminder of the risks and mysteries of fishery management. More than 20 years later, the persistent depression of Bering Sea crab stocks—despite total closure of several fisheries and tight harvest limits on those that are still open—remains a troubling puzzle for fishery managers in the region. Some believe that warmer water temperatures and other climatic influences are preventing temperature-sensitive shellfish populations from recovering in parts of Alaska. Today's tightly controlled harvests, however, should ensure that fishing does not aggravate the problem.

5 Is the decision-making process transparent, open to the public, and rigorous?

stocks. The increased age composition data from expanded surveys will also improve stock assessments and forecasts, particularly for the younger incoming year-classes…"[6]

Open Government

The openness of fisheries governance in Alaska is well-documented. One good indicator of this is the vigorous ongoing debate over every serious point—and a few threadbare ones—at which fishery management might have room for improvement. The North Pacific Fishery Management Council meets five times a year in open session, and the meetings are closely attended by many competing interests, who demand transparency, accountability, and demonstrable attention to their own agendas. For example, some agency biologists, fishermen, and activists who are skeptics about Alaska's large groundfish harvests attend many of these meetings; they serve a useful purpose by persistently challenging managers to build wide precautionary margins into fishery regulations.

The diversity of the management and science community engaged in fisheries governance is another important indicator of its strength. The International Pacific Halibut Commission, which in many ways set the template for modern fishery management in the North Pacific, is a U.S.–Canadian body with staff and commissioners from both nations. Representatives from Canada are not reticent in demanding accountability from U.S. fisheries that impact halibut, especially through bycatch taken by fleets pursuing other species. The North Pacific Fishery Management Council itself comprises members from Alaska, Oregon, and Washington, with representation from the Coast Guard and scientific advice from researchers on several panels; these scientists are drawn from state and federal fisheries agencies, universities and, on some occasions, even from research institutions overseas.

Access Limitation

Limiting access has been a major focus of fishery management in the North Pacific for decades. Much of the heavy lifting has now been done, with the implementation of limited-entry permits, Individual

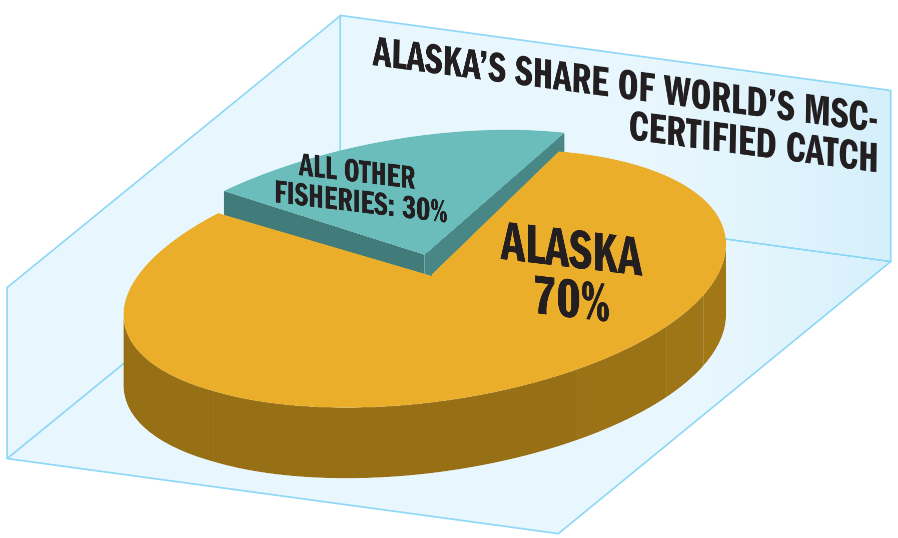
6 Are effective access controls in place to prevent unrestrained fleet growth and permit accurate predictions of harvest rates?

Fishing Quotas (IFQs), and other measures. Collectively, these controls improve the ability of fishermen and managers to plan and predict outcomes for their actions. They permit seasonal openings and closures to operate more precisely than in an unlimited-access fishery, increasing efficiency and reducing waste of harvested fish. One of the benefits has been to reduce waste of unintentionally caught fish that are not marketable. The development of vessel quotas for catch and bycatch in halibut, sablefish, pollock, and Bering Sea crab fisheries has allowed fishermen to stop racing for their share of a common harvest. They can fish more selectively, and also schedule catching activities to maintain steady throughput in fish plants, which dramatically increases the industry's ability to convert the catch into useful products instead of scrap.

An Independent View

Taken together, all of these factors have greatly simplified the challenge faced by the region's fishery managers today in widening the scope of stewardship to encompass whole ecosystems, not just the health of commercially important fish and shellfish stocks. The Marine Stewardship Council (MSC), the leading international ecolabeling authority for fisheries, was established to recognize and promote sustainably managed fisheries and to encourage continual improvement. The MSC system relies on independent scientific certifiers to determine whether fisheries comply with its standards and criteria, which were developed by a blue-ribbon international panel of scientists. Fisheries in the North Pacific—principally in Alaska—produce 70% (by weight) of all seafood approved by the MSC at this writing. Certified fisheries in Alaska include pollock, salmon, halibut, sablefish, and Bering Sea freezer-longline cod. With its careful, science-based management, the region represents a leading example of the sustainable fishery management that the MSC was designed to encourage.

FACT: Catch regulations in Alaska groundfish fisheries are based on "probably the most extensive survey effort implemented by a single government agency anywhere in the world."



By weight, Alaska produces more than two-thirds of the seafood approved by the world's leading seafood "ecolabel" authority, the Marine Stewardship Council. Alaska salmon, pollock, cod, halibut and blackcod all passed rigorous review to earn this mark of ecological soundness.

SOURCE: MSC, ADF&G, NMFXS[7]

Stock Conservation Index

In an era when overfishing has become an endemic and grave problem in world fisheries—including some in the United States—fishery managers in Alaska have taken a different approach.

Strict harvest limits designed to anticipate and prevent overexploitation—of target species and, increasingly, non-target species as well—have been standard operating procedure in Alaska since long before the term "precautionary management" came into vogue. Fishery managers in Alaska have maintained low harvest rates to buffer against the risks associated with scientific uncertainty about stock condition and environmental factors. When necessary, they have aggressively reduced harvest rates to end overfishing or prevent it from occurring.

The North Pacific Fishery Management Council has consistently kept catch limits within the bounds recommended by scientific advisors. In setting catch limits, the Council and its advisors take steps to restrain harvests so that enough fish are left in the water for other sea creatures to eat. The Council and NMFS also have instituted bycatch caps, habitat protection zones, harvest control rules, and cumulative, multi-species harvest caps (2 million metric tons in the Bering Sea and Aleutian Islands, 800,000 metric tons in the Gulf of Alaska). These interact to keep actual catches in groundfish fisheries significantly lower than each stock's Acceptable Biological Catch (ABC), which represents the annual harvest that scientists believe these populations can sustain. In some ways it is a fair criticism to observe that the North Pacific relies on "single-species management," but in fact, these measures reflect a practice of fisheries governance which has already evolved beyond that stage, embracing far more rigorous and conservative ecosystem constraints on fishing. If fisheries actually were managed on a single-species basis, the whole ABC could be taken, and exploitation rates would be considerably higher.

Rank of Gulf of Alaska pollock fishery among similar world fisheries, by lowest exploitation rate on targeted adult fish:[1] 1

Rank of the U.S. Bering Sea pollock fishery in the same group of fisheries:[2] 1

Average portion of Acceptable Biological Catch (ABC), for 10 major groundfish stocks, actually taken by fleets fishing in the Eastern Bering Sea and Aleutians, 1995-2004:[3] 51%

Number of federally managed fish stocks currently being overfished in the U.S. North Pacific:[4] 0

Number of federally managed fish stocks currently being overfished in other regions of the United States:[5] 38

Estimated Alaska salmon catch in 1959, in number of fish:[6] 25 million

Alaska salmon catch in 2005, in number of fish:[7] 206 million

ALAN HAIG-BROWN

Multiple by which North Pacific biomass of female spawning halibut increased from 1974 to 2004:[8] 13

Multiple by which estimated biomass of female pollock increased from 1964 to 2003 in the Eastern Bering Sea:[9] 7.6

Estimated abundance of age 3+ pollock in Eastern Bering Sea during 2005, in metric tons:[10] 9,277,000

Pollock catch in Eastern Bering Sea during 2005, in metric tons:[11] 1,478,500

Estimated Bering Sea biomass, in metric tons, of the rockfish Pacific Ocean perch in 1960, before overfishing by foreign factory ships depleted the resource:[12] 795,299

Estimated biomass of Pacific Ocean perch in the Bering Sea and Aleutians (BSAI), in metric tons, when the North Pacific Fishery Management Council began regulating fishing in 1978:[13] 112,000

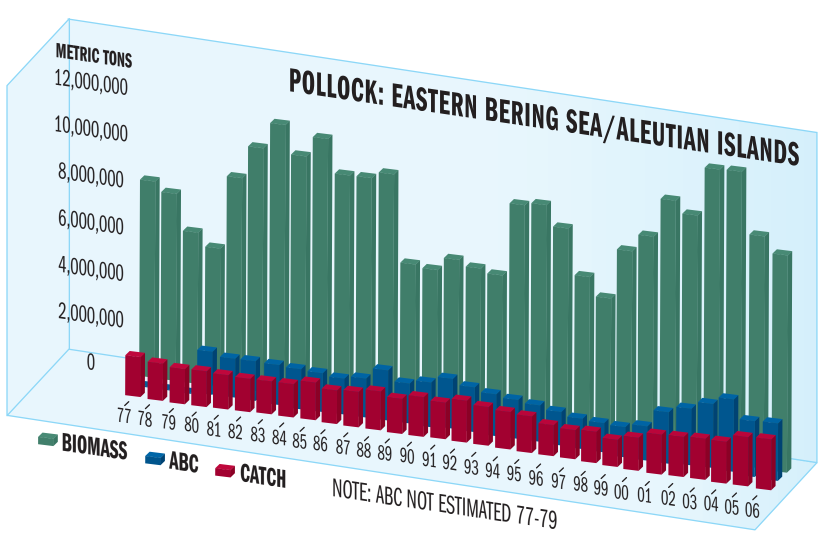
Amount by which the Council subsequently reduced the fishery's exploitation rate for Pacific Ocean perch:[14] 88%

Estimated biomass, in metric tons, of Pacific Ocean perch in the Bering Sea in 2004:[15] 578,999

Trophic level of the North Pacific catch under federal management over the last 25 years, according to NMFS analysis of whether fisheries are "fishing down the food web":[16] "High, stable"

Portion of known groundfish biomass in the Eastern Bering Sea that consists of pollock, since 1977:[17] 50+%

Number of months during which federal fishery managers in February 1995 closed the entire EEZ off Alaska to scallop fishing in order to craft new rules closing a loophole that briefly allowed a single scallop vessel to defy state of Alaska scallop regulations by shifting its operations into federal waters:[18] 17



Cautious catch limits fisheries off Alaska. Here, pollock biomass (green) towers above the permitted catch (red) in the Bering Sea and Aleutian Islands. The catch is kept well below the Acceptable Biological Catch (blue), that scientists believe could be safely harvested.

CREDIT: Natural Resources Consultants, from NMFS data.

Multiple by which the relative abundance of Tanner crab, flathead sole, and pollock has increased since 1976 in Ugak Bay on Kodiak Island, according to ADF&G's survey:[19] 10

Year when fisheries conducted by foreign factory fleets took the greatest reported all-species catch in Eastern Bering Sea:[20] 1972

Total catch reported in 1972 in Eastern Bering Sea, in metric tons:[21] 2,149,000

Factor by which actual catch in early 1970s exceeded the reported catch, due to poaching by foreign fleets, according to an NMFS biologist's estimate based on informal admissions of cheating by Japanese fish captains:[22] 2+

Percentage reduction in total reported catch in Eastern Bering Sea between 1972 and 1978, when the newly established North Pacific Fishery Management Council began limiting harvests:[23] 37%

Number of metric tons at which the Council later capped total removals of groundfish in the Eastern Bering Sea in order to safeguard ecosystem function:[24] 2,000,000

Trend in density of all fish and invertebrates found in Bering Sea by trawl surveys, 1982-2003:[25] Increasing

Year when trawl surveys found the greatest density of fish and invertebrates ever recorded in Gulf of Alaska, as of 2004:[26] 2003

Year when Southeast Alaska, after years of increasing Chinook salmon production, recorded its largest catch of Chinook salmon since Alaska statehood in 1959:[27] 2004

Year of largest pink salmon harvest in Alaska history:[28] 2005

Rank of 2005 salmon harvest, among largest in Alaska history:[29] 3

Multiple by which estimated biomass of the "other flatfish" species group (Dover sole, longhead dab, rex sole, Sakhalin sole, starry flounder, and butter sole) increased in the Bering Sea and Aleutians, from 1985 to 2004:[30] 3.8

Approximate multiple by which female Pacific cod spawning biomass increased from 1977 to 2005 in the Eastern Bering Sea, according to stock assessments:[31] 6.5

Estimated increase in groundfish biomass in the Gulf of Alaska, 1984-1996:[32] >30%

Multiple by which biomass of slope rockfish, an aggregation of species, increased in the Gulf of Alaska from 1984 to 2001:[33] 3.9

Number of metric tons set by the North Pacific Council in 1987 as a precautionary cap on annual groundfish harvests in the Gulf of Alaska:[34] 800,000

Number of metric tons of groundfish that the Council's scientific advisors recommended as sustainable harvest level (the acceptable biological catch) in the Gulf of Alaska during 2005:[35] 539,263

Total Allowable Catch (TAC) of groundfish, in metric tons, authorized by the Council in the Gulf of Alaska for 2005:[36] 291,000

Estimated total biomass of groundfish in the Gulf of Alaska in 2006, in metric tons:[37] 5,473,907

Average exploitation rate for groundfish in the Gulf of Alaska, 1988-2004:[38] 4.5%

Number of times during the decade 1987-1996 when the North Pacific Fishery Management Council authorized a TAC larger than the sustainable harvest range, or Acceptable Biological Catch, recommended by stock-assessment scientists:[39] 0

Number of groundfish TACs set by the Council during that decade:[40] 281

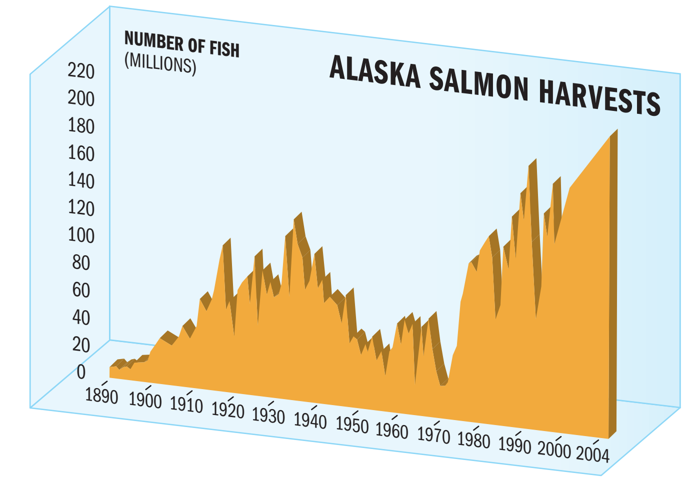
Percentage increase in pollock biomass estimated to have occurred in the Eastern Bering Sea between the 1950s and the 1980s:[41] 400%

Estimated biomass of pollock in the Gulf of Alaska between 1961 and 1971, in metric tons:[42] <300,000

FACT: Between 1977 and 2005 the female Pacific cod spawning biomass in the Eastern Bering Sea increased by a multiple of approximately 6.5.

Estimated biomass of pollock in the Gulf of Alaska in the mid-1970s, in metric tons:[43] >2 million

Rank of Gulf of Alaska pollock biomass prior to 1961 (before a large-scale fishery developed) among the lowest levels ever observed, according to model estimates:[44] 1



Alaska's salmon populations have rebounded — setting many new records for abundance since Alaskans took over management of the resource in 1960.

CREDIT: Natural Resources Consultants, from ISER (UAA) and ADFG data.

Number of long-term declines in abundance, of Gulf of Alaska pollock since 1978:[45] 0

Rank of 2004 Shelikof Strait pollock spawning biomass among largest recorded since the early 1980s by a hydroacoustic survey of the region:[46] 1

Ratio of 2004 estimated spawning biomass to unfished spawning biomass for Gulf of Alaska pollock (erroneously reported by one Alaska environmental group as 20%, which would make the stock overfished):[47] 37%

Probability of current harvest levels reducing this stock to overfished status (i.e., to 20% of unfished biomass):[48] 0%

Decline, in the Bering Sea and Aleutians, in estimated biomass of Greenland turbot from 2004 to 2005—a reduction attributed to continued warm conditions on the Eastern Bering Sea shelf—which puts spawning biomass at its lowest recorded level:[49] 24%

Reduction in TAC for BSAI Greenland turbot, from 2004 to 2005:[50] 23%

Reduction in total fishery mortalities (catch+bycatch) for BSAI Greenland turbot, 2000 to 2005:[51] 43%

Reduction in estimated female spawning biomass for BSAI Greenland turbot, 2000 to 2005, according to the 2005 Assessment:[52] 31%

Ratio of BSAI Greenland turbot catch to estimated biomass in 2005:[53] 3.4%

Major Stock Trends

Change in abundance in Alaska groundfish

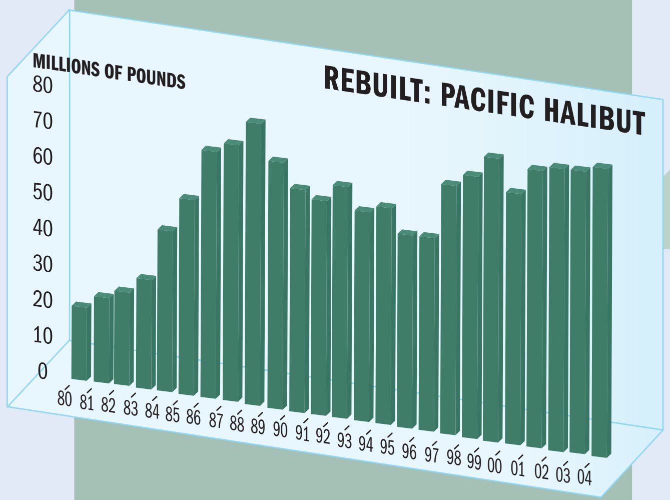
BERING SEA AND ALEUTIAN ISLANDS

STOCK	Trend since 1977	EXPLOITATION RATE 2004 (catch/biomass)	ESTIMATED EXPLOITABLE BIOMASS IN METRIC TONS 1977	1985	1995	2005
Total groundfish	48% increase	13%	11,124,439	17,429,625	19,643,500	16,467,010
pollock	13% increase	13%	7,900,000	10,900,000	8,711,000	8,952,000
Atka mackerel	140% increase	21%	197,529	306,780	832,000	486,000
Greenland turbot & arrowooth flounder	94% increase	2%	403,500	430,100	775,000	782,300
other flatfish (including rock sole)	580% increase	2%	436,400	1,664,000	3,732,000	2,996,000
all flatfish	197% increase	4%	1,536,400	3,964,000	6,502,000	4,556,000
rockfish (including thornyheads)	374% increase	3%	135,810	197,595	491,100	644,000
Pacific cod	30% increase	13%	390,800	1,094,500	1,620,000	1,290,000
rock sole	576% increase	4%	204,000	743,600	2,330,000	1,380,000
sablefish	17% decrease	3%	82,100	169,600	30,400	68,000
other species	48% increase	4%	478,300	367,050	682,000	708,000
yellowfin sole	42% increase	5%	1,100,000	2,300,000	2,770,000	1,560,000

GULF OF ALASKA

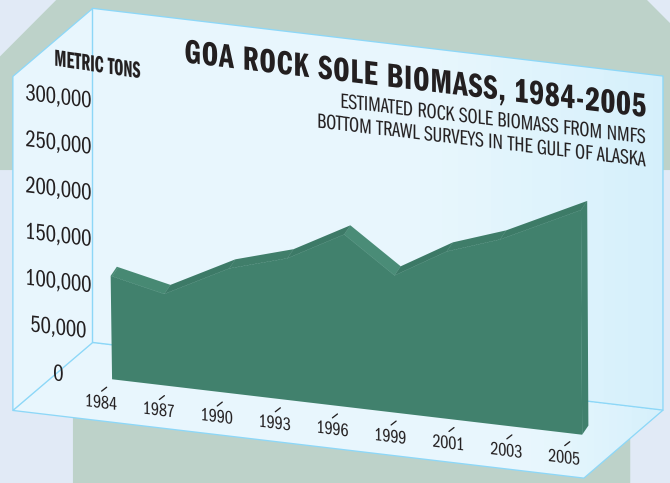
STOCK	Trend since 1984 (1977 for pollock)	EXPLOITATION RATE 2004 (catch/biomass)	ESTIMATED EXPLOITABLE BIOMASS IN METRIC TONS 1977	1984	2005
Total groundfish	20% increase	4%		5,364,012	5,473,907
pollock	20% decrease	8%	781,000	1,613,000	765,180
Pacific cod	24% decrease	9%		627,679	472,000
Total flatfish	62% increase	1%		2,056,808	3,324,355
sablefish	32% decrease	9%		274,000	185,000
rockfish (including thornyheads)	10% increase	3%		658,657	727,372

SOURCE: June, J. Natural Resources Consultants, from NMFS resource assessment/SAFE documents, 2005



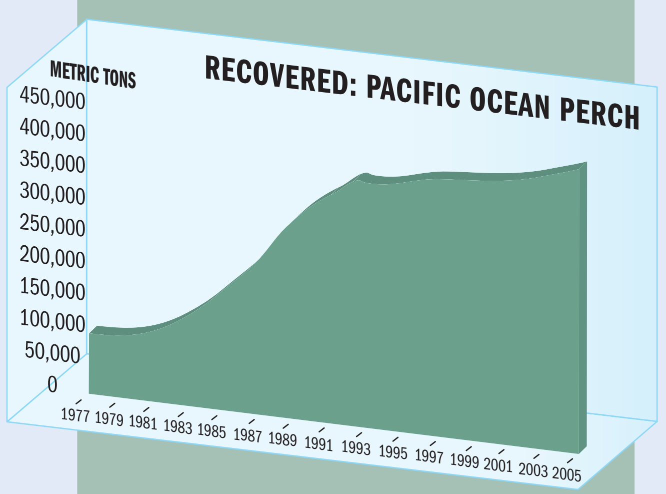
Alaskans and Canadians teamed up to end overfishing of this shared resource in the 1920s. Their legacy continues. Thanks to tight harvest regulations and favorable ocean conditions, the allowable halibut catch for U.S. and Canadian fishermen has more than tripled since 1980.

SOURCE: IPHC



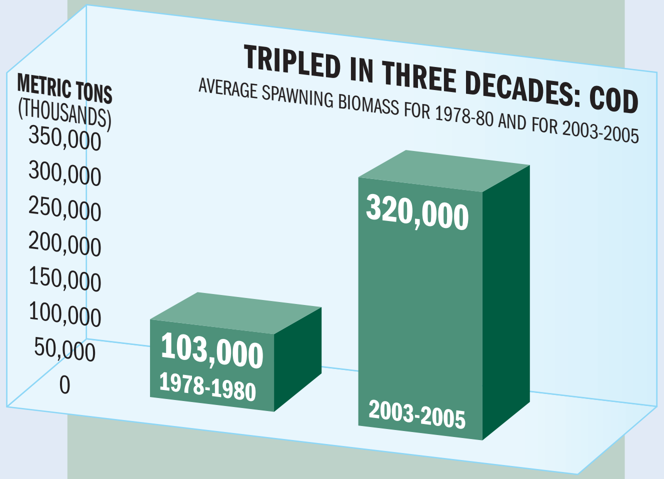
Rock sole, prized for its valuable roe, has thrived under Alaska's careful fishing limits. Its biomass in the Gulf of Alaska has nearly doubled since the mid 1980s.

SOURCE: NMFS



Beaten down by foreign overfishing during the 1960s and 70s, Pacific Ocean perch in the Bering Sea and Aleutians has rebounded under the North Pacific Council's careful management. Estimated biomass has nearly quadrupled since the Council began regulating the fishery in 1978.

SOURCE: NMFS



Alaska's cod thrives because tight catch limits leave plenty of them in the water to reproduce. While the rest of the world struggles to curb overfishing of cod stocks, the Bering Sea cod population off Alaska has more than tripled its spawning biomass since the North Pacific Council took over management.

SOURCE: NRC, from NMFS data.

Is Bering Sea Crab Being Overfished?

Stock assessment reports show that no crab stock in Alaska is currently being overfished. However, in a turn of phrase that can be misleading, several stocks are officially considered to be in an "overfished" condition because abundance is low and, regardless of the cause of decline, tight catch restrictions are necessary to protect and rebuild these populations. Whether fishing or unfavorable ocean conditions originally triggered these population declines is a matter of ongoing debate, and both factors have been implicated. What's clear today, however, is that harvest limits have been reduced enough—in some cases to zero—to eliminate any chance that today's catches might slow recovery of these populations.

Harvests of Alaska's red king crab are tightly controlled to protect the resource.

KLAS STOLPE

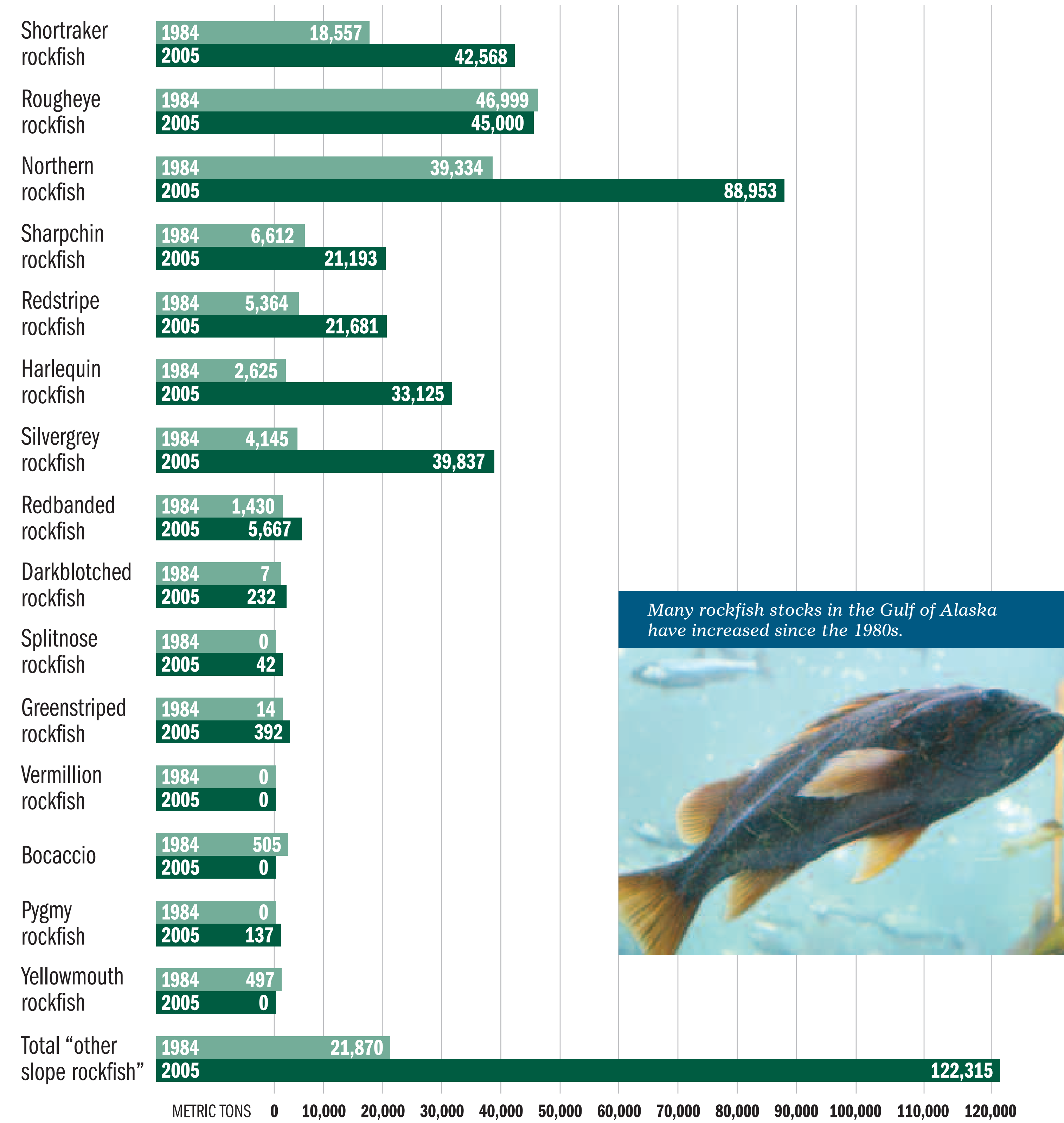
Crab Conservation Index

Number of the six surveyed Bering Sea/Aleutians stocks of king and Tanner crab that are above overfished level, according to a 2005 survey:	4
Margin by which mature biomass of Bristol Bay red king crab exceeded the overfished level in the same survey:	306%
Margin by which Pribilof red king crab exceeded the overfished level:	145%
Margin by which Eastern Bering Sea Tanner crab exceeded the overfished level:	71%
Margin by which Eastern Bering Sea snow crab exceeded the overfished level:	33%
Multiple by which total mature biomass of Bristol Bay red king crab in 2005 exceeded the biomass associated with maximum sustained yield (i.e., a margin of safety for the stock):	2
Year when the annual crab survey found the largest biomass of mature-sized Bristol Bay red king crab since 1982:	2005
Number of years for which the Bristol Bay red king crab fishery was closed, starting in 1994, to rebuild the depressed stock:	2
Number of years during the period 1996-2004 when the harvest rate for Bristol Bay red king crab was restricted to 10 percent of legal-sized males, half the level allowed before the 1994 closure:	6

FACT: Measured by a 2005 survey, the mature biomass of Bristol Bay red king crab exceeded the overfished level by 306%

Change in Rockfish Biomass, 1984-2001

Comparison of biomass estimates (in metric tons) for slope rockfish in the Gulf of Alaska.



Many rockfish stocks in the Gulf of Alaska have increased since the 1980s.

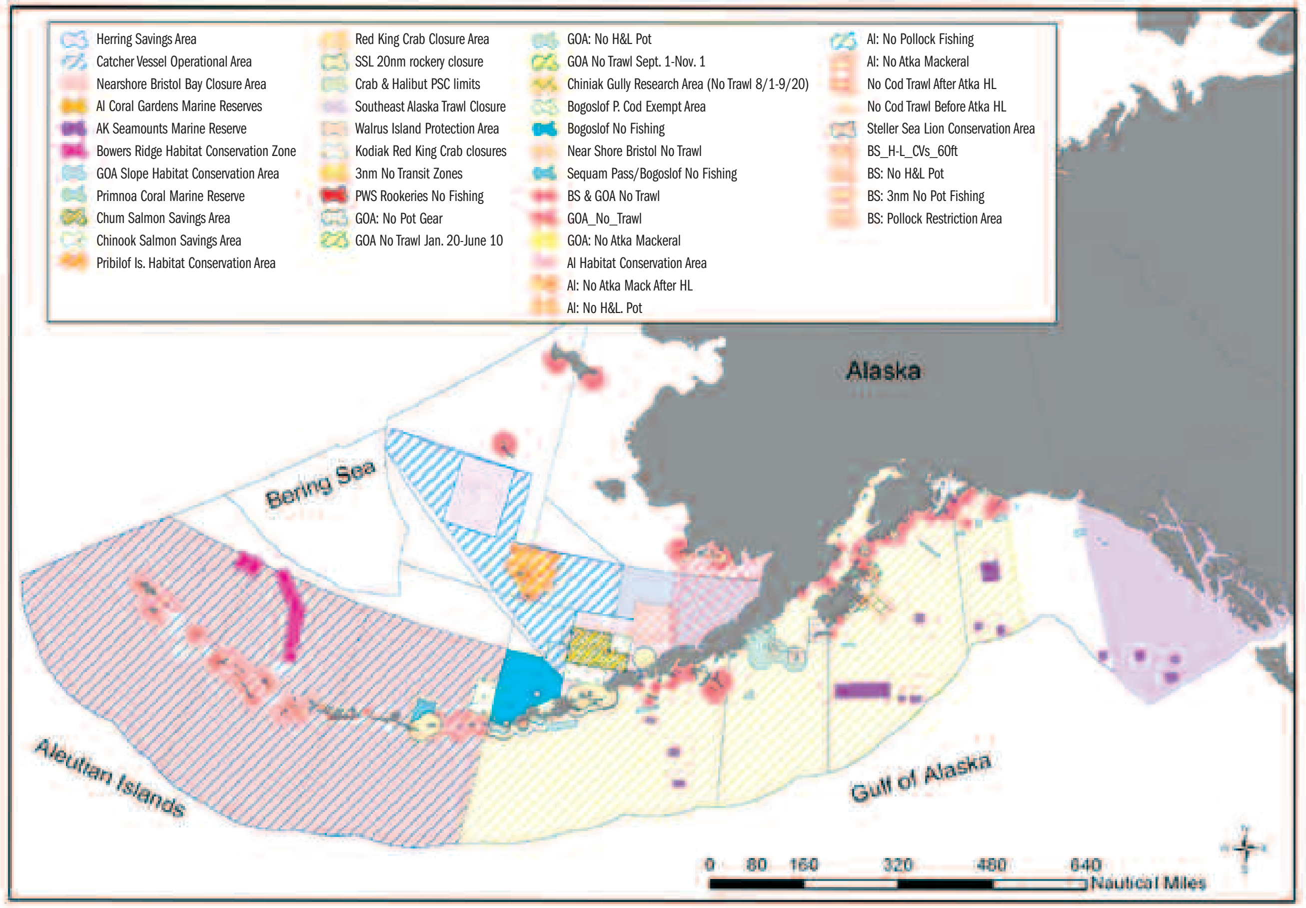
SECTION TWO:

Habitat and Bycatch Measures

Today's extensive system of ecosystem protections in Alaska fisheries—with dozens of closed areas and restrictions on the time, place, and method of fishing—evolved out of early struggles to control halibut bycatch by fleets targeting different species in the same waters. The aim of regulations has gradually widened to protect habitat and ecosystems that provide the foundation of productive fisheries and healthy seas.

By the 1930s, there were trawling bans to protect juvenile halibut and temporal closures to protect nursery grounds. The movement for statehood in Alaska was fueled by Alaskans' determination to rebuild and assert control over salmon resources, which had been gravely damaged by distant corporate interests that historically ruled the territory's fisheries. Upon achieving statehood in 1959, Alaskans abolished the canning companies' salmon traps. They soon closed creek mouths to purse seining and enacted habitat protections for salmon-producing creeks and lakes. In later decades, habitat conservation spread further into the sea, evolving as the major groundfish and crab fisheries off Alaska developed and came under U.S. control.

This commitment to habitat arose naturally, and largely as a matter of self-interest. Industry participants, scientists, and managers have insisted on policies to protect the fish, crabs, and shrimp that provide their livelihood; in many cases, industry groups have lobbied for restrictions on other fleets they suspected of excessive bycatch or deleterious habitat impacts. Over time, the rationales for habitat protection have broadened to include non-economic objectives such as preservation of biodiversity. Similarly, the scale and complexity of these protective measures has expanded. With improved scientific understanding of the ocean's biological communities and increased monitoring of fishery impacts on marine ecosystems, a multitude of regulations, policies, and conservation initiatives have evolved.



Fishery Management Closures in Alaska

Plentiful and protected river habitat has helped Alaska's coho salmon populations grow, sustaining harvests that have roughly tripled since the 1970s.

BRAD WARREN

By 2006, approximately 395,113 square nautical miles off Alaska have been closed year-round to some or all trawl fisheries to protect seabed habitat and shelter the feeding grounds of marine mammals and other marine species.[1] This area is 56 percent larger than the entire Atlantic coast Exclusive Economic Zone (EEZ) and more than twice the size of the Gulf of Mexico EEZ.[2] In the spring of 2005 alone, the North Pacific Fishery Management Council banned trawling in an area larger than Texas: 277,114 square nautical miles in the Aleutian Islands. At the same time, to protect coral gardens, the Council closed an additional 110 square nautical miles to all bottom-contact fishing gear[3] and another 5,286 square nautical miles to all mobile gear that contacts the seabed (e.g., to trawls and "dinglebar" gear used for rockfish) to protect sensitive habitat at Bowers Ridge, north of the Aleutians.[4] To safeguard both seabed habitat and local fish stocks, all of Southeast Alaska is closed to bottom trawling under Amendment 41 to the Gulf's Fishery Management Plan (FMP). This encompasses waters in the Gulf of Alaska out to 140° longitude. The Sitka Pinnacles Marine Reserve, established by FMP Amendment 59, encompasses 2.5 square nautical miles in which federal and state fishery regulations prohibit commercial fishing and even anchoring by groundfish and halibut vessels. This reserve shields "an unusually productive area that contains great concentrations of spawning lingcod and a variety of rockfish species, which find shelter in the algae and anemones along the rock walls," according to a federal environmental impact report.[5]

In an aggressive application of the precautionary principle, closures covering thousands of square miles were specifically crafted to prevent harm never actually observed, but which is hypothesized as possible. For example, some 22,000 square miles of water within 10 nautical miles of Steller sea lion rookeries and haulouts are off limits to pelagic trawling for pollock. This precaution reflects concerns that this fishery might remove prey needed by Alaska's endangered western stock of Steller sea lions.[6] Other protected areas off Alaska are closed to all fishing vessels, while some management rules allow only

FACT: In the spring of 2005 alone, the North Pacific Fishery Management Council banned bottom trawling in an area larger than Texas: 277,114 square nautical miles in the Aleutian Islands.

Better swimmers than flyers, horned puffins can dive 80 feet to catch fish and invertebrates. A ban on fisheries that target forage fish protects hunting grounds of puffins and many other birds.

MILO BURCHAM

fishing methods believed to cause no significant impact to habitat or vulnerable bycatch species.

Beyond year-round closures, a calendar of seasonal closures protect approximately 218,000 square nautical miles from bottom trawl impacts (and in some cases from other gear) at times of year when vulnerable species are present.[7] These temporal measures protect herring, crab, and walruses from unintended fishing impacts; they also reduce bycatch of several fish and shellfish species.

Overall, bottom trawling operations impact a relatively small fraction of the sea floor off Alaska. “Large areas of the Bering Sea appear to have no trawling activity,” the National Research Council reported in 2002. “Both the spatial extent and the intensity of fishing effort decreased significantly in the 1990s. Between 1998 and 2000, 57 percent of the total area monitored was swept annually by bottom gear; less than 2 percent of the area was swept more than once a year. The Gulf of Alaska experienced considerably less trawling activity than did the Bering Sea during the 1990s, and there were significant reductions in the geographic extent and the intensity of trawling in the Gulf of Alaska.” Similarly, in the Aleutian Islands, “the intensity of trawling was relatively light compared with the Bering Sea during the 1990s, and there was about a 40 percent reduction in observed effort during the decade.”[8]

The Road Ahead

Although much has been done to limit fishing impacts on marine habitat in Alaska, there is still much to be learned—and little time for resting on laurels.

Additional waters may be closed in the Bering Sea as the North Pacific Fishery Management Council identifies and moves to protect habitats of particular concern. Further conservation measures may be proposed as research yields a more detailed grasp of predator-prey interactions, indirect effects of fishing, and the role of particular structures in the ocean—such as current and temperature boundaries or corals and other benthic organisms that shelter finfish and shellfish.

Many advocacy groups, scientists, and fishery managers have championed a shift from single-species stewardship toward ecosystem-wide management. Fishery managers in Alaska have long embraced this goal, and they have already moved much farther toward it than some activists wish to admit. It’s tough to raise money to crusade against environmental “wrongdoers” when they keep rising to each conservation challenge. Indeed, conservation measures are continually being improved and expanded in Alaska’s fisheries.

The crux of this continuous improvement has been the iterative process of monitoring impacts, assessing resources, and adjusting fishery regulations with annual catch limits and frequent in-season measures to control bycatch, habitat impacts, and total catch. The objectives and metrics applied in this process are built upon the careful application of the tools of single-species fishery management, but they have long since grown to embrace broader goals for ecosystem conservation. Rather than merely limiting harvests so that fish can reproduce and sustain themselves, managers have taken numerous steps to protect the structure and function of ecosystems within which fisheries operate. These steps include enacting habitat protection and bycatch reduction measures (some of which are described above); prohibiting fishing on all forage species except herring; and, especially, keeping exploitation rates low. A number of constraining factors are routinely used to reduce allowable harvests, including uncertainty in scientific knowledge about productivity, natural mortality, and predation effects on a stock; observed, modeled, or hypothetical prey requirements of particular predators, such as seabirds, that feed on the same stocks taken by fisheries; changes in stock structure or abundance of target species or, in some cases, of predators such as Steller sea lions; changes in size at maturity, abundance of incoming year-classes, or survival of juvenile fish to reproductive age; even changes in primary or secondary ocean productivity (as measured by indexes of phytoplankton and zooplankton abundance) are used in assessing the capacity of the ecosystem to support fish stocks.

The next era in ecosystem-based fishery management may further protect habitat, but its implementation may not be as simple as in the past. Much now depends on development of analytic methods and metrics that can be used to measure ecosystem impacts and the efficacy of measures taken to

Warmer climate conditions have enabled the black oystercatcher (left) to extend its range north of the Aleutians—one of many species moving north. Rockfish, on the other hand, often are tightly bound to their habitat.

BRAD WARREN

control them. This is a focus of current research in the North Pacific and worldwide.

One big challenge that may loom in the future is to control fishing impacts—to habitat, target stocks, and incidentally caught species—in a time of rising global and regional temperatures. Sustained warming during the latter decades of the 20th Century is frequently cited as an important driver behind major changes in the distribution and abundance of many fish, shellfish, seabirds, and marine mammal species. If this trend continues, it is sure to complicate identification and protection of important habitat areas amid changes in the geographic range, abundance, and behavioral ecology of many marine species. Further complicating this issue is the likelihood that fishing fleets will adapt to a changing environment by altering the methods and locations of their operations. As harvesters adapt to exploit new opportunities and react to new problems, management and conservation measures will need to keep pace.

How all of these forces will play out is, for now, still a matter of guesswork and generalized projections. Fishery managers in the North Pacific, however, will meet these challenges from a stronger position than their peers in most other regions. This region enjoys the advantages of consistent and extensive resource assessments, thorough fishery monitoring systems, and adaptive management processes that already incorporate precautionary practices to hedge against uncertainty. Important as they are today, these practices will be even more crucial if, as expected, present warming trends continue.

Threshold Questions

Have fishery managers aggressively protected marine habitat in Alaska?

Yes. As one example, in 2005 the Council banned bottom trawling in an area larger than the entire U.S. EEZ off the Atlantic coast. In total, trawl fisheries of one kind or another are prohibited year-round in nearly 40 percent of the EEZ off Alaska. Year-round and seasonal closures protect spawning and rearing grounds of herring, halibut, lingcod, rockfish, and several crab species.

Do habitat conservation measures protect ecosystem functions—not just underwater acreage?

For example, some measures are designed specifically to protect prey fields that support marine life. In April 1997, the North Pacific Council adopted a ban on directed harvest of forage fish species (Amendment 36 in the Bering Sea and Neutians, Amendment 39 in the Gulf of Alaska), aiming to protect prey resources for seabirds and other predators that depend on energy-rich fish such as capelin, smelt, and sandlance. In general, harvests of protected forage species are restricted to bycatch, which has been controlled at very low levels; total commercial catch has remained below 75 mt in the BSAI, and below 130 mt in the Gulf of Alaska in all but one year, according to the 2004 federal environmental impact statement (FPSEIS for Alaska Groundfish Fisheries).

What’s next for marine habitat conservation in Alaska fisheries?

In many respects, the biological communities that live on the sea are still poorly understood, and more research is needed to assess populations of benthic organisms, their rates of regeneration when disrupted, and their roles in providing shelter, breeding, and rearing habitat for fish and other ecological services.

In addition, both cyclical and long-term changes in climate are altering marine habitat and the restructuring ecosystems in the North Pacific. The range, abundance, and feeding habits of many species have already changed. If these trends continue as expected, they will challenge fishery managers to develop new strategies for conserving fish stocks, their prey, and their habitat.

Ecosystem Footprint Index

Measures of the status of non-target organisms, their habitat, and fishing impacts on them.

Total area, in square nautical miles, in which some or all trawl fisheries are prohibited year-round in waters off Alaska:[1] 395,113

Number of square nautical miles off Alaska in which the North Pacific Fishery Management Council voted in 2005 to ban bottom trawling to protect seabed habitat:[2] 277,114

Number of square miles in Texas:[3] 268,581

Number of additional square nautical miles in Aleutians that the Council closed to all bottom-contacting fishing gear, to protect coral gardens:[4] 110

Number of additional square nautical miles at Bowers Ridge, north of the Aleutians, closed to all bottom-contact mobile gear in order to protect seabed habitat:[5] 5,286

Most bycatch reduction efforts—including this experimental halibut excluder—focus on enabling trawlers to avoid non-target species. One of the most effective methods is Sea State, an electronic network for sharing information about bycatch "hot spots" so that vessels can steer clear. MARK BUCKLEY

Percentage increase in northern fur seal pups on Bogoslof Island, from 1994 to 1997:[6] 272.6%

Percentage annual increase in northern fur seal pups on Bogoslof Island from 1997 to 2005:[7] 12%

Percentage increase in count of Steller sea lion pups in Alaska's endangered Western stock, from 2001 to 2004:[8] 3%

Estimated annual mortality of Dall's porpoises incidentally entangled by Japanese North Pacific high-seas salmon driftnets in 1981-1985, before a concerted effort by Alaska fishermen and others abolished large high-seas driftnets and shifted much of their harvest to better-managed coastal fisheries:[9] 5,295 to 12,002

Estimated annual mortality of Dall's porpoise incidentally entangled by North Pacific high-seas squid driftnet fleets from Japan, (data are not available for Korean and Taiwanese squid driftnet fleets operating in the area) during 1982-1984:[10] 2,329 to 8,403+

Estimated annual mortality of Dall's porpoises in Alaska salmon fisheries during 1997-2001, by which time Alaskan fleets were enjoying larger salmon harvests due to elimination of interceptions by high-seas driftnets:[11] 28

Trophic level of the North Pacific catch under federal management over the last 25 years, according to NMFS analysis of whether fisheries are "fishing down the food web":[12] "High, stable"

Number of Alaska regions where increasing seabird populations equaled or outnumbered declining ones, in 2001 survey:[13] 3

Number of Alaska regions where declining seabird populations equaled or outnumbered increasing ones:[14] 3

Number of fisheries targeting forage fish in federal waters off Alaska:[15] 0

Year when survey found highest relative abundance of osmerid species (smelt and similar fish) since 1980 in the Gulf of Alaska:[16] 2003

Year when survey found highest relative abundance of eulachon since at least 1972 in the Gulf of Alaska:[17] 2003

Year when density of longsnout pricklebacks reached highest level since 1992 in the Gulf of Alaska:[18] 2003

Last year in which relative abundance of Pacific sandfish equaled that found since 2002 in Gulf of Alaska:[19] 1980

Multiple by which catch of Tanner crab, flathead sole, and pollock has increased since 1976 in Ugak Bay on Kodiak Island, according to ADF&G's survey:[20] 10

Number of metric tons at which the Council has capped total removals of groundfish in the Eastern Bering Sea:[21] 2,000,000

Harbor seals in Southeast Alaska have been increasing since at least 1983. BRAD WARREN

Reduction in wastage rate for harvested pollock by U.S. factory trawlers between 1998 and 2000, after co-ops formed under the American Fisheries Act enabled operators to boost utilization Rates:[22] 35%

Apparent trends, either increasing or decreasing, in zooplankton abundance in Bering Sea, 1954-1999:[23] None

Increase in Alaska's eastern stock of Steller sea lions, 1991-2002:[24] 15.4%

Trend in density of all fish and invertebrates found in Bering Sea by trawl surveys, 1982-2003:[25] Increasing

Year when trawl surveys found the greatest density of fish and invertebrates ever recorded in Gulf of Alaska, as of 2004:[26] 2003

Multiple by which estimated biomass of northern rockfish (which are taken only as bycatch) in the Bering Sea and Aleutian Islands, increased 1980-2004:[27] 4.4

Multiple by which estimated biomass of the "other flatfish" group (Dover sole, longhead dab, red sole, Sakhalin sole, starry flounder, and butter sole), increased in the Bering Sea and Aleutians, from 1985 to 2004:[28] 3.8

Reduction, since 1972, in ratio of "Squid and Other Species" bycatch taken per ton of groundfish in the Bering Sea and Aleutian Islands:[29] 66%

Alaska's marine birds, such as this Laysan albatross, are protected by strict rules on seabird avoidance and a total ban on directed fisheries for many of the forage species they eat. Nearly three-fourths of the world's Laysans nest on Midway Island in the Hawaiian archipelago, migrating thousands of miles to feeding grounds in Alaska and the North Pacific. COURTESY OF WASHINGTON SEA GRANT

Multiple by which biomass of skates (for which a directed fishery began in 2003 in the Gulf of Alaska), increased in the Eastern Bering Sea shelf survey, from 1979 to 2004:[31] 7.4

Minimum biomass of squid, (reckoned via inferences from bycatch and survey data; squid stocks are not specifically assessed) in the Bering Sea and Aleutian Islands, in metric tons:[32] 100,000+

Total 2003 removals (catch and discards) of squid by BSAI groundfish fisheries, in metric tons:[33] 1,234

Percentage reduction in total squid removals by BSAI groundfish fisheries, from 1977 to 2003:[34] 82%

Year when the North Pacific Council banned roe-stripping of pollock in the Bering Sea and Aleutian Islands to stop waste and prevent possible ecosystem impacts:[35] 1991

Percentage of all vessels targeting Pacific cod, Atka mackerel, or pollock that, since June 10, 2002, have been required to carry a satellite transponder so that a Vessel Monitoring System can ensure compliance with fishing closures off Alaska, such as those meant to protect Steller sea lions:[36] 100%

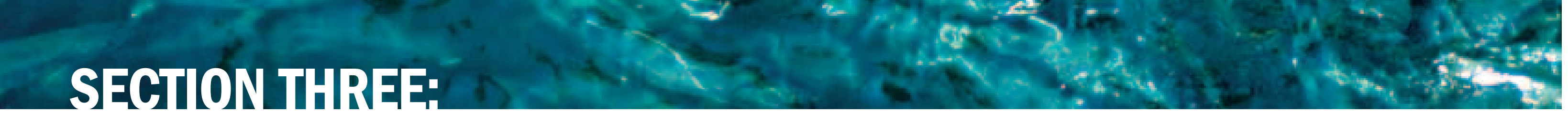
Multiple by which zooplankton abundance during the 1980s in the Alaska Gyre, in the Gulf of Alaska, was estimated to exceed that of the 1950s and 1960s:[37] 2

Share of Bering Sea primary production indirectly consumed by commercial fisheries during the 1980s, according to a study comparing the ecosystem burden from harvests during the 1980s to those the 1950s:[38] 6.1%

Share of Bering Sea primary production indirectly consumed by commercial harvest of whales in the 1950s, before this fishery was discontinued:[39] 47%

FACT: More than 395,000 square nautical miles of waters off Alaska are closed to some or all trawl fisheries year-round.

Percentage increase in biomass of sharks in Eastern Bering Sea shelf survey, from 1979 to 2004:[30] 351%



SECTION THREE:

Recommendations & Conclusion

BRAD WARREN

Careful stewardship of marine resources has been the hallmark of fishery management in Alaska for decades. While other regions of the world have seen declines, Alaska's salmon, pollock, cod, Pacific Ocean perch, and many other species have multiplied. Overfishing—the central problem for many fisheries elsewhere—has been prevented or, when necessary, stopped and reversed in Alaska. Alaska's sea lions, otters, birds, and whales are carefully protected, and no-trawl zones preserve hundreds of thousands of square miles of sensitive habitat. The real challenge now to make certain Alaska's record of excellence can be continued into the future.

1. Continue science-based management in Alaska, and consider how the "Alaska model" could be emulated in other regions of the United States.

There are no perfect or invincible methods of fishery management, but the practices and policies that guide fishery management in the U.S. EEZ off Alaska are about as good as it gets anywhere in the world. They represent the state of the art in precautionary, science-based governance of modern fisheries and a leading example in the evolution of ecosystem-based fishery management (EBFM). Specific measures from the Alaska region that could be explored elsewhere include:

a. A precautionary harvest strategy.

b. Use of ABCs, TACs, and multi-species total removal caps.

c. Careful monitoring and conservation of multi-species fish stocks, which may sometimes be disaggregated to ensure that populations with differential rates of productivity are properly managed.

d. A TAC-setting process that formally recognizes prey requirements of other species that feed on targeted fish stocks.

e. Regular stock surveys and assessments, annually updated for all targeted stocks and many incidentally encountered species that could experience population-level effects from fishing.

f. Closures and gear restrictions to protect sensitive ocean habitat.

g. A commitment to continuous improvement in conservation practices.

h. Development of indicators of ecosystem health and a plan for monitoring them.

2. Expand efforts to better understand the impacts of fisheries on marine ecosystems—and the effects of ecosystem changes on fisheries.

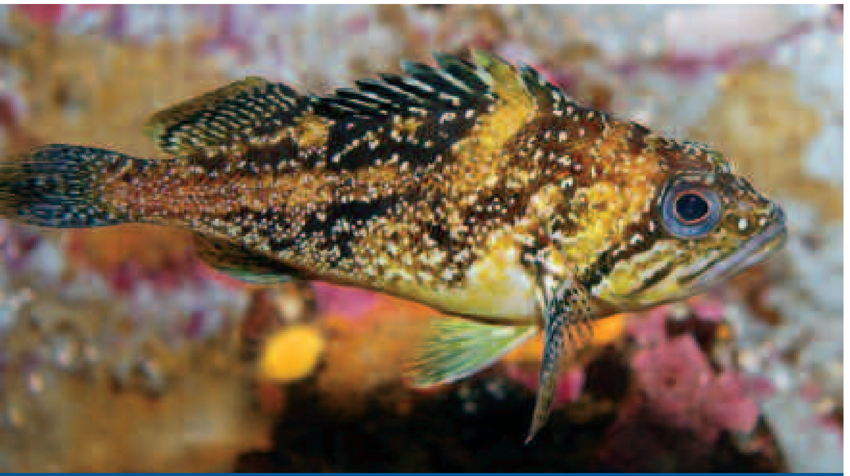
Although Alaska's fisheries have become a globally recognized model of sustainable management, there are important gaps in our knowledge. Major government and university research efforts are already underway to address these questions. They could use more support. If the global climate continues to warm as expected—and to warm faster at high latitudes—the job of filling these gaps will become more urgent. Cyclical changes in ocean climate also exert profound effects on the ecological communities that sustain fisheries. Fishery managers' ability to respond adeptly to these large-scale environmental forces could be greatly enhanced by improving our understanding of marine food-web interactions. That entails at least two ambitious steps: (a) expanded monitoring of environmental and biological conditions; and (b) development and refinement of models to predict and understand environmentally driven changes and to forecast fishery impacts on the ecosystem, at every level from plankton to seabirds and whales.

Hundreds of humpback whales summer in Alaska's southern waters, often mingling with seabirds at the surface. Once nearly wiped out by whalers, humpbacks have been increasing in Southeast Alaska and may even be approaching the natural limit of ocean carrying capacity. PHIL CLAPHAM/NOAA FISHERIES

3. Continue to explore options for conservation of stocks within multi-species aggregations.

Fishery managers and biologists in the North Pacific recognize that managing such aggregations poses significant conservation challenges. Under current practices, very low exploitation rates provide a working conservation margin today. But when groups of species are managed and surveyed collectively, effects of fishing can be more difficult to identify and control for some stocks in the group. Populations in the same multi-species group may experience different rates of removal by fishing; new fisheries may emerge, targeting previously unexploited stocks within the complex; or changing environmental conditions may have uneven effects on populations within the complex. A variety of tools can be used to address these concerns. Some of the options include increased or improved survey methods, targeted harvest refugia and improvements in fishing gear selectivity. Choosing the most appropriate tools for each case is a decision best left to hands-on fishery managers.

BRAD WARREN



Like many rockfish, China rockfish are long-lived, slow growing, and sensitive to fishing pressure. To protect demersal shelf rockfish—a bottom-dwelling group that includes this species—fishery managers have embraced a conservative harvest strategy that limits the annual catch to 2% of combined biomass. (Source: NMFS, SAFE report for Demersal Shelf Rockfish in the Gulf of Alaska, Dec. 2005

4. Expand efforts to survey abundance of plankton and forage fishes.

Fluctuations in these lower levels of the food web can directly affect the abundance of fish caught by humans. Better understanding of primary production and forage populations may become increasingly important for fishery management in the future.

5. Expand research on effects of size-selective fishing.

In some species, the most prolific breeders are larger, older fish. Selective removal of these large fish, which are frequently more valuable, may have significant effects on productivity of these stocks. This represents an important area for further research to support reasoned decisions in fishery management.

6. Conduct a scenario-planning exercise to explore avenues for adapting fishery management to deal with continued warming in the North Pacific.

It is possible, for example, that new survey designs may become necessary in order to manage fisheries as fish stocks adapt to changing conditions. New stock assessment models may be needed, incorporating more ecosystem factors as data becomes available. Some questions to consider: How should managers respond if new fisheries develop in previously ice-bound Arctic waters? Can current management systems, some of which assume spatial stability in fisheries, be adapted to keep fishing effort properly targeted and controlled if (or when) warming alters the geographic range of fish populations? Do current laws and policies provide the authority and flexibility that managers will need if warming continues as expected?

7. Expand efforts to identify, prevent, and manage potential declines in non-target species that interact with fisheries. Non-target fish and wildlife populations fluctuate. Sometimes this is in response to interactions with fisheries, often it is not. In order to prevent "crises management" in fisheries, managers and stakeholders should work together to anticipate such potential problems.

Instead of reacting to crises—a mode of response that has proved costly and subject to unintended consequences—managers can then target research to allow more measured solutions that are based on science. In some cases, it may be wise to invest early to develop modifications in gear and fishing practice to minimize entanglement and incidental mortality; to define critical habitat for strategically identified species; to identify sources of mortality for vulnerable populations; and, especially, to fill gaps in knowledge about affected populations so that management can be tailored to achieve conservation goals more effectively and with less unnecessary loss of fishing opportunity.

8. Safeguard and promote open channels of communication between fishery managers and their scientific advisors.

The task of fishery management is to steer a continuous interplay of societal and biological forces, and managers need to be as fully informed as possible about that interaction in order to make sound decisions. Some proposals have been floated in Congress to "separate science from allocation," based on the idea that biological decisions (such as setting catch limits) should be insulated from political and economic pressure. Proponents hope this approach might prevent managers from authorizing overfishing. However, their plan rests on two faulty assumptions: first, that political pressure does not affect scientists; and second, that effective fishing regulations can be created without extensive participation of stakeholders.

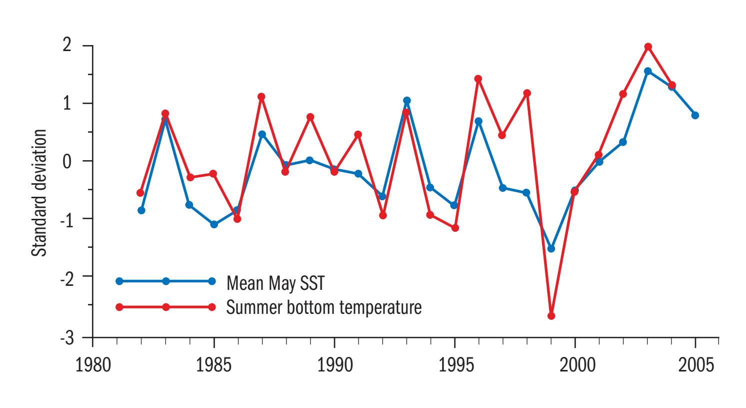
Implications of Climate Change

Effects of a warming climate are now evident in the Bering Sea and elsewhere in Alaska. This long-term warming trend is changing the distribution, abundance, and behavior of important commercial species. It is also reducing production of organisms that sustain much of the marine food web, particularly in the Northern Bering Sea, because warming is occurring faster at high latitudes. These changes, which are well documented, will present serious challenges and altered opportunities for fisheries and many species that inhabit the region. For this reason, several recommendations of this report specifically address impacts of warming and strategies for adaptation.

Indications of these changes have been reported in many scientific papers. Here are some of the significant changes reported in March 2006 in the journal *Science:*[1]

- "A change from arctic to subarctic conditions is under way in the northern Bering Sea, with an attendant northward shift of the pelagic-dominated marine ecosystem that was previously limited to the southeastern Bering Sea. The ice-dominated, shallow ecosystem favoring bottom-feeding sea ducks, such as spectacled eiders *(Somatera fuscgeri)*, and marine mammals, including walrus *(Odobenus rosmarus)* and gray whales *(Eschrichtius robustus)*, is being replaced by one dominated more by pelagic fish."
- By 2004, ice melt was beginning three weeks earlier than in 1997 around St. Lawrence Island.
- Sea ice is becoming thinner and retreating earlier (despite occasional excursions of late, southerly ice), and satellite observations show a decline in sea ice cover since 1979.
- Declining benthic productivity since the 1980s has changed the behavior of gray whales, which now forage farther north and stay longer in Arctic waters.
- Bivalve populations, an important prey item for diving sea ducks, are also in decline.
- Earlier break-up of sea ice is harming walruses by hindering their ability to hunt from ice floes.
- An increase in warm winds during winter, and replacement of stable ice with thinner ice, has affected hunting by Yup'ik residents of St. Lawrence Island.
- Surface air temperatures in the region have increased significantly since 1997, advancing the onset of spring and delaying the arrival of winter conditions.
- Temperatures at the bottom of the Bering Sea have also increased significantly since the late 1980s.

Salmon are also directly affected by the warming trend observed throughout the North Pacific basin. Some Bristol Bay sockeye salmon appear to benefit from a longer growing season in their home lakes. But rising temperatures look more problematic further south. Based on well-accepted climate models, Canadian researcher David Welch and his colleagues forecast a northward movement of the temperature boundary for marine waters inhabited by sockeye salmon, beyond which they normally do not range except to return to their spawning streams. This "thermal barrier" is projected to retreat northward, reducing their ocean feeding grounds to a much narrower range than they enjoy today.[2] Canadian researchers have suggested that the severe spawning failure of some Fraser River sockeye in 2004 may be attributable to unusually warm water conditions in the river and its tributaries, which reached temperatures dangerous to fish. Fishing opportunities have already been curtailed on late-run Fraser sockeye in some years, and the weakness of this stock could force a complete shut-down of several salmon fisheries in 2008, in order to protect the diminished brood of 2004 when the surviving fish return as adults to spawn.[3] Implications of climate change for Alaska fisheries are still uncertain, but this subject is attracting increasing scientific attention.



The May sea surface temperature (SST) index and mean summer bottom temperature in the southeastern Bering Sea, 1982-2005.

SOURCE: NMFS

BRAD WARREN

Nearly wiped out by Russian fur traders in the 18th and 19th Centuries, Alaska's sea otters have since rebounded under rigorous protection. Tens of thousands of them now frolick along the shores. Sea otters in the Aleutians have declined lately-perhaps eaten by killer whales, some scientists suggest-but Southeast and South Central Alaska populations have been growing at around 20% annually.

Crafting fishery regulations in scientific isolation has been tried before (notably in the design of a marine protected area in California's Channel Islands) and has resulted in failure, in part because consultation and collaboration with fishery stakeholders is essential to development of working fishery regulations. Such consultation helps to minimize unintended consequences and maximize the chances of achieving the goals of fishery management measures. Two distinguished panels that reviewed the role of science in fishery and ecosystem management concluded in 2005 that insulating fishery managers from their scientific advisors could weaken fishery management. One panel, a group of scientists, was convened by the Pacific States Marine Fisheries Commission (PSMFC); the other panel, which included managers as well as scientists, was jointly convened by the University of Alaska Anchorage and the Marine Conservation Alliance at the American Fisheries Society (AFS) annual conference in Anchorage during September 2005. Both panels affirmed the need for a consultative process of fishery management that integrates societal as well as biological objectives. That conclusion echoed the widely held view that participatory decision-making is crucial in this field.

9. Continue to widen the objectives of fishery management to embrace the broader goals of ecosystem-based fishery management.

The North Pacific Fishery Management Council has played a leading role in this area, as mentioned above. The PSMFC panel suggested that further progress could be made in ecosystem-based fishery management, defining "an approach that (1) recognizes, up front, an expanded list of societal goals, (2) develops, tests, and uses new models for management that explicitly incorporate these goals, (3) includes factors such as oceanography, habitat productivity, food-web interactions, life-history, spatial variability, environmental trends, and uncertainty considerations, and (4) evaluates these measures to assure that specific goals are being met." Much of this work depends on increasing public funding for crucial research. The panel observed, "Progress is critically dependent upon obtaining additional resources and funding to bridge the gap between current fishery management practices and EBFM."

10. Initiate a campaign to develop stable and sustained sources of funding for increased stock assessment, ecological monitoring, modeling, and research that may be required in the future.

This is perhaps the most important recommendation of all. Alaska's science-based approach to fishery management demands a substantial investment in research. Its continued success may depend on doing even more. All interest groups have a stake in the quality of our science programs, yet often more effort is spent on fighting about the crises of the moment than looking to the future. Environmental groups, Alaska Native organizations, and the seafood industry should all work to achieve this long term goal.

FACT: There are strong indications that warmer conditions are changing the northern Bering Sea from an arctic to a subarctic environment—bringing more pelagic fish and displacing benthic prey populations that support gray whales, walruses and sea ducks.

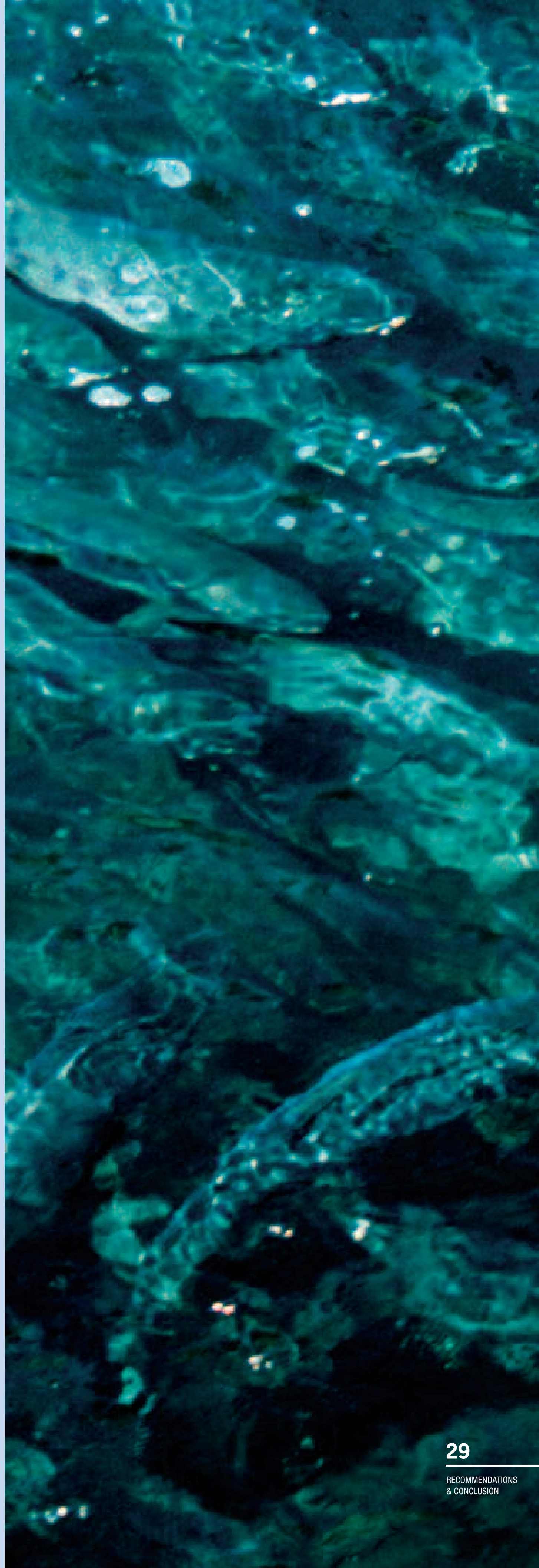
Conclusion

The Road Ahead

Marine research is not cheap, and these are fiscally constrained times. However, with large and potentially destabilizing climate changes under way, filling critical research gaps in the North Pacific may represent a prudent form of environmental insurance.

As the source of more than half the nation's seafood harvest, Alaska's oceans are an asset of national, and arguably global importance. It is a remarkably well-managed asset. Fishery managers in Alaska have a distinguished record of preventing and eliminating overfishing, reducing bycatch, protecting habitat, monitoring fishery impacts, and assessing target populations. The region's management institutions have embraced open governance and cultivated a diverse field of stakeholders, scientists, and managers who frequently hold one another accountable for meeting performance measures—a process that acts to improve the quality of management. Taken together, these practices amount to a strong working foundation for expansion and development of ecosystem-based fishery management, a goal shared by many stakeholders in the region's fisheries. They also represent a record that many conscientious fishery managers elsewhere aspire to emulate.

Nonetheless, as the recommendations above indicate, there are significant scientific challenges facing North Pacific fishery managers in the years ahead. Gaps in our understanding of the marine environment remain an area of vulnerability, exposing fisheries to crises that may become more difficult to manage in the future. Initiatives are already underway to fill critical scientific gaps. These efforts (primarily funded by NOAA, the North Pacific Research Board, the National Science Foundation, and other agencies) represent a crucial investment in sustaining the region's legacy of pro-active and successful fishery management.



Timeline of Bycatch and Habitat Conservation in Alaska

Control of bycatch has been a central concern of fishery management in the North Pacific for more than 80 years. Over time, a complex system of regulations and industry initiatives has evolved to curtail bycatch, especially for rare and vulnerable species; to increase utilization of fish that are caught (intentionally or otherwise); and to reduce injury to fish that must be returned to the sea (discarded).

The early evolution of bycatch control measures emanated mainly from the halibut industry, a traditional longline fleet that for generations has lobbied effectively to limit gear conflicts and impacts on halibut by other fisheries. Their activities in this field set the pattern followed by later fleets, especially crabbers. More recently, many rules and practices have emerged to limit impacts on biodiversity and protected species, especially where incidental impacts on these species might trigger regulatory actions to shut down fisheries.

The following timeline is far from complete, but it gives a representative sampling of initiatives to control incidental catch and protect habitat in waters off Alaska. A complete timeline could fill a book. It would acknowledge numerous actions and negotiations at the International North Pacific Fisheries Commission and the North Pacific Anadromous Fish Commission to control impacts of foreign fleets; it would mention more international agreements (such as the Central Bering Sea Pollock Convention), legislative measures, and research and management initiatives in the region.

1923 Canadian–United States Halibut Convention is signed, establishing only two regulatory controls: a three-month closed season in winter and rules concerning incidental catch of halibut, including detailed catch reporting and authority to close any area "populated by small, immature halibut." (Skud, 1977)

1930s International Pacific Halibut Commission (IPHC) begins conducting first stock assessments and implements first catch limits for halibut in the North Pacific. (IPHC, 1998)

1932 IPHC institutes a year-round closure to halibut fishing "in two 'nursery areas' to protect young halibut." These closures, in Southeast Alaska and in British Columbia, endure until 1960, when the areas are reopened because they were found to contain many "large and old fish." (Skud, 1977)

1937 Halibut Convention of 1937 institutes more effective control of vessels catching halibut incidentally while fishing for other species during the closed season. (IPHC, 1998)

1938 IPHC prohibits use of set-nets for halibut. (Skud, 1977)

1944 IPHC prohibits use of "nets of any kind" to harvest halibut, mainly based on concerns about impact on undersized and juvenile halibut. Retention of trawl-caught halibut is prohibited, resulting in mandatory discarding and additional injury of halibut taken incidentally by trawlers. Studies later show that trawl-caught halibut are smaller and younger (average 5 pounds, 6 years) than longline-caught halibut (average 10-40 pounds, 6-12 years). (Leaman and Williams, 2004; Skud, 1977)

1953 Revised Pacific Halibut Convention specifically includes a size limit for halibut, bolstering IPHC's existing regulation, which by 1944 defined the minimum size as 26 inches in length (head on), with a minimum weight as well. (Skud, 1977)

Early 1960s Halibut bycatch mortality increases rapidly as distant-water trawl fleets of Japan, Korea, the Soviet Union, Poland, and other nations begin operating off Alaska. (Leaman and Williams, 2004)

Early 1960s International agreements with nations operating distant-water fleets in U.S. waters begin to sew a patchwork of time and area regulations in waters off Alaska, designating periods and places in which the foreign fisheries are prohibited. These agreements aim to reduce gear conflicts between the U.S./Canadian halibut longline fishery and foreign trawl operations, which frequently snag longline gear and take an incidental toll on both the catch and the resource. Typical closures last 5-15 days surrounding the halibut fishery seasons established by the IPHC. These closures indirectly reduce halibut bycatch. (Leaman and Williams, 2004)

1962 IPHC enhances catch accounting, which previously tracked only targeted commercial catch of halibut, to track incidental catch of halibut by other fisheries. (IPHC, 1998)

1965 Total halibut bycatch in all areas of the North Pacific (U.S. and Canadian) peaks at 21 million pounds, mainly due to rapid growth of Japan's groundfish fisheries off Alaska. (IPHC, 1998)

1967 IPHC closes area 4E in the southeastern Bering Sea year-round, designating it as a halibut nursery area. (Skud, 1977)

Late 1960s Halibut bycatch mortality declines as early bycatch restrictions (notably including observers and catch accounting) are instituted by the United States as a condition of access for nations operating in U.S. waters of the North Pacific. (Leaman and Williams, 2004)

1972 Congress enacts the Marine Mammal Protection Act, requiring the National Marine Fisheries Service to protect and restore populations of marine mammals to their "optimum sustainable population level," among other measures. (NOAA Fisheries Office of Protected Resources)

1972 Use of pots to catch halibut is prohibited (Skud, 1977).

1973 The IPHC proposes that the U.S. and Canada ban foreign trawling in areas of the Bering Sea when halibut are concentrated there. Japan responds by voluntarily refraining from trawling in certain areas of the Eastern Bering Sea from December 1, 1973, through November 31, 1974. (Congressional Research Service Report 95-460; Skud, 1977)

1973 IPHC increases minimum size for halibut to 32 inches (head on). (Skud, 1977)

1973 Congress enacts Endangered Species Act, giving National Marine Fisheries Service responsibility to list species threatened by any of five factors: damage to habitat or range, overutilization (including commercial harvest or incidental impacts, among others), disease or predation, inadequacy of existing regulatory protections, or other natural or human factors. Once a species is listed, recovery or conservation plans must be prepared and implemented; fishery regulations frequently require avoidance of protected species or use of fishing methods and gear modifications to prevent mortality. (Congressional Research Service Report 95-460)

1973 NMFS begins placing observers on foreign fishing vessels off the Northwest and Alaska, initially to track incidental catch of halibut and to verify statistics in the Japanese crab fishery. Observers later expand data collection to cover king and snow crab, salmon, and biological data on other species. (North Pacific Groundfish Observer Program: History, AFSC)

1975-1976 The time/area closures already embraced by the Japanese in the Bering Sea and Gulf of Alaska set the pattern for subsequent agreements governing access of foreign fleets to U.S. waters off Alaska. Such closures are considered at the time to be more easily implemented than direct limits on bycatch, probably because no comprehensive observer program existed yet. (Leaman and Williams, 2004)

1976 Following a long campaign by coastal fishing interests to restrain foreign fleets and control Report 95-460; North Pacific Groundfish Observer Program, AFSC)

1977 International Pacific Halibut Commission modifies its catch analysis to track waste of halibut along with catch and incidental catch. (IPHC, 1998)

1977 With the adoption of U.S. and Canadian Exclusive Economic Zones (EEZ) out to 2004 nautical miles (nm), and the newly mandated fishery management plans off Alaska, a new generation of bycatch controls are imposed on foreign fisheries. Foreign bottom trawlers are excluded from the EEZs of the United States and Canada. (Leaman and Williams, 2004)

1977 U.S. observers now monitor 10%-29% of active fishing days in foreign fisheries operating off Alaska.

FACT: NMFS observers were placed on foreign fishing vessels off the Northwest and Alaska in 1973.

1979 NPFMC adopts three herring-savings areas (BSAI Amendment 16a), seasonally barring foreign trawl operations in portions of the Bering Sea to limit bycatch of herring. (Page 3.6-25 FPSEIS, NMFS June 2004; 20 Year History, NPFMC)

1980 NPFMC adopts Prohibited Species Catch (PSC) limits for halibut, crab, and salmon in Gulf of Alaska foreign groundfish fisheries. (20 Year History, NPFMC)

1980 Council implements Kodiak Lechner Line closure to foreign trawling to prevent gear conflicts with U.S. crabbers. (20 Year History, NPFMC)

1980 Foreign trawlers intercept 100,000 Chinook salmon in Bering Sea. (20 Year History, NPFMC)

1981 NPFMC adopts BSAI Amendment 1a, establishing prohibited species catch limits to control bycatch of Chinook salmon in foreign trawl operations. This was a special point of concern to Western Alaska Native groups, which negotiated with foreign trawl interests to achieve a 15% reduction in the bycatch limit for Chinook taken during 1982. (Appendix C, FPSEIS, NMFS, June 2004)

1981 NMFS regional director gains field order authority to close areas. (20 Year History, NPFMC)

1981 Voluntary logbooks approved for joint-venture fisheries (20 Year History, NPFMC)

1981 Japanese trawler associations agree to limit Chinook interceptions; cap set at 65,000 Chinook. (20 Year History, NPFMC)

1981 Extensive prohibited species reduction schedule approved for foreign fisheries. (20 Year History, NPFMC)

1981 NPFMC and industry groups promote voluntary bycatch measures for domestic groundfish fishermen. (20 Year History, NPFMC)

1981 Overall observer coverage reaches 10%. (20 Year History, NPFMC)

1982 IPHC urges North Pacific Council to consider fishermen share system, in part to reduce bycatch and waste of halibut. (20 Year History, NPFMC)

1982 Observer coverage rises to 33% in foreign and joint-venture fisheries. (20 Year History, NPFMC)

1983 NPFMC adopts BSAI Amendment 3, setting low limits on incidental harvests "to reduce incidental bycatch of salmon, halibut, king, and Tanner crab in foreign trawl fisheries and thereby reduce the economic costs to U.S. fisheries that participate in these fisheries," according to a 2004 environmental impact statement on Alaska groundfish fisheries. (Appendix C, FPEIS for Alaska Groundfish Fisheries, NMFS, June 2004)

1983 Observer coverage levels rise to exceed 44% on foreign vessels fishing off Alaska. (Appendix F10, FPEIS, NMFS June 2004)

1984 Observer coverage is increased to 90% on foreign vessels, a level maintained through 1990. (Appendix F10, FPEIS, NMFS June 2004)

1985 Japanese groundfish fleet, responding to pressure from U.S. fishermen and government, reduces halibut bycatch mortality to a record low of 6.1 million pounds. This is a decline of nearly 58% since the initial levels seen when U.S.-foreign joint-venture fisheries began. (IPHC, 1998)

1985 Foreign trawling ends within 20 miles of Aleutians. (20 Year History, NPFMC)

1985 Emergency rule requested to allow only longlines for sablefish east of 147 degrees W. (20 Year History, NPFMC)

1985 Council prohibits intentional discard of fishing gear by U.S. fishermen. (20 Year History, NPFMC)

1985 Taiwan announces new controls on high-seas squid fishery to reduce salmon bycatch. (20 Year History, NPFMC)

1985 Council restricts use of pots and trawls for sablefish in GOA Amendment 14. (20 Year History, NPFMC)

1985 NMFS requested to incorporate bycatch amounts into planning of catch limits and seasons in GOA fisheries. (20 Year History, NPFMC)

1985 Weekly catch reports required for catcher-processors. (20 Year History, NPFMC)

1986 Japanese allocation withheld pending reductions in salmon interceptions. (20 Year History, NPFMC)

1986 Emergency action to close Kodiak areas to trawling to protect king crab. (20 Year History, NPFMC)

FACT: In 1987 the Council established a bycatch management committee and observers were placed on domestic vessels.

1986 Yellowfin sole/flounder joint-venture trawling closed in part of the Bering Sea to protect king crab; PSC limits set for halibut, king crab, and Tanner crab in newly established zones, constituting the first major PSC restrictions on domestic trawlers. These bycatch caps trigger closure of entire fisheries, frequently before the target catch has been taken, and thus create strong incentives and peer pressure to reduce bycatch rates. (20 Year History, NPFMC)

1986 NPFMC requests $250,000 for pilot program to place observers on domestic vessels; NMFS declines. (20 Year History, NPFMC)

1986 Council passes BSAI crab and halibut bycatch caps (PSC limits) for domestic groundfish fleet. (20 Year History, NPFMC)

1987 Council establishes bycatch management committee. (20 Year History, NPFMC)

1987 Pilot observer program begins with four observers. (20 Year History, NPFMC)

1987 Anti-driftnet legislation passed by Congress. (20 Year History, NPFMC)

1988 Alaska fishermen and wildlife conservation groups win court injunction blocking issuance of an incidental take permit for marine mammals taken by Japan's distant-water driftnet fleet. "Japanese driftnet fisheries were therefore effectively banned from the U.S. EEZ," reported a study of driftnet impacts for FAO. (Northridge, 1991)

1988 NMFS proposes designation of Steller sea lions as "depleted" under the Marine Mammal Protection Act (MMPA). (20 Year History, NPFMC)

1988 NPFMC adopts habitat policy embracing three objectives: (1) Ensure that there is "no net habitat loss caused by human activities"; (2) "Restore and rehabilitate the productive capacity of habitats which have already been degraded by human activities"; and (3) "Maintain productive natural habitats where increased fishery productivity will benefit society." (20 Year History, NPFMC)

1989 Agreements are concluded with Japan, Korea, and Taiwan to start a pilot program to jointly monitor commercial driftnet fleets in the North Pacific. Japan agrees to place nine U.S. and five Canadian observers on board 14 squid driftnet vessels during the 1989 season, representing 4% of the fleet. The pilot program places one U.S. observer aboard a Taiwanese squid driftnet vessel. (Paul, 1994)

1989 United Nations General Assembly unanimously adopts Resolution 44/225, calling for immediate action to reduce large scale pelagic driftnet fishing activities in the South Pacific, cease further expansion of such fisheries outside the Pacific, and establish a moratorium on all large-scale pelagic driftnet fishing on the high seas by June 30, 1992, with the proviso that institution of effective conservation measures could make the moratorium unnecessary. (Paul, 1994)

1989 Vessels in U.S. fisheries that frequently interact with marine mammals are required to carry observers for 20%-30% of fishing days, under 1988 amendments to the MMPA. (North Pacific Observer Program: History, AFSC)

1989 Industry and NOAA provide $250,000 for observers. (20 Year History, NPFMC)

1989 Comprehensive mandatory observer program approved, to start in 1990 with observers paid by industry. (20 Year History, NPFMC)

1989 Pollock roe–stripping emerges as a major issue; emergency action is taken to prohibit the wasteful practice. (20 Year History, NPFMC)

1989 Directed fishing definitions established for groundfish fisheries. (20 Year History, NPFMC)

1989 Council adopts policy encouraging full utilization of catch instead of discards. (20 Year History, NPFMC)

1989 North Bristol Bay areas closed to protect walrus. (20 Year History, NPFMC)

1989 Trawl closures renewed for three years around Kodiak to protect king crab. (20 Year History, NPFMC)

1989 Halibut mortality cap, which limits bycatch of halibut in GOA, is split between fixed and trawl gear. (20 Year History, NPFMC)

1989 Council urges Congress to withhold fishing privileges that allow Korean vessels to fish in the U.S. EEZ, aiming to reduce interceptions of salmon by Korean driftnet fleets. (20 Year History, NPFMC)

1990 Observer coverage in the Japanese squid driftnet fleet reaches 10%. Eleven U.S. and 13 Korean observers are placed on 24 Korean driftnet vessels for one to two months during the 1990 season. Twelve U.S. observers and nine Taiwanese observers are placed on Taiwanese driftnet vessels for an average of four weeks during 1990. Results show large numbers of birds, marine mammals, and non-target fish are killed. Observed mortalities include more than 100 species, encompassing thousands of marine mammals, hundreds of thousands of seabirds, more than 700,000 blue sharks, and some 141,000 salmon in the Japanese squid fleet alone. (From The North Pacific Joint Observer Program 1989-1991, in Paul, 1994)

1990 NMFS takes emergency action to limit herring bycatch in trawl fisheries in the BSAI. (20 Year History)

1990 Secretary of Commerce approves Council's ban on pollock roe–stripping. (20 Year History)

1990 GOA pollock fishery divided into quarterly allocations to reduce potential for disturbance and prey competition with Steller sea lions. (20 Year History)

1990 Council sharpens bycatch limits by apportioning Prohibited Species Caps in the BSAI to specific fisheries and seasons. (20 Year History)

1990 Council recommends "penalty box" (a mandatory no-fishing period) for high-bycatch fishermen; the measure is later rejected by the Secretary of Commerce. (20 Year History)

1990 Regional director of NMFS gains "hot spot" authority to close areas of concentrated bycatch. (20 Year History)

1990 NPFMC establishes limits on herring bycatch in groundfish fisheries with PSC caps. (20 Year History)

1990 NPFMC establishes herring savings areas, restricting trawling to reduce bycatch of herring. (20 Year History)

1990 Regulations define allowable gear, including definition of pelagic trawl gear, which in some cases remains legal where bottom trawling is prohibited. (20 Year History)

1990 NPFMC gains authority to establish an observer fee program to fund observers. (20 Year History)

1990 All vessels larger than 60 feet in length are required to carry observers while participating in Alaska groundfish fisheries. Minimum observer coverage is set at 30% for vessels of 60 to 125 feet, 100% for larger vessels, and 100% for shore-based processing plants. (Witherell et al, 2002)

1991 NPFMC apportions Pacific cod quota seasonally in the BSAI. (20 Year History, NPFMC)

1991 NPFMC establishes Vessel Incentive Program (VIP) to replace the "penalty box" plan, which was disapproved by the Secretary of Commerce; the VIP program establishes bycatch rate standards in specific fleets. (20 Year History, NPFMC)

1991 Sea lion protective measures adopted for 1992, instituting no-trawl zones around rookeries and haulouts. (20 Year History, NPFMC)

1991 Council approves walrus protection areas around Round Islands, the Twins, and Cape Pierce. (20 Year History, NPFMC)

1991 Council approves Individual Fishing Quota (IFQ) system for halibut and sablefish fixed-gear fishery. (20 Year History, NPFMC)

1991 Council approves "hotspot authority" for groundfish plans, enabling rapid closure of areas where bycatch of prohibited species is high. (20 Year History, NPFMC)

1991 Rising U.S. halibut bycatch off Alaska, which undercut the yield to the directed fishery in both Alaska and British Columbia, leads to a confrontation at the annual meeting of the IPHC. The Commission passes a resolution addressing bycatch mortality by establishing a work group to review scientific issues and management measures taken by each country to reduce bycatch, to recommend additional bycatch-reduction measures, and to determine appropriate target levels for reducing mortality. The working group's recommendations are adopted formally by both countries. The centerpiece: reduce bycatch mortality by 10% each year in Alaska, starting in 1993. (Leaman and Williams, 2004)

1991 Increasing bycatch of Chinook salmon (48,873 in 1991) and chum salmon (29,706 in 1991) by trawlers in the BSAI results in rising political pressure from Western Alaska Native groups to curtail impacts on salmon, which support coastal fisheries. (Witherell et al, 2002)

1991 Federal regulations refine definitions of subspecies and populations to be protected under the Endangered Species Act (ESA), affording protection to populations that qualify as "evolutionarily significant units," defined as "substantially reproductively isolated" and "an important component in the evolutionary legacy of the species." This standard elevates requirements for controlling bycatch of ESA-listed species, including certain salmon runs from the Columbia River, that mingle with abundant fish stocks off Alaska. (CRS Report 95-460)

1991 Community Development Quota (CDQ) program takes effect in Alaska pollock fisheries, removing a fraction of the catch from the open-access "race for fish" that characterizes the main fishery; with individual vessel allocations under the CDQ program, bycatch and waste become easier to control in this segment of the fishery. (20 year History, NPFMC, 2004)

1991 Renegotiated agreements with Japan, South Korea, and Taiwan provide for continuing observer coverage on high seas driftnet fleets in the North Pacific. (Paul, 1994)

1991 The United Nations General Assembly passes Resolution 46/215 calling on the international community to implement the 1989 resolution limiting large-scale high-seas driftnetting. The new measure asks nations to prevent expansion and reduce effort and these fisheries by 50% by June 30, 1992, and to implement a global moratorium by December 31, 1992. (Paul, 1994)

1991 In the U.S., a federal prohibition on sale of fish from high-seas driftnets takes effect under the U.S. Driftnet Act Amendments of 1990. These initially restrict only fish caught in the South Pacific Convention area and tuna caught with this gear in any region. (Paul, 1994)

1991 Both houses of the U.S. Congress, responding to the failure of Taiwan and South Korea to enforce agreements restricting time and area of high-seas driftnet operations, vote to levy trade sanctions against the two countries; the sanctions would block imports of fish or fishing gear. (Paul, 1994)

1992 NPFMC begins work to improve total catch measurement, ultimately replacing most volumetric measurement with use of scale weights. (NMFS, June 2003)

1992 NPFMC approves halibut PSC caps for non-trawl fisheries off Alaska. (20 Year History, NPFMC)

1992 Careful release procedures are approved to reduce mortality of halibut incidentally caught by longliners targeting other groundfish species (e.g., cod, Greenland turbot, etc.). (20 Year History, NPFMC)

1992 Research plan approved to support observer coverage. (20 Year History, NPFMC)

1992 Bycatch mortality of halibut in domestic fisheries off Alaska peaks at 12,000 metric tons, reflecting a steady rise since 1985 with the phase-out of foreign fisheries and, with them, the strict bycatch controls that could not legally be imposed on U.S. citizens because of due-process issues. (Leaman and Williams, 2004)

1992 Congress passes the High Seas Driftnet Fisheries Enforcement Act to put more teeth in the United Nations resolutions that the U.S. co-sponsored against these fisheries. The Act authorizes denial of port privileges; mandatory sanctions on fish products from countries that continue using the banned fishing method; a ban on imports of fish, fish products, and sport fishing equipment; and expansion of presidential authority to pursue sanctions against non-fisheries products. (Paul, 1994)

1993 NPFMC institutes three types of bottom trawl closures, designed to protect Kodiak red king crab. Type I areas are closed year-round to protect concentrated crab populations; Type II areas are closed seasonally during the molting period (February 15 through June 15) in waters with lower crab concentrations; Type III closures take effect only during specified "recruitment events," leaving areas open otherwise. (FPSEIS, NMFS June 2004; Salmon and Crab Bycatch Measures, NPFMC 2005a)

FACT: The Council set limits for herring bycatch in groundfish fisheries and restricted trawling in herring savings areas in 1990.

1993 To reduce waste of prohibited species' incidentally caught fish in groundfish fisheries, NPFMC approves experimental permit for program to process halibut and salmon bycatch and donate the fish to food banks. (20 Year History, NPFMC)

1993 No-trawl zones around certain sea lion rookeries are extended seasonally to 20 nm. (20 Year History, NPFMC)

1993 To ensure that catch and bycatch are properly accounted for in the new CDQ fisheries, the Council imposes requirement for two observers plus bins or scales on CDQ catcher-processors. (20 Year History, NPFMC)

1993 Alaska Department of Fish and Game requires all scallop vessels to carry observers in order to document location, scallop catch, size distribution, bycatch, meat recovery, and injury rates. (Kruse, et al., 2000)

1993 U.S. Navy begins developing a global driftnet surveillance program to support Coast Guard and NMFS enforcement efforts. An operational/training video and guide for recognition of driftnet vessels are produced. (Paul, 1994)

1993 Japan announces that it has stopped issuing large-scale driftnet fishing licenses and will deploy six patrol vessels for a total of 495 days to enforce the ban. A government compensation plan is offered to vessel owners to surrender their licenses. Some vessels are reportedly sold to Taiwanese and Chinese. (Paul, 1994)

1993 Taiwan prohibits all driftnet fishing by Taiwanese vessels on the high seas after January 1. By March 5, international reports indicate that the national government has purchased 93 drift vessels, paid scrapping costs, and received applications from 69 vessel owners seeking to convert to other fishing methods. (Paul, 1994)

1993 Korea reports that it has completely suspended all large-scale pelagic driftnet fishing and offers a compensation program to pay vessel owners for some conversion and scrapping costs. (Paul, 1994)

1994 Modifications to the MMPA require NMFS to prepare stock assessments for all marine mammals in waters under U.S. jurisdiction; to control taking of marine mammals incidental to commercial fishing through a permit program; and to study interactions between fisheries and pinnipeds (seals and similar species). (Office of Protected Resources, NMFS)

1994 Chum Salmon Savings Area in the Bering Sea is closed (and remains so) from August 1 through August 31 annually, with the closure extending through October 14 if trawl fisheries reach a trigger of 42,000 chum salmon caught incidentally in the southeastern part of the Bering Sea. (Witherell et al, 2002)

1994 New regulation prohibits discarding of salmon taken incidentally in BSAI trawl fisheries until an NMFS-certified observer has counted the salmon. (Witherell et al, 2002)

1995 IFQs take effect in Alaska, by 1996 reducing waste of incidentally caught legal-sized halibut by 59% and sublegal-sized waste by 33% from levels documented in 1994. (IPHC, l998)

1995 NPFMC imposes year-round closure to scallop dredging in the EEZ to shut a regulatory loophole, protect stocks, reduce high bycatch of crabs, and avoid critical areas such as nursery waters for groundfish and shellfish. (Kruse et al 2000, 20-Year History, NPFMC, 2004)

1995 The decline of rare short-tailed albatross—due to hunting and habitat loss on its remote nesting island in Japan—prompts concern that even rare entanglements when these birds dive on Alaska longliners' bait could threaten the species. Because even small numbers of mortalities among birds diving on longline gear could shut down Alaska longline fisheries, the longline industry scrambles to develop proactive seabird avoidance practices and promote regulations to ensure that all vessels participate. (Smith, 2005)

1996 The Sustainable Fisheries Act (SFA), amending the original Magnuson Act of 1976, focuses attention on bycatch through the new National Standard 9: "Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." The Act also defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use," including both economic and regulatory discards (e.g., fish thrown overboard because they are unwanted or illegal to keep). Further, Section 303 of the SFA requires the regional councils to add provisions to all Fishery Management Plans to "establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery." Recognizing that some bycatch problems are international in scope, the Act directs the U.S. Secretaries of Commerce and of State to secure international bycatch reduction agreements for species that migrate across national boundaries and to report to Congress on progress in this effort. (Institute of Public Law, University of New Mexico School of Law)

FACT: **IFQs took effect in Alaska in 1995 and, within a year, had reduced waste of incidentally caught, legal-sized halibut by 59% and sublegal-sized waste by 33% from levels documented in 1994.**

1996 Regulations instituted to prohibit trawling in the Chinook Salmon Savings Areas of the Bering Sea through April 15 if and when trawl fisheries reach the threshold bycatch level of 48,000 Chinook salmon. These seasonal-closure regulations remain in place through 1999. (Witherell et al, 2002)

1997 First seabird avoidance regulations take effect, driven by concern over the potential for entanglement of short-tailed albatross to trigger closure of longline fisheries. Longline groups, NMFS, and the U.S. Fish and Wildlife Service (USFWS) seek to identify and promote fishing methods that further reduce seabird bycatch. (Smith, 2005)

1998 NOAA fisheries' national bycatch team produces report, "Managing the Nation's Bycatch," which identifies high-priority research needs in gear technology and selectivity and fish behavior. (Implementing the SFA, June 2003, NMFS)

1998 USFWS publishes a Biological Opinion that limits fishery-induced mortality to six short-tailed albatross per two-years. The agency requires reporting of all short-tailed albatross incidentally caught, salvage of dead birds of this species, and initiates a program to educate fishers on seabird avoidance, among other measures. Any mortality in excess of the limit would trigger action under the Endangered Species Act that potentially could shut down groundfish, sablefish, and halibut longline fisheries. (Melvin et al, 2001)

1998 Groundfish FMP Amendments 49/49 implemented, requiring 100% retention of pollock and Pacific cod in all fisheries, regardless of gear type, in federal waters off Alaska. (NPFMC website)

1999 Ed Melvin, a biologist noted for development and testing of seabird avoidance measures at Washington Sea Grant, starts a two-year study deploying streamer lines and other techniques to identify the most effective measures for Alaska longline fisheries. By the end of the 2000 season, results demonstrate that use of paired streamer lines, which flap above the baited hooks during setting, effectively deter birds diving on the gear, reducing attacks on the gear by 88%-100%. This method soon becomes mandatory in longline fisheries in Alaska and other regions worldwide. (Smith 2005, Melvin et al, 2001)

1999 The United Nations Food and Agricultural Organization adopts an International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries, calling on countries to assess the extent of seabird impact, develop national plans to reduce it where fisheries take excessive numbers of seabirds, and develop a course of future research and action to continue these reductions (NMFS, February 2001)

2000 New regulations are implemented to reduce Chinook salmon bycatch in BSAI trawl fisheries. These regulations incrementally reduce the Chinook bycatch limit from 48,000 to 29,000 over the next four years. Also required: year-round accounting of Chinook bycatch in the pollock fishery, revised boundaries of the Chinook Salmon Savings Areas, and more restrictive closure dates. Should the limit be triggered before April 15, "the Chinook Salmon Savings Area closes immediately"; reaching the limit during April 15-September 1 results in closure of the area on September 1; reaching the limit later in the year triggers immediate closure through the end of the year. (Witherell et al, 2002)

2000 Following a legal dispute over adequacy of measures to avoid hypothesized depletion of prey needed by endangered Steller sea lions, a U.S. District Court order closes all Steller sea lion critical habitat, including offshore foraging areas, to trawling from August 8 through December 14, 2000. The measure has the unanticipated result of barring the fleet from areas that historically produced high Chinook salmon bycatch, which reduced the fleet's overall take of Chinook. (Witherell et al, 2002)

2002 Council initiates a process to tighten existing salmon bycatch controls in Alaska groundfish trawl fisheries. (Witherell et al, 2002)

2002 An analysis by several authors concludes that actual impacts of Alaska trawl bycatch on salmon returns in Western Alaska are minor, especially for chum salmon. Total trawl bycatch amounted to <0.4% of lowest minimum run size for Western Alaska chum. However, impacts on Chinook salmon appear to be larger, if still unlikely to account for the decline in Western Alaska Chinook returns. (Witherell et al, 2002)

2003 Development of a small fishery for skates in the central Gulf of Alaska raises concerns about potential impacts, not merely on skates, but on other species that are not well understood. Scientists advising the NPFMC recommend protecting the rest of the "other species" complex (squid, sharks, sculpins, octopi) by placing them on "bycatch only" status. They also recommend increased data collection on species in this complex. (NPFMC, October 14, 2005)

2004 NPFMC separates skates from the "other species" complex for management purposes in the Gulf of Alaska. Lacking abundance and life history data, and perceiving a risk that bycatch in major groundfish fisheries might overexploit the remaining species in this complex, the Council seeks scientific guidance on reducing the 5% bycatch rate cap for the complex. (NPFMC, October 14, 2005)

2004 Seabird avoidance regulations for Alaska longline fisheries are refined, detailing specifications for deterrent systems to be deployed on vessels for maximum effect. (Federal Register, January 13, 2004)

2005 A joint program to distribute free bird-deterrent streamers, sponsored by USFWS, Washington Sea Grant, and the Pacific States Marine Fisheries Commission, reaches a new benchmark: 4,000 of these lines have been given away. A new project begins to adapt the original streamer design by using lighter line for easier deployment on small vessels. (Alaska Sea Grant, May 24, 2005)

FACT: **Seabird deterrence regulations —sought and embraced by the fleet—helped freezer longliners reduce incidental take of seabirds by more than 80%.**

2005 Seabird avoidance measures in Alaska longline fisheries demonstrate sustained effects, reducing mortality not only for albatrosses, but for all seabirds. An estimated 88%-100% of seabird strikes on baited hooks are reported deterred; overall seabird incidental take in the freezer-longline fleet is reduced by more than 80% since 1997. Still, as a precautionary measure, a new research effort commences to test effectiveness of weighted groundlines, which may sink the hooks faster and reduce opportunities for birds to attack the bait. (Smith, 2005)

Acknowledgements

A report as broad and detailed as this one is never solely the work of one author. Too many people to name provided data, insight, corrections, and useful suggestions. Thanks are due to all who helped, to all whose work is cited here, and to some whose work, while not cited for factual attribution, helped define the issues and tools this report addresses. I am indebted to the scientists and managers of the National Marine Fisheries Service, the Alaska Department of Fish and Game, the North Pacific Fishery Management Council, the International Pacific Halibut Commission, the University of Alaska, the University of Washington, Washington Sea Grant, the Marine Conservation Alliance, the Marine Stewardship Council, and Natural Resources Consultants. Thanks are also due to the team who helped by troubleshooting text and footnotes at various stages (Eric Swenson, Brianna Morgan, and Patti Parisi); providing good photography (Susan Chambers, Alan Haig-Brown, Joel Gay, Milo Burcham, Mark Buckley, Klas Stolpe, and contributors to the NOAA photo archives and Washington Sea Grant photo stock); and designing these pages (Brenden Hyde and Heather Barta at CircleTriangleSquare). Though many helped, any errors here are my own.

—Brad Warren

Glossary of Terms and Acronyms

HARVEST CONTROL

Acceptable Biological Catch (ABC): A biologically based estimate of the amount of fish from a given stock that may be caught sustainably.

Maximum Sustained Yield (MSY): The largest average catch or yield that theoretically could be taken continuously from a stock under existing environmental conditions. Calculation of MSY often provides a long-term ceiling on harvest rates. Year-to-year stock fluctuations and other factors may prompt scientists to recommend an ABC that is below MSY; additional constraints may then further reduce the size of the Total Allowable Catch (see below).

Overfishing Level: A threshold level of catch, above which biologists believe further fishing would harm a fish stock's capacity to sustain itself. Specifically, overfishing would jeopardize the stock's ability to maintain Maximum Sustained Yield over time.

Total Allowable Catch (TAC): The total amount of catch authorized by fishery managers for a given period, usually a year.

BIOLOGY

Anadromous: Migrating from freshwater spawning grounds to sea. Salmon and some other fish are anadromous.

Biomass: Total combined weight; common measure of abundance for fish stocks and their components, and for groups of stocks.

Euphasiid: An order of small, shrimp-like crustaceans.

Female Spawning Biomass: Total combined weight of females of reproductive age in a population.

Osmerid: A class that includes smelts and smelt-like fish.

Pinniped: A suborder of carnivorous, aquatic mammals (including seals, sea lions, walruses etc) possessing flippers and bodies streamlined for swimming.

Plankton: A class of small drifting aquatic organisms, including both plants (phytoplankton) and animals (zooplankton such as euphausiids).

Spawning Biomass/Spawning Stock Biomass: The total weight of all sexually mature fish in a population.

MANAGEMENT & SCIENTIFIC BODIES

Alaska Department of Fish and Game (ADF&G): State agency responsible for management and conservation of fish and game resources in Alaska, including marine waters out to three miles offshore; ADF&G also has delegated federal authority over crab fisheries further offshore.

International Council for the Exploration of the Sea (ICES): Scientific organization that coordinates and promotes marine research in the North Atlantic, including extensive data on relevant fisheries throughout the world.

International North Pacific Fisheries Commission (INPFC): Joint U.S.-Japanese-Canadian commission, now expired, that oversaw many high-seas fisheries and provided a forum for international negotiations about development and regulation of fleets. Established by convention in 1952, it was dissolved in 1992.

International Pacific Halibut Commission (IPHC): Joint U.S.-Canadian commission established by convention in 1923 to oversee research, conservation, and management of the shared Pacific halibut resource.

International Whaling Commission (IWC): International body established by convention in 1946 to provide for conservation and management of whale stocks.

National Marine Fisheries Service (NMFS, also NOAA Fisheries): The federal agency within the U.S. Commerce Department responsible for conservation and management of fisheries and marine mammals. Jurisdiction usually limited to waters between three and 200 miles offshore.

National Oceanic and Atmospheric Administration (NOAA): U.S. federal agency for ocean and atmospheric research and management, which includes the National Marine Fisheries Service.

North Pacific Anadromous Fish Commission (NPAFC): International commission established in 1993 to promote conservation of anadromous fish (salmon etc). The NPAFC took over salmon responsibilities of the former INPFC.

North Pacific Fishery Management Council (also called the Council, the North Pacific Council, NPFMC): One of eight regional councils established by the Magnuson Fishery Conservation and Management Act in 1976 (this law has since been renamed; see below) to oversee management of the nations fisheries. The Council has jurisdiction over fisheries between three and 200 miles offshore. It recommends regulations to NMFS and the Commerce Department

United Nations Food and Agriculture Organization (FAO): UN program that provides research, policy advice, and other support for food production and distribution worldwide; has an extensive program on fisheries.

LAWS

Endangered Species Act (ESA): The federal law passed in 1973 to protect species from extinction; it includes provisions for defining and protecting Critical Habitat for species in jeopardy.

The Magnuson Act (Also known as Magnuson Fishery Conservation and Management Act/ Sustainable Fisheries Act/Magnuson-Stevens Act: Federal law, originally passed by Congress in 1976, that established the fundamental groundrules for management of fisheries, including the eight regional councils.

Marine Mammal Protection Act (MMPA): Federal law passed in 1972 to protect marine mammals.

JURISDICTION & GEOGRAPHY

Exclusive Economic Zone (also known as the 200-mile zone or federal waters): Marine waters between three and 200 miles offshore, which are subject to federal management.

Bering Sea (also Eastern Bering Sea, Bering Sea and Aleutian Islands or BSAI): Large body of saltwater north of the Aleutians adjoining Alaska. For purposes of this report, these terms covers U.S. waters, not Russian.

Gulf of Alaska (GOA): Body of saltwater south of the Aleutians adjoining Alaska.

Endnotes

Introduction:

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Section One:

Management Performance

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Section Two:

Habitat Protection

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[38] [share of primary consumption consumed by fisheries in 1980s] PSEIS for Alaska Groundfish, pp. 3.10-18, NMFS, June 2004. Data were generated by an Ecopath modeling study designed to determine if intensive whale harvesting in the 1950s and 1960s may have caused structural changes in the Bering Sea ecosystem.

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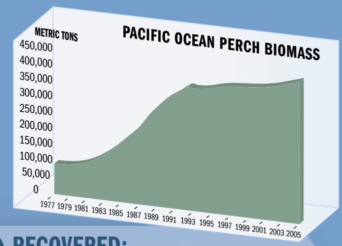
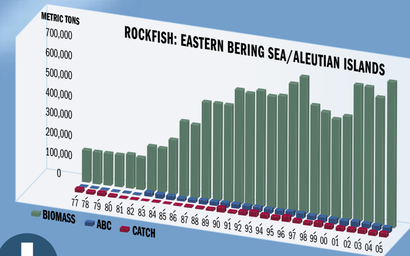


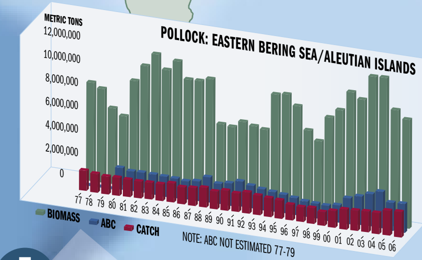
RECOVERED: PACIFIC OCEAN PERCH

Beaten down by foreign overfishing during the 1960s and 70s, Pacific Ocean perch in the Bering Sea and Aleutians has rebounded under the North Pacific Council's conservative catch limits. Estimated biomass has nearly quadrupled. Data source: NMFS SAFE reports for 2004 and 2005.



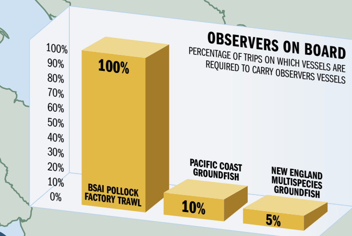
THRIVING: ROCKFISH

Total rockfish biomass has expanded in the Eastern Bering Sea during three decades of Council management. The secret? Once again, catches are kept well below the limit for sustainable harvests (blue bars for Acceptable Biological Catch).



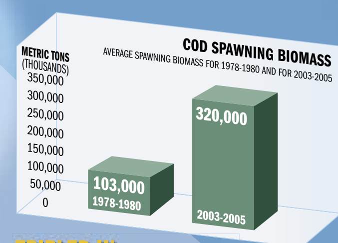
CAUTIOUS CATCH LIMITS: POLLOCK

Alaska's enormous pollock resource in the Bering Sea and Aleutians is harvested at the lowest exploitation rate of all fisheries of its kind in the world. Biomass (green) towers above the permitted catch (red). The catch is kept well below the limit, known as the Acceptable Biological Catch (blue), that scientists believe could be safely caught.



KEEPING WATCH: INDEPENDENT OBSERVERS

Alaska's fisheries are among the most thoroughly monitored in the world. In Alaska's most prolific fishery, Bering Sea and Aleutians pollock, observers directly track 76% of the catch as it comes aboard. Sources: APA, NMFS, NEFMC.

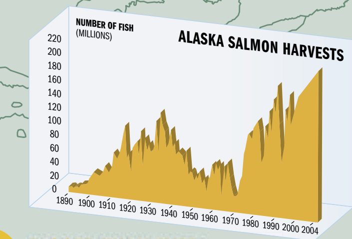


TRIPLED IN THREE DECADES: COD

The Bering Sea and Aleutians cod stock off Alaska has more than tripled its spawning biomass since the North Pacific Council took over management responsibility. The key? Extremely cautious catch limits leave plenty of fish in the water to multiply.

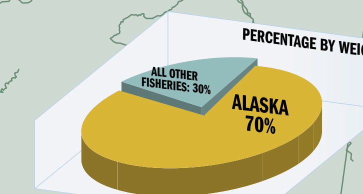
TOUGH LOVE: CRAB STOCKS

Alaska fishery regulators followed science and closed fisheries when crab stocks declined. Today, the crabs are safe from overfishing. Alaska's crab fisheries are managed conservatively, and several are under strict rebuilding plans or closed entirely to protect crab populations.



BIGGER THAN EVER: SALMON RUNS

Alaska's salmon populations are at record levels, generating the largest harvests in history. That's no coincidence. Stung by overfishing in the past, Alaskans mandated sustainable resource management in their constitution when they achieved statehood.

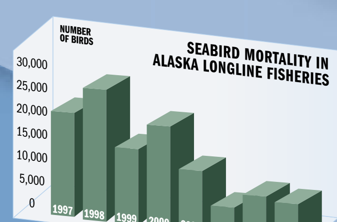


ALASKA'S SHARE OF WORLD'S MSC-CERTIFIED CATCH

By weight, Alaska produces more than two-thirds of the seafood approved by the world's leading seafood "ecolabel" authority, the Marine Stewardship Council. Alaska salmon, pollock, cod, halibut and black cod all passed rigorous review to earn this mark of ecological soundness.

ONCE HUNTED, NOW HARBORED: RIGHT WHALES

Nearly wiped out by Soviet whalers, Alaska's right whales are now protected from human hunters and watched over by fishermen. To help recover the endangered whale, NOAA designated 36,750 square miles off Alaska as critical habitat in 2006. The fishing industry and NOAA have published a guide to help fishermen identify and avoid entangling these whales.

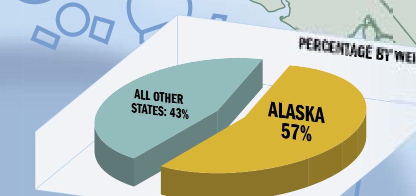


OFF THE HOOK: SEABIRDS

New seabird avoidance procedures have enabled Alaska longliners to prevent entanglement of thousands of fulmars, albatrosses, and other marine birds. Seabird mortality has dropped by 77 percent since 1997.

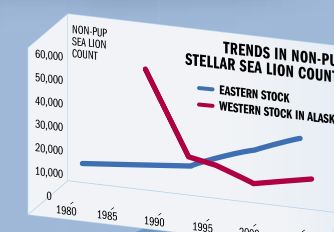
PROTECTED

Year-round and seasonal fishing closures (indicated by the light blue shaded areas) protect more than 395,000 square miles of marine waters off Alaska-preserving corals and other sea life.[1]



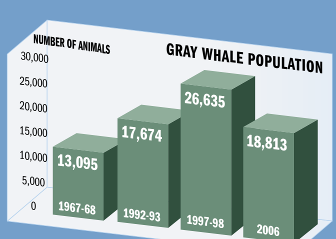
ALASKA'S SHARE OF US SEAFOOD PRODUCTION

Alaska's fish-rich waters produce 57% of America's seafood catch.



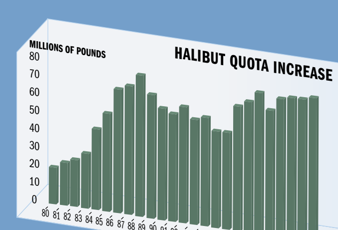
ON THE MEND? STELLER SEA LIONS

Alaska's endangered western Steller sea lions appear to be bouncing back. Surveys showed an 11-12% increase in adults and juveniles between 2000 and 2004—reversing a long decline. The 2006 survey failed to produce a complete count, leaving the current trend uncertain. Alaska commercial fishermen stopped shooting and ended nearly all accidental entanglement of sea lions by the early 1990s.



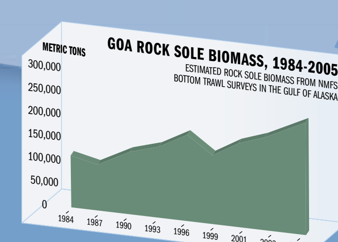
SAVED: THE GRAY WHALE

Gray whales have recovered to historic population levels off Alaska and the North American coast. In 1994, the gray whale was removed from the endangered species list, no longer threatened by extinction. Since the mid-1990s the population has fluctuated normally at high levels.



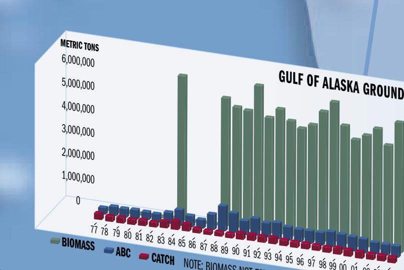
REBUILT: PACIFIC HALIBUT

Alaskans and Canadians teamed up to end overfishing of halibut in the 1920s. Their conservation culture still pays dividends: The allowable halibut catch has more than tripled since 1980.



DOUBLED IN 20 YEARS: ROCK SOLE

Rock sole, prized for its valuable roe, has thrived under careful catch limits and favorable ocean conditions. Its biomass in the Gulf of Alaska has nearly doubled since the mid 1980s.



SAFE & STRONG: GULF GROUNDFISH

Gulf of Alaska groundfish are harvested (red) at only a fraction of the Acceptable Biological Catch (blue), leaving most of the biomass (green) untouched.

Poster available through MCA (907) 523-0731

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NRC
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promoting sustainable fisheries to feed the world