RETHINKING SUSTAINABILITY:
A NEW PARADIGM FOR FISHERIES MANAGEMENT

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EXECUTIVE SUMMARY

"The assumption that the current single-species management approach [to fishery management] is ecologically safe is highly questionable and must be challenged."[1]

Our oceans are in crisis, a fact that has been all too well established by scientists, but not yet addressed by policy makers. While climate change, toxic pollution, destruction of coastal habitats, and high nutrient runoff are collectively wreaking incalculable havoc on marine ecosystems, it is the industrialization of fishing that has been responsible for the most sweeping changes. Worldwide populations of large predatory fish, including marlin, swordfish, and tuna, have been reduced by 90% since the introduction of industrial fishing.[2] The deep sea coral and sponge forests of the continental shelves have been decimated by bottom trawling. Entire fishing communities have ceased to exist, while at the same time, the fish populations on which they once depended have collapsed.

Photos Top (L to R): Alaska pollock © 2006 Alaska Stock, Steller sea lions S.E. Alaska © John Hyde/ Greenpeace 1989, Alaskan fishing boats © Greenpeace.

GREENPEACE

Fortunately, the rapid decline in the diversity and abundance of marine life is not irrevocable if we muster the social and political will to act decisively. Successive ocean commissions have called for meaningful and immediate change in the way we manage our oceans and their valuable resources. In February 2006, Admiral James Watkins and the Honorable Leon Panetta, chairmen of two expert commissions on oceans, issued our nation's administration, governors, and legislature a "D+" for ocean policy in their U.S. Ocean Policy Report Card. The Joint Ocean Commission Initiative – made up of chairmen and commissioners from both the U.S. Commission on Ocean Policy and the Pew Oceans Commission – is taking aim at "accelerat[ing] the pace of change resulting in meaningful ocean policy reform."[3] One of its most important findings is the urgent need for a shift to ecosystem-based management (EBM). A key component of this crucial reform in ocean governance and policy is the establishment of a network of fully protected marine reserves.

> **"We have reached a crossroads where the cumulative effect of what we take from, and put into, the ocean substantially reduces the ability of marine ecosystems to produce the economic and ecological goods and services that we desire and need. What we once considered inexhaustible and resilient is, in fact, finite and fragile."**
>
> Pew Oceans Commission. 2003. *America's Living Oceans: Charting a Course for Sea Change.* p. v.

The scientific community, the federal fisheries agency, Congress, and the Bush administration have all spoken of the necessity to move to a more comprehensive approach to fisheries and oceans management. While this recognition is crucial, it has not yet been backed up by action. As a result, our marine ecosystems continue to suffer.

> *"We do not know the full effects of commercial fishing on the environment, nor do we understand the effects of fishing on the ecosystem and its processes."*[4]

This statement, made by National Marine Fisheries Service (NMFS), the federal agency responsible for managing our nation's fisheries, reflects the lack of understanding of marine ecosystems and fishing's impacts upon them. Rather than employing the precautionary principle and placing the burden of proof on the fishing industry, our current system is set up so that irreversible harm must be demonstrated before the unsustainable extraction of marine resources and/or destruction of habitat is stopped or reduced.

For the first time in 10 years, Congress is preparing to reauthorize the Magnuson-Stevens Fishery Management and Conservation Act (Magnuson-Stevens Act, or MSA), the law that governs federal fisheries, and consider what changes in the national law are needed for the future. Reauthorization comes on the heels of clarion calls for major reforms of fisheries management, national ocean policy, and governance in recent national panel reports, all of which have called for adoption of a more holistic, ecosystem-based approach to fisheries management.

The message is clear: We need to rethink the myopic, single-species approach to fishery sustainability in the MSA; protection of marine ecosystems on which the fish depend should be the organizing principle of fisheries management and ocean policy.

FACTORY FISHING ON THE LAST FRONTIER

"It is difficult to fully appreciate the extent of the changes to ecosystems that fishing has wrought …"[5]

The limits of sustainability as defined in the Magnuson-Stevens Act are illustrated by the Alaska pollock fishery, the nation's largest fishery, as well as the largest food fishery in the world. However, the fishery-focused definition of "conservation and management" in federal fisheries law fails to account for the impacts of the fisheries on marine food webs and habitats in an ecosystem context. The Alaska pollock fishery typifies these shortcomings.

The U.S. territorial seas off Alaska's 33,000-mile coastline encompass an area twice the size of the combined East and West Coast exclusive economic zones (EEZ[6]) and include some of the most productive marine ecosystems in the world. Historically, these ecosystems have supported some of the largest assemblages of marine mammals and seabirds on Earth, and – since the 1960s – an enormous fishery for bottom-tending "groundfish," dominated by Alaska pollock. The biggest source of this bounty is the extensive continental shelf in the eastern Bering Sea, accounting for about half of the marine fish and shellfish caught in the entire United States annually.

Factory trawler *Northern Eagle* fishing for pollock in the Bering Sea © Greenpeace/Visser

FIGURE 1. MAP OF BERING SEA/ALEUTIAN ISLANDS AND GULF OF ALASKA

SOURCE: National Marine Fisheries Service. *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS on the Bering Sea/Aleutian Islands and Gulf of Alaska Fishery Management Plans.* June 2004.

IMPROVING UPON THE ALASKA APPROACH TO OVERFISHING

Sustainability is the watchword of the reauthorized Magnuson-Stevens Act, also known as the Sustainable Fisheries Act of 1996. Yet the word "sustainable" appears in the statute only in reference to "maximum sustainable yield" (MSY), which is the statutory yardstick by which successful conservation and management are measured. The MSA is focused on maximizing resource utilization, and sustainability is defined in terms of economic benefits of fisheries, not stewardship of natural ecosystems or ecological integrity.[7]

The Alaska approach to overfishing employs a system of enforceable catch limits, or quotas, based on criteria for achieving MSY from individual species or groups of species in each fishery management plan (FMP). In the current debate over MSA reauthorization, advocates of enforceable catch limits as a method to prevent overfishing in U.S. fisheries have portrayed the Alaska fisheries as models to emulate.

OVERFISHING: MSY AS YARDSTICK

In the amended Magnuson-Stevens Fishery Conservation and Management Act of 1996, the terms "overfishing" and "overfished" are defined as a rate or level, respectively, of fishing mortality that jeopardizes the ability of an exploited fish stock (or group of species treated as a "stock" for management purposes) to produce the maximum sustainable yield (MSY) on a continuing basis.

In the simplest terms, MSY is the largest catch that the stock can sustain, on average, over a long period of time, given current ecological and environmental conditions. This sounds like a straightforward concept, but the Magnuson-Stevens Act's own National Standard Guidelines on overfishing cautioned that MSY is a theoretical concept rather than an empirical one.

That cautionary note has been all but lost in the debate about enforceable catch limits and Alaska's approach to overfishing. Measuring fishery sustainability by the theoretical yardstick of MSY is fraught with uncertainty, and the approach ignores the ecosystem.

Catch limits establish a bright line, defining the scope of opportunity as well as the limits of the resource. But catch limits by themselves are not a panacea; following scientific advice on fishing mortality limits is just the beginning. Once managers set a catch limit, they must be able to enforce it, which means they also need reliable measures of catch, including incidental bycatch of non-target species. Effective quota-based management is information-intensive and expensive.

The use of fishing mortality control rules and catch limits do not guarantee that overfishing will not occur, in part because the true abundance of fish in the ocean is inherently uncertain. Indeed, the highly theoretical yardstick of MSY and overly simplistic assumptions of "state-of-the-art" stock assessments are fertile ground for mistakes. The collapse of the northern cod fishery of Canada serves as a reminder of the fallibility of claims of conservative single-species quota management. Errors in stock size estimation were most likely responsible for the rapid collapse of Alaska's red king crab fishery in the late 1970s and early 1980s, which was the most lucrative fishery in the Bering Sea at the time.[8]

Factory trawler, *Ocean Rover,* Bering Sea Alaska © Visser/Greenpeace Opposite: Indian Paintbrush Fireweed & Daisies in bloom along shoreline of Unalaska Bay, Unalaska Island, Alaska © 2006 Alaksa Stock.

UNCERTAINTY IN CATCH LIMITS NECESSITATES GREATER PRECAUTION

Single-species stock assessment models oversimplify population dynamics of wild, free-ranging fish and they tell us nothing about the larger uncertainties associated with:

- **climate variability**
- **food web dynamics in the ecosystem**
- **the impacts of fishing gear on the habitats of fish and other wildlife**
- **the spatial and temporal effects of concentrated fishing in localized areas**
- **the effects on hundreds of poorly understood non-target species taken as bycatch.**

Thus, much of the uncertainty and risk inherent in managing such large fisheries is left out of the stock assessment calculation of acceptable biological catch (ABC).

For all these reasons, stock assessments and catch limits by themselves are no guarantee of avoiding overfishing or fostering recovery:

> *". . . many stock assessments have been predicated on the assumption that survey estimates of abundance, age-specific metrics of commercial catch, and a broad sense of the geographical limits of a commercially harvested fish population are all that one really requires to understand and predict the effects of fishing on fish populations. Yet, for many fisheries, we seem unable to predict either the susceptibility of fish stocks to collapse or their ability to recover therefrom."*[9]

The failure of single species or stocks of fish to respond predictably to MSY-based exploitation strategies may be attributable to inadequate information, flawed assumptions about species responses to a regimen of fishing mortality, extrinsic factors such as climate variability, or all of the above. Uncertainties and risks must be fully recognized and accounted for in setting catch limits. A great deal more precaution must be exercised in setting catch limits, and in cases of uncertainty, managers should err on the side of protecting the ecosystem.



POLLOCK'S CENTRAL ROLE IN THE NORTH PACIFIC FOOD WEB

"It seems extremely unlikely that the productivity of the Bering Sea ecosystem can sustain current rates of human exploitation as well as the large populations of all marine mammal and bird species that existed before human exploitation - especially modern exploitation - began."[10]

A common thread linking marine predators in western Alaska is their reliance on walleye pollock (*Theragra chalcogramma*), a prolific member of the cod family whose range extends across the North Pacific Rim from Puget Sound to the Sea of Japan. Pollock's central importance as a forage fish in the Bering Sea food web has been known since the 19th century, hence pollock's scientific name, *Theragra*, from the Greek *Ther* = beast, *agra* = prey or food.[11] Pollock is widely consumed at every stage of its life cycle by mammals, birds, invertebrates, and fishes.

Pollock is the dominant prey fish in the eastern Bering Sea,[12,13,14] and was the dominant prey of groundfish and Steller sea lions in the Gulf of Alaska during the 1990s.[15,16] Groundfish predators of pollock include some of the most abundant and most highly valued species in the Bering Sea and Gulf of Alaska.[17]

The explosive growth of the pollock fishery since the 1960s has been accompanied by steep declines of top predators in the pollock food web, including endangered Steller sea lions, depleted northern fur seals, depleted Pacific harbor seals, and some seabird species, indicating major changes in the structure of the ecosystem.[18] The threats posed by this fishery to pollock consumers in the ecosystem have been a lightning rod for controversy and conflict in scientific, political, and legal arenas for nearly two decades.

Photos: Humpback whale with calves. Steller sea lions, Round Island, Bristol Bay, Alaska. Red-legged Kittiwakes on Rock Ledge, St George Island, Alaska © 2006 Alaska Stock.

OVERFISHING IN AN ECOSYSTEM CONTEXT

The simplest way to describe Alaska's approach to overfishing is that if you take 60% of the fish out of the stock population by fishing, the remaining 40% will produce the maximum sustainable yield. Any new production in the "target" stock above the 40% level is considered a surplus for the fishery.[19] As the 1999 Bering Sea/Aleutian Islands Fishery Management Plan acknowledges, however, there *is* no surplus production in marine ecosystems for fisheries to take.[20,21] In the absence of the enormous pollock fishery, the foregone catch would be turned not into fake crabmeat or fish sticks, but into more fur seals, sea lions, seabirds, whales, halibut, cod, an pollock.

> **"The North Pacific marine ecosystem appears to be suffering from a serious case of single-species management, compounded by a narrow regimen of extraction-based policymaking."**
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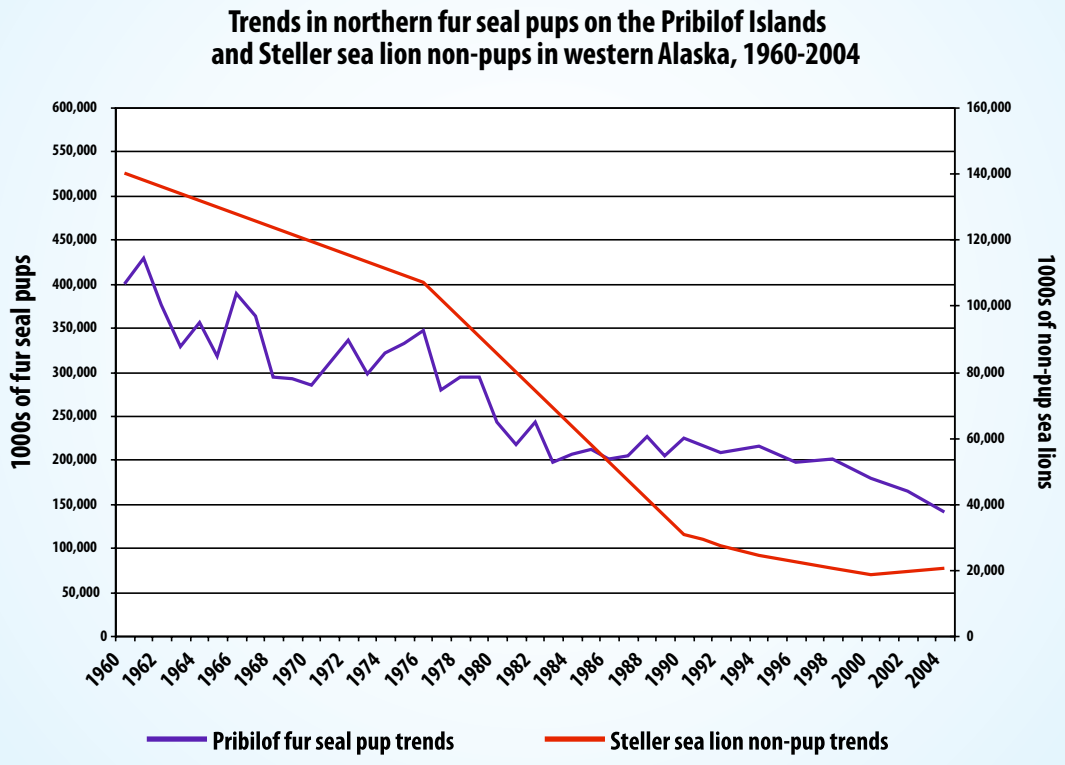
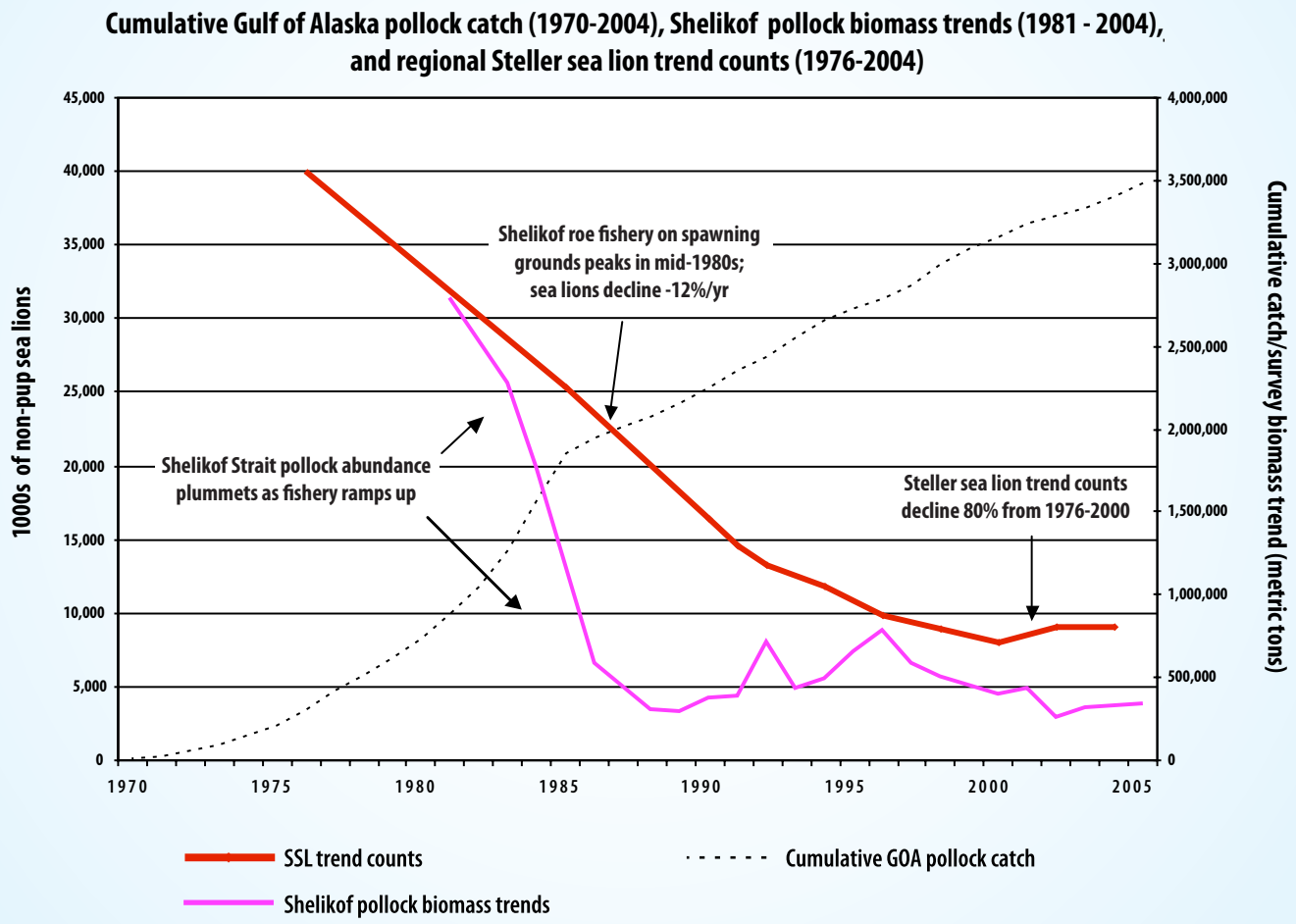
> Alaska Oceans Program. 2005. *Vital Signs in the North Pacific: Code Blue for the Ocean.* 2005.

FIGURE 2. THE TWO MOST AT-RISK SPECIES, THE STELLER SEA LION AND NORTHERN FUR SEAL, HAVE DECLINED MOST SHARPLY SINCE THE POLLOCK FISHERY'S EXPLOSIVE GROWTH IN THE 1960S.

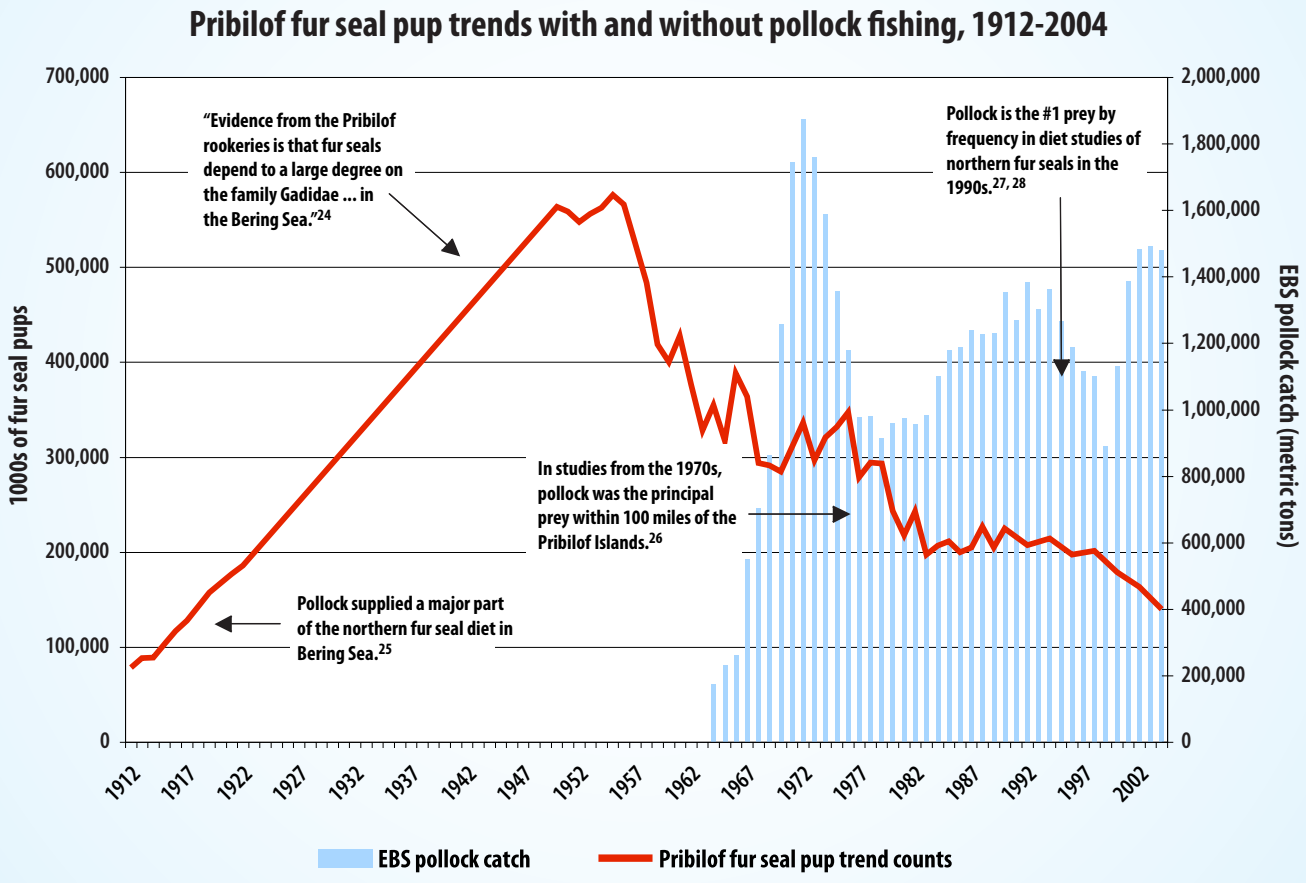




This policy is the cornerstone of the North Pacific Fishery Management Council's (NPFMC – the body responsible for the management of federal fisheries off of Alaska's coast) claim of conservative management of the fishery resources. This approach results in allowable catch levels somewhat below the level that would be obtained from a strict MSY strategy.[22,23] However, this single-species approach to setting catch levels fails to consider the following question: *What are the effects on competing predators and other related and dependent species in the food web of seeking to reduce fully exploited spawning stocks by 60%, on average*? The NPFMC does *not* account for the needs of predators or other ecosystem-level considerations when setting groundfish catch levels.[24] Each stock's allowable catch levels are set in isolation from its relation to the ecosystem.[25]

The decline of Steller sea lions (*Eumetopias jubatus*) and northern fur seals (*Callorhinus ursinus*) in western Alaska has persisted over three decades, confounding scientists' expectations for these long-lived species. This decline in waters shared with the pollock fishery is in startling contrast to increasing trends for seals and sea lions from southeast Alaska to California.

The evidence that removal of selected species can cause ripple or "cascading" effects in the trophic structure of aquatic ecosystems is well established in the ecological literature, but links of cause and effect are notoriously difficult to establish scientifically in the open ocean environment, and hypotheses are nearly impossible to test.

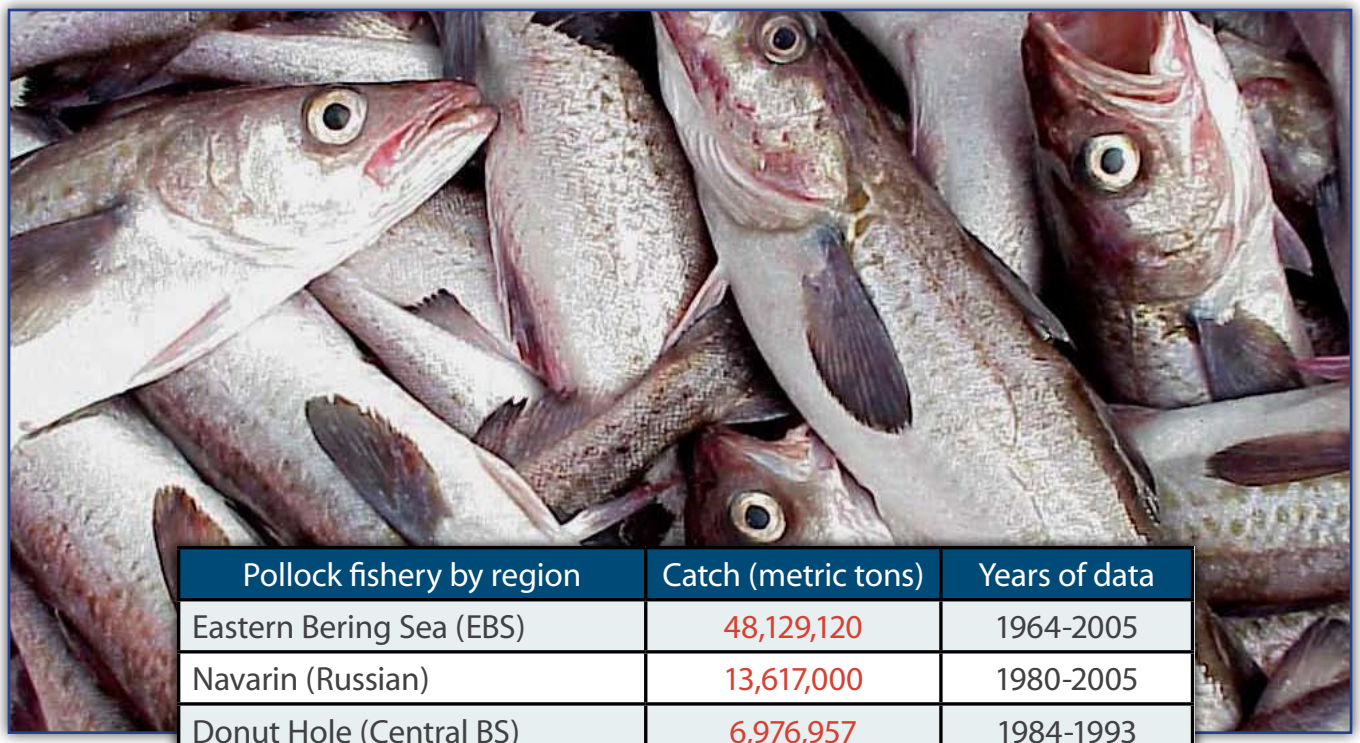


Data source: National Marine Mammal Laboratory. Seattle, Washington. Unpublished data.

While NMFS maintains claims of sustainability, such claims are made in the conventional single-species sense, and the ongoing declines of some of the North Pacific's most iconic species suggest that the limits of sustainability have been exceeded in an ecosystem context.

The pollock fishery reduces the overall availability of pollock to competing sea lions and fur seals by its very design. NMFS has acknowledged that this approach has the potential to reduce carrying capacity of competing pollock predators in the ecosystem.[26,27] They further concluded in 1998, and again in 2000, that the pollock fisheries are likely to jeopardize Steller sea lion survival and recovery and adversely modify sea lion critical habitat, the defining feature of which is abundantly available prey.

The potential for conflict between large-scale commercial fisheries for pollock and large populations of pollock predators in the North Pacific was recognized more than twenty years ago in the final Environmental Impact Statement for the Bering Sea/Aleutian Islands Fishery Management Plan and was deemed "*especially acute with respect to the more than 2 million pinnipeds that inhabit the Bering Sea and Aleutians, particularly the northern sea lion and the northern fur seal*."[33] A 1982 report to the NPFMC cited large increases in catches of Bering Sea pollock and other groundfish from a mere 12,500 tons in the early 1950s to over 2.2 *million* tons in the early 1970s and specifically noted that large-scale groundfish fishery removals may reduce the carrying capacity for competing top predators such as the Steller sea lion.[34]



Pollock fishery by region	Catch (metric tons)	Years of data
Eastern Bering Sea (EBS)	48,129,120	1964-2005
Navarin (Russian)	13,617,000	1980-2005
Donut Hole (Central BS)	6,976,957	1984-1993
Gulf of Alaska	3,484,192	1970-2005
Aleutian Islands	975,724	1979-2005
Bogoslof/Aleutian Basin	920,636	1987-2001
Total all areas:	**74,103,629**	

TOTAL CATCH OF ALASKA POLLOCK SINCE 1964 = 70,619,437 METRIC TONS (155,687,610,810 POUNDS)

This is the equivalent weight of 855,334,348 average male American adults,[35] or nearly three times the entire American population.[36]

This total catch could circle the globe at the equator 1845 times.[37],[38] It could reach to the moon and back over 96 times.[39]

The Alaska pollock caught in 2004 alone weighed over 1.5 million metric tons, or 3.4 billion pounds.[40] This is equal to the weight of over 17.8 million adult male Americans, or more than twice the population of New York City.[41]

If you were to lay these fish end to end, they would measure a length of 957,900 miles. This is equivalent to circling the globe at the equator approximately 38.5 times.

North Pacific Fishery Management Council. 2005. Stock Assessment and Fishery Evaluation (SAFE) Report for the Groundfish Resources of the BS/AI and GOA Regions as Projected for 2006-2007. Photo Top: Freshly caught Alaska pollock © 2006 National Marine Fisheries Service/Alaska Fisheries Science Center.

ALASKA POLLOCK BIOLOGICAL CHARACTERISTICS

Evidence from the past suggests that the pollock fishery substantially reduced the average age, size, weight, and abundance of pollock in the Bering Sea in the 1970s[42] and in the Gulf of Alaska in the 1980s.[43]

LIFE SPAN OF ALASKA POLLOCK

- **Pollock can attain ages of 12-16 years, and some may live considerably longer.**
- **The oldest recorded pollock was age 31.[44]**
- **The average age of Alaska pollock, however, was estimated in 1993 at about nine years.[45]**

AVERAGE LENGTH AND WEIGHT OF ALASKA POLLOCK

- **Reports from the beginning of the 20th century reflect that adult pollock could reach lengths of three feet (90 cm).[46]**
- **However, data from the 1980s indicated that pollock rarely attained lengths greater than two feet (60 cm), though some specimens reached lengths of about two and a half feet (70-80 cm).[47]**
- **The average 5-year-old pollock is about 18 inches in length (45 cm) and weighs about one and a half pounds (.6-.8 kg).[48]**

SPAWNING AND FECUNDITY (EGG PRODUCTION) OF ALASKA POLLOCK

- **Peak spawning varies from region to region, generally ranging from February to March or April in the Gulf of Alaska and southeastern Bering Sea, later in the northwestern Bering Sea.[49] Depending on location and latitude, spawning may occur any time from early winter to late summer in the Bering Sea.[50]**
- **Pollock are batch spawners, meaning that females release eggs every two to three days over a period of about a month.[51]**
- **As pollock females age and grow bigger and heavier, their egg-bearing potential increases substantially.[52]**

From "Concerns with the Alaska pollock fisheries regarding the Marine Stewardship Council Sustainability certification review," Marz, S., and K. Stump, 2002. Prepared for Trustees for Alaska.

A NEW PARADIGM – SHIFTING THE BURDEN OF PROOF

The Steller sea lion crash and the accompanying declines of fur seals (see Figures 2-4), harbor seals, and some of the largest nesting colonies of fish-eating seabirds in the world are indicators of major change in the structure of the ecosystem in recent decades.[53] However, NMFS maintains that the information required to quantify fishery impacts on marine mammal food supplies and habitat would entail decades of sustained research, funding and fieldwork. Given the inherent difficulties of research in this environment and the limits of research budgets, that scientific evidence could be a very long time coming. As noted by NMFS's own scientists, marine science is likely to provide glimpses of underlying ecosystem mechanics rather than complete understanding for the foreseeable future.[54] And in the absence of baseline historical information to compare the current state of the ecosystem to an unfished environment, the causes of ecosystem changes in a complex system remain uncertain.[55]

The question then becomes: *Who bears the burden of proof in the meantime – the fisheries or the ecosystem?* All these uncertainties underscore the need for a more precautionary approach to fisheries management in the context of food web and habitat conservation, and illustrate why the agency's National Environmental Policy Act determinations of "insignificance" for fishery impacts on prey availability and spatial and temporal concentration of fisheries are inherently arbitrary.

Historically, the burden of proof has been on advocates of greater ecosystem protection to demonstrate that limits or constraints on fishing are justified. The management bias consistently avoids finding harm from fisheries activi-

Photo Top: Alaskan King Crab © 2006 Alaska Stock

ties even when the evidence strongly suggests otherwise, largely for economic reasons.[56]

Versions of ecosystem-based management now under consideration at the federal and regional level would remain discretionary in terms of legal requirements and largely informational in terms of the fishery management decision-making process, requiring no explicit management actions. Ecosystem planning and management actions to address ecosystem impacts of fishing remain ancillary to the real business of the fishery management councils, which is to allocate fish and maximize economic benefits.

In the context of the Alaska pollock fisheries, perhaps the clearest examples of how the management system errs on the side of the fishing industry in the face of uncertainty can be seen in the inadequate response to needs of declining populations of pollock predators such as the Steller sea lion and northern fur seal. Another illustrative example is the absence of habitat reserves for pollock spawning grounds in the Bering Sea and Gulf of Alaska, both prime fishing grounds of the trawl fleet in the winter season. In both cases, the operating assumption is that current levels of fishing have no significant adverse impacts until proven otherwise, and the burden of proof on advocates of greater precaution is very high. Even when scientific evidence of adverse effects on the food web or habitat is brought forward, the inherent uncertainties are exploited by economic interests in the council process to deny, delay or weaken any management measures that constrain fishing.

The difficulties of providing adequate protection to the pollock themselves and to dependent species in the pollock food web illustrate the obstacles to achieving ecosystem-based management under existing fisheries law. The fisheries-focused objectives, the narrow single-species scope of overfishing criteria based on maximum sustainable yield, the weak and discretionary habitat conservation mandate, the lack of explicit ecosystem conservation objectives or recognition of the precautionary principle, and the pervasive influence of the fishing industry in the decision-making process of the NPFMC all militate against an ecosystem-based approach worthy of the name.

The 1996 reauthorization of the MSA tasked NMFS with convening a panel to develop recommendations "to expand the *application* of ecosystem principles in fishery conservation and management activities."[57] The report to Congress of the Ecosystem Principles Advisory Panel (EPAP) recommended an ecosystem-based management approach for fisheries and identified a broad fishery conservation and management goal of maintaining the health and sustainability of exploited ecosystems.[58]

"Our activities … are altering and threatening the structure and functioning of marine ecosystems — from which all marine life springs and upon which all living things, including humans, depend."

Pew Oceans Commission. 2003. *America's Living Oceans: Charting a Course for Sea Change.* p. vii.

Although some of the EPAP's principles, goals, and policies are currently applied in the North Pacific, the panel concluded that they are not applied comprehensively and systematically in any fishery management region, nor is there a clear mandate for this ecosystem approach. Thus the major recommendation of the EPAP Report to Congress was to mandate the development of an explicit Fisheries Ecosystem Plan (FEP) for ecosystems under the jurisdiction of the regional fishery management councils.

In September 2005, the Bush Administration released its bill to reauthorize the Magnuson-Stevens Act. According to Commerce Secretary Carlos M. Gutierrez, the amended MSA would "elevate the importance of ecosystem-based management by authorizing the

regional fishery management councils to develop ecosystem plans."[59] Importantly, the councils are authorized, *but not mandated*, to prepare Fishery Ecosystem Plans.[60]

In this proposed version of ecosystem-based management, FEPs are envisioned as separate from the FMPs, discretionary in terms of legal requirements, and largely informational in terms of the council management decision-making process.[61] In other words, this version of ecosystem-based management requires no real changes to the existing way of doing business. Even more striking, if it wasn't for an amendment added six months later, the word "ecosystem" wouldn't appear at all in the 48-page bill introduced by Senator Ted Stevens (R-AK) in December 2005.

> **"U.S. ocean and coastal resources should be managed to reflect the relationships among all ecosystem components, including humans and nonhuman species and the environments in which they live."**
>
> U.S. Commission on Ocean Policy. Final Report, *An Ocean Blueprint for the 21st Century.* p.6. 2004.

The goal of ecosystem-based fisheries management is to put ecosystem principles into *practice*, a desire also expressed in the Magnuson-Stevens Act.[62] In an ecosystem context, fishery sustainability may be understood as the levels and methods of fishing that are compatible with explicitly stated FMP objectives for preserving the productivity, nutrient dynamics, habitats, trophic structure, species richness, and resilience of the natural ecosystem. More broadly, NMFS defines ecosystem approaches to fisheries management as the means "whereby management programs consciously account for and address (1) all living resources within a specific marine area/ecosystem, including stocks targeted by fishing operations, non-target stocks, and the marine environment; and (2) all sources of environmental stress and factors influencing the ecosystem including fishing operations."[63]

Indian Paintbrush Fireweed & Daisies in bloom along shoreline of Unalaska Bay, Unalaska Island, Alaska © 2006 Alaksa Stock.

BENEFITS OF MARINE RESERVES

Fishery related:

- Increase abundance, average size, reproductive output, and genetic diversity of target species
- Enhance fishery yield in adjacent areas
- Provide a simple and cost-effective management regime that is readily understood and enforced
- Guard against uncertainty and reduce probability of overfishing and fishery collapse
- Protect endangered species and marine mammals
- Provide opportunities for increased understanding of exploited marine systems
- Provide basis for ecosystem management

General:

- Increase habitat quality, species diversity, and community stability
- Provide undisturbed control sites for monitoring and assessing human impacts in other areas
- Create or enhance non-extractive, non-destructive uses, including tourism
- Reduce user conflicts
- Provide opportunities to improve public awareness, education, and understanding
- Create areas with intrinsic value

In the absence of clearer guidance and statutory requirements, however, an unspecified mandate to "account for and address" ecosystem considerations can be interpreted any number of ways by fisheries managers, whose primary objective under the MSA remains maximizing fisheries yield. The NPFMC may follow the advice of its scientific advisors, but that advice only comes within the narrow constraints of the mandate to maximize sustainable yield. Looking more broadly, there is a growing scientific consensus that "no take" marine reserves are a valuable tool to manage marine resources. While estimates for the most effective size of reserves range from 20-50% of a given ecosystem, less than half of one percent of U.S. waters is currently protected under the Marine Sanctuary Program – and much of this is open to some form of extractive industry. In the 900,000 square miles that are managed by the NPFMC, the amount of ocean closed entirely to fishing is zero.[4]

This is why the Pew Oceans Commission and U.S. Commission on Ocean Policy called for more basic reforms of the federal fisheries management system, including a new national ocean policy aimed at implementing an ecosystem approach for oceans and coasts and a complete overhaul of the federal governance system to provide more effective guidance and coordination among federal agencies whose activities affect the marine environment.[65,66]

Point on Round Island Bristol Bay, Bering Sea, Alaska ©2006 Alaska Stock

PUTTING ECOSYSTEM-BASED MANAGEMENT INTO PRACTICE

The steps proposed by Greenpeace and others in 2003 and in this report build upon these recommendations in an effort to redefine sustainability in an ecosystem context and operationalize ecosystem-based management in the water. Fishery ecosystem plans should be adopted for each major ecosystem, incorporating explicit principles, policies, guidelines, and regulations for ecosystem-based management into the fishery management plans. Under these ecosystem plans, conservation and management is defined as all the rules designed to:

- **Protect, maintain, and restore healthy marine ecosystems, understood as ecosystems in which ecological processes, habitats, trophic levels, and productive capacity are comparable to an unexploited system, and the diversity of the native flora and fauna is preserved at the genetic, species, and community levels.**
- **Rebuild, restore, and maintain exploited fish stocks at high levels relative to an unfished condition in order to preserve the ecological relationships between the exploited, dependent, and related species in the food web.**
- **Establish a network of marine reserves to conserve fish and other wildlife habitats within a comprehensive plan for the protection of Essential Fish Habitat (EFH) of managed species, critical habitat of Endangered Species Act-protected species, known important habitat of Marine Mammal Protection Act-protected species, and habitat of management-defined categories of non-target and unmanaged species.**
- **Provide for commercial, recreational, and non-consumptive uses of the marine environment within the framework of 1-3.**
- **Avoid irreversible or long-term adverse effects on fishery resources and the marine environment.**
- **Transmit a legacy of healthy ecosystems to future generations.**

These rules illustrate what fisheries management would look like if the burden of proof were truly shifted from the environment onto the fisheries. As such, they contrast sharply with the version of ecosystem-based management offered by NMFS as the "Preferred Alternative" Fishery Management Plan in the court-ordered programmatic supplemental Environmental Impact Statement on the Alaska groundfish fishery management plans.[67] While consistent with the recommendations of the Pew Oceans Commission and the U.S. Commission on Ocean Policy, this proposal for an ecosystem-based approach to management also contrasts sharply with the current proposals by Senator Stevens and the Bush administration.

Less than one half of one percent of marine habitats are protected — compared with 11.5 percent of global land area.

Alaska Oceans Program.
http://www.alaskaoceans.org/facts/fiftyfacts

There can no longer be any doubt about the enormous impact of large-scale industrialized fisheries on the ocean's fish populations, and, consequently, on marine ecosystems as a whole. Indeed, in an ocean that is increasingly affected by myriad human activities, from habitat destruction to toxic and nutrient pollution, to the all-pervasive threat of global warming, the need to address the destructive impacts of commercial fisheries has never been greater. To this point, however, the response to this growing crisis on the part of fisheries managers across the nation has been insufficient and reluctant. It is time for decisive action, for bold new steps requiring a radical makeover of the way in which fisheries are managed in this country. Following the recommendations laid out above would be the first, important steps toward the development and implementation of a sustainable fisheries management regime, for the benefit of fish populations, the fishing industry, and ocean ecosystems as a whole.

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