

The
**BERING SEA
ECOREGION**



A CALL
TO ACTION
IN MARINE
CONSERVATION





Symbols used in the design of this booklet can be linked to the many peoples who have made the Bering Sea ecoregion their home for thousands of years. We have used them with respect for their creators, and with the knowledge that the future of this treasured place is closely tied to them.

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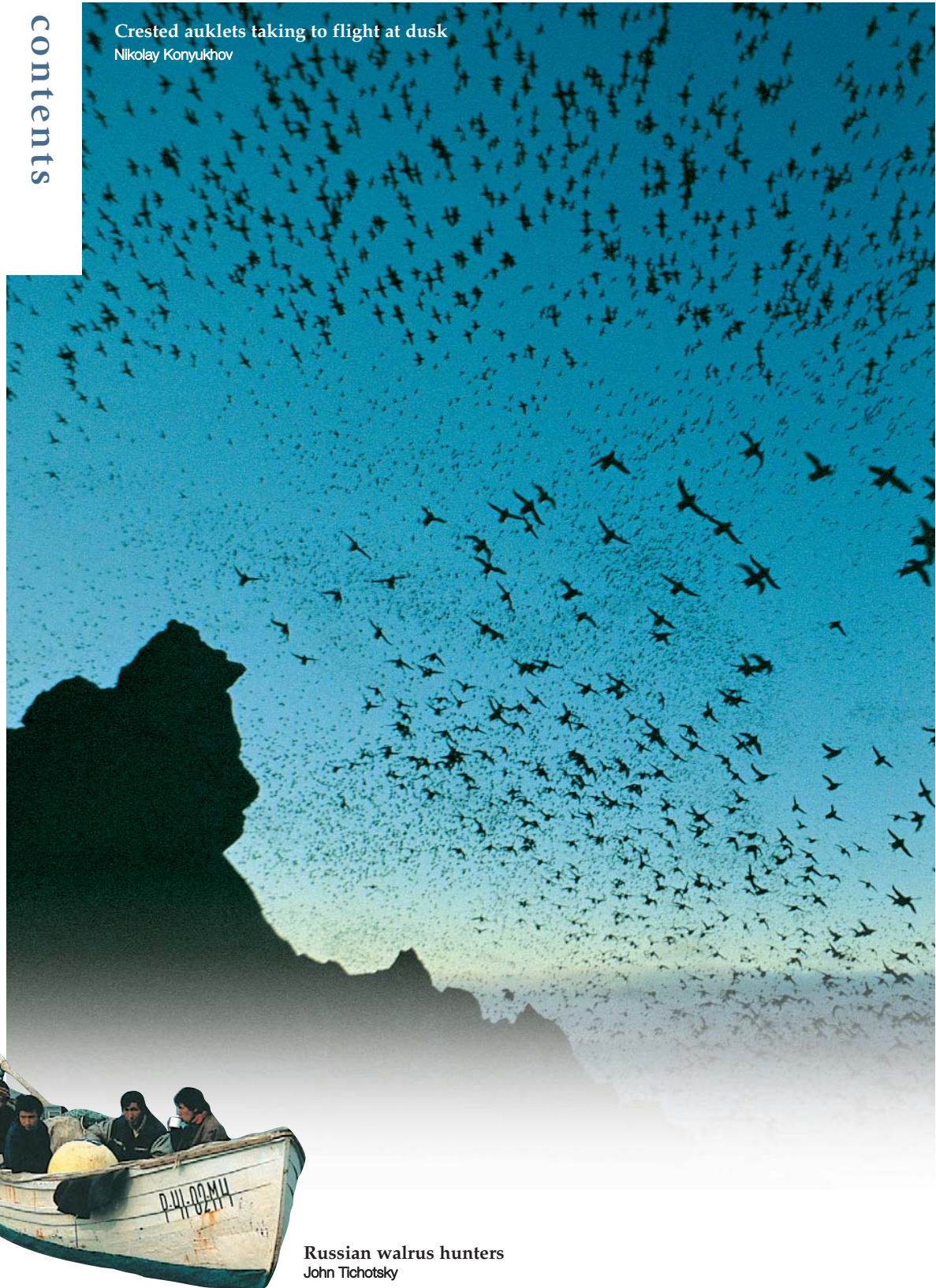
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Crested auklets taking to flight at dusk
Nikolay Konyukhov



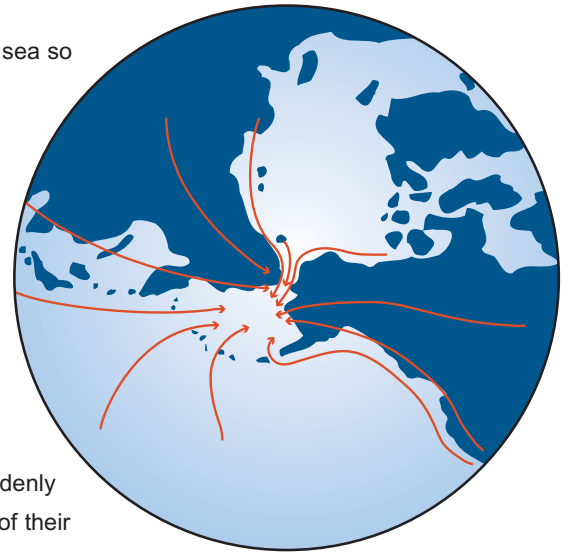
Russian walrus hunters
John Tichotsky

THE BERING SEA ECOREGION

In the waters between Russia and Alaska lies a sea so rich in wildlife and variety of coastal and subsea habitats that it is considered one of the world's most biologically productive and diverse marine environments. Covering almost a million square miles of Arctic and sub-Arctic waters, the Bering Sea supports vast populations of fish and shellfish, birds from every continent on earth, and countless numbers of whales, dolphins, porpoises, walrus, sea lions, polar bears, fur seals, sea otters and sea lions.

It is here spectacular flocks of seabirds suddenly take to the air from the towering headland cliffs of their summer nesting grounds while, far below, 80-foot blue whales consume several tons of krill each day along the edge of the continental shelf. Highly endangered sperm whales, the deepest and longest diving cetacean, can sometimes be seen resting near the surface of the sea. Huge salmon runs, massive schools of pollock, and generations of long-lived halibut are migrating through deep and shallow waters. Small arctic foxes are trailing majestic polar bears hundreds of miles across the northern sea ice through brutal winter storms and hurricane force winds. And a million Northern fur seals, spending eight months to two years at sea, are migrating thousands of miles through ocean waters to the Bering Sea islands, the very rookeries, where they were born.

Covering the coastal regions of two continents and one of earth's largest semi-enclosed seas, this northern extension of the North Pacific Ocean harbors more than 450 species of fish, crustaceans and mollusks, 50 species of seabirds, waterfowl, shorebirds and raptors, 25 species of marine mammals, and hundreds of human communities. Over 50 percent of the United State's annual fish catch comes from the Bering Sea as does an estimated 50 percent of Russia's annual fish production. The region's wetlands, coastlines and islands provide globally significant habitats for many additional wildlife species, and its natural history holds answers to critical questions about world history. Renowned today for its environmental, economic, and cultural importance, the Bering Sea's wildlife and indigenous people have thrived on its productive waters for centuries.



Marine birds and mammals come from around the world to the Bering Sea each year to feed in the rich waters and give birth to their young.

Map by Eric Cline



Crested auklet

Nikolay Konyukhov

"I am not one to exaggerate events or paint them in gaudy colors, but I can maintain that a thick cloud of birds rose from those rocky cliffs, blanketing the sea with black as far as we could see."

Georg von Langsdorff
St. George Island, 1805



**“In the end,
we will
conserve
only what
we love, we
will love
only what
we under-
stand, we
will
understand
only what
we are
taught.”**

Senegalese
conservationist
Baba Dioum

On every scale, in all its complex dynamics, the Bering Sea is one of our planet's most spectacular ecological regions -- that rare place where nature's creatures and biological processes are still providing a wealth of benefits that attract and sustain an extraordinarily abundant diversity of life.

Yet there are signs of significant and disturbing changes in the Bering Sea. Steep declines in some marine mammal populations, fluctuations in seabird populations, and the reduction

or collapse of certain commercially important crab and fish stocks have generated concern among Bering Sea coastal residents, natural resource managers, policymakers, commercial fishing operators, and conservationists. In its Global 200 conservation assessment, World Wildlife Fund (WWF) lists the Bering Sea ecoregion as **one of the most outstanding yet endangered marine environments, whose protection is essential for the preservation of the world's biodiversity.**

Intensive efforts are underway at the grassroots level, regionally, nationally, and internationally to better understand the many complex systems that make up the Bering Sea ecoregion. These efforts range from examining declines in species, reassessing existing research strategies, developing programs aimed at both short-term management and longer-term ecological problems to strengthening community stewardship and conservation programs, and finding substantive ways in which to incorporate the concerns and knowledge of the region's indigenous people.

The effort to conserve biodiversity in this remote but vital region requires innovative approaches to working in a fluid, migratory world that does not recognize political borders, cultural disagreements, or the economic interests of different nations. The challenge is to be as adaptive and resilient, as brilliant as nature itself if we are to sustain the wildlife and human life dependent on one of earth's most remarkable seas.

This publication provides an overview of the Bering Sea ecoregion, the environmental changes and human activities threatening its health, and proposals aimed at conserving biodiversity in this vital part of our world. Greater public awareness about this area's unique and magnificent features, the problems affecting it, and the measures needed to sustain its biodiversity, is critical. As the renowned biologist Edward O. Wilson has observed, "There is an implicit principle of human behavior important to conservation: the better an ecosystem is known, the less likely it will be destroyed."¹



John Schoen

Steller sea lions

¹Edward O. Wilson, *The Diversity of Life*, p. 320, W.W. Norton and Harvard University Press, 1999

a brief history of beringia

During the Pleistocene glacial epoch, between ten and thirty thousand years ago, much of the shallow northern sea lying between Asia and North America retreated as its waters became part of vast continental glaciers. This gradual process left an immense land bridge between the two continents. Ice Age animals such as the saber-toothed cat, short-faced bear, the woolly mammoth and rhinoceros, bison, wild horse, camel, and saiga antelope eventually made their way across this fertile steppe and were followed by the first human immigrants to the New World.



In opening a corridor that allowed plants, animals and early humans to cross from one continent to another, the Bering Land Bridge had a profound influence on the natural history of the world. Although land mammals such as the woolly mammoth are now long gone others such as caribou, bears, wolves, moose and lynx have evolved into the modern species that now range across Siberia,

Alaska and Canada. Many of the first human immigrants across the land bridge kept moving, settling farther inland and south and eventually establishing some of the great Indian nations of North and South America. Others stayed in Beringia, as it is now called, and are the ancestors of today's Inupiat, Inupiaq, Yup'ik, Aleut, Chuckchi, Cup'ik, Kamchadal, Koryak, Itelman – the people of the Bering Sea.

Though separated today by a wild rich sea, the shared human ancestry and natural heritage of this region can be seen everywhere: in the common physical environment that supports a similar range of terrain, plants and animals, and in the language, subsistence styles, and family ties between Alaska and Siberian Natives.

Indigenous People of the Bering Sea Ecoregion

Bering Sea coastal people have a wealth of invaluable knowledge about the environment and wildlife upon which they have depended for so many years. Native communities in Russian and Alaskan coastal regions date back at least 10,000 years to the last ice age when a wide land bridge connected the Asian and American continents. The migration of people across Beringia led to many settlements of highly successful coastal cultures whose skills were honed by a fierce physical environment. Generations of hunters and fishers from these coastal tribes and villages kept alive the acquired knowledge and wisdom learned from their surroundings. Such traditional knowledge is widely recognized today as essential to the future conservation of

the Bering Sea's exceptional marine life.

Most of the estimated 100,000 Aleut, Chuckchi, Cup'ik, Inupiat, Inupiaq, Koryak, Kamchadal, Itelman and Yup'ik people now living along Bering Sea coasts and on islands remain highly dependent on subsistence use of fish, seals, whales, other marine mammals, seabirds, and plants. Many still work traditional fishing and hunting grounds in near-shore waters,

"In 1700 the North Pacific Ocean appeared much bigger than it does today. On maps of the time, it occupied nearly all of western North America. Mariners feared its storms, fogs, and ice. No European power dared explore its limits. It was Russia - a nation with little ocean going experience - that would reveal the North Pacific to the world."

[Science Under Sail](#)
Russia's Great Voyages to
America, 1728-1867

**Nunivak Island
mother and child**
Dave Cline



Hope for preserving and reclaiming the many practices that have defined and distinguished Bering Sea indigenous cultures for thousands of years also comes from grassroots initiatives and partnerships in Russia and Alaska.

Sumner MacLeish


Den Lamont



St. Paul Village, Pribilof Islands

biologically rich areas known by their fathers and grandfathers. Others have developed successful management initiatives with regulatory agencies such as the Alaska Eskimo Whaling Commission, which, since 1981, has managed all aspects of bowhead subsistence whaling through a cooperative agreement with the National Marine Fisheries Service. Other co-management agreements in the region govern subsistence use of beluga whales, geese, Pacific walrus, polar bears and sea otters.

Hope for preserving and reclaiming the many practices that have defined and distinguished Bering Sea indigenous cultures for thousands of years also comes from grassroots initiatives and partnerships in Russia and Alaska. Many are aimed at young people such as seasonal and year-round stewardship programs that involve community members in cleaning up beaches, disentangling animals caught in fishing gear, and working in the field with biologists and with researchers at sea. Other initiatives are embracing the newest technologies such as the Internet and electronic message boards where coastal people can share observations of shifts in local wildlife trends, weather patterns or other aspects of their environments that could help determine stress or problems affecting marine life.

These actions, together with widespread support for full participation of indigenous people at all levels of biodiversity conservation, offer considerable promise for improving the health of wildlife and human life throughout the Bering Sea ecoregion. 




Chukotka school boys
John Tichotsky



the bering sea ecoregion today

The Bering Sea is bordered to the north by Alaska, the 53-mile wide Bering Strait, and north-eastern Siberia. Its southern border is framed by the arc of the Alaska Peninsula, the Aleutian Islands, and Russia's Commander Islands. Two principal geographic phenomena compose its bathymetry: an unusually broad, shallow continental shelf extending from Alaska across the northeastern half of the sea and a deeper oceanic basin in the southwestern half.

Four major ocean currents, a massive seasonal ice pack, great kelp forests, the world's most extensive eelgrass beds, a vast continental shelf and an unusually long shelf-break zone (where the shallow sea floor gives way to a deep abyssal plain) also set the stage for a wide variety of habitats for marine and coastal life, and for the high biological productivity on which such life depends. Added to these physical characteristics are fantastic populations of migratory and resident wildlife which play important roles in how their environment, and surrounding ecosystems, function. It is this fluent, complex web of interdependent relationships that drive the Bering Sea ecoregion's significant energy and activity. Some of these ecological processes are well understood but many are not, despite years of research and investigation.

What is known is that two centuries of intensely exploiting fish and wildlife, increasing levels of pollution, rising global temperatures along with natural regime shifts are believed to be causing widespread, unprecedented biological changes in the structure and dynamics of the Bering Sea. And these changes may be seriously affecting the health of coastal people, of wildlife, and the very businesses and industries that depend on the region's abundant natural resources. 



Maximum extent of the ice pack

What is an

ecoregion?

Ecoregions are relatively large areas of land or water that harbor a characteristic set of species, communities, dynamics, and environmental conditions.

Working at the ecoregion scale offers several advantages for conservation planning and action. Defined in biological terms, an ecoregion focuses attention on the biodiversity at stake, compelling us to think, plan and act across political boundaries that are often obstacles to conservation. Because ecoregions are biologically coherent, it is possible to set more meaningful and strategic biodiversity conservation goals – focusing on populations, processes and ecological phenomena and threats important to the region, rather than focusing on political units. Ecoregion-based conservation is visionary, encouraging us to plan for the long term, 50 to 100 years hence. The ecoregion approach requires us to address threats to biodiversity that occur beyond the ecoregion's boundaries.

World Wildlife Fund (WWF) includes the Bering Sea among 200 ecoregions on earth that are globally significant for conserving biodiversity. WWF defines the Bering Sea ecoregion as the marine area north of the Aleutian Chain, the waters and coastal fringe of the Bering Sea, the Bering Strait, and the southern Chukchi Sea.

CONSERVATION CONCERNS


"It seems extremely unlikely that the productivity of the Bering Sea ecosystem can sustain current rates of human exploitation as well as large populations of all marine mammal and bird species..."

National Research Council
1996 report on the Bering
Sea Ecosystem

There is growing consensus among scientists, conservationists and local people that the most critical contributors to changes in the Bering Sea ecoregion's biodiversity include:

- Overfishing, unenforced fishing regulations, fisheries management -particularly in Russia, overcapacity of the Bering Sea fishing fleet, and the wasteful taking of non-targeted species (known as incidental catch and bycatch);
- Loss of critical marine habitat including: ocean bottom communities that are damaged or destroyed; coastal areas that are impacted by industrial activities; and pack ice, the average extent of which is shrinking in response to rising arctic temperatures;
- The failure of research and management programs to adequately involve local indigenous people in policy-making processes, and the erosion of traditional stewardship ethics in Native communities;
- The threats posed to native wildlife by the invasion of non-native animals such as Norway rats and other exotic flora and fauna carried by ships and fishing vessels from other regions;
- Chemical pollution from: air and water-borne toxins; the accidental and illegal dumping of marine vessel waste and oil; toxic marine paint; discarded fishing gear; deteriorating World War II and Cold War military sites that, among other problems, may be leaking radioactive nuclides into the region; and from aging nuclear powered Russian coastal navigation lights;
- Lack of awareness beyond the ecoregion about the biological, cultural, and economic importance of the Bering Sea, and about the effects of external forces such as pollution and climate change on this vulnerable and remote marine system; and;
- Global and regional climate changes that affect temperature-sensitive marine wildlife, species composition and location, ocean circulation, nutrient supply and distribution.

Although oceans around the world are subjected to many of these same pressures, the Bering Sea may be particularly sensitive because of its high latitude and semi-enclosed nature.

Cold temperatures slow down many chemical and biological processes, thereby increasing the length of time pollutants circulate through the food web. Limited sunlight and short "growing" seasons also reduce the opportunities for energy production and feeding, critical factors that can affect fish and wildlife's breeding and reproductive abilities. 



Dan Lamont

Bering Sea crab catch

THREATS TO BIODIVERSITY

Exploiting Fish and Wildlife Resources

Commercial exploitation of the Bering Sea's resources began in the late eighteenth century and increased significantly in the nineteenth and twentieth centuries. Sea otters and Northern fur seals with their luxuriously dense fur coats were early targets of Russian fur traders. Soon, Russia was joined by Canada, Japan, the United States and, later, by China, Korea, Poland and

Taiwan in large-scale commercial whaling, sealing and fishing operations. Whaling and sealing for profit continued through the 1950s until they were banned in the early 1970s and 1980s, respectively.

In contrast, commercial fishing activity grew dramatically as sophisticated fishing technologies and massive subsidies supported an ever-expanding fleet. Bering Sea trawl fisheries in the mid-1900s severely reduced shelf flatfish and slope rockfish populations. Pollock abundance increased in the late 1960s and soon became the focus of the multi-national fishing fleet where it remains today. In fact the Bering Sea pollock fishery, which contributes a billion dollars a year to the U.S. economy (including shares to local communities), is currently one of the largest single-species fisheries in the world. The overall fish and shellfish catches taken from the Bering Sea

account for between two and five percent of the world's fishery production.²

The consequences of such intense exploitation coupled with climate change, various forms of pollution, and shifts in natural cycles and trends of fish and wildlife have resulted in profound ecological changes as well as unusual fluctuations in certain populations. While we have less information from Russia, a number of fisheries are declining in the eastern Bering Sea:

- Red king crab stocks collapsed in the early 1980s shifting the fleets' focus to opilio crab (subsequently ranked Alaska's third most valuable fishery after pollock and salmon); A sudden drop in opilio crab stocks, including young crabs, was reported in 1999.
- Herring, capelin, and other small forage fishes important to top predators like seabirds have been declining since the mid-1990s;
- Seven great whale species that use the Bering Sea for summer foraging are listed as Endangered under the federal Endangered Species Act (ESA). (See our Species Watch List on page 13);
- Steller sea lion populations have dropped 50 to 80 percent throughout their range in the Bering Sea since the 1980s, causing the species to be listed in 1996 as Endangered under the ESA;
- Northern fur seals, 70 percent of which breed in the Bering Sea, are listed as depleted under the federal Marine Mammal Protection Act (MMPA);
- Sea otter populations on several Aleutian Islands have plummeted as much as 90 percent in the last seven years;



Old Dartmouth Historical Society

Whaling era



Pollock factory trawler unloading nets
Anchorage Daily News,
Bob Hallinen

²National Research Council, The Bering Sea Ecosystem, National Academy Press, 1996

The American Monarch

The American Monarch is one of the largest factory trawler-processors in the world, capable of catching over one thousand tons of fish every 24 hours and processing more than six hundred tons of pollock a day. Part of the overcapitalized, huge fleet of supertrawlers plying the world's oceans, the Norwegian-owned Monarch had applied for (and been denied) 1997 permits for fisheries in Chilean and U.S. waters. She spent much of 1998 docked in Seattle, losing money as her investors looked for other fisheries. When the Monarch sought permission to fish in the western Bering Sea, the government of Kamchatka, regional agencies, and environmentalists protested but were overruled by the Federal Fisheries Committee in Moscow, which retains final authority over all Russian fisheries. Granted unlimited fishing rights within Russia's EEZ in the Bering Sea, the Monarch has been catching and processing pollock, much of it juvenile, undersized fish of American stock, since late 1998. Immature pollock are a major source of food for many threatened seabird populations and marine mammals in the Bering Sea, including the endangered Steller sea lion.

Source: Biodiversity Briefings from Northern Eurasia, Vol.1, Issue 1, published by *Russian Conservation News*.

- Red-legged kittiwakes have declined 40 to 60 percent throughout the Pribilof Islands since the mid-1970s;
- Both Steller's and spectacled eiders are now listed as Threatened species under the ESA; and,
- The short-tailed albatross is listed as Endangered under the ESA.

The health of fish, bird and marine mammal populations in the western Bering Sea is not as well documented. However, reports from scientists and conservation groups suggest that fish exploitation rates are unsustainably high within Russia's 200 nautical mile Exclusive Economic Zone (EEZ), and that ongoing economic and political conditions within the Russian Federation will increase pressure

on fish stocks in the coming years. A recent North Pacific Fishery Management Council report to Congress on Russian Far East Fisheries Management cites several factors likely to produce conditions conducive to overfish-



USFWS

Russian fishing vessel

ing pollock. One contributing factor is the ongoing modernization of the Soviet-era fleet of large fishing vessels. There are signs that Russia is actively rebuilding its fishing capacity through purchase, lease and vessel refitting which requires hard currency, the kind generated from the sale of fish and fish products abroad. Meanwhile, coastal community fisheries languish. As the Russian government strives to overcome economic pressures, and as people struggle for survival in areas far from Moscow, conservation of fisheries resources is seldom a priority.

The Russian government's diminishing budgets for scientific research, conservation programs, and law enforcement indicate a critical breakdown of that country's long and highly regarded history of marine ecosystem research and fisheries management. Finding ways to address these problems is of considerable concern, particularly for the United States. Pollock – the target of the largest fishery in the eastern Bering Sea - are highly migratory and spend much of their young life in Russian waters before returning to U.S. waters. Such trans-boundary characteristics of Bering Sea fish and wildlife are compelling evidence of the need for long-term international research and conservation measures. It is critical that the United States work with Russia to ensure

the Bering Sea is well managed on both sides of the international marine boundary.

Finally, decades of exploitation and the large-scale taking of fish and other marine life in the Bering Sea have altered the physical, chemical, and biological relationships linking upper, middle, and bottom levels of the food web. While changes occur naturally in large marine ecosystems, human-induced stresses of the magnitude experienced during the last two hundred years in the Bering Sea have exacerbated these inherent variations. Such changes are less visible than declining fish and wildlife populations and may take decades to become apparent, as many of the sea's processes do not operate on a human time scale. Yet further long-term research into understanding how these complex ecological relationships work and are being affected is absolutely critical to developing sound conservation policies and sustainable fisheries.

Bycatch

Bycatch, the 'incidental' and irresponsible discarding of non-targeted fish and wildlife, has long been a problem in the Bering Sea. Large-scale industrial fishing driven by intense competition and economic incentives to catch as many fish as possible as quickly as possible, leads to highly wasteful fishing practices.

Fisheries target specific, commercially valuable species such as pollock, Red King crab, or Chinook salmon, and their catch must meet size, age or gender regulations. Any marine life caught that does not meet the regulations is thrown back into the sea, including undersized target fish, different fish species, shellfish, birds, seals and other 'incidental' marine life.

Some fisheries permit extraordinarily high amounts of bycatch. Until recently Bering Sea groundfisheries were legally allowed to catch over eight million pounds of non-targeted halibut each year and still continue harvesting³. Other fisheries, including small community types such as longlining for halibut, are stopped if two or more short-tailed albatrosses (see box) are killed annually.

Bycatch occurs with various types of fishing gear. Trawling with heavy nets is highly indiscriminate and responsible for most 'unwanted' marine life caught and then discarded. Commercial longlining (with baited, multi-hook monofilament lines up to 80 miles long) attracts seabirds that dive for the bait and then drown if they are caught by one or more hooks. Even discarded fishing gear contributes to bycatch: nets, lines and other "ghost fishing" gear lost during storms or through vessel breakdowns continue to catch, entangle, injure and kill fish, birds and marine mammals for years.

Growing awareness of destructive fishing practices that lead to unacceptable levels of bycatch has led to consideration of various regulations, policies and incentives aimed at reducing such waste. One law addressing the problem of "ghost fishing" now requires every crab pot to have a biodegradable panel that allows trapped marine life to escape. Another initiative has



Hiroshi Hasagawa

Short-tailed albatross

There are fewer than 1,000 short-tailed albatrosses left in the world. These large seabirds with seven-foot wingspans and long pink bills mate for life, returning to the same nest sites in breeding colonies for many years. Like other seabirds searching for food, short tailed albatross dive at bait being played out on longlines behind fishing vessels. If caught by big baited hooks, these magnificent birds can be pulled under the water and drowned. Under the federal ESA, longline fisheries in the Bering Sea now can be shut down if commercial fishers kill more than two of these birds in any one year. Closing fisheries can be economically devastating to local fishers whose annual income depends on money earned during seasonal fishing.

(Sources: Living Oceans News, a publication of National Audubon Society's Living Oceans Program, the Alaska Marine Conservation Council, and the Alaska Department of Fish and Game.)

³Alaska Marine Conservation Council, *Bycatch: Wasting Alaska's Future*, 1998



In the course of the last two centuries, two wildlife species are known to have become extinct in the Bering Sea:

➤ **Spectacled cormorant**

(*Phalacrocorax perspicillatus*) A large, nearly flightless seabird identified in 1741 by the naturalist Georg Wilhelm Steller while shipwrecked on a small island in the western Aleutians. The population of spectacled cormorants declined rapidly as whalers, fur traders and Natives (forcibly brought to Bering Island by the Russians) killed the slow-moving birds for food and feathers. Less than 100 years after Steller recorded its existence, the spectacled cormorant was extinct.

➤ **Steller's sea cow**

(*Hydrodamalis gigas*) A giant northern manatee measuring up to 25 feet long and 22 feet around. Individual animals weighed up to 8,800 pounds. Georg Steller's description of these huge creatures are the only written accounts of the sea cow, quickly hunted to extinction by seal hunters and fur traders just 27 years after they were first seen by Europeans.

Source: Alaska Department of Fish and Game



The extinct Steller sea cow

shellfish, and tens of thousands of seabirds and marine mammals are killed each year either through "ghost fishing" or active fishing. In some fisheries the amount of bycatch exceeds the amount of fish caught and kept. And even in fisheries with a low bycatch rate, the amount of marine life wasted is unacceptable: the one and one-half percent bycatch rate of the 1997 shoreside mid-water trawl pollock fishery meant 11 million pounds of catch was thrown back.⁵ Other examples in the Bering Sea ecoregion include:

- the 1997 rock sole trawl fishery, which discarded 60 percent of what it caught;⁶
- the 1997 yellowfin sole trawl fishery, which had a 36 percent bycatch rate and discarded 80,000 metric tons of its total catch including 65 million pounds of yellowfin sole, 1.7 million pounds of halibut, and 4.2 million crabs;⁷
- the 1996 pacific cod fishery during which 760,000 pounds of halibut were discarded;⁸
- the 1992 red king crab fishery during which approximately three million crabs were kept while an estimated 16 million crabs were discarded;⁹ and,
- the 1992 Bering Sea bottom fishery that threw back 61 percent of what it caught. Of the 114 million pounds harvested, 70 million were dumped. This figure does not include the same fishery's 1992 bycatch amount of prohibited species which, under federal regulations must also be thrown overboard and which included discarding 20 million crab, 100,000 salmon, 1 million herring, and 20 million pounds of halibut.¹⁰

In a new effort to address the problem, the North Pacific Fishery Management Council and the commercial fishing industry are implementing a program called "Improved Retention/Improved Utilization" which aims to phase out bycatch in the Bering Sea groundfish fishery. Other measures being considered include establishing "no-trawl" zones in areas vital to declining marine mammal populations, and reducing allowable bycatch levels of halibut, salmon, herring and crab.

banned bottom trawling in certain near-shore Bristol Bay waters, a move biologists say is critical to helping regional king crab populations recover.⁴

Yet bycatch today remains an immense problem. In the Bering Sea alone, it is estimated that millions of pounds of fish and

⁴Alaska Marine Conservation Council, *Sea Change*, December 1998

⁵Alaska Department of Fish & Game, *Discards in the Groundfish Fisheries of the Bering Sea/Aleutian Islands and Gulf of Alaska, 1995-1997*, pub. 1998

⁶Alaska Marine Conservation Council, *Bycatch: Wasting Alaska's Future*, 1998

⁷Alaska Department of Fish & Game, *Discards in the Groundfish Fisheries of the Bering Sea/Aleutian Islands and Gulf of Alaska, 1995-1997*, pub. 1998

⁸*Ibid*

⁹Dr. Carl Safina, cited in the *World's Imperiled Fish*, Scientific American Vol.9, No. 3, Fall, 1998

¹⁰Larry Cotter, Report to the Alaska Department of Fish & Game, 1993



Habitat Destruction

The Bering Sea's diverse bottom habitats are essential to the survival of this ecoregion's rich animal and plant life. These seabed communities include coral outcrops, kelp forests, sea grass beds, as well as gravels, muds, and other shallow substrates that provide critical feeding and protective areas for many species - particularly for young fish and shellfish. Currently, a great number of important marine areas in the ecoregion are threatened by human activities that alter the under-sea environment. One of the most disruptive practices is bottom trawling where heavily weighted nets are dragged across the seafloor scouring the landscape, crushing, burying and displacing everything in their wide path. Proposed dredging plans for clams in Bristol Bay would be even more damaging. In addition to the destruction of habitat, this fishery would target the same species that is a principal food source for the Pacific walrus which haulout in the Bristol Bay region.

Bottom trawling and dredging are harmful for many reasons. The physical disturbance caused by certain types of gear can damage the structure and integrity of vital seafloor communities, displacing sediments and disrupting the complex environments of marine organisms. The damage can be especially long lived in areas where species recover slowly. For example, corals and some mollusks in the Bering Sea may be particularly sensitive. And since many areas are trawled repeatedly in the same year, the ability of bottom dwelling organisms to recover is greatly diminished. Scientists have also noted indirect effects of trawling and dredging include reduced abundance, species richness, and diversity of fauna in heavily trawled areas.¹¹

Experts have likened the effects of bottom trawling to clear cutting forests on land. Yet we are losing far greater areas in our ocean. Worldwide, trawling affects 150 times more area than forest clear cutting and already covers a region twice the size of the lower 48 United States.¹²

Uninvited Guests

Biologists have identified a list of 24 non-indigenous species that have already invaded Alaska. As fishing and shipping activities in the Bering Sea increase so does the risk of introducing non-indigenous wildlife including rats, mice, fleas, cockroaches, jellyfish, mussels, clams, snails, fish, bacteria and algae, and other organisms. These "exotic" or "alien" flora and fauna travel from region to region aboard fishing boats, ships, and their gear - sometimes with disastrous results. Incidents where the successful invasion and establishment of non-native species have and/or are having serious ecological, economic and human health repercussions include:

- The 240 species that have become established in San Francisco Bay;
- the spreading of European green crabs and Chinese mitten crabs along the West Coast of the U.S. where they may compete with native crab species of the Bering Sea;
- the displacement of indigenous fresh-water organisms of the Great Lakes by European zebra mussels;
- red and brown algae and bryozoans that are fouling waters of Alaska's Prince William Sound;
- Atlantic salmon in Southeast Alaska that can be predatory on native salmon; and,
- a boring sponge in Prince William Sound that can cause oyster shell damage.



USFWS

Norway rat

¹¹Bergman, M.J.N. & Hup, *Direct Effects of Beamtrawling on Macrofauna in a Sandy Sediment in the Southern North Sea*, ICES J. Mar. Sci. 49:5-11. 1992. And Collie, J.S., Escanero, G.A., Valentine, P.C. *Effects of Bottom Fishing on the Benthic Megafauna of Georges Bank*. *Mar. Ecol. Prog. Ser.* 155:159-172. 1997

¹²Wattling and Norse. *A Comparison of Mobile Fishing Gear and Forest Clearcutting*. *Conservation Biology*. Vol. 12, No. 6, December 1998

ENDANGERED, THREATENED AND SPECIES OF SPECIAL CONCERN IN THE BERING SEA ECOREGION

The Bering Sea provides essential habitat and critical food for an exceptional diversity of wildlife species, some of which are in danger of extinction. Under the 1973 landmark conservation law known as the U.S. Endangered Species Act (ESA), and through Alaska's Endangered Species Act, plants and animals facing the greatest threats are afforded significant protection. This involves the prohibition of most activities affecting threatened or endangered species, including hunting, trapping, possessing, harassing, harming and selling those that are listed. These laws also restrict activities that affect a species' critical habitat and, under Alaska statute, the Departments of Fish and Game and Natural Resources are required to protect the natural habitat of endangered species on lands and waters (up to three miles off the coast) under their jurisdiction. An "endangered" species, marked by the symbol "E" below, is any species in danger of extinction throughout all or a significant portion of its range. A "threatened" species, marked by the symbol "T", is one likely to become endangered in the foreseeable future.

Endangered and threatened wildlife in the Bering Sea ecoregion include:

<input type="checkbox"/> Aleutian Canada Goose (<i>Branta canadensis leucoparela</i>)	T
<input type="checkbox"/> Blue whale (<i>Balaenoptera musculus</i>)	E
<input type="checkbox"/> Bowhead whale (<i>Balaena mysticetus</i>)	E
<input type="checkbox"/> Eskimo curlew (<i>Numenius borealis</i>)	E
<input type="checkbox"/> Fin whale (<i>Balaenoptera physalus</i>)	E
<input type="checkbox"/> Humpback whale (<i>Megaptera novaeangliae</i>)	E
<input type="checkbox"/> Northern right whale (<i>Eubalaena glacialis</i>)	E
<input type="checkbox"/> Short-tailed albatross (<i>Diomedea albatrus</i>)	E
<input type="checkbox"/> Spectacled eider (<i>Somateria fischeri</i>)	T
<input type="checkbox"/> Sperm whale (<i>Physeter macrocephalus</i>)	E
<input type="checkbox"/> Steller's eider (<i>Polysticta stelleri</i>)	T
<input type="checkbox"/> Steller sea lion (<i>Eumetopias jubatus</i>)	E

The following "Watch Lists" for birds and mammals are intended to serve as an "early warning system" for species or populations that are declining or vulnerable in the Bering Sea ecoregion, but for which there is time to avert the crisis that leads to their eventually being federally "listed" as threatened or endangered.

Species suggested for inclusion on a "Bering Sea Marine Mammal Watch List" include:

- Harbor Seal (*Phoca vitulina*)
- Northern Fur Seal (*Callorhinus ursinus*)
- Pribilof Island Shrew (*Sorex pribilofensis*)
- St. Lawrence Island Shrew (*Sorex jacksoni*)
- St. Mathew Island Vole (*Microtus abbreviatus*)

Source: National Marine Fishery Service and U.S. Fish & Wildlife Service

Species suggested for inclusion on a "Bering Sea Bird Watch List" include:

- Yellow-billed Loon (*Gavia adamsii*)
- Red-faced Cormorant (*Phalacrocorax urile*)
- Emperor Goose (*Chen canagica*)
- Aleutian Canada Goose (*Branta canadensis leucopareia*)
- Oldsquaw (*Clangula hyemalis*)
- Barrow's Goldeneye (*Bucephala islandica*)
- Peale's Peregrine Falcon (*Falco peregrinus pealei*)
- Gyrfalcon (*Falco rusticolus*)
- Pacific Golden-Plover (*Pluvialis fulva*)
- Black Oystercatcher (*Haematopus bachmani*)
- Wandering Tattler (*Heteroscelus incanus*)
- Whimbrel (*Numenius phaeopus*)
- Bristle-thighed Curlew (*Numenius tahitiensis*)
- Hudsonian Godwit (*Limosa haemastica*)
- Bar-tailed Godwit (*Limosa laponica*)
- Marbled Godwit (*Limosa fedoa*)
- Black Turnstone (*Arenaria melanocephala*)
- Surf-bird (*Aphriza virgata*)
- Rock Sandpiper (*Calidris ptilocnemis*)
- Red-legged Kittiwake (*Rissa brevirostris*)
- Aleutian Tern (*Sterna aleutica*)
- Marbled Murrelet (*Brachyramphus marmoratus*)
- Kittlitz's Murrelet (*Brachyramphus brevirostris*)
- Whiskered Auklet (*Aethia pygmaea*)
- Short-eared Owl (*Asio flammeus*)
- Olive-sided Flycatcher (*Contopus cooperi*)
- McKay's Bunting (*Plectrophenax hyperboreus*)

Source: Alaska State Office, National Audubon Society

Watch List Species



Top:
Spectacled Eider
John Warden



Middle:
Steller sea lion
Anchorage Daily News
Bob Hallinen

Bottom:
Short-tailed albatross
Hiroschi Hasagawa



NOTE: It is important to develop similar "Species Watch Lists" for fish and invertebrates, and to work with Russian scientists in developing such lists that are of concern in the western Bering Sea. A list of the region's endangered and threatened plants may be found in the Conservation of Arctic Flora and Fauna's (CAFF) Atlas of Rare Endemic Plants of the Arctic.

“Whatever strategies are used to protect species, people with different points of view will have to search for common ground that combines economic and social concerns.”

National Geographic Magazine

The devastating consequences of introduced Norway rats, ground squirrels, foxes, cattle, dogs and reindeer are of particular concern in the Bering Sea ecoregion where dense concentrations of nesting seabirds can be extremely vulnerable to such predators. Arctic and red foxes



NOAA

Ship wrecks pose a variety of threats including oil spills and introduction of rats.

were introduced on most of the Aleutian Islands in the southern Bering Sea for fur farming prior to 1930. The native bird populations were decimated. Since about 1950, personnel of what is now the Alaska Maritime NWR have removed these introduced predators from more than 30 islands and many species of native waterfowl, seabirds, shorebirds and songbirds are returning to normal population levels. Rats can severely reduce or extirpate entire island populations by killing nesting birds, snatching their young and eating their eggs. Rodents can also transmit diseases to native wildlife. The Bering Sea islands of St. Paul and St. George are two of the very few islands with harbors in the world that are rat-free. Maintaining that status quo takes extraordinary vigilance but it is critical as two to three million seabirds nest in the Pribilof Islands each year. With several bird species already suffering high reproductive failure rates, the added stress of predatory rats could prove disastrous to some of these weakened populations.

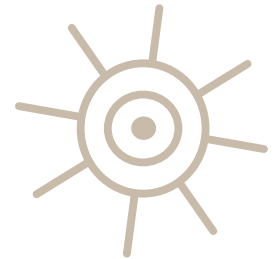
Less obvious to the untrained eye but as serious a concern among biologists, conservationists, and public health officials is the transfer of unwanted marine organisms through ships' ballast water. Ballast is any solid, liquid or sediment placed in a ship to ensure safe operation of the vessel. Ballast can be taken on and discharged at any time during the ship's journey, as well as at the port of departure and the port of arrival. A National Research Council Report highlights the problem. "Ballast water has a clearly identified role in directly and consistently releasing large numbers of organisms in every major port of the world every day."¹³ Currently, there are no international agreements or regulations addressing this issue though voluntary guidelines have been established and further actions are being considered by individuals states, countries, and by the International Maritime Organization.

¹³ National Research Council, *Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships' Ballast Water*, National Academy Press, 1996

Contaminated sites

Adak Naval Air Station in the Aleutian Islands is considered one of the most seriously polluted hazardous substance sites in the United States and is on the U.S. Environmental Protection Agency's "National Priorities List" (NPL) for cleanup. Some contaminated waste released on this 80-thousand acre site include one million gallons of petroleum, over two thousand gallons of oil containing PCBs, solvents, pesticides, and hazardous substances from 70,000 unexploded military ordinance (not including such contaminated areas as military firing ranges, minefields and offshore disposal sites).^{*} Other sites being investigated for potential long-term contamination in and around the Bering Sea include Little Diomed Island, the Pribilof Islands, St. Lawrence Island and Nome.

^{*} U.S. Environmental Protection Agency, Alaska Superfund Progress Report, 1997

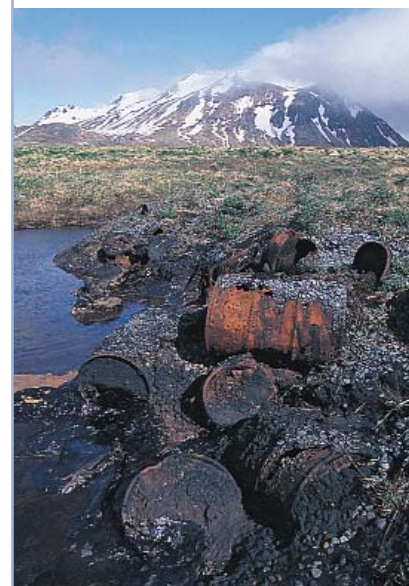


Toxic Pollution

Local people are increasingly fearful about the cumulative effects of pollution in this high-latitude marine environment where toxins travel through the food web as contaminated plants, fish and other wildlife are consumed. Concentrations of highly toxic chemical compounds known as polychlorinated biphenyl (PCBs), pesticides known as persistent organic pollutants (POPs), and heavy metals such as arsenic and cadmium are being found in the tissues of marine mammals. These contaminants threaten the wildlife and people of the Bering Sea because they are toxic. They resist the normal processes that break down contaminants in the body and the environment; they are not readily excreted and accumulate in body fat; and, they vaporize and travel great distances. Even at low levels, contaminants like POPs pose a hazard because they build up over time in the body fat of organisms and become increasingly concentrated as they move through the food chain. Bering Sea indigenous people whose diet remains largely fish, seal, and sea lion tell officials they believe soaring cancer rates and a host of other "new" illnesses among their people are related to exposure to toxic chemicals.

The magnitude and sources of pollution affecting the Bering Sea ecoregion are wide-ranging and include:

- The illegal dumping, discharging and leaking of pesticides, human waste, plastics, and other debris (including nuclear waste according to some reports) into the sea;
- The accidental spilling and illegal discharging of petroleum and fuel oils from ships;
- The direct discharging of hazardous byproducts from both on-shore and at-sea fish processing operations;
- Contaminated freshwater runoff from shore-based industries including those bordering Russian and Alaskan rivers emptying into the Bering Sea; and,
- The leaking of toxic waste from World War II and Cold War military operations and deteriorating equipment (see above sidebar).



**Leaking barrels on
St. Lawrence Island**
Kevin Schafer

BERING SEA ECOREGION

Priority Area Icon Species

Each priority area has an "icon species" to represent it. See how many icon species you can name here and then check yourself in the Priority Areas Chapter beginning on page 22.

SEA OF OKHOSTK



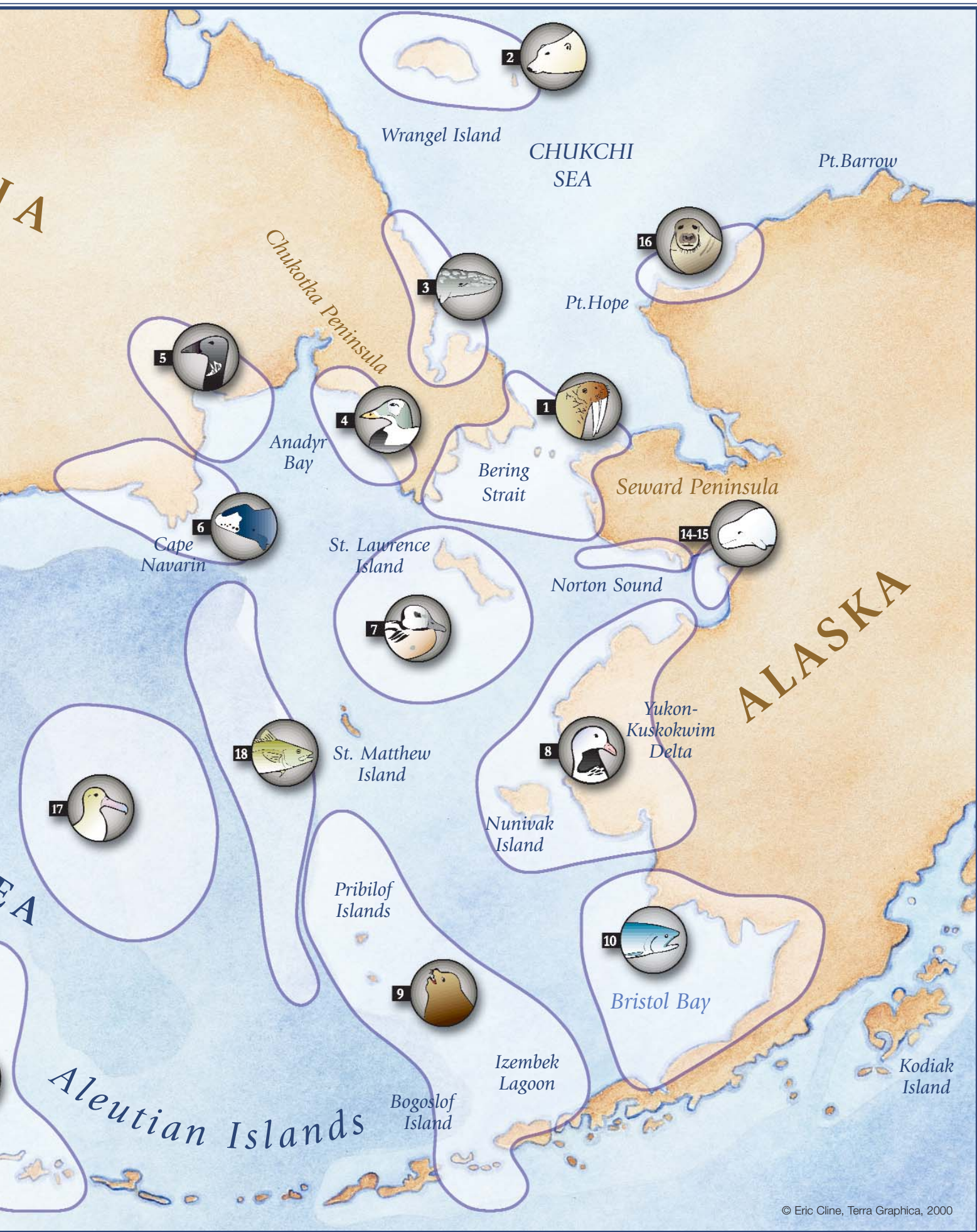
RUSSIA

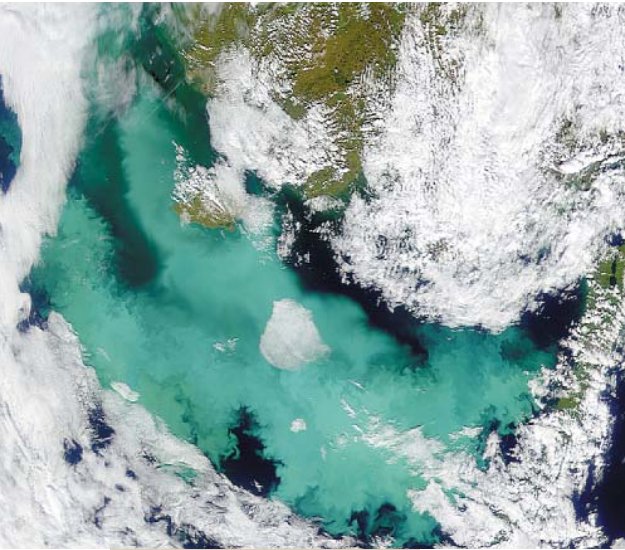


PRIORITY AREAS

- 1 Bering Strait
- 2 Wrangel & Herald Islands
- 3 Kolyuchin Bay & Coast
- 4 Sireniki Polynya
- 5 Anadyr River Estuary
- 6 Cape Navarin & Meynypil'gyno River System
- 7 St. Lawrence Island & St. Lawrence Island Polynya
- 8 Yukon-Kuskokwim Delta & Nunivak Island
- 9 Golden Triangle: Pribilof & Bogoslof Islands & Izembek Lagoon
- 10 Bristol Bay
- 11 Commander Islands
- 12 Aleutian Islands
- 13 Karaginsky & Olyutorsky Bays
- 14-15 Eastern & Northern Norton Sound
- 16 Kasegaluk Lagoon & Ledyard Bay
- 17 Aleutian Basin
- 18 Bering Sea Shelf Break
- 19 Kronotsky Peninsula
- 20 Kamchatsky Peninsula

BERING SEA





This satellite photograph is a true-color image of the Bering Sea in July, 1998. The chalky aquamarine color shows the presence of a massive bloom of microscopic marine plants typically found in low-nutrient waters at lower latitudes.

The image was provided by the SeaWiFS Project, NASA/Goddard Space Flight Center.

More recently, concern has focused on a network of some 80 nuclear powered navigation lights lining the Chukchi and Arctic seacoasts that are no longer maintained by the Russian government. Officials believe these deteriorating generators constitute a major health and safety hazard.¹⁵

Global Warming

It appears that the health of humans and wildlife in the Bering Sea ecoregion is already being affected by global and regional climate changes. The average surface temperature across Arctic Siberia, Alaska and Northwestern Canada has risen about one degree Celsius during the last 30 years. This dramatic change is supported by other indicators of long-term warming, including accelerated permafrost thawing and melting glaciers (an estimated 80 percent of Alaska glaciers are receding).¹⁶ And the extent of sea ice in the Bering Sea has shrunk as much as five percent in the last 30 years.¹⁷

Diminishing ice cover alone has vast implications for the region. Sea ice is a critical component of this ecoregion. It influences a wide range of physical activity from atmospheric events to oceanic mixing and sea bottom temperatures. It provides essential hunting and breeding sites as well as protective habitat for polar bears, seals, walrus, and other wildlife. It is an essential environment for the growth of micro-algae that are the base of the entire Bering Sea food web. And the spring phytoplankton blooms along its extensive ice edge boosts productivity into early summer.¹⁸

Other effects of warmer temperatures in this region include changes in the distribution, location and abundance of fish and other temperature-sensitive marine species that people throughout the world rely on for food and income; substantial dietary changes among coastal people as altered sea ice conditions and animal distribution make subsistence ice hunting both more difficult and dangerous; and, an increase in severe weather events such as the frequency and power of storm surges that cause coastal erosion and flooding.

Unusual oceanic and atmospheric conditions in the Bering Sea in the late 1990s may provide some sense of the multi-layered reaction of an Arctic ecoregion and its wildlife to warmer temperatures. In 1997 extreme El Niño conditions were present in the tropics, and the early summer climate over the North Pacific Ocean and the Bering Sea was uncharacteristically warm, windless and cloud-free. Rare and massive blooms of coccolithophores, microscopic marine plants usually found in low nutrient waters at lower latitudes, occurred over a large portion of the eastern Bering Sea during the same year. Though unusually strong storms in the region were present in the spring of 1998, huge coccolithophore blooms also appeared that summer.¹⁹ While the consequences of this plankton bloom are not understood, the unprecedented phenomenon represents the unforeseen and possibly significant impacts of climate change in these northern waters.

There were a number of other significant, unusual events that occurred in the eastern Bering Sea during 1997 and 1998 according to a report issued by the Fisheries-Oceanography

¹⁵ World Wildlife Fund, *Ecoregion-Based Conservation in the Bering Sea: Identifying Important Areas for Biodiversity Conservation*, 1999

¹⁶ International Arctic Science Committee, *Summary of the Main Implications of Global Change in the Region*. Bering Sea Impact Study, (BESIS), 1998

¹⁷ *Ibid*

¹⁸ World Wildlife Fund and the Marine Conservation Biology Institute, *Turning Up the Heat: How Global Warming Threatens Life in the Sea*. 1999

¹⁹ National Oceanic and Atmospheric Administration, *FOCI International Workshop on Recent Conditions in the Bering Sea*. 1999






Coordinated Investigations (FOCI) International Workshop. These include the deaths of unusually high numbers of seabirds, particularly short-tailed shearwaters that nest in southeastern Australia but migrate to forage in the Bering Sea's rich waters every summer. An estimated 190,000 shearwaters, many of which washed ashore on Russian and American coasts, appeared to have starved to death while tens of thousands of deep-diving common murrelets were also affected. Research suggests seabirds had difficulty locating their normal prey due to one or more of the following factors: the birds were unable to find their preferred food through the dense, milky coccolithophore bloom; lower nutrients in the water made prey less available; or the birds may have faced considerable competition for food from untypical concentrations of baleen whales feeding near the bloom. There were also unanticipated low salmon returns in Bristol Bay, the world's largest wild sockeye fishery, a situation that wreaked economic havoc and extreme hardship for many coastal communities.

Other events that may be connected to the warmer Bering Sea waters of 1997 and 1998 include the first recorded outbreak of a southern fungal infection in Northern fur seals, about 70 percent of which breed each year on the Pribilof Islands. One observed result of this infection was the loss of 'guard hairs,' the coarse outer layer of seals' dense fur coats that help the animals retain body heat and provide protection against the cold waters.

The FOCI report concludes that not enough is known about the Bering Sea ecosystem and its workings "to surmise any conclusions about the co-occurrence of coccolithophore blooms, bird die-offs, low salmon runs, increased whale sightings, etc." Further, it is not yet known whether these warm water changes were passing anomalies, such as those associated with El Niño, or whether they were indications of persistent large-scale changes. Yet there is clear concern about these circumstances and their relationship to each other. Noting that "recent events have demonstrated how quickly and dramatically the Bering sea ecosystem responds to changes in established weather patterns," recommendations from this international workshop include the design and immediate implementation of long-term research initiatives that would provide a more thorough understanding of how this exceptionally productive ecoregion operates. This would include information obtained from scientific monitoring, observations from Bering Sea coastal people, and data from the fishing industry.

Scientists studying global warming believe Arctic ecosystems and their wildlife will be far more vulnerable to climate changes than those at lower latitudes. Temperate and tropical animals, fish, and plants may be able to shift their geographic ranges northward to stay within comfortable climatic ranges. But for temperature-sensitive wildlife living near the poles even a modest amount of warming leaves no options. For the "organisms of the tundra and polar seas," writes biologist Edward O. Wilson, "the North and South poles are the end of the line. All the species of the high latitudes, reindeer moss to polar bears, risk extinction."²⁰

Computer models analyzing the present rate at which carbon dioxide is accumulating in the earth's atmosphere predict that temperatures in high northern latitudes, including Alaska, could rise as much as four to six degrees Celsius (about 10 degrees Fahrenheit) in the next 80 to 100 years. The resulting changes would have profound social, economic and biological repercussions far beyond the Bering Sea ecoregion, affecting ocean circulation patterns, climate, and the productivity of terrestrial and marine food chains throughout the world. 

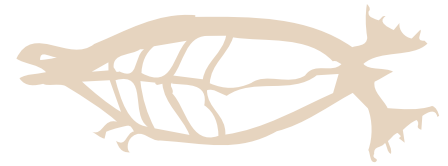
"The havoc global warming could wreck on ocean life may be much greater than we previously imagined."

World Wildlife Fund



²⁰ Edward O. Wilson, *The Diversity of Life*. W.W. Norton and Harvard University Press. 1999

CONSERVATION STRATEGIES



**“Biodiversity:
the variety
of living
things in an
ecosystem.”**

The combined, unprecedented effects on the Bering Sea ecoregion of natural and human-induced changes have prompted an urgent reassessment of the ways in which research is conducted, resource management decisions are made, and natural resources are exploited.

Concern cuts across international, socio-economic, and cultural lines as indigenous people, scientists, conservationists, industry representatives, federal and state regulatory officials, and independent researchers work together to address the issues threatening this spectacular region.

From this work, as well as from studies conducted by the National Research Council, the Alaska Governor’s Bering Sea Task Force, and other groups, a broad consensus is emerging on a number of steps that must be taken to better manage and conserve the resources of the Bering Sea. Among the most urgent priorities identified by conservationists are measures to:

- Reverse the decline in marine mammal and bird populations. This may require restructuring fishery harvests so they are less concentrated in time and location; providing better habitat in areas of commercial exploitation; prohibiting destructive fishing practices; establishing stricter measures to reduce bycatch; eliminating sources of toxic pollution; and implementing additional international conservation agreements that recognize the highly migratory nature of marine species and their life needs;
- Reduce our dependency on burning fossil fuels that contribute to global warming. Scientists say the Bering Sea ecoregion is already being adversely affected by human activity such as burning of coal, oil, and gas that increase “greenhouse” gases trapped in the atmosphere. The Conservation of Arctic Flora and Fauna (CAFF), an eight-nation working group, considers climate change the greatest threat to Arctic biodiversity;
- Develop innovative approaches to marine habitat conservation in cooperation with local fishermen and communities. These approaches may include establishment of a range of marine conservation areas, from refugia to low-intensity use areas or subsistence-only use areas that adhere to sound conservation principles. Providing scientifically based information that demonstrates the long-term benefits of such areas will be a crucial step in this process;
- Incorporate the traditional knowledge and wisdom of coastal residents in all phases of research, conservation and resource management initiatives. Local people amass an extraordinary amount of knowledge about the resources and ecosystems on which they directly depend. Local resource use patterns, observations, and knowledge of ecological



Kevin Schafer

Halibut long-liners

relationships are widely recognized as critical sources of insight into biological diversity;

- Implement cooperative and highly coordinated ecosystem-based research to improve understanding of the many complex relationships, mechanisms and influences affecting Bering Sea ecosystems. There are significant gaps in what is known of the natural processes that sustain the region's biodiversity. Long-term research on physical and biological phenomena is critical to solving short-term management problems and to conserving the ecoregion's rich biodiversity;
- Develop an international marine biodiversity conservation initiative to coordinate cooperative research, conservation and management policies that are environmentally responsible, economically viable and socially relevant. Such an initiative would stimulate interregional incentives for conserving marine resources and lead to long-term objectives involving sustainable use of the Bering Sea and its wildlife; and,
- Keep rats and dogs off islands where fur seals breed. Eradicate rats and fox from high priority islands. Keep other exotics out.

Hundreds of individuals, tribal councils, village and native corporations, agencies, regional organizations such as the Alaska Marine Conservation Council and other fishing, industry and conservation groups are now actively engaged in this work. They are designing, developing, funding and implementing grassroots programs, ecoregion-wide research activities, interregional, multicultural and international partnerships – all with the goal of improved stewardship of the Bering Sea and its exceptional biodiversity. 



Fur seals
Sumner MacLeish

Priority Areas for Biodiversity Conservation in the Bering Sea Ecoregion

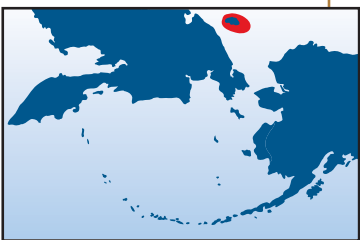
The following 20 areas in the Bering Sea ecoregion have been identified for their biodiversity richness through a collaborative effort involving the World Wildlife Fund, The Nature Conservancy of Alaska, and participants in a "Bering Sea Experts Workshop" held in Girdwood, Alaska, March 20-23, 1999.



Area 1 - **Bering Strait**

Icon Species: Pacific walrus

This 53-mile wide "Crossroads of the Continents" constitutes a vital ocean link between the Bering and Chukchi Seas. The strait's nutrient rich waters support some of the highest levels of primary productivity in the world. It serves as a major migratory corridor and summer foraging and breeding area for an estimated five million seabirds, and thousands of marine mammals that include polar bears, Pacific walrus, and a variety of ice seals and whales. A total of 26 species of seabirds - an estimated 3.3 million in number - have been recorded in waters along Russia's Chukotka Peninsula. Thirteen species are known to breed in extensive coastal colonies. One of the world's largest haulouts for Pacific walrus is found on the north coast of Arakamchechen Island.



Area 2 - **Wrangel and Herald Islands**

Icon Species: polar bear

These two extremely remote Arctic islands provide the most important onshore denning habitat for polar bears in the circumpolar Arctic. They, in fact, attract 80 percent of denning female polar bears in the ecoregion. The largest haulouts in the world for Pacific walrus are found on Wrangel's shores. The only snow goose nesting colonies in Eurasia are located on upland tundra areas of the island's interior. Coastal waters serve as feeding grounds for whales and seals. The islands are recognized as supporting the richest flora in the Arctic including survivors from the Ice Age. Wrangel was the last place on earth where woolly mammoths survived as a pygmy race. The two Arctic islands and surrounding waters, out to 36 miles, constitute the Wrangel Island Zapovednik, one of Russia's most treasured nature reserves. Because of its unique assemblage of biodiversity, the reserve is proposed for designation as both a World Heritage Site and International Biosphere Reserve.



Wrangel Island polar bear
Nikita Ovsyanikov



Spectacled eider winter concentration
USFWS

Area 4 - Sireniki Polyna

Icon Species: spectacled eider

This is a huge lake in the ice (polyna) south of the Chukotka Peninsula that provides an exceptional year-round abundance of food for a rich diversity of marine wildlife. This includes millions of seabirds such as murres, scoters, eiders and gulls, along with thousands of Pacific walrus, whales, and seals.



Area 5 - Anadyr River Estuary

Icon Species: black brant

A dense network of river channels, coastal wetlands and a highly productive ocean embayment fed by the nutrient rich Anadyr current attract spawning Pacific salmon, capelin and large numbers of waterfowl and shorebirds. This is one of two areas in Russia where the beautiful emperor goose is known to nest.



Area 6 - Cape Navarin and Meynypil'gyno River System

Icon Species: bowhead whale

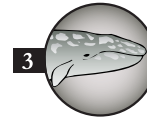
One of the largest seabird colonies in northeastern Russia occurs on Cape Navarin. A variety of marine mammals such as whales, ice seals, Pacific walrus and Steller sea lions inhabit coastal waters. Bowhead whales overwinter near the cape. The Meynypil'gyno Lagoon is an important spawning area for Pacific salmon and feeding area for juvenile pollock that spend their adult lives in Alaska waters.



Area 3 - Kolyuchin Bay and Coast

Icon Species: gray whale

Vast coastal tundra and wetlands constitute important breeding and feeding habitats for a variety of migrating waterfowl and shorebirds. Polar bears use coastal mountains for denning. Coastal waters are important in summer and fall for feeding seabirds, seals, whales and walrus.





Area 7 - St. Lawrence Island and St. Lawrence Polyna

Icon Species: Steller's eider

An estimated 2.7 million seabirds nest on the island's towering cliffs. Ice-free waters associated with the extensive polyna south of the island constitute the only known wintering area for the threatened spectacled eider. The St. Lawrence polyna is also an important winter feeding area for seabirds, seals, whales, and polar bears.

Exceptionally productive island coastal waters provide important foraging habitat for Pacific walrus, ice seals, and whales, and support high concentrations of halibut along with blue king crabs, snow crabs and other shellfish.



Area 8 - Yukon-Kuskokwim Delta and Nunivak Island

Icon Species: emperor goose

The Y-K Delta's elaborate maze of coastal lakes, ponds, marshes and rivers that spread over millions of acres attract the largest concentrations of breeding shorebirds and waterfowl in North America - an estimated 100 million shorebirds, two million ducks, and more than 750,000 geese and swans. Marine mammals including beluga whales, Pacific walrus, bearded and harbor seals. The endangered Steller sea lion inhabits rich coastal waters. Major runs of Pacific salmon occur in the Yukon and Kuskokwim Rivers and their tributaries. Herring, flounder, cisco and capelin constitute vitally important coastal fish species. The nearby 1.1 million-acre Nunivak Island is home to introduced populations of muskox and reindeer, and supports spectacular coastal sand dune, wetland and sea cliff communities (the latter inhabited by several million seabirds). More than 19 million acres of prime coastal and island habitats are included in the Yukon Delta National Wildlife Refuge.

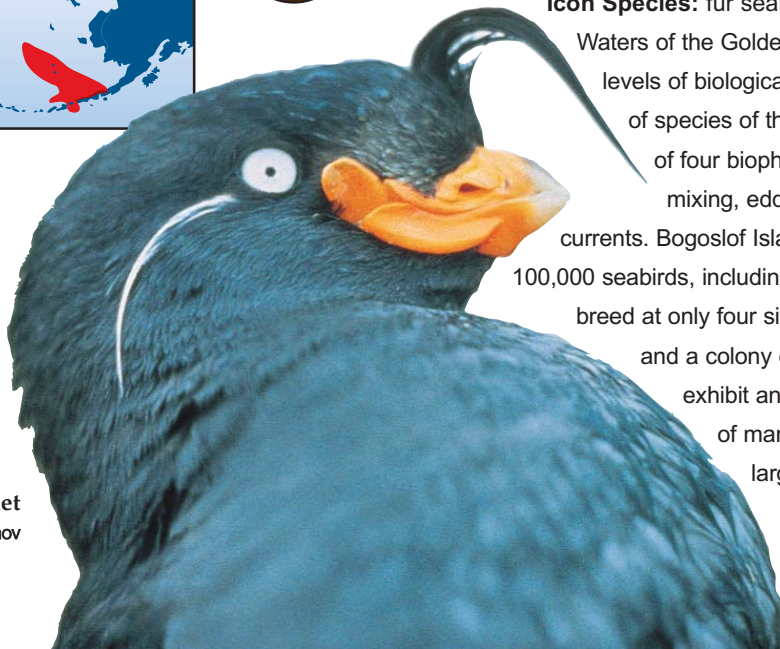


Area 9 - The Golden Triangle: Bogoslof Island to the Pribilof Islands to Izembek Lagoon

Icon Species: fur seal

Waters of the Golden Triangle are characterized by high levels of biological productivity and diverse assemblages of species of the open sea. This is due to the presence of four biophysical domains combined with tidal mixing, eddy pumping and turbulent ocean currents. Bogoslof Island provides nesting habitat for nearly 100,000 seabirds, including nesting red-legged kittiwakes which breed at only four sites in the world - all in the Bering Sea - and a colony of northern fur seals. The Pribilof Islands exhibit an extraordinary abundance and diversity of marine life. This includes some of the largest seabird colonies in the Northern

Crested auklet
Nikolai Konyukhov



Hemisphere comprising nearly 2.5 million birds. Well over 80 percent of the world's endemic red-legged kittiwakes nest on island sea cliffs. A spectacular assemblage of 800,000 northern fur seals comprising about 75 percent of the world population crowd volcanic sand beaches. Large populations of blue king, snow and hair crabs, and halibut inhabit surrounding waters. Izembek Lagoon supports one of the largest eelgrass beds in the world. Hundreds of thousands of migrating and staging waterfowl including the entire population of Pacific black brant, most of the world's emperor geese, and the vast majority of the world's Steller's eider - a threatened species - along with millions of migrating shorebirds rely on the lagoon as critical habitat in their annual life cycles. This biologically rich coastal estuary has been designated "Izembek State Game Refuge" by the State of Alaska, and a "Wetland of International Importance" under the Ramsar Convention. Most surrounding watershed lands are protected in the Izembek National Wildlife Refuge. Unimak Pass is also physically dynamic and highly productive. Immense numbers of shearwaters feed there in summer. It constitutes a major wintering area for auklets. Many species of seabirds and marine mammals use it as a migration corridor between the Pacific Ocean and Bering Sea.



Anchorage Daily News, Stephen Nowers

"There is one thing people here agree on: if the resource is gone, we're gone."

Chris Price
Unalaska Tribal Council

Bristol Bay commercial sockeye salmon fishery

Area 10 - Bristol Bay

Icon Species: sockeye salmon

Shallow and productive bay waters support some of the largest populations of groundfish, crabs and marine mammals in the world. Bristol Bay is perhaps best known, however, as the site of the world's largest sockeye salmon fishery. Important Pacific walrus haulouts and breeding areas occur at such places as the Walrus Islands State Game Sanctuary near Togiak. Spotted seals and six species of whale inhabit offshore waters while sea otters prefer the more sheltered waters of coastal lagoons. Large seabird colonies occur at Cape Newenham and Cape Peirce. Coastal littoral and wetland areas attract thousands of migrating



shorebirds and waterfowl spring and fall. Waterfowl including the emperor goose and threatened Steller's eider winter in coastal lagoons.



Area 11 - Commander Islands

Icon Species: horned puffin

Because of their location on the boundary between the Eurasian and North American continents, the Commanders serve as a bridge for wildlife migrating between the two land masses. The convergence of several ocean currents and

upwelling of nutrient rich waters result in a rich abundance of marine life. This includes nearly all species of marine mammals in the Bering Sea with the exception of Pacific walrus. About 15 percent of the world's breeding population of northern fur seals and rookeries of the endangered Steller sea lion occur here. Several large seabird colonies are inhabited by horned puffins, common murre, red-faced cormorants along with red-legged kittiwakes that nest in only three other locations in the world. Wintering waterfowl are common and include the emperor goose, threatened Steller's eiders and oldsquaw ducks. The Commander Islands Zapovednik (Federal Nature Reserve) includes a 30-kilometer wide marine zone.



USFWS

Sea otter



Area 12 - Aleutian Islands

Icon Species: sea otter

The cold, turbulent and nutrient-rich waters surrounding the 200 Aleutian

Islands create an 1,100-mile long arc of high marine productivity and diversity. This results in some of the most productive fishery stocks in the world with wall-

eye pollock, Pacific perch, Pacific herring, Pacific cod and halibut being among the most favored. Pacific salmon spawn in streams throughout the chain. Large coastal kelp forests and eelgrass beds provide essential habitat for a rich variety of fish and shellfish along with sea otters. Nearly half of Alaska's endangered Steller sea lion population is found in the Aleutian Islands. About 40 percent of Alaska's estimated 10 million seabirds of 25 species occur here, including the endemic whiskered auklet along with high populations of tufted puffins. Buldir Island supports the most diverse seabird breeding populations in the Northern Hemisphere. The threatened Aleutian Canada goose nests on fewer than five islands. The central and western Aleutians offer the opportunity of sighting Asian bird species that cannot be seen anywhere else in North America. Most of the chain's islands are protected in the Aleutian Island Unit of the Alaska Maritime National Wildlife Refuge.

Common murre

Nikolai Konyukhov

Area 13 - Karaginsky Island and Olyutorsky Bays

Icon Species: harlequin duck

Numerous rocky cliffs provide nesting habitat for thousands of seabirds. Some of the largest populations of Harlequin ducks in the Russian Far East nest in coastal wetland habitats. The island is a breeding area for the southernmost population of Pacific walrus in the Bering Sea. It also hosts rookeries of the endangered Steller sea lion. A high concentration of marine invertebrates and fish provides a rich food base for a diversity of marine wildlife including seabirds, whales, seals, walrus, and sea lions in offshore waters.



Areas 14 & 15 - Eastern and Northern Norton Sound

Icon Species: beluga whale

Coastal littoral and wetland habitats are frequented by thousands of feeding shorebirds during their spring and fall migrations. Red-necked and red phalaropes, western sandpipers and dunlins are among those that remain to nest in the area. Sea cliffs at Bluff and Square Rock attract up to 150,000 seabirds. The northern sound is known as an important spawning area for red king crab, hair crab, capelin, and Pacific cod, as well as harbor seal pupping. The eastern sound supports an abundance of beluga whales, Pacific salmon, Pacific herring and sand lance. Its offshore waters constitute critical fall molting and foraging habitat for the threatened spectacled eider.



Kevin Schafer

Beluga whale





Bowhead whale

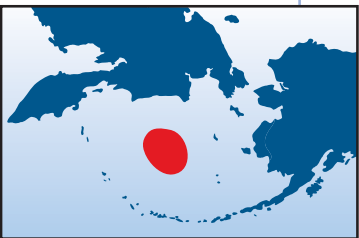


16

Area 16 - Kasegaluk Lagoon and Ledyard Bay

Icon Species: bearded seal

Some of the world's largest concentrations of spotted, ringed and bearded seals inhabit these sheltered coastal waters of northwest Alaska. Polar bears are attracted by the abundance of seals with some female bears remaining to den and raise their cubs along the coast. In summer, beluga whales congregate to feed in Kasegaluk Lagoon and gray whales in Ledyard Bay, respectively. Bowhead whales migrate through offshore waters in spring. The richness and diversity of bird life is greater than in other lagoon systems in the Beaufort and Chukchi Seas. The nearby Cape Lisburne seabird colony is the largest in arctic Alaska. The majority of female and juvenile spectacled eiders from arctic Alaska molt in Ledyard Bay. Large numbers of Pacific black brant stage for migration in the lagoon in late summer.



17

Area 17 - Aleutian Basin

Icon Species: short-tailed albatross

The Bering Sea is the terminus for circulation of some of the oldest waters in the world's oceans and among the highest in nutrient concentrations. Large and little understood populations of mesopelagic fish and squid inhabit this basin with lanternfish, which is suspected to be the most abundant fish species in the Bering Sea. Together these deep water fish and squid constitute key prey for pollock and Pacific salmon in winter, and great numbers of sperm whales and Dall's porpoises in summer. Most of the Bering Sea's pollock stocks winter in basin waters.

Area 18 - Bering Sea Shelf Break

Icon Species: walleye pollock

An extensive shelf-break zone extends diagonally across the central Bering Sea, marking a distinct biophysical domain between the shallow waters of the vast continental shelf to the east and a deep abyssal plain to the west. Commonly referred to as the "Green Belt" because of its high levels of productivity, this relatively narrow shelf break zone attracts an unusually rich assemblage of fish and wildlife of the open ocean. Concentrations of squid provide a favored summer food source for Chinook salmon. Great schools of other commercially valued fish concentrate here to feed including walleye pollock, Pacific ocean perch, Pacific cod, sablefish, Greenland turbot, arrowtooth flounder, Pacific halibut, herring and capelin. The shelf edge also plays a vital role in the life cycles of millions of marine birds along with marine mammals like the northern fur seal, fin, sperm, blue, minke, and Stejneger's beaked whale, and Dall's porpoise which are attracted by the rich abundance of forage fish.



Area 19 - Kronotsky Peninsula


Icon Species: Steller's sea eagle

This is an especially rich area for Russian flora and fauna with 750 plant species (16 of which are endemic) and 260 bird species having been recorded. The majestic Steller's sea eagle occurs along the coast in company with a host of nesting seabirds. Nine species of marine mammals have been observed in coastal waters including the endangered Steller sea lion. The peninsula is protected in the Kronotsky Zapovednik, which is recognized by UNESCO as a World Heritage Site.



Area 20 - Kamchatsky Peninsula

Icon Species: Steller's sea lion

Sea lion rookeries are found on peninsula shores and sockeye salmon spawn in Azabachiye Lake. 



CALL TO ACTION IN THE BERING SEA ECOREGION

**"I'm
committed
to helping
protect
what we
have left
in the
Bering
Sea."**

Walt Tellman
Unalaska Village
Corporation

To address the many threats to biodiversity in the Bering Sea, we must work on many levels with many partners. We must cross international boundaries to engage Russia and other countries; we must promote multi-lateral strategies; and, we must counteract the global threats to the Bering Sea occurring far beyond the ecoregion. However, global scale action will not be enough. Site specific and ecoregion-scale efforts are equally, if not more, important. Following are a number of measures that World Wildlife Fund (WWF), with agreement and support from the Beringia Conservation Program, will undertake or promote in order to ensure the long-term viability of the Bering Sea.

Global-scale Actions

Many activities and decisions affecting the Bering Sea occur beyond the ecoregion, making it necessary to consider policies and conservation measures at the global level, including:

- Reversing the trend of increasing greenhouse gas emissions in industrialized nations by increasing energy efficiency. Accelerating the transition away from fossil fuels like coal and oil towards transitional fuels such as natural gas and, ultimately, to cleaner and more renewable forms of energy such as solar, wind and tidal power;
- Eliminating production and use of persistent organic pollutants (POPs) through the on-going UNEP-sponsored global POPs treaty negotiations;²¹
- Developing comprehensive international research strategies that address high priority conservation and management issues;
- Raising public awareness of the critical role of the Bering Sea ecoregion in the conservation of the world's biodiversity;
- Implementing international treaties and agreements with Russia and other nations. Among our recommendations are reducing at-sea mortality of Northern fur seals through reauthorization of the International Fur Seal Treaty between the United States, Russia, Canada and Japan; adoption and implementation of the 1998 Agreement for the Conservation and Management of the Alaska-Chukotka Polar Bear Population; and negotiation of an agreement between the United States and Russia for conservation of the Pacific walrus; and,
- Finally, we must develop international regulations that control ballast water operations to prevent further introduction of alien species and protect native biodiversity of the Bering Sea.

²¹ The UNEP-sponsored global POPs negotiations are currently targeting twelve priority POPs; Aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, PCNs, dioxins and furans.

Ecoregion-scale Actions

At the Bering Sea ecoregion level, we must take action to ensure healthy populations of marine biodiversity by:

- Developing recovery plans for depleted Bering Sea fish and wildlife populations.
- Preventing the introduction and establishment of non-native species in the Bering Sea ecoregion through regulations governing shipboard treatment of ballast water, emerging monitoring technologies, alternative ship designs, and individual port programs. This work also involves raising public awareness of the negative health implications, such as the spread of diseases, beyond port communities;
- Expanding programs to assess and remove destructive non-native wildlife such as rats and foxes from Bering Sea islands;
- Providing new incentives to stop the bycatch of birds, marine mammals, and fish through restricting indiscriminate fishing gear and practices, reducing the legally allowable amount of bycatch, and increasing fish allocations to commercial operators using cleaner gear;
- Working with conservation-minded fishermen to develop recommendations for state-of-the-art management practices in "Priority Areas for Biodiversity Conservation;" and,
- Increasing observer coverage on fishing vessels in the Bering Sea to better meet data collection and monitoring needs.



Nikolai Konyukhov

The red fox is native to some islands, but a devastating intruder to others

We must take bold and visionary measures to conserve habitat over the long term by:

- Working with local experts, fishermen and communities on both sides of the Bering Sea to identify candidate marine protected areas as essential refugia for biodiversity conservation and sustainable subsistence use while allowing for the regeneration and reproduction of marine and coastal species.

In addressing global threats such as pollution, we must begin:


- Reducing overboard dumping of plastics, netting, packing tape and other debris through improved law enforcement, prosecution, fining and revoking offenders' licenses;
- Supporting and promoting the EPA's cleanup of the Superfund site at Adak Naval Air Station and other areas;
- Removing contaminated wastes from St. Lawrence Island; and,
- Preventing the opening of a northern sea shipping route through the Bering Strait;



“Life is more diverse and plentiful than anyone had previously known.”

Edward O. Wilson

We must also work across borders to ensure responsible stewardship of the Bering Sea. These actions include:

- Supporting subsistence by local people as a priority use of Bering Sea resources, consistent with sound conservation principles and practices;
- Requesting information from Native leaders, Tribal Council presidents, City Council staff and other local representatives on how best to create opportunities for more meaningful community involvement in all aspects of Bering sea biodiversity conservation. Also, providing reasonable levels of funding and other support to ensure better local participation;
- Increasing funding for essential research and fishery law enforcement activities;
- Improving Russian monitoring and enforcement of fishing laws on the high seas through funding assistance for observer programs, satellite monitoring systems, and training for inspectors; and,
- Providing improved staffing and funding support essential for the achievement of conservation objectives for existing protected areas. 



Sue Steinmacher

Subsistence hunters

Credits

- This Public Information Report was researched and written by Sumner MacLeish.
- Edited by David Cline of the Beringia Conservation Program and Margaret Williams of the World Wildlife Fund.
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The Alaska based Beringia Conservation Program is a Russian-American partnership in environmental protection, wildlife conservation and sustainable economics. Its mission is to promote greater cooperation between the U.S. and Russia in the conservation of a shared natural heritage in Beringia that is of planetary significance.



World Wildlife Fund (WWF), known worldwide by its panda logo, is dedicated to protecting the world's wildlife and the rich biological diversity that we all need to survive. The leading privately supported international conservation organization in the world, WWF has sponsored more than 2,000 projects in 116 countries and has more than one million members in the United States.



Whiskered auklet
Nikolai Konyukhov

Cover Photos

Shorebird flock
John Sarvis

Walrus
Vasily Baranjuk

Tufted puffin
Kevin Schafer

Polar bear
Dan Guravich

Sea otter
Kevin Schafer

Back Photos

Frozen sockeye salmon
Kevin Schafer

Yupik couple
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