

America's Living Oceans

CHARTING A COURSE FOR SEA CHANGE



Summary Report
Recommendations for a
New Ocean Policy
May 2003

FRONT AND BACK COVER

Light of the setting sun bathes battered sea stacks shrouded by summer fog at McClure's Beach, in Point Reyes National Seashore, California. Here, pounding Pacific waves have carved a shoreline of white crescent beaches and rocky cliffs.

DAVID SANGER/DAVIDSANGER.COM

OPPOSITE

Tourists kayak the turquoise waters of Virgin Islands National Park. Americans love their freedom to move about the ocean surface where no streets, signs, or fences impede them, yet their sense that no one owns this vast realm has allowed them to tolerate no one caring for it.

STEVE SIMONSEN/MARINE SCENES

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*Pacific double-saddle butterfly fish,
Western Shoals, Agana Harbor, Guam
Steve Simonsen/Marine Scenes*

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CHARTING A COURSE FOR SEA CHANGE

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Restoring AMERICA'S OCEAN TRUST

Cushion sea star, Hurricane Hole, U.S. Virgin Islands
Steve Simonsen/Marine Scenes

Who has the most hope in the world? It is a fisherman, of course, for every time he casts out his line he has hope. Perhaps that hope can motivate us so that we can save and preserve the oceans and all its creatures from man, the apex predator.

Stephen Sloan

Trustee, International Game Fish Association

Americans have always loved the ocean. Half of us live in coastal communities and the other half come to visit. Perhaps, as President John F. Kennedy once suggested, it is “the salt in our veins.”

When we stand at the water’s edge, we stare longingly out to sea—for the boat to return, for the tides to shift, for the winds to arrive, for the fish to bite, for the sun to rise or set—beyond the far horizon.

Inspired by their majesty and mystery, we depend on our oceans and their coasts, not just for pleasure and food—although these uses are central—but also as a counterweight to extremes of heat and cold on land, as a sponge for absorbing excess carbon, and as a generator of life-giving oxygen. Although we often view the ocean as starting where the land ends, that separation is arbitrary. Land and oceans are part of the same global system. Activities on one profoundly affect the other.

Just as the 20th century brought us into knowledgeable contact with outer space, the 21st will almost certainly connect us more intimately to our oceans. In fact, it is imperative because—as much as we love our oceans—our ignorance has been destroying them. We love clean beaches, but what we discharge into the oceans befouls them. We destroy the very coastal wetlands we need to buffer storms and filter fresh water. A nation of seafood lovers, we are careless about how we treat the oceans’ “nurseries” and brood stocks that replenish our fish supply.

Furthermore, the size of the world’s human population and the extent of our technological creativity have created enormously damaging impacts on all of the oceans. We are now capable of altering the

ocean’s chemistry, stripping it of fish and the many other organisms which comprise its rich biodiversity, exploding and bleaching away its coral nurseries, and even reprogramming the ocean’s delicate background noise.

We love our freedom to move about the ocean surface where no streets, signs, or fences impede us, yet our sense that no one owns this vast realm has allowed us to tolerate no one caring for it.

During the 20th century our nation came to regard the air we breathe, the fresh water we drink, and the open lands as “common goods,” part of our public trust. Now we must acknowledge that the oceans, too, are part of our common heritage and our common responsibility.

The report of the Pew Oceans Commission, summarized here, outlines a national agenda for protecting and restoring our oceans. It is a vision that projects an equilibrium of goods withdrawn from and goods regenerated within the ocean. It is a vision that abhors the careless—no less the systematic—extinction of vital sea species. It is a vision of clean water and clear horizons.

Both comprehensive and detailed, the report presents a new direction for governing our oceans. From identifying the pollutants that rush down our waterways into our coastal bays to proposing protected zones for critical marine life, the Commission has confronted the most challenging aspects of ocean policy. If its recommendations are accepted and acted upon, we can anticipate a future when fish will again be plentiful and fishing communities will thrive, when beaches will be clean, and now-impoverished coral reefs will teem with life.

For those less familiar with our oceans, this summary report provides an overview of the challenges faced by our oceans and coasts in the 21st century and an agenda for meeting those challenges. For those already familiar with our oceans, we hope this summary leads you to delve into the Commission’s full report for inspiration to help us protect, maintain, and restore our magnificent ocean trust for all future generations.



A mother and her young son experience the wonders of marine life at Hanauma Bay, Hawaii. The Pew Oceans Commission calls for a new era of ocean literacy that prepares today's children to be tomorrow's stewards.



Justin Kenney/Pew Oceans Commission

During their visit to Maine, commissioners went lobster fishing off Spruce Head. Captain Bob Baines talks with Pew Oceans Commission Chair Leon Panetta about innovative measures to manage the highest revenue-producing fishery in the Northeast.

ASSESSING OUR LIVING OCEANS

In June 2000, the 18 members of the independent Pew Oceans Commission embarked on the first national review of ocean policies in more than 30 years. They brought together their collective experiences from the worlds of fishing, science, conservation, education, government, philanthropy, and business to develop recommendations for a new national policy to restore and protect ocean and coastal ecosystems and to maintain the many benefits the oceans provide. Each member of the Pew Oceans Commission brings a lifetime of personal and professional connections to the oceans.

In the ensuing two and a half years, commissioners traveled around the country to learn firsthand about the problems facing our oceans. Along the way, they spoke with thousands of citizens who live and work along the coasts. They heard from dozens of leading scientists and published a series of reports on pollution, coastal development, marine

reserves, fishing, aquaculture, and invasive species.

Commissioners traveled from Maine to Hawaii, from the Gulf of Alaska to the Gulf of Mexico. They studied coastal development in Charleston, South Carolina, and Portland, Oregon. They met with sportfishermen in Florida, lobstermen in Maine, salmon fishermen in Kodiak, and crabbers in Baltimore. The commission toured aquaculture facilities in Maine, Florida, and Washington, and a pineapple plantation in Hawaii. Commissioners reviewed habitat restoration programs in South Carolina, Maine, and California. They traveled to Des Moines, Iowa, to talk with farmers about ways to limit polluted runoff from fields and feedlots.

The story that unfolded is one of a growing crisis in America's oceans and along our coasts. Although the issues and circumstances vary from community to community, the Commission found a shared sense of urgency and commitment to reverse the decline in the health of the oceans.



Members OF THE PEW OCEANS COMMISSION

Kenai Fjords National Park, Alaska
Deb Antonini/Pew Oceans Commission



The Honorable Leon E. Panetta, Chair

He is director of the California State University Panetta Institute for Public Policy. He served in Congress for eight terms. He chaired the House Budget Committee and served as White House chief of staff.

John H. Adams

He is the founder and president of the Natural Resources Defense Council—one of the nation's leading environmental organizations. In 1998, he was named one of Audubon's 100 Champions of Conservation.



The Honorable Eileen Claussen

She is president of the Pew Center on Global Climate Change. She is a former assistant secretary of state for oceans, environment, and science.

The Honorable Carlotta Leon Guerrero

She is a former member of the Guam Senate where she chaired committees with jurisdiction over transportation, telecommunications, and Micronesian affairs. She is currently co-director of the Ayuda Foundation, a nonprofit health care organization in Guam.



The Honorable Mike Hayden

He is the secretary of the Kansas Department of Wildlife and Parks. The former governor of Kansas served as president and CEO of the American Sportfishing Association, a recreational fishing group.

Geoffrey Heal, Ph.D.

He is the Garrett Professor of Public Policy and Corporate Responsibility and professor of economics and finance at the Graduate School of Business at Columbia University. One of his major research interests is the interaction of human societies and their natural resources.



Charles F. Kennel, Ph.D.

He is director of the Scripps Institution for Oceanography and the author of more than 250 publications in plasma physics, planetary science, and astrophysics. He has been both a Fulbright and Guggenheim Scholar.

The Honorable Tony Knowles

He recently completed his second term as governor of Alaska. He was the mayor of Anchorage and served on the North Pacific Fishery Management Council, where he was instrumental in efforts to reduce bycatch.



Jane Lubchenco, Ph.D.

She is an Oregon State University professor of marine biology, a MacArthur Fellow, and past president of both the American Association for the Advancement of Science and the Ecological Society of America. She is president-elect of the International Council for Science, and recipient of the 2002 Heinz Award for the Environment.

**Julie Packard**

She is the founder and executive director of the Monterey Bay Aquarium and vice chair of the David and Lucile Packard Foundation. She is the 1998 recipient of the Audubon Medal for Conservation.

The Honorable Pietro Parravano

He is a commercial fisherman and owner of the *Anne B.* He is the president of the Pacific Coast Federation of Fishermen's Associations and an elected member of the San Mateo County Harbor Commission.

**The Honorable George E. Pataki**

He is currently serving his third term as governor of New York. After graduating from Columbia Law School, he served ten years in the state legislature and was mayor of the city of Peekskill, his hometown.

The Honorable Joseph P. Riley, Jr.

He is serving his seventh term as mayor of Charleston, South Carolina. He has served as the president of the U.S. Conference of Mayors and has received many awards, including the Outstanding Mayors Award from the National Urban Coalition.

**David Rockefeller, Jr.**

He is director and former chair of Rockefeller Co., Inc., and is an active participant in the nonprofit fields of art, philanthropy, and the environment. He is a trustee of the National Park Foundation.

Vice Admiral Roger T. Rufe, Jr., U.S. Coast Guard (Retired)

He is the president and CEO of The Ocean Conservancy. While in the U.S. Coast Guard, he led offices responsible for marine conservation in Alaska and the Southeast U.S.

**Kathryn D. Sullivan, Ph.D.**

She is the president and CEO of COSI, a hands-on science center in Columbus, Ohio. As a NASA astronaut, she was the first U.S. woman to walk in space. She served as NOAA's chief scientist from 1992 to 1996. She has a Ph.D. in geology.

Marilyn Ware

She is the chairman of the board of American Water Works Company, the nation's largest private drinking water utility. She is a former newspaper editor and publisher, and currently serves on the board of the American Enterprise Institute.

**Patten (Pat) White**

He is a commercial fisherman and CEO of the Maine Lobstermen's Association. He is a member of the Atlantic States Marine Fisheries Commission, and serves on the editorial board of *National Fisherman*.





Our Oceans IN CRISIS

Digital Vision

How inappropriate to call this planet Earth, when it clearly should be named Ocean.

Arthur C. Clarke
Noted Author and Futurist

The oceans are our largest public domain. The United States' oceans span nearly 4.5 million square miles¹, an area 23 percent larger than the land area of the nation (see map on pages 17–18). Their biological riches surpass that of our public lands. The genetic, species, habitat, and ecosystem diversity of the oceans is believed to exceed that of any other Earth system. Yet, incredibly, we are squandering this bounty.

Humanity's hunger for ocean resources and our vast capacity to exploit them result in unprecedented impact upon the oceans and coasts. The disturbing signs of these impacts can be found nearly everywhere we look (Box One, pages 7–8). Yet, our laws, government institutions, and governance practices have not kept pace with these changes.

FISHING FOR TROUBLE

Most obviously, we are depleting the oceans of fish, and have been for decades. We only know the status of one-third of the commercially fished stocks in U.S. waters, and 30 percent of the fish populations that have been assessed are overexploited to some degree (Figure One). Put another way, the government can only assure us that 22 percent of managed fish stocks are being fished sustainably. Even this figure is optimistic because the legal definition of overfishing does not account for the needs of other species and overall ecosystem health.

The decline of New England fisheries is most notorious. By 1989, New England cod, haddock, and yellowtail flounder had reached historic lows. In U.S. waters, Atlantic halibut are commercially extinct—too rare to justify a commercial fishing

effort. In addition, by the mid-1990s, we halved the breeding population of Atlantic swordfish (Safina, 1994). However, such problems are by no means limited to the East Coast. In September 2002, the government imposed substantial restrictions on bottom fishing along the West Coast in an attempt to save four severely depleted rockfish species. Populations of bocaccio rockfish, commonly sold as Pacific red snapper, have been driven to less than 10 percent of their historic numbers (MacCall and He, 2002).

Already depleted sea turtle, marine mammal, seabird, and noncommercial fish populations are endangered by incidental capture in fishing gear. Worldwide, about 25 percent of the catch is discarded, either because it is not commercially valuable or because of regulatory requirements that prohibit keeping (Continued on page 9)



Jim Knowlton

Two bocaccio rockfish glide past a column of kelp near San Miguel Island, California.

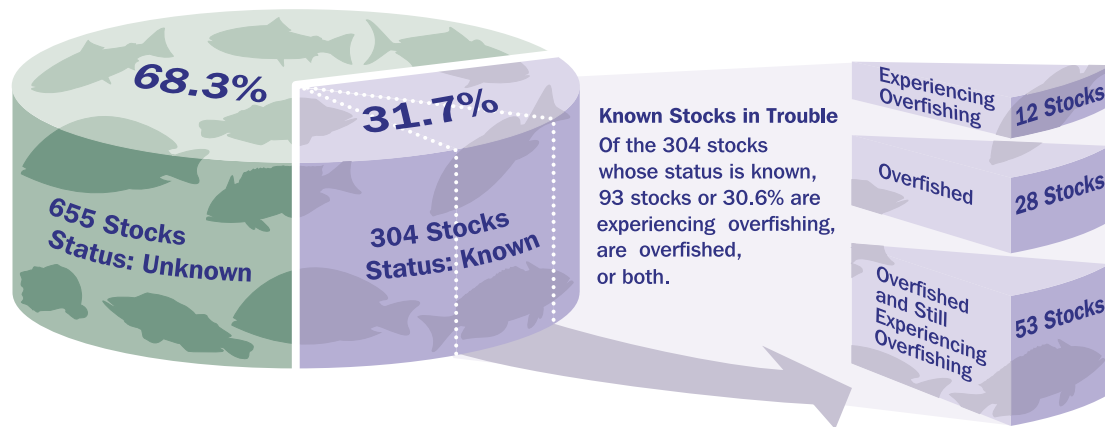
¹ This is the approximate area (in square statute miles) of the United States Exclusive Economic Zone (EEZ)—the area of the oceans over which the United States exercises exclusive environmental and economic jurisdiction. The U.S. EEZ was established by Presidential Proclamation in 1983. The establishment of an EEZ extending 200 nautical miles from the shoreline of a coastal nation is recognized and accepted under the United Nations Convention on the Law of the Sea.

FIG. ONE

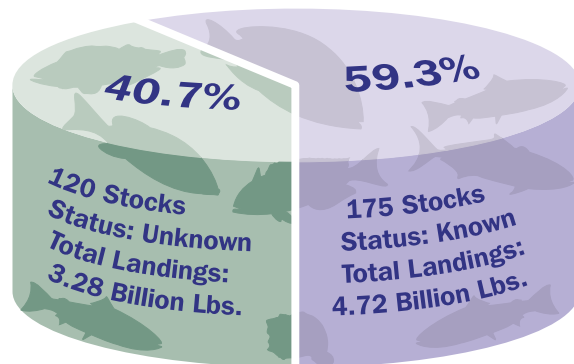
Status of Marine Fish Stocks

The U.S. Department of Commerce listed 959 stocks in its 2001 Annual Report to Congress on the Status of U.S. Fisheries. The data in the pie charts below are drawn from information in the annual report.

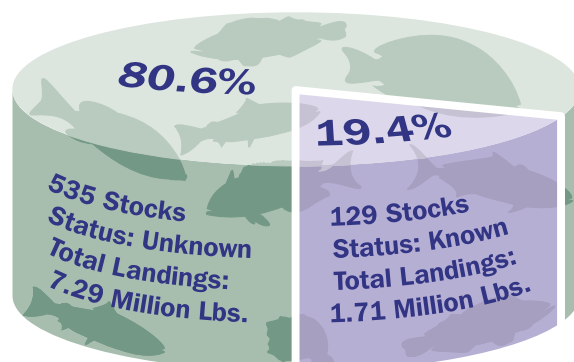
A. Status for 959 Stocks in 2001



B. Status for 295 Major Stocks* in 2001



C. Status for 664 Minor Stocks in 2001



*Major stocks are those with landings of at least 200,000 pounds. In 2001, 295 major stocks produced the majority of landings, totaling more than 8 billion pounds, compared with 9 million pounds from 664 minor stocks.

Lucidity Information Design, LLC

Major Threats to Our Oceans

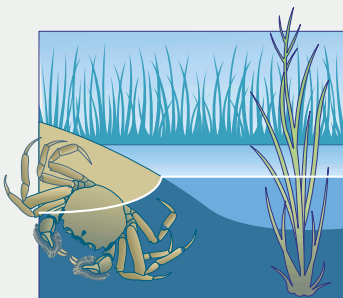


NONPOINT SOURCE POLLUTION

- A recent National Academy of Sciences study estimates that the oil running off our streets and driveways and ultimately flowing into the oceans is equal to an *Exxon Valdez* oil spill—10.9 million gallons—every eight months (NRC, 2002).
- The amount of nitrogen released into coastal waters along the Atlantic seaboard and the Gulf of Mexico from anthropogenic sources has increased about fivefold since the preindustrial era, and may increase another 30 percent by 2030 if current practices continue (Howarth et al., 2000).
- Two-thirds of our estuaries and bays are either moderately or severely degraded by eutrophication (Bricker et al., 1999).
- More than 13,000 beaches were closed or under pollution advisories in 2001, an increase of 20 percent from the previous year (NRDC, 2002).

POINT SOURCE POLLUTION

- In the U.S., animal feedlots produce about 500 million tons of manure each year, more than three times the amount of sanitary waste produced by the human population (EPA, 2002).
- Based on EPA estimates, in one week a 3000-passenger cruise ship generates about 210,000 gallons of sewage, 1,000,000 gallons of gray water (shower, sink, and dishwashing water), 37,000 gallons of oily bilge water, more than 8 tons of solid waste, millions of gallons of ballast water containing potential invasive species, and toxic wastes from dry cleaning and photo-processing laboratories (Royal Caribbean Cruises Ltd., 1998; Eley, 2000; Holland America, 2002).

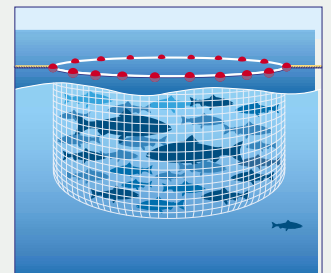


INVASIVE SPECIES

- Introduced species crowd out native species, alter habitats, and impose economic burdens on coastal communities.
- The rate of marine introductions has risen exponentially over the past 200 years and shows no sign of leveling off (Carlton, 2001).
- More than 175 species of introduced marine invertebrates, fish, algae, and higher plants live in San Francisco Bay (Cohen and Carlton, 1995, 1998; Cohen and Carlton, unpublished data).

AQUACULTURE

- A December 2000 storm resulted in the escape of 100,000 salmon from a single farm in Maine, about 1,000 times the number of documented wild adult salmon in Maine (NRC, 2002).
- A salmon farm of 200,000 fish releases an amount of nitrogen, phosphorus, and fecal matter roughly equivalent to the nutrient waste in the untreated sewage from 20,000, 25,000, and 65,000 people, respectively (Hardy, 2000).
- Over the past decade, nearly one million non-native Atlantic salmon have escaped from fish farms and established themselves in streams in the Pacific Northwest.



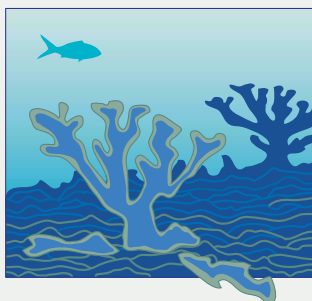
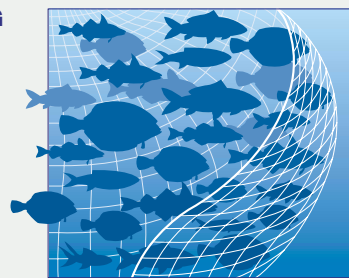


COASTAL DEVELOPMENT

- Sprawl development is consuming land at a rate of five or more times the rate of population growth in many coastal areas. Sprawl needlessly destroys wildlife habitat and degrades water quality.
- More than one-fourth of all the land converted from rural to suburban and urban uses since European settlement occurred during the 15-year period between 1982 and 1997 (the last year for which such figures are available) (NRI, 2000).
- Coastal marshes, which trap floodwaters, filter out pollutants, and serve as “nurseries” for wildlife, are disappearing at a rate of 20,000 acres per year. Louisiana alone has lost half a million acres of wetlands since the 1950s.

OVERFISHING

- As of 2001, the government could only assure us that 22 percent of fish stocks under federal management (211 of 959 stocks) were being fished sustainably (NMFS, 2002).
- Overfishing often removes top predators and can result in dramatic changes in the structure and diversity of marine ecosystems (Dayton et al., 2002).
- By 1989, populations of New England cod, haddock, and yellowtail flounder had reached historic lows. In U.S. waters, Atlantic halibut are commercially extinct—too rare to justify a directed fishing effort. Populations of some rockfish species on the West Coast have dropped to less than 10 percent of their past levels (MacCall and He, 2002).
- Rebuilding U.S. fisheries has the potential to restore and create tens of thousands of family wage jobs and add at least 1.3 billion dollars to the U.S. economy (POC, 2003).

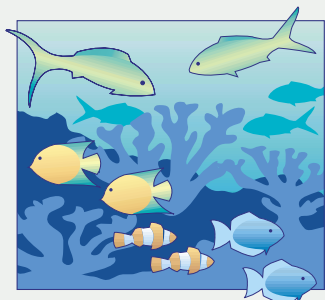
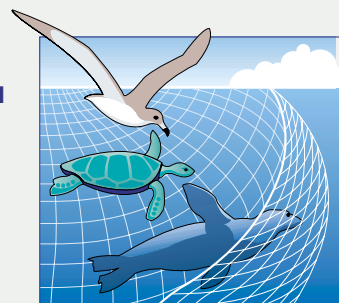


HABITAT ALTERATION

- Fishing gear that drags along or digs into the seafloor destroys habitat needed by marine wildlife, including commercially fished species.
- Typical trawl fisheries in northern California and New England trawl the same section of sea bottom more than once per year on average (Friedlander et al., 1999; Auster et al., 1996).
- Bottom-dwelling invertebrates can take up to five years or more to recover from one pass of a dredge (Peterson and Estes, 2001).

BYCATCH

- Worldwide, scientists estimate that fishermen discarded about 25 percent of what they caught during the 1980s and the early 1990s, about 60 billion pounds each year (Alverson et al., 1994; Alverson, 1998).
- Bycatch of albatrosses, petrels, and shearwaters in longline fisheries is one of the greatest threats to seabirds (Robertson and Gales, 1998; Tasker et al., 2000).
- Bycatch in the Atlantic pelagic longline fishery may be jeopardizing the continued existence of the loggerhead and leatherback sea turtles off the eastern U.S. seaboard (NMFS, 2001).



CLIMATE CHANGE

- Global air temperature is expected to warm by 2.5 to 10.4°F (1.4 to 5.8°C) in the 21st century, affecting sea-surface temperatures and raising the global sea level by 4 to 35 inches (9 to 88 cm) (IPCC, 2001).
- Recent estimates suggest an increase in mean sea-surface temperature of only 2°F (1°C) could cause the global destruction of coral reef ecosystems (Hoegh-Guldberg, 1999).
- Climate change will modify the flow of energy and cycling of materials within ecosystems—in some cases, altering their ability to provide the ecosystem services we depend upon.
- Increases in temperature may slow or shut down the Atlantic thermohaline circulation that powers the Gulf Stream, causing reductions in sea-surface and air temperatures over the North Atlantic and northern Europe, changes in the geographic distributions of fisheries, and increased risk of hypoxia in the deep ocean.

undersized or nontargeted marine life. Destructive fishing practices, such as bottom trawling and dredging, are damaging vital habitat upon which fish and other living resources depend. Taken together, overfishing, bycatch, and habitat destruction are changing relationships among species in food webs and altering the functioning of marine ecosystems.

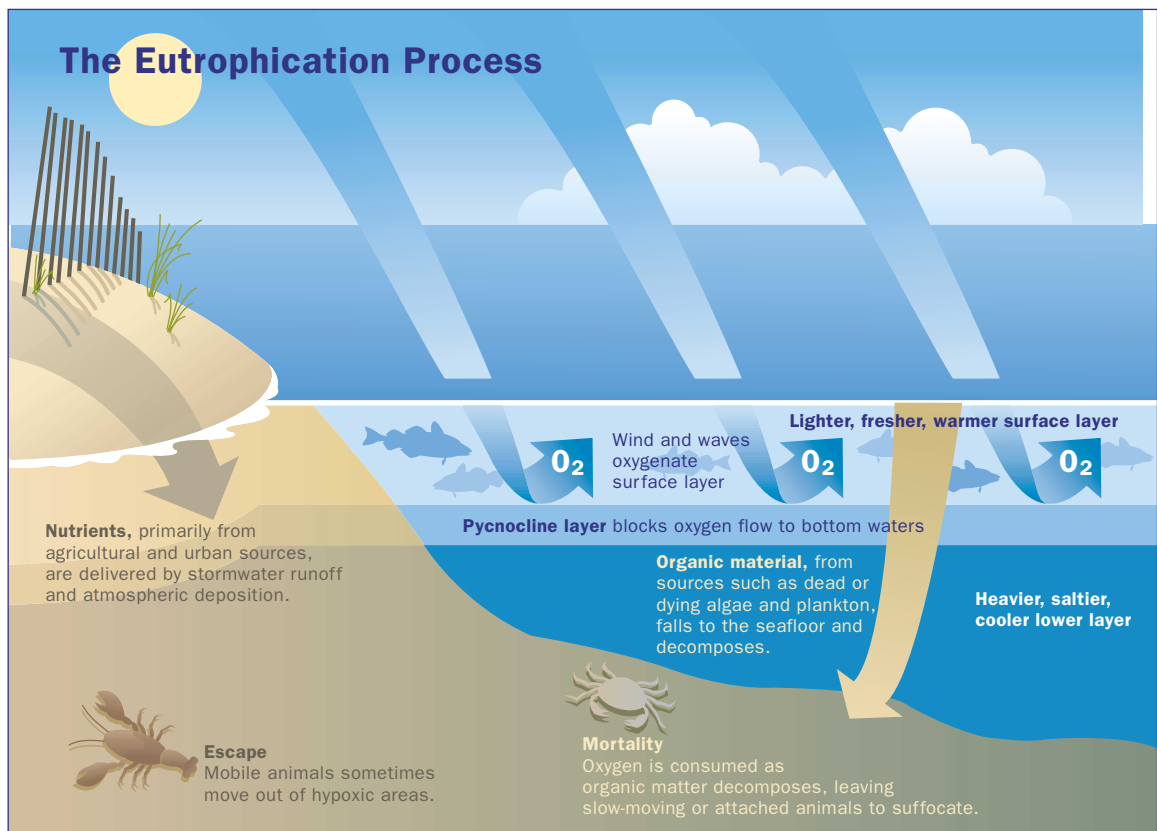
We need to restore depleted populations of fish and other marine wildlife because they are essential components of marine ecosystems and

because they are essential to the economies of coastal communities. Robust fish stocks are characteristic of healthy ecosystems, and healthy ecosystems are more resilient in the face of other threats to our oceans, many of which come from far inland.

TROUBLED WATERS

The greatest pollution threat to coastal marine life today is the runoff of excess nitrogen from fertilized farm fields, animal feedlots, and urban areas.

FIG. TWO



Eutrophication is a long-term increase in the supply of organic matter to an ecosystem—often because of excess nutrients. Eutrophication creates two harmful effects in marine ecosystems: reduced water clarity and oxygen depletion. Reduced water clarity can starve seagrasses and the algae that live in corals for light, reducing their growth or killing them. While wind and waves aerate surface waters, the pycnocline—a layer of rapid change in water temperature and density—acts as a barrier to oxygen exchange in bottom waters. Oxygen is consumed in this deep layer as bacteria decompose plankton, dead fish, and other organic matter that sinks from the surface. When dissolved oxygen levels reach two milligrams per liter or less—a condition called hypoxia—most slow-moving or attached animals suffocate, creating areas known as dead zones in the bottom waters.

Source: Boesch et al., 2001; EPA, 2000.

Airborne nitrogen—from industrial smokestacks, automobile exhaust pipes, and ammonia rising from huge manure lagoons—is also deposited in the ocean.

Just as they fertilize the land, nutrients fertilize coastal waters, and excess amounts can cause massive blooms of algae. These blooms can trigger a chain of events that deplete the ocean waters of oxygen, turning vast areas into hypoxic dead zones (Figure Two). Some of these algal blooms produce toxins that can be fatal to fish, marine mammals, and occasionally people.

The deaths of one million menhaden in North Carolina's Pamlico Sound in 1991, 150 endangered Florida manatees in 1996, and 400 California sea lions along the central California coast in 1998, all have been attributed to harmful algal blooms (McKay and Mulvaney, 2001). These blooms disrupt aquaculture, wild fisheries, and coastal tourism. In the past two decades, their effects have expanded from a few scattered coastal areas to nearly all coastal states² (Burke et al., 2000).

Meanwhile, invasive species are establishing themselves at an alarming rate in our coastal waters, often crowding out native species and altering habitat and food webs. More than 175 non-native species thrive in San Francisco Bay alone. Nearly one million Atlantic salmon escaped from pens on the West Coast of North America in the last 15 years. The species is now successfully reproducing in British Columbia rivers. Of the 374 documented invasive species in U.S. waters, 150 have arrived since 1970 (Ruiz et al., 2000). While "invasions" from the sea are altering marine ecosystems, there are other threats from the landward side.

PAVING OUR COASTS

Nationwide, commercial and residential development is gobbling up land at an unprece-

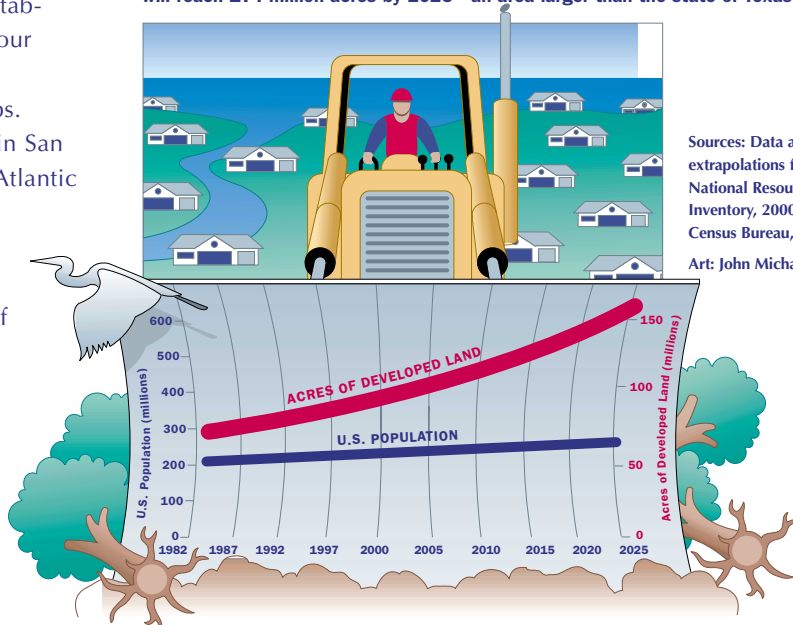
dent rate (Figure Three). Most of this growth is occurring along our coasts (Figure Four, page 11). Coastal counties, which comprise just 17 percent of our land area, are now home to more than half of the U.S. population. Another 25 million people will live along the coast by 2015 (Beach, 2002), further straining our wetlands, mangrove forests, estuaries, coral reefs, and other coastal habitats.

Habitat destruction and the decline of coastal water quality resulting from development jeopardize species with which we share the coastal environment. For example, urban sprawl contributed to the

FIG. THREE

The Rate of Land Development and the Rate of Population Growth

Land in the United States has been developed at more than twice the rate of population growth since 1982. This increase is a result of a consistent decline in development densities over the past few decades. If this trend continues through the year 2025, the nation will consume another 68 million acres of rural land—an area the size of the state of Wyoming. The total developed land in the United States will reach 174 million acres by 2025—an area larger than the state of Texas.



Sources: Data and extrapolations from National Resources Inventory, 2000; U.S. Census Bureau, 2000.

Art: John Michael Yanson

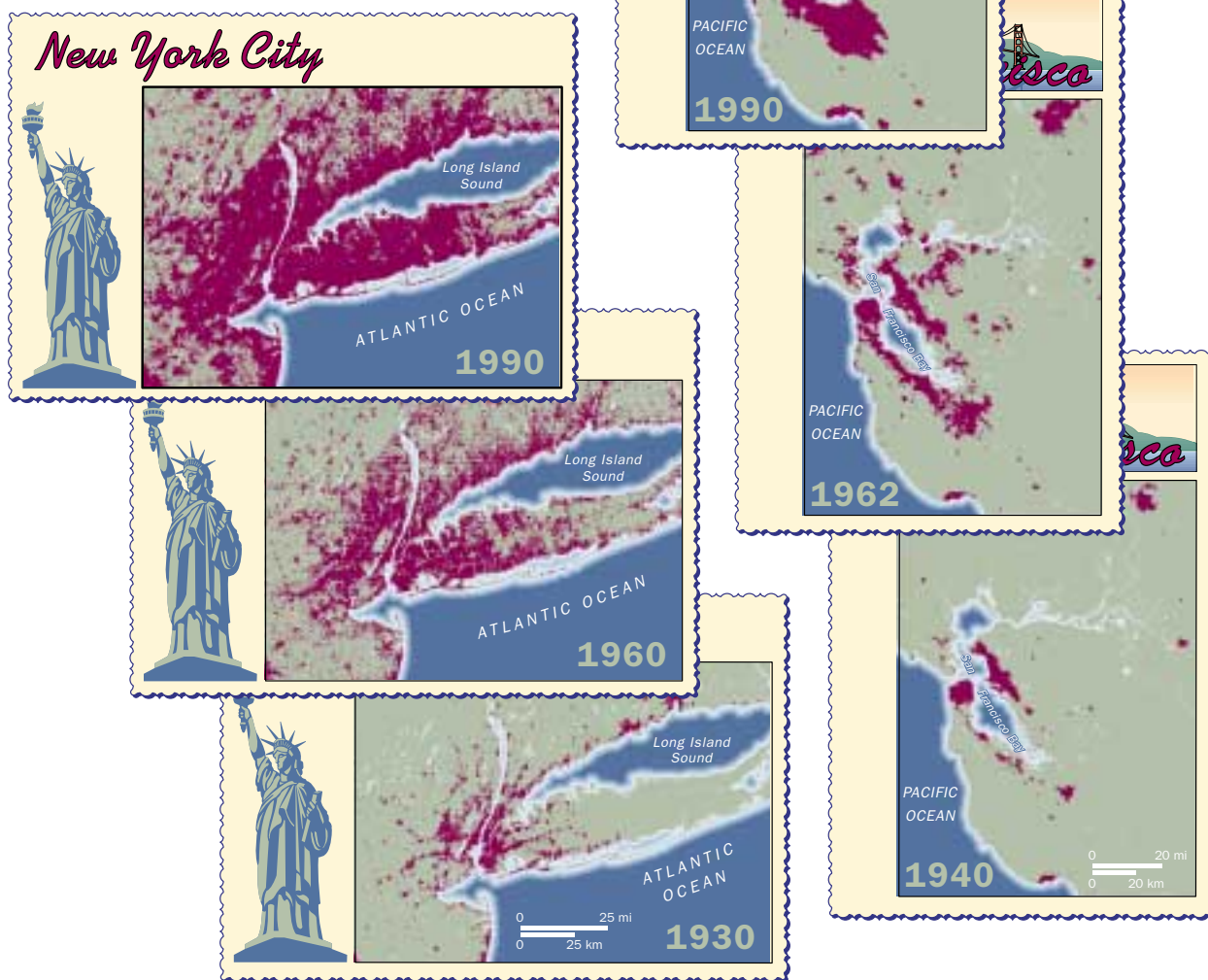
² As used by the Pew Oceans Commission, the terms "state" or "states" mean any or all of the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, American Samoa, the Virgin Islands, Guam, and any other commonwealth, territory, or possession of the United States.

FIG. FOUR

Expansion of Metropolitan Coastal Areas

Geographic Information Systems (GIS) technology has recently made it possible to graphically depict the expansion of metropolitan areas.

The developed "footprints" (burgundy) of many coastal regions are expanding faster than the national average. The metropolitan regions of New York City (below, left) and San Francisco (at right) experienced physical growth rates far in excess of population growth.



Sources: NOAA, 2002; Map images for New York adapted from maps created by Craig Campbell, using data provided by a partnership of Regional Plan Association, the United States Geological Survey, and Cornell University. Source for San Francisco map images: United States Geological Survey.
 Art: John Michael Yanson
 Maps: Jerome N. Cookson

A great egret stalks prey in the Florida Everglades. Diking, draining, and water diversion have reduced freshwater flow through Florida's Everglades by approximately 70 percent since the 1940s. During this time, the population of wading birds has dropped by 90 percent.



Cliff Beittel

decline of 188 of the 286 California species that are listed under the Endangered Species Act, making it the leading cause of species decline in that state (Doyle et al., 2001).

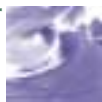
Florida has experienced some of the nation's most rapid coastal development. From 1940 to 1996, the state population increased 700 percent, from 1.8 million to 14.3 million. Development has altered both water quality and water quantity, leading to the loss of more than half of the Everglades, the largest contiguous wetland in the United States. Freshwater flow through the Everglades has declined by approximately 70 percent since the 1940s and the population of wading birds has dropped by 90 percent (Koehler and Blair, 2001).

For coastal ecosystems, one of the most harmful aspects of development is the creation of impervious surfaces. Roads, parking lots, rooftops, and other impervious surfaces typically make up about 40 percent of the surface area of suburban development. They collect pollutants from automobiles, fields, lawns, and golf courses and provide a conduit for their rapid transfer to rivers, estuaries, and—ultimately—our oceans. For example, a one-acre parking lot produces about 16 times the volume of runoff that would come from a one-acre meadow.



Chris Johns/National Geographic Image Collection

Vast irrigated farmland has spread to the edge of Everglades National Park (right). Irrigation has impeded the flow of life-giving fresh water to the park, shrinking vital habitat for more than 1,500 species of plants and animals.



Numerous studies show that when more than ten percent of the acreage of a watershed is covered with impervious surfaces, its aquatic biodiversity begins to decline (Schueler and Holland, 2000).

Where and how we live has a profound effect on the health of our oceans and coasts.

ZERO DEGREES OF SEPARATION

Our current state of knowledge can make it difficult to unravel the relative roles of natural processes and human influence, whether from chemical pollution, nutrient enrichment, or climate change. But scientists are finding increasing human influence on the environment.

For example, in Puget Sound, PCB contamination may be a factor in the decline of orcas, or killer whales, whose numbers have declined by 14 percent since 1995. PCB levels in the Puget Sound population exceed that known to suppress immune function in another marine mammal, the harbor seal (Ross et al.,

2000; Forney et al., 2000). Similarly, high levels of PCBs, DDT, and tributyltin (a component in boat paint) may be contributing to the deaths of California southern sea otters. Scientists have also discovered that increasing sea-surface temperatures are associated with the northward spread of a pathogen that attacks the eastern oyster. The pathogen, *Perkinsus marinus*, was itself likely introduced into the U.S. Atlantic and Gulf coasts via aquaculture.

The crisis in our oceans is such that many marine populations and ecosystems may be reaching the point where even a small disturbance can cause a big change. We must therefore initiate large changes ourselves, if we are to protect and restore the oceans, in our governance of them and our attitude toward them. We must no longer structure our thinking in terms of maximizing the short-term commercial benefit we derive from the oceans, but rather in terms of maximizing the health and persistence of ocean ecosystems (Box Two).



Frans Lanting/Minden Pictures

Anchored by kelp strands, three southern sea otters float in California waters. High levels of PCBs, DDT, and tributyltin may be contributing to decline of southern sea otters along the California coast.

ECOSYSTEM HEALTH

Ecosystem-based management requires defining standards of ecosystem health. Maintaining, protecting, and, where appropriate, restoring ecosystem health should be the goal of our new ocean governance.

Marine ecosystems are too varied and complex to write a single definition—scientific or legal—of health. However, as in human health, where we take basic measurements such as temperature, blood pressure, and cholesterol, we can identify and measure certain parameters in marine ecosystems to learn more about their health. These parameters include the number of species, population sizes of species, water quality, and habitat composition. Marine scientists need to develop an understanding of what good health means for each major ecosystem in U.S. ocean waters, and then policymakers and those who use ocean resources need to practice preventive medicine.

The term “ecosystem health” refers to the ongoing capability of an ecosystem to support a productive and

resilient community of species, irrespective of the human activity permitted there. This requires a holistic approach to management, focusing not only on individual species but also on the interactions among them and their physical environment. A healthy ecosystem is capable of providing ecological goods and services to people and to other species in amounts and at rates comparable to those that could be provided by a similar undisturbed ecosystem.

Although often taken for granted, the goods and services provided by coastal and marine ecosystems would be difficult—if not impossible—to replace. These benefits include protection from coastal storm damage, the filtering of toxins and nutrients, production of oxygen, and sequestration of carbon dioxide. In addition, fishing, tourism, and recreation provide economic benefit, and support ways of life that contribute to the social and cultural wealth of the nation.

FRACTURED POLICY

Governance is a reflection of the knowledge and values of the society that creates it. Our ocean governance needs updating to reflect substantial changes in our knowledge of the oceans and our values toward them since our major ocean laws, policies, and institutions were established.

Not a system at all, U.S. ocean policy is a hodgepodge of individual laws that has grown by accretion over the years, often in response to crisis. More than 140 federal laws pertain to the oceans and coasts. Collectively, these statutes involve at least six departments of the federal government and dozens of federal agencies in the day-to-day man-

agement of our ocean and coastal resources.

Authority over marine resources is fragmented geographically as well. The Submerged Lands Act of 1953 gave most states authority over submerged lands and overlying waters from the shoreline out three miles. Federal territorial sovereignty extends 12 miles offshore, and, consistent with the United Nations Convention on the Law of the Sea, the federal government controls ocean resources out 200 miles or more. This federal/state division of ocean jurisdiction makes it difficult to protect marine ecosystems because it divides their management into a nearshore and an offshore component with insufficient means or mandate to harmonize the two.



Our Nation AND THE SEA TODAY

Megan's Bay, St. Thomas, U.S. Virgin Islands
Steve Simonsen/Marine Scenes

Now, I truly believe, that we in this generation must come to terms with nature, and I think we're challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves.

Rachel Carson

Naturalist and Author

An excerpt from CBS Reports,

"The Silent Spring of Rachel Carson," April 3, 1963

Addressing the crisis of our seas will require a serious rethinking of ocean law, informed by a new ocean ethic. The legal framework that governs our oceans is more than 30 years old, and has not been updated to reflect the current state of ocean resources or our values toward them. The last comprehensive review of our ocean policy was completed in 1969, when the Stratton Commission produced its seminal report, *Our Nation and the Sea*.

The recommendations of the Stratton Commission, including the establishment of the National Oceanic and Atmospheric Administration and the enactment of the Coastal Zone Management Act, provided the blueprint for U.S. ocean policy (Cicin-Sain and Knecht, 2000). But our oceans and coasts—and our society as well—have changed dramatically since that time.

For example, nearly 30 years ago, in response to public outrage over foreign overfishing of abundant fish populations off America's shores, Congress took action to develop a domestic fishing industry and capture the wealth of fisheries for this country. Today, the problem is reversed. We are overfishing our already depleted fish populations, harming marine ecosystems, and leaving fishermen out of work (Figure Five).

Over the past three decades, our understanding of the oceans has also evolved. For too long we viewed the ocean as a limitless resource. We now know better. We overlooked the connections between the land and sea. Now we know that our activities on land—from building roads to logging trees to damming rivers—have a direct and considerable impact on the oceans.

Over time, experience on land has made

biologists and ecologists aware of the many linkages within and among ecosystems, fostering development of a more sophisticated approach called ecosystem-based management. An ecosystem is composed of all of the organisms living in a certain place and their interactions with each other and with their environment. Weather, currents, seafloor topography, and human activities are all important influences on ecosystems. The goal of ecosystem-based management is to maintain the health of the whole as well as the parts. It acknowledges the connections among things.

Marine reserves—areas of the ocean in which all extractive and disruptive activities are prohibited—are a relatively new, but very promising, approach to marine conservation (Figure Six, page 19). The establishment of areas that prohibit extractive and disruptive activities, such as wilderness areas, has been a well-accepted conservation practice on land for more than a century and has greatly enhanced ecosystem protection. While 4.6 percent of the land area of the United States is preserved as wilderness, the area of the ocean under U.S. jurisdiction that is protected in marine reserves is a small fraction of one percent.

Maintaining healthy ecosystems is crucial. When we sacrifice healthy ecosystems, we also sacrifice economic and social stability. Indeed, once an ecosystem collapses, it may take decades or centuries for it to recover, and the species that we so valued may be permanently lost (Figure Seven, page 20).

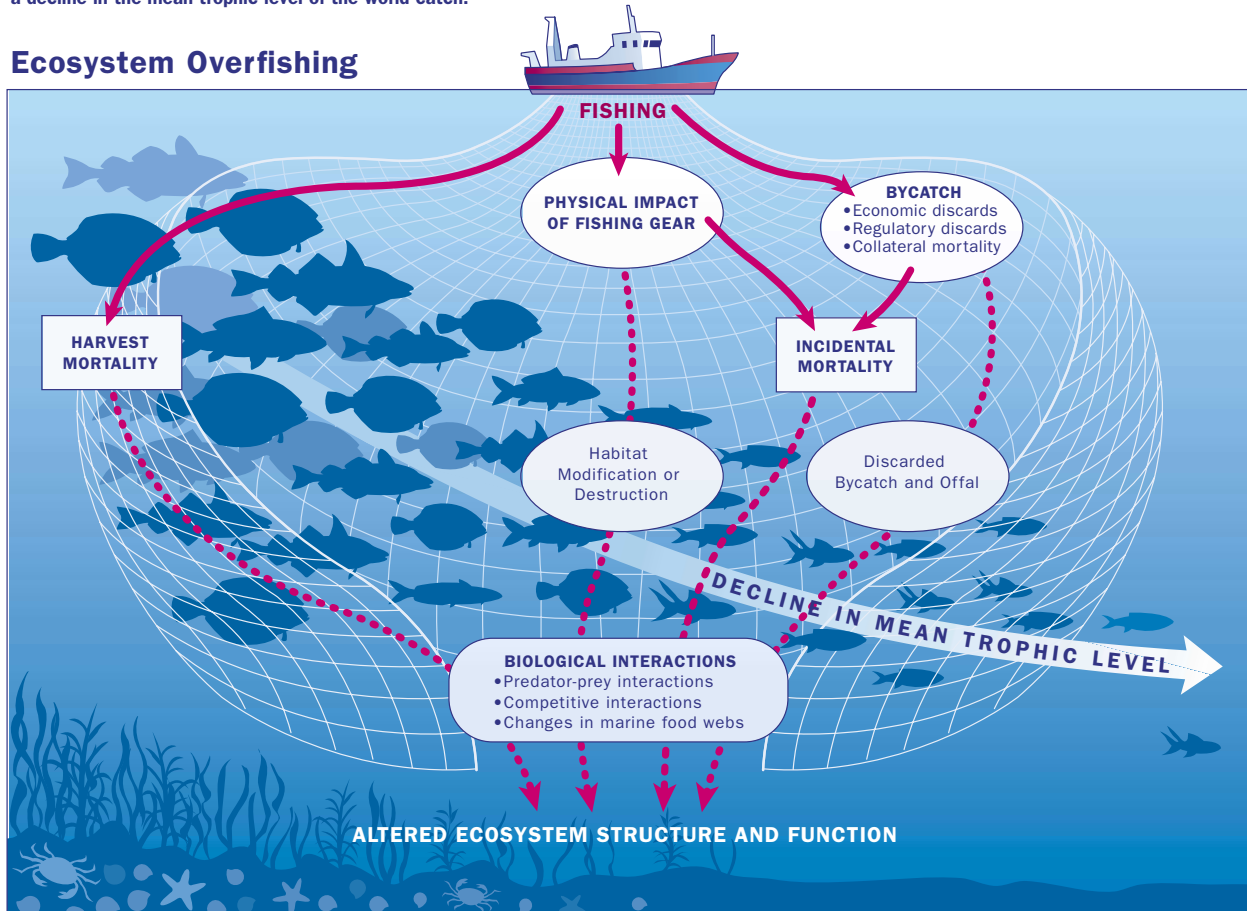
TOWARD AN OCEAN ETHIC

In July 2000, the Pew Oceans Commission embarked on a journey of inquiry. We sought to understand the state of our oceans and the effectiveness of the nation's ocean policy. Our approach encompassed extensive research, consultation with scientific and policy experts, and testimony from Americans whose lives are intertwined with the ocean. We identified three primary problems with ocean governance. The first is its focus on exploitation of ocean resources with too little regard for environmental consequences. The second is its fragmented nature—institutionally, legislatively, and geographically. Thirdly, our

FIG. FIVE

Fishing directly affects the abundance of marine fish populations as well as the age of maturity, size structure, sex ratio, and genetic makeup of those populations (harvest mortality). Fishing affects marine biodiversity and ecosystems indirectly through bycatch, habitat degradation, and through biological interactions (incidental mortality). Through these unintended ecological consequences, fishing can contribute to altered ecosystem structure and function. As commercially valuable populations of fish declined, people began fishing down the food web, which has resulted in a decline in the mean trophic level of the world catch.

Ecosystem Overfishing



Source: Adapted from Pauly et al., 1998; Goñi, 2000.

Art: John Michael Yanson

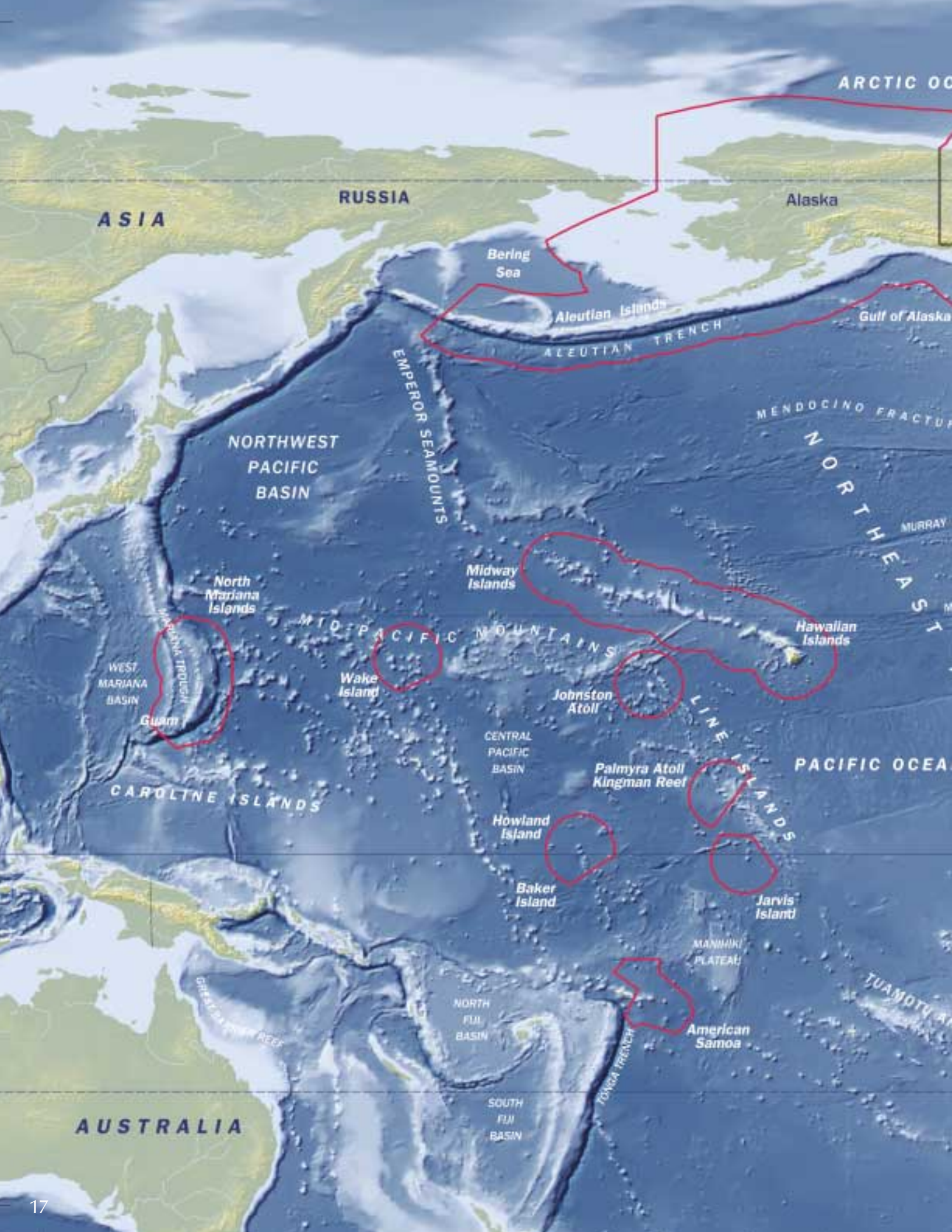
ocean governance has focused on individual species as opposed to the larger ecosystems that produce and nurture all life in the sea.

To correct this situation, we have identified five main challenges and corresponding recommendations for revising our laws and institutions: reforming ocean governance, restoring America's fisheries, protecting our coasts, cleaning coastal waters, and guiding sustainable aquaculture. These challenges require comprehensive action.

New laws and policies, however substantial, are not enough. A more fundamental change in values—not only what we value, but how we value—is essential to protecting and restoring our oceans and coasts.

Our society needs an ethic of stewardship and responsibility toward the oceans and their inhabitants. Like the conservation land ethic that has taken shape in our nation over many decades, an ocean ethic provides a moral framework to guide the conduct of individuals and society.

FOLLOWING PAGES: In 1983, President Ronald Reagan established the United States Exclusive Economic Zone, which extends 200 nautical miles (a nautical mile equals 1.15 statute miles) from our shores. The United States' oceans span nearly 4.5 million square miles, an area 23 percent larger than the land area of the nation.



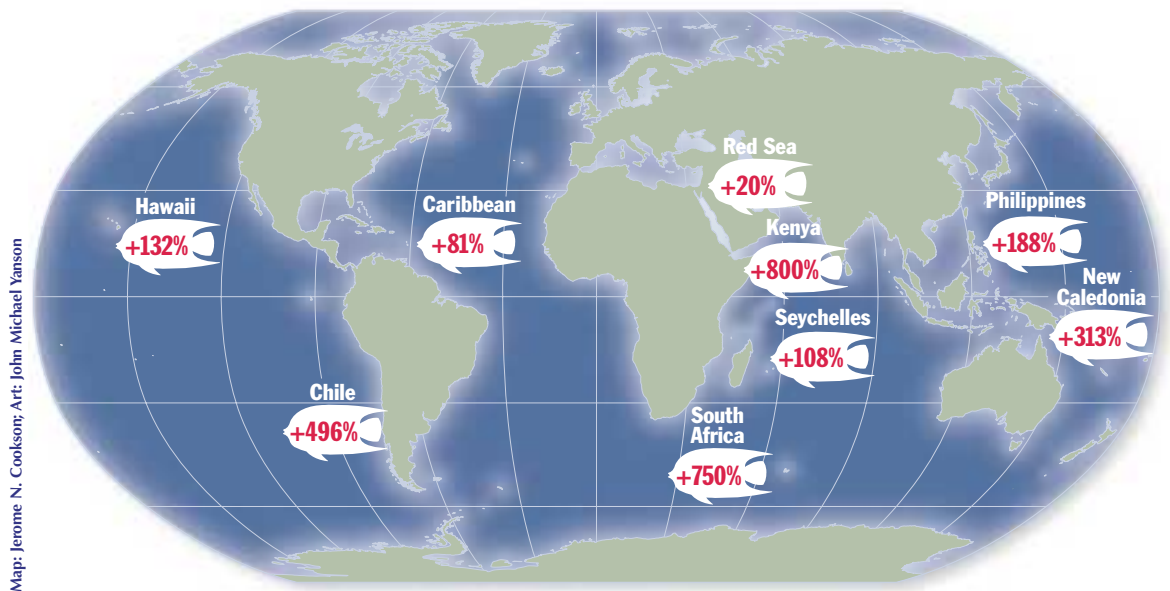
AMERICA'S OCEAN REALM



FIG. SIX

Marine Reserves Increase Fish Biomass

Around the world, marine reserves have demonstrated the ability to increase fish biomass inside their borders. In most reserves studied, fish biomass doubled within five years. The larger fish found within reserves also produce more eggs. For example, ling cod within a reserve in Washington State produced 20 times more eggs per unit area than cod outside the reserve (Palumbi, 2003).



Map: Jerome N. Cookson; Art: John Michael Yanson

Source: Data are from 32 studies summarized by Halpern (2003) that were published in peer-reviewed journals.

Extending environmental protection beyond a single medium—such as air, or water, or a single species of plant or animal—to entire ecosystems is both a practical measure and our moral obligation as the stewards of our planet.

The Commission has framed six key principles that form the core of a new ocean ethic and that underlie all of its recommendations.

UPHOLD THE PUBLIC TRUST

The oceans of the United States are a vast public domain that is vitally important to our environmental and economic security as a nation. The public has entrusted the government with the stewardship of our oceans, and the government should exercise environmental and economic control over them with a broad sense of responsibility toward all citizens and their long-term interests. Likewise, public and private users of ocean resources should be responsible in their use and should be held accountable for their actions.

PRACTICE SUSTAINABILITY

The essence of sustainable development is using our planet's resources as if we plan to stay. In the long term, economic sustainability depends on ecological sustainability. We must reassess and, where necessary, change our actions to take out no more living things than the system can reliably replace and put in no more contaminants than the system can safely absorb. We must protect what should not be destroyed, and repair as much of the damage as we can.

APPLY PRECAUTION

Despite the wealth of knowledge we have accumulated, there is a great deal of uncertainty in our understanding of the structure and functioning of coastal and marine ecosystems. However, we depend on ecological and economic goods and services provided by healthy marine ecosystems. In the face of uncertainty, we should err in our decisions on the side of protecting these ecosystems.

RECOGNIZE INTERDEPENDENCE

Human well-being and the well-being of our coasts and oceans are interdependent. We depend on marine ecosystems, and they depend on our respectful treatment. Other interdependencies are likewise crucial: between land and sea; among species and between species and their habitats; among all levels of government with jurisdiction over the marine environment; and among government, the public, and the users of coastal and marine resources. An ocean ethic requires us to understand these connections, and use that knowledge wisely.

ENSURE DEMOCRACY

Our current system of ocean governance and the patterns of ocean use resulting from it too often allow the needs and desires of a few to dictate the availability of benefits for all of us. The public should be able to count on governance decisions that respect broad and long-term societal goals. It should be confident that

those decisions are made by institutions that are accessible, efficient, and accountable through processes that are transparent and collaborative.

IMPROVE UNDERSTANDING

We know enough about coastal and marine ecosystems to improve their sustainable use. With better information, we could do much more. Public and private institutions need to work together to fill the gaps in our knowledge and to ensure that decision-makers have timely access to the information they need to protect the public interest. In addition, they need to provide the public with understandable information about the structure and functioning of coastal and marine ecosystems, how ecosystems affect our daily lives, and how we affect ecosystems.

The scope of the problems before us requires sweeping change. With a strong ocean ethic to anchor us, we must place conservation of ocean ecosystems and resources as the primary goal of a new national ocean policy.

FIG. SEVEN



Coral reefs—often called the “rain forests of the sea”—are among the most diverse ecosystems on the planet. Pollution, destructive fishing activities, coastal development, and climate change contribute to the declining health of the world’s reefs.



A Plan OF ACTION FOR OUR OCEANS

Green sea turtle, Kona, Hawaii

© Chuck Davis/www.tidalflatsphoto.com

The Commission formulated a body of recommendations to reverse the declining health of our ocean and coastal ecosystems. It received extensive testimony and engaged in discussions at numerous public meetings, and sought reports and advice from experts in marine science and policy. In addition, the Commission conducted thorough analyses of issues and proposed solutions. Taken separately, each of these actions would improve the health of our oceans and coasts. Taken together, these recommendations form a plan of action to protect, maintain, and restore the health of our oceans and coasts.

OCEAN GOVERNANCE FOR THE 21ST CENTURY

1. Enact a National Ocean Policy Act (NOPA).

Congress should enact a National Ocean Policy Act requiring federal, state, and territorial agencies to protect, maintain, and restore marine and coastal

ecosystems, and reorienting national and regional decision-making bodies to these ends. This legislation should provide clear and measurable goals and standards to govern activities affecting the oceans, establish mechanisms to ensure compliance with the national policy, and establish national and regional institutions capable of carrying out that policy.

2. Establish Regional Ocean Ecosystem Councils.

As part of the National Ocean Policy Act, Congress should establish regional ocean ecosystem councils consisting of appropriate federal, state, and tribal representatives. These councils should be charged with developing and overseeing implementation of enforceable regional ocean governance plans to carry out the national policy to protect, maintain, and restore marine ecosystems. To be enforceable, plans must include performance goals and indicators, must be binding on all parties, and must meet federal standards established under the National Ocean Policy Act. The geographic extent of authority for each regional ocean council should be specified by statute. Each regional ocean council should establish permanent advisory committees to obtain the views and advice of fishermen, environmental organizations and others with an interest in ocean resources, scientists, local government, and the public.

The regional ocean ecosystem councils should utilize ocean zoning to improve marine resource conservation, actively plan ocean use, and reduce user conflicts. Ocean zoning should allow for the protection of key habitats or resources while facilitating a variety of human activities.

3. Establish a National System of Marine Reserves.

Congress should enact legislation mandating the establishment of a national system of marine reserves to protect marine ecosystems, preserve our national ocean treasures, and create a legacy for our children. Congress should authorize regional ocean ecosystem councils to create marine reserves within the areas of their jurisdiction but should itself take action to protect areas of national significance.



© David Fleetham/Seapics.com

In the northwestern Hawaiian Islands, an accumulation of drifting fishing gear resulted in the deaths of 25 endangered Hawaiian monk seals in a two-year period (MMC, 2000).



BOX THREE

Steve Simonsen/Marine Scenes

A NEW ERA OF OCEAN LITERACY

To create a new national ocean policy that restores and maintains ocean ecosystems, we will need more than new laws and institutions. We must also build a national constituency for the oceans that includes all Americans, whether we live along the coast or in the Rocky Mountains. We must prepare today's children to be tomorrow's ocean stewards.

The Pew Oceans Commission calls for a new era of ocean literacy that links people to the marine environment. Through greater marine education and awareness, we can inspire the next generation of scientists, fishermen, farmers, business and political leaders—indeed all citizens—with a greater understanding and appreciation for the oceans.

The federal government is only one part of this effort. As the Commission traveled around the country, we saw people across all levels of government and in many professions promoting ocean literacy. We also saw outstanding examples of aquariums and science centers helping

the public to connect with the marine world. In California alone, the major aquariums attract as many as six million visitors each year.

Restoring and sustaining the oceans requires broad public support. This support begins with greater awareness of just how valuable—and vulnerable—the oceans are. It is time to make a national commitment to teach and to learn about our oceans throughout society.

The Commission encourages greater collaboration at all levels of government and partnerships between the public and private sectors to provide teachers with the materials and training they need to bring the oceans into the classrooms. The Commission urges the national oceans agency to take a strong role in building ocean literacy nationwide, similar to what NASA has done for education about outer space. The Commission supports the ongoing efforts of aquariums and science centers to link the public with the ocean realm and instill greater appreciation for their role in its protection.

4. Establish an Independent National Oceans Agency.

Congress should establish an independent agency outside the Department of Commerce to address the national interest in the oceans and atmosphere. This agency should consolidate under one roof as many federal ocean programs as is practical. At a minimum, the agency should consist of the programs of the

- current National Oceanic and Atmospheric Administration as well as the ocean minerals, marine mammal, and seabird programs of the Department of the Interior;
- Chesapeake Bay Program and the National Estuaries Program of the Environmental Protection Agency;

- aquaculture programs for marine species from the Department of Agriculture;
- shoreline protection and estuarine restoration activities of the Army Corps of Engineers.

The national oceans agency will be responsible for ensuring compliance with the National Ocean Policy Act, chairing the regional ocean ecosystem councils, providing technical and financial assistance to the councils, and reviewing and approving regional ocean governance plans.

5. Establish a Permanent Interagency Oceans Council.

Congress should enact legislation establishing a permanent national ocean policy council within the Executive Office of the President. The head of the



A commercial shrimp trawler heads from Louisiana to the Gulf of Mexico. Shrimp is the most valuable fishery in the United States. Shrimp trawling often results in substantial unintentional capture of red snapper, sea turtles, and other nontargeted species.

national oceans agency should chair the national council. Its membership should be specified by law to include the heads of federal departments or agencies whose activities have a significant effect on the oceans. Council duties would include coordinating and overseeing agency implementation of the National Ocean Policy Act, resolving interagency disputes regarding NOPA implementation, and coordinating and certifying agency ocean budgets to address the national ocean policy. To assist the President and the national ocean policy council in carrying out NOPA, a position of national oceans adviser should be established within the Executive Office of the President.

RESTORING AMERICA'S FISHERIES

Congress should amend the Magnuson-Stevens Act and other applicable fisheries laws to codify the following recommendations as national marine fishery policy.

1. Redefine the Principal Objective of American Marine Fishery Policy to Protect, Maintain and Restore Marine Ecosystems.

The principal objective of fishery management should be to protect the long-term health and via-

bility of fisheries by protecting, maintaining, and restoring the health, integrity, productive capacity, and resilience of the marine ecosystems upon which they depend. The objective should apply to all U.S. ocean waters. In cases of conflict between this objective and short-term social or economic needs, or in cases where information is uncertain or inconclusive, the need to protect, maintain, and restore these features of marine ecosystems should always be the top priority.

2. Separate Conservation and Allocation Decisions.

There should be a clear separation between conservation and allocation decisions in the fishery-management planning process. The purpose of this change is to assure that ecological sustainability takes precedence over short-term economic or political considerations. Conservation and allocation decisions are discrete processes that require different management skills and different types of decision-making organizations. Conservation decisions should be made by the National Marine Fisheries Service (NMFS), or a revamped fishery service within a new independent oceans agency. They should be based upon recommendations from regional science and technical teams composed of federal, state, and academic scientists. Conservation decisions should precede and remain unchanged by allocation decisions, with one exception: allocation decision-makers may adopt more conservative policies than those set in the conservation planning process. Regional fishery councils should take the lead on allocation decisions subject to final approval by NMFS.

3. Implement Ecosystem-Based Planning and Marine Zoning.

Fishing should not proceed in the absence of an approved plan. Core problems in existing fisheries, such as bycatch and habitat damage, must be managed and mitigated as a condition of fishing. Before fishing begins, the government should determine where and when the fishing shall occur, how much exploitation is acceptable, and how the fishing should be conducted. The government should make these decisions only after considering how the entire

ecosystem that supports the fishery—not just the target species—will be affected by fishing. For new fisheries, this requires enactment of an emerging fisheries policy. Plan implementation should incorporate comprehensive zoning to partition planned areas into sections designated for specific uses.

4. Regulate the Use of Fishing Gear that is Destructive to Marine Habitats.

Fishing gear should be approved for use subject to a zoning program. The program should designate specific areas for bottom trawling and dredging if scien-

tific information indicates that these activities can be conducted without altering or destroying a significant amount of habitat or without reducing biodiversity. Zones not designated suitable for these purposes should be closed to bottom trawling and dredging. Sensitive habitats as well as areas not currently trawled or dredged should be closed to such use immediately. Gear modification and conversion programs, with funding provisions, should accompany the new zoning regime. Funding should also be provided for research into possible ways to reduce habitat impacts of bottom trawls and dredge gear.

BOX FOUR

Steve Simonsen/Marine Scenes

SCIENCE FOR SUSTAINABLE SEAS

There has never been a more critical time for the nation to increase its investment in ocean science and research. We know the oceans are in crisis. Unfortunately, as the nature, scale, and complexity of threats to marine ecosystems have increased, our national investment in ocean science and research has stagnated. For more than a decade, federal spending on ocean sciences has hovered near 755 million dollars annually—less than four percent of the nation's annual expenditure for basic scientific research.

The nation must increase investment in ocean science and research, particularly broader programs to monitor and to understand ecosystems. To support this endeavor, the Commission recommends that Congress at least double funding for basic ocean science to 1.5 billion dollars annually or approximately seven percent of the basic federal research budget.

At the core of this financial commitment is a quest for knowledge that can help to sustain the biodiversity, productivity, and resilience of marine ecosystems for future generations. We need a deeper understanding of

the effects of both natural and anthropogenic change on marine ecosystems as well as of the oceans' interaction with terrestrial ecosystems and the atmosphere. Increased capacity is needed in four areas to improve applied ocean science and research:

1. acquisition of new information, knowledge, and understanding;
2. monitoring to evaluate status and trends;
3. capability to integrate and synthesize existing and new information;
4. sharing of information and knowledge with the public.

The Commission also believes that to assure the independence and integrity of scientific advice, scientific work needs to be insulated from political and economic pressures. This may require reorganizing the institutional relationship between scientific research and resource management in some programs. Nowhere is this need more evident than in fisheries management, where the Commission recommends separating science-based conservation decisions from economic and political allocation decisions.

5. Require Bycatch Monitoring and Management Plans as a Condition of Fishing.

Bycatch monitoring and minimization plans should be approved before the commencement of fishing. The statutory goal of these plans should be to reduce bycatch to levels approaching zero. Individual bycatch quotas for valuable fish species (except threatened and endangered species) appear to provide the most rational approach for managing toward that goal. Conservative catch quotas should be set for species, accounting for intended and unintended catch. Fishermen should be allowed to keep fish they catch within conservative limits, rather than being forced to discard and waste one species because they are in a target fishery for another. A plan should be developed for each fishery, using a stakeholder process modeled on the Marine Mammal Protection Act Take Reduction Teams, that is subject to statutory standards.

6. Require Comprehensive Access and Allocation Planning as a Condition of Fishing.

Regional fishery councils should develop allocation plans, before the commencement of fishing, that limit access and allocate catch in a manner consistent with conservation goals. At a minimum, each plan should: (1) help match the size of fishing fleets and their catching capacity to the health of exploited populations and their ecosystems; (2) manage fishing effort with privileges, such as total allowable catches, that control exploitation of fish populations

within ecologically safe limits; and (3) allocate privileges in a manner that properly aligns incentives, allows for the orderly operation of a fishery (e.g., individual or community fishing quota programs), and maintains flexibility, resilience, and adaptability within the industry and fishing communities.

7. Establish a Permanent Fishery Conservation and Management Trust Fund.

A permanent trust fund for marine fisheries should be available, without appropriation or fiscal year limitation, solely for the purposes of improving fishery research, data collection, management, and enforcement; for habitat restoration; and—in the first 5 to 10 years of operation—for transitional buyback and community-development programs. Potential revenue sources include revenues generated by royalty payments on landed catch (e.g., royalty payments collected as part of an individual or community fishing quota auction process) and fees collected from fines and other penalties.

CONFRONTING COASTAL SPRAWL

1. Develop an Action Plan to Address Nonpoint Source Pollution and Protect Water Quality on a Watershed Basis.

Addressing the complex array of point and non-point sources of pollution related to development requires a comprehensive, watershed-based approach to water quality protection. States should establish and enforce water quality standards for nutrients, thus providing an enforceable benchmark against which progress can be measured. The Clean Water Act and state water quality laws should be amended to require action to reduce nonpoint source pollution. States should determine the total maximum daily load (TMDL) of pollutants that a water body can accept and still attain water



Fishermen aboard a longliner rejoice atop the day's catch of halibut near Kodiak Island, Alaska.

quality standards. The states should then implement meaningful plans for achieving the point and non-point source pollution reductions indicated by TMDLs. Implementation also requires watershed-based water quality compliance planning, which the federal government can encourage by providing a complementary suite of incentives for improving water quality and disincentives for activities that harm water quality.

2. Identify and Protect from Development Habitat Critical for the Functioning of Coastal Ecosystems.

Congress should provide a significant, permanent, and dedicated source of funding for habitat protection. Comprehensive habitat-protection planning by the states is important to ensure that federal, state, and local funds provide the maximum benefit in protecting habitat and water quality. The broadest possible array of financial tools and incentives should be made available to government and private land-protection efforts. Lastly, strong partnerships among all levels of government, private land trusts and foundations, and the business community are crucial for large-scale habitat protection.

3. Institute Effective Mechanisms at All Levels of Government to Manage Development and Minimize its Impact on Coastal Ecosystems and their Watersheds.

Substantial changes in development patterns and practices on private lands are needed. Municipalities and counties should change their zoning and subdivision codes to promote compact growth in areas where it is desirable, to discourage growth in relatively undeveloped areas where it is not desirable, and to reduce impervious surface cover wherever possible. States should take an active role in developing a consensus on growth management, encouraging urban growth boundaries to protect agriculture and environmentally sensitive lands, and restricting state development funding to designated growth areas. Congress should make federal funding for transportation and development available only to states that comply with the Clean Water Act and other federal environ-

mental laws. Federal grants and loans should be required to be used consistent with state and local growth-management efforts.

4. Redirect Government Programs and Subsidies Away from Harmful Coastal Development and Toward Beneficial Activities, Including Restoration.

The Army Corps of Engineers should be reformed to ensure that its projects comport with the agency's missions, are environmentally and economically sound, and reflect national priorities. Congress should transform the Corps into a strong and reliable force for environmental restoration, working in partnership with natural resource management agencies. Tax structures should be examined at all levels of government to ensure that they are supporting compact, appropriately sited growth. The National Flood Insurance Program should be reformed by setting premiums that reflect the true risk of coastal hazards, phasing out coverage of repetitive-loss properties, and denying coverage for new development in hazardous or environmentally sensitive areas.



Runoff from a sugar field in central Florida carries nutrient and other chemical pollution into an adjacent ditch. Nutrients, particularly nitrogen, flowing from farm fields, streets, and yards across the nation represent the largest pollution threat to coastal waters.

CLEANING COASTAL WATERS

1. Revise, Strengthen, and Redirect Pollution Laws to Focus on Nonpoint Source Pollution on a Watershed Basis.

EPA and the states should establish water quality standards for nutrients, especially nitrogen, as quickly as possible. EPA and the states should also ensure that water quality standards are in place for other pollutants—such as PAHs, PCBs, and heavy

metals such as mercury—where these are identified as problematic on a watershed-by-watershed basis. Congress should amend the Clean Water Act to require the use of best management practices to control polluted runoff resulting from agriculture and development. Congress and the Executive Branch should provide substantial financial and technical support for the adoption of such practices. Congress should link the receipt of agricultural and other federal subsidies to compliance with the Clean Water Act. Finally, Congress and the Environmental Protection Agency should ensure that air emissions of nitrogen compounds, mercury, and other pollutants are reduced to levels that will result in a substantial reduction of their impact on marine ecosystems.

2. Address Unabated Point Sources of Pollution.

Concentrated animal feeding operations should be brought into compliance with existing provisions in the CWA. Congress should enact legislation that regulates wastewater discharges from cruise ships under the CWA by establishing uniform minimum standards for discharges in all state waters and prohibiting discharges within the U.S. Exclusive Economic Zone that do not meet effluent standards. Congress should amend the National Invasive Species Act (NISA) to require ballast-water treatment for all vessels for all travel in U.S. waters, and regulate ballast-water discharge through a permitting system under the CWA. Finally, the International Maritime Organization draft convention on ballast-water

BOX FIVE

Steve Simonsen/Marine Scenes

BEYOND OUR BORDERS

The Pew Oceans Commission, though charged with a review of U.S. ocean policies, recognizes the international nature of the crisis facing our oceans and believes that the United States must demonstrate leadership in the area of marine protection. We have the largest Exclusive Economic Zone in the world, with a footprint that stretches across the Pacific Ocean; what we choose to do in our waters invariably affects the condition of the global oceans, and our interests are readily affected by the actions of others. Many of the Commission's recommendations—to protect fisheries, reduce the flow of pollution into coastal waters, and preserve coastal habitat—require action at home and abroad.

To address the crisis in our oceans, the U.S. will need the assistance of the community of nations. The Commission believes, however, that this nation must get its own house in order first to provide a solid foundation upon which to lead internationally. By establish-

ing appropriate standards for sustaining marine species and ecosystems, the U.S. will be in a better position to use trade pressures—as it did successfully to protect sea turtles from unsustainable shrimp fisheries—or participate credibly in the negotiation of ocean resource treaties. For example, only by adopting strong conservation standards for its domestic aquaculture industry can the U.S. establish the moral and legal authority to demand protective practices in other countries.

All nations of the world must examine their ocean policies. If we are to restore the world's fisheries, reduce pollution, protect marine habitats, and sustain coastal communities, it is time to acknowledge the international dimension of ocean resource protection, and engage U.S. policymakers and citizens—and the international community—to find solutions.

The first step is ours to take.

management should be finalized and its provisions implemented through appropriate U.S. laws.

3. Create a Flexible Framework to Address Emerging and Nontraditional Sources of Pollution.

A national electronic permitting system should be created under NISA to facilitate communication and track imports of live species that may result in aquatic introductions. Each state should inventory existing species and their historical abundance, in conjunction with the development of the regional ocean governance plans under the National Ocean Policy Act. Congress should provide adequate funding for developing statewide invasive-species management plans that include provisions for inventorying, monitoring, and rapid response. With regard to sound, a comprehensive research and monitoring program should be developed to determine the effects of sound sources on living marine resources and ecosystems. Consideration should be given to requiring the utilization of best-available control technologies, where the generation of sound has potential adverse effects. Finally, the environmental ramifications of any sound-producing project should be taken into formal consideration—pursuant to the National Environmental Policy Act or other applicable statutes—at the planning stages of the project, before significant resources, time, and money have been devoted to its development.

4. Strengthen Control of Toxic Pollutants.

The U.S. should ratify the Stockholm Convention on Persistent Organic Pollutants (POPs) and implement federal legislation that allows for additions to the list of the “dirty dozen” chemicals. In concert with this effort, EPA should develop and lead a comprehensive monitoring program to quantify levels of particular toxic substances in designated ocean habitats and species, and sufficient resources should be devoted to studying the effects of toxics on marine species. This monitoring program should be coordinated with Food and Drug Administration and EPA seafood contaminant advisory efforts, to enable people to know where their seafood comes from and what it contains.



Local children examine a whale stranded in the northern Bahama Islands in 2000. During March, at least 17 whales beached themselves subsequent to Navy sonar operations nearby. Investigations suggested that the sonar transmissions were a critical factor in the strandings.

SUSTAINABLE MARINE AQUACULTURE

1. Implement a New National Marine Aquaculture Policy Based on Sound Conservation Principles and Standards.

Congress should enact legislation to regulate marine aquaculture pursuant to sound conservation and management principles. The legislation should establish national standards and comprehensive permitting authority for the siting, design, and operation of ecologically sustainable marine aquaculture facilities. The lead authority for marine aquaculture should reside in the proposed independent oceans agency or the National Oceanic and Atmospheric Administration.

Until national marine aquaculture standards and policy are established, the Administration or Congress should place a moratorium on the expansion of marine finfish farms. Likewise, until an adequate regulatory review process is established, the government should place a moratorium on the use of genetically engineered marine or anadromous species.

2. Provide International Leadership for Sustainable Marine Aquaculture Practices.

The United States should negotiate and work with other nations to establish environmental provisions in international trade agreements to encourage ecologically sustainable marine aquaculture practices in the international community.



Charting A NEW COURSE

Sailing in Pillsbury Sound, U.S. Virgin Islands
Steve Simonsen/Marine Scenes

We take our oceans for granted. We must view our oceans as a public trust, and handle them in a way that ensures that living marine resources are there for our children and for future generations.

LEON E. PANETTA

*Chair of the Pew Oceans Commission
An excerpt from Mr. Panetta's testimony before the
U.S. Commission on Ocean Policy in Washington, D.C.
October 30, 2002*

Over the past two years, the Pew Oceans Commission heard from thousands of Americans from Maine to Hawaii and the Gulf of Mexico to Alaska. We considered the latest scientific information regarding our oceans. In the midst of unease and even alarm about the conditions of our oceans, we heard expressions of hope and saw signs of success. Marine life rebounds within marine reserves where hooks and nets are forbidden. Striped bass, severely depleted along our Atlantic shores, made a striking comeback when given a chance. Seabirds, kelp beds, and fish communities returned to the coastal waters off Los Angeles after waste discharges were reduced.

But such successes will remain the exception rather than the rule until we chart a new course for ocean management.

Our country must articulate a clear, strong commitment to our oceans. As mariners weathered storms for centuries with simple tools, our nation can navigate today's troubled seas. We know what we need: a compass, a chart, and the wind in our sails. That compass is a strong ocean ethic, the chart is a new legal framework, and the wind is our national will. The commitment of leaders and citizens alike is needed to steer us to healthy oceans.

THE COMPASS: AN OCEAN ETHIC

In recent decades, our nation has made great strides in environmental and natural resource protection. We fought back at the sight of litter, fouled rivers, and sooty air. We discovered a national conscience and articulated an environmental ethic.

Our vast oceans—the final frontier on this planet—are now showing the same signs of stress that mobilized our nation to protect our land, air, and fresh water 30 years ago. Pollution, poorly guided development, and habitat-destroying fishing practices are a sampling of humanity's heavy hand on the oceans. We are altering ecosystems and their capacity to support marine life, as well as their ability to provide the goods and services that we have grown to expect without thinking, just as we take for granted the beating of our hearts.

Extending strong environmental protection to the oceans is both a practical measure to preserve the ecological benefits that we require as a species and our moral obligation as the stewards of our planet.

It is time we apply this ethic to our oceans, our country's largest public resource.

THE CHART: DEFINING A NATIONAL OCEAN POLICY

A mariner turns to the charts in preparation for a voyage. Likewise, it is time for America to lay out a new policy that guides the nation toward healthy oceans.



© Kip F. Evans

Rising some 400 feet above the crashing surf of the Pacific Ocean, the Point Sur Lighthouse alerts ships to the dangers of the treacherous Big Sur coastline.

Congress and the President should begin by enacting a National Ocean Policy Act, significantly adjusting our nation's attitude toward the sea and establishing the standards and expectations necessary to achieve healthy, productive, and resilient marine ecosystems. This action will facilitate a host of other changes including necessary adjustments in existing fisheries, pollution, and coastal management policies to protect ocean health.

Achieving the Commission's vision for our oceans requires action in the following critical areas: do no more harm to the oceans, protect pristine areas, and restore degraded marine ecosystems. To do no more harm, we must stop excessive fishing of already overfished stocks; end wasteful bycatch and unnecessary habitat damage from fishing gears and practices; reduce the polluted runoff from our city streets and farmlands; and curtail harmful development practices that degrade water quality and destroy coastal habitat.

Secondly, we must place a premium on protecting and maintaining those areas that are relatively healthy and pristine, both on land and in the ocean. We should identify those areas critical to the functioning of productive coastal and marine ecosystems and place these areas off-limits to harmful activities.

Finally, the United States should restore its degraded marine ecosystems actively and aggressively. These systems are tremendously valuable.

Although most areas will never return to a pristine condition, we can at least restore their function and productivity.

THE WIND IN THE SAILS: LEADERS AND CITIZENS ALIKE

Even with a new sense of direction and a chart to guide us, we still need the power to make it hap-



Steve Simonsen/Marine Scenes

A kayaker navigates through turquoise waters near Virgin Islands National Park, U.S. Virgin Islands.

pen. Charting a new course for the oceans will not be easy. It will take the time and dedication of countless individuals to work for—and to demand—healthy oceans for our children and for ourselves.

A legacy of healthy oceans requires a national commitment from government, the private sector, and citizens alike. The commitment must start with leadership from the President and Congress on the necessary reforms to national laws and policies. Our governors should reinvigorate state efforts and expand the partnership with the federal government



Steve Simonsen/Marine Scenes

Cushion sea stars, Virgin Islands National Park, U.S. Virgin Islands

for coastal protection and management begun 30 years ago. Finally, we need a commitment from industry to reform its practices and from individuals to take responsibility for the impact of their choices on our oceans.

A NATIONAL COMMITMENT TO MARINE ECOSYSTEMS

We confront an ethical, environmental, and economic challenge that requires our nation to realign its posture toward the sea. Changing our policy course requires knowing where we want to go, applying the great energy required to overcome inertia, and taking action in time to avert disaster. Only a concerted and innovative effort will accomplish what the Commission's work alone cannot—

compel action through leadership, not crisis.

This Commission has a vision of how the health of our oceans and coasts can be restored and protected. It is a vision based on the principle that we must treat our oceans as a public trust to be managed for the common good. It recognizes that the land and ocean are interrelated and that we must work regionally and locally to protect our ocean ecosystems and the watersheds that sustain them. The outcomes of this vision are healthy and plentiful marine life, thriving fishing communities, clean beaches and coastal waters, and healthful seafood.

We invite the American public to join with us to launch a national effort in behalf of future generations—to understand, restore, and protect the bountiful life and habitats in our vast ocean trust.

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Brock Little finds a rideable surfing wave off Oahu's North Shore.

Vince Cavataio/Pacific Stock

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Harbor seal near Santa Cruz Island, California
Jim Knowlton

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As with all ventures of this magnitude and



Ron Niebrugge/wildnatureimages.com

Fishermen aboard a commercial purse seiner draw in their catch of pink salmon in Prince William Sound, Alaska.

length, it is impossible to fully and appropriately convey our thanks for all the help we got along the way. This report is just the beginning of our work, and we hope to meet you again as we set a course for a better ocean future.





Pew Oceans Commission

CONNECTING PEOPLE AND SCIENCE TO SUSTAIN MARINE LIFE

Sea otters in Monterey, California, float among kelp beds.
Frans Lanting/Minden Pictures



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*To me the sea is a continual
miracle; The fishes that swim—the
rocks—the motion of the waves—
the ships, with men in them, What
stranger miracles are there?*

WALT WHITMAN
American Poet (Miracles, 1856)

Opposite Photo: Ron Dahlquist/rondahlquist.com



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Local children celebrate the beginning of summer vacation. Americans have an obligation to provide children a bountiful ocean legacy. Our vast oceans are a national trust we must preserve for this and future generations.



