



## TEN STRESSES ON THE PLANET

# Degradation of the Oceans

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*Destructive fishing practices in combination with over fishing, toxic runoff from the land, and warming of the ocean are rapidly degrading marine ecosystems. Twenty-nine percent of all marine species caught for human consumption have collapsed.<sup>1</sup> Marine animals are killed by the millions each year as unintended by-products of industrial fishing. Excess nitrogen is causing dead zones, and coral reefs are disappearing. This degradation is often overlooked due to the vast expanse of oceanic waters.*

### **DESTRUCTIVE FISHING METHODS**

Industrial fishing has impacts on the ocean analogous to clear cutting of forests on the land. We just don't see them. The common practice of bottom trawling, where huge weighted nets are dragged across the ocean floor, is an indiscriminate fishing method that catches everything in its path and destroys structurally complex habitats. Another widely used method is surface long-lining. A boat sets a monofilament line up to 60 miles long to support vertical lines dangling at different depths. The lines hold up to 10,000 baited hooks intended to catch primarily tuna and swordfish. In fact, an estimated 40,000 sea turtles and millions of sharks are killed annually as well. Even the massive albatross, some species of which are critically endangered, is hooked on these lines as it dives for baited hooks or hooked fish.<sup>2</sup> A third technique is drift netting where almost invisible nylon nets are set, sometimes as much as 1,600 feet below the surface, and left unattended. In stormy seas they may get lost but continue to ensnare marine life. For every four pounds of fish caught, one pound of by-catch (unwanted species) is dumped overboard.<sup>3</sup>

### **OVERFISHING**

In 2000 the total wild fish catch, which grew 500 percent between 1940 and 1997, peaked despite better technology and intensified efforts by fishermen.<sup>4</sup> In some areas the catch is less than one percent of what it was before industrial fishing.<sup>5</sup> Large fish, such as tuna, halibut, and cod, have been hit particularly hard. In the last 50 years, industrial fleets have fished out 90 percent of the ocean's large fish.<sup>6</sup> The few blue marlin still in the ocean reach only one-fifth the weight they once reached.<sup>7</sup> According to the Millennium Ecosystem Assessment, fisheries cannot sustain current demand, which is projected to increase.<sup>8</sup>

As many of the world's important commercial fish populations have collapsed, fish farms have stepped in to fill the void. Farming of plant-eating fish, such as tilapia, in fresh water can be done without harm to the environment, but both salmon and shrimp farming have created problems. Off both coasts of North America, salmon are farmed in pens. Because salmon are carnivorous, millions of tons of small fish like herring, sardines, and anchovies are ground up and made into fish meal for them, hastening the collapse of fish stocks in the lower half of the food chain. It can take three pounds of fish meal to yield one pound of salmon.<sup>9</sup> Other environmental effects of coastal fish farming are the transmission of diseases to wild fish and the feces and uneaten food wastes which are dispersed into the water. A single farm of 200,000 fish can produce as much waste as a city of 62,000 people.<sup>10</sup>

Rapidly expanding shrimp farming in Southeast Asia, India, and parts of South and Central America poses one of the gravest threats to mangroves, which are often clear cut to make way for farms.<sup>11</sup> Mangroves are salt-tolerant trees and shrubs with stilt-like roots that form dense thickets along tidal shores of tropical and subtropical coastlines. These ecosystems filter water, control sediments, prevent flooding, and provide food and fiber to indigenous people. They also serve as a buffer for strong winds and waves produced by cyclones. When they are removed, the coastline is subject to rapid erosion. More than 50 percent of the world's mangroves have already been lost.<sup>12</sup>

## **POLLUTION**

Some 80 percent of pollution in the ocean is runoff from agricultural, industrial, and urban activities. One of the most serious problems in coastal waters is excess nitrogen. As humans have converted fossil fuels to our own uses like burning them for fuel and making billions of pounds of synthetic fertilizers, we have more than doubled the amount of fixed nitrogen in the biosphere.<sup>13</sup> When farmers apply synthetic fertilizer, not all of the nitrogen is used by the intended plants, and the excess flows into rivers. The emissions from power plants eventually fall to the land and waters. Other sources of nitrogen include outflows from sewage treatment plants and manure from industrial feedlots.

Excess nitrogen is one cause of dead zones in coastal waters. The Gulf of Mexico, once one of the world's most biologically prolific bodies of water, is now one of the most polluted. In addition to nitrogen, massive quantities of phosphorus and other nutrients flow down the Mississippi creating a dead zone the size of New Jersey in the Gulf. Algae, feeding on the nutrients, bloom, and when they die, the decomposing bacteria use up all the oxygen.<sup>14</sup> Some of the blooms, called "red tides" or "brown tides," also produce biological toxins. The lack of oxygen and toxins result in mass fish kills every summer.<sup>15</sup> Scientists have found 200 dead zones in the world's oceans; the largest permanent one—more than three times the size of the one in the Gulf—is in the Baltic Sea.

Pesticides, heavy metals, and industrial chemicals are also found in runoff. Ten tons of mercury flow down the Mississippi annually. The Food and Drug Administration has found pesticide residues in 73 percent of seafood samples from U.S. fishing waters. High rates of tumors in fish have been found in Quincy Bay, Massachusetts, Chesapeake Bay, and Puget Sound.<sup>16</sup> Oysters, especially vulnerable to contamination from heavy metals, are almost gone on the Atlantic coast of the US.<sup>17</sup>

Shipping is another source of pollution. Every year the Army Corps of Engineers dredges some 500 to 700 million cubic yards of material from harbors and channels and deposits them in the ocean. Some are highly contaminated with pesticides, heavy metals, PCBs, and oil. The infamous Exxon Valdez oil spill in Alaska spewed 11 million gallons (40,700 tons) of crude oil into the marine environment and killed at least 100,000 sea birds and 1000 sea otters.<sup>18</sup> Mussel beds may take 30 years to recover from the spill.<sup>19</sup> Since that time, even larger spills have occurred. The Braer ran aground on Shetland Island, UK, in 1993, losing 77,000 tons of heavy bunker oil. Millions of salmon had to be destroyed, and mussel and lobster fishing are still excluded. In 1996 the Sea Empress grounded off Wales and released almost 66,000 tons of heavy fuel oil. In 2002 the Prestige suffered damage in heavy seas off Spain and lost 57,400 tons of fuel oil.<sup>20</sup>

Cutting plastic six-pack holders so they don't ensnare wildlife is common practice in many American households, but plastic takes many forms (raw pellets used in manufacturing, fish nets

and Styrofoam are a few examples) and causes a wide range of threats to wildlife. An estimated 100,000 mammals and thousands of birds die annually from ingesting or becoming entangled in plastic. Dead birds have been found with plastic toys, bottle caps, and toothbrushes in their stomachs. Sea turtles often mistake plastic bags for jellyfish. When ingested, the bags block their stomach openings.<sup>21</sup> Over time plastic breaks down into “dust.” A Seattle oceanographer says that one pound of plastic turns into 100,000 small pieces resembling zooplankton. In an area of the western Pacific Ocean, he found six times more plastic than zooplankton. It is eaten by jellyfish, which are eaten by fish, which in turn are eaten by larger consumers. The plastic “dust” cannot be digested, thereby affecting the health of the whole food chain.<sup>22</sup>

### **WARMING AND EXCESS CARBON DIOXIDE**

In recent years a great deal of attention has been focused on coral reefs for two reasons; (1) they shelter or nourish up to 9 million species—a third of all marine life forms,<sup>23</sup> and (2) they are particularly sensitive to changes in their environment (light, temperature, salinity, and nutrients). A coral is an animal that secretes limestone for its exoskeleton and lives in colonies, forming large reefs that help protect coastlines. It lives in symbiotic relationship with a type of algae that provides it with the bulk of its food and gives a reef its golden, red, and yellow hues.

According to the Millennium Ecosystem Assessment, 20 percent of coral reefs have been destroyed and another 20 percent degraded.<sup>24</sup> One of the causes of this die-off is sediment and pollution runoff from cleared land.<sup>25</sup> However the 2005 *Status of the Coral Reefs of the World* warns that global warming is the single greatest threat to corals.<sup>26</sup> When the temperature of the water heats up, the corals become stressed and spit out the algae in a phenomenon called “bleaching.” The corals become weak and quit reproducing.<sup>27</sup> Sometimes they bounce back, but if the stress is repeated or is too great, as in the El Niño of 1997, they die.<sup>28</sup>

Oceans absorb about a third of the carbon emitted by humans, raising the acid level of the sea. The current rate of carbon input is 50 times higher than normal, and in less than 100 years the pH of the oceans could drop from 8.2 to 7.7, marking a huge change in ocean chemistry. The acid causes the shells and skeletons of marine organisms, such as corals, clams, and plankton, to dissolve. When smaller creatures disappear, the salmon, cod, and baleen whales that feed on them also will be threatened.<sup>29</sup>

Many of the plants, animals, and microbes around and inside the reefs may vanish before they are even identified, similar to the extinction of species in rain forests.<sup>30</sup> Ken Caldeira of the Carnegie Institution’s global ecology department says that coral reefs could disappear within two decades along with hundreds of other species.<sup>31</sup> Some scientists say the consequences could be even greater than for extinctions on land because of the enormous biological wealth and diversity in the oceans. The oceans contain many more major groups of animals that have undergone separate evolution for hundreds of millions of years.<sup>32</sup>

### **WHAT IS BEING DONE?**

Two promising methods of restoring fisheries and protecting threatened species are gaining favor: individual transferable quotas and marine protected areas. For example, in Alaska, sablefish and halibut are regulated by individual fishing quotas. Each fishing boat gets a permit for a share of the total allowable catch. When this system was introduced in the Gulf of Mexico, unintentional by-

catch dropped by 80 percent, and red snapper began coming back because fishermen were no longer in a race to catch as many fish as possible.<sup>33</sup>

Marine sanctuaries restrict certain activities within a specified area so that wildlife populations have a chance to recover. Most of the 13 sanctuaries in the US, administered by the National Oceanic and Atmospheric Administration, are small, but in 2006 President Bush designated a 140,000-square-mile area around the northern Hawaiian Islands as a national monument. Fishing in that area will be phased out within five years.<sup>34</sup> In 2007, local management commissions have designated preserves along the coasts of California and the South Atlantic between North Carolina and Florida.

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<sup>1</sup> "Troubled Seas," *New York Times*, 11/14/06

<sup>2</sup> Youth, Howard, "The Plight of Birds," *WorldWatch*, May/June 2002

<sup>3</sup> Whitty, Julia, "The Fate of the Ocean," *Mother Jones*, March/April 2006

<sup>4</sup> Whitty, Julia, *ibid.*

<sup>5</sup> *Guardian Weekly*, April 2005

<sup>6</sup> "Watching What We Eat," *WorldWatch*, July/August 2004

<sup>7</sup> Whitty, Julia, *ibid.*

<sup>8</sup> [news.bbc.co.uk](http://news.bbc.co.uk), 2005

<sup>9</sup> Swing, John Temple, "What Future for the Oceans," *Foreign Affairs*, September/October 2003 and Pauly, Daniel & Watson, Reg, "Counting the Last Fish," *Scientific American*, July 2003

<sup>10</sup> Gies, Erika, "Sustainable Seafood," *E Magazine*, November/December 2005

<sup>11</sup> Quarto, Alfredo, "The Mangrove Forest," 1997

<sup>12</sup> <http://en.wikipedia.org/wiki/mangrove>, 2006

<sup>13</sup> Lubchenco, Jane, *Science*, January 1998

<sup>14</sup> Whitty, Julia, *ibid.*

<sup>15</sup> Vitousek, et al, *Science*, July 1997

<sup>16</sup> *Ebb Tide for Pollution*, Natural Resources Defense Council

<sup>17</sup> Franklin, Bruce, "Net Losses," *Mother Jones*, March/April 2006

<sup>18</sup> [www.itopf.com/casehistories.html](http://www.itopf.com/casehistories.html), September 2004 and *Ebb Tide for Pollution*, *ibid.*

<sup>19</sup> [http://en.wikipedia.org/wiki/Exxon\\_Valdez\\_oil\\_spill](http://en.wikipedia.org/wiki/Exxon_Valdez_oil_spill)

<sup>20</sup> [www.itopf.com/casehistories.html](http://www.itopf.com/casehistories.html), *ibid.*

<sup>21</sup> *Ebb Tide for Pollution*, *ibid.*

<sup>22</sup> "Plastic in the Plankton," [www.acfnewsresource.org/environment/plastic\\_plankton.html](http://www.acfnewsresource.org/environment/plastic_plankton.html), 7/10/03

<sup>23</sup> Stone, Richard, "A World without Corals?" *Science*, May 4, 2007

<sup>24</sup> *Guardian Weekly*, *ibid.*

<sup>25</sup> Diamond, Jared, *Collapse*, 2005

<sup>26</sup> Whitty, Julia, *ibid.*

<sup>27</sup> "Coral Reefs and Your Coastal Watershed," EPA, 2006

<sup>28</sup> Woodard, Colin, "Warming Up the Seas," *E Magazine*, July/August 2005

<sup>29</sup> Leake, Jonathan, "Acid Seas Kill Coral Reefs," *Sunday Times* (London), 2/26/06

<sup>30</sup> Raeburn, Paul, *The Associated Press*, 2/21/94

<sup>31</sup> Leake, Jonathan, *ibid.*

<sup>32</sup> Raeburn, Paul, *ibid.*

<sup>33</sup> Environmental Defense, "Novel Plan Revives Embattled Fish Species," *Solutions*, January 2008

<sup>34</sup> Owen, James, "Hawaiian Islands Named World's Largest Marine Sanctuary," *National Geographic Online*, <http://news.nationalgeographic.com/news/2006/06/060615-bush-hawaiian.html>, 6/15/06