WILDLIFE AND OFFSHORE DRILLING

The 2010 Gulf of Mexico Disaster: Coral Reefs

FLORIDA'S BARRIER REEF COURTESY NOAA; OIL RIG © U.S. COAST GUARD

One of nature's most spectacular creations, coral reefs are also among the most complex, diverse and economically valuable ecosystems in the world. They account for only one-tenth of one percent of the world's surface area, yet they harbor at least 5 percent of its known species and 25 percent of all marine species–leading some to call them the rainforests of the sea. Sadly, coral reefs face myriad threats, including oil spreading across the Gulf of Mexico from the BP Deepwater Horizon disaster.

CORAL REEFS IN THE GULF OF MEXICO

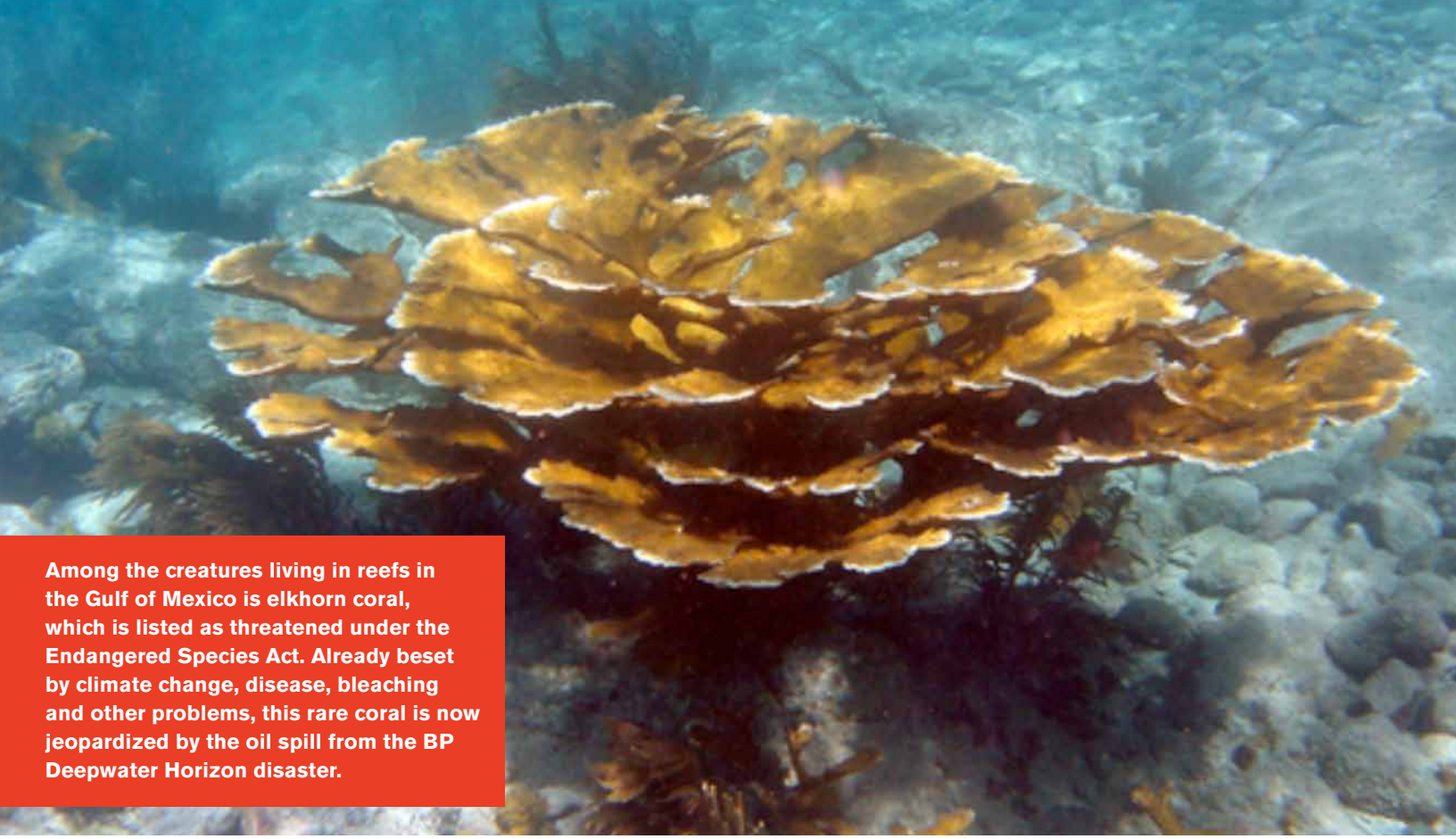
Corals are distinctive for the symbiotic relationship between a tiny animal and an even tinier alga. The coral itself is a primitive animal related to jellyfish, consisting mostly of a stomach topped with tentacles that they use to sting and eat floating plankton. Inside its body, the coral harbors algae that help nourish the creature. Corals usually live in large colonies, and build hard skeletons of calcium carbonate around themselves that can extend hundreds of miles long. These coral reefs offer both food and shelter to other aquatic organisms, enabling the reef ecosystem to pull itself up by its proverbial bootstraps and create a marine oasis.

The Gulf of Mexico is a semienclosed sea with warm, nutrient-rich waters. In the northern Gulf of Mexico, coral reefs occur along the mid- to outer-edge of the continental shelf off the Big Bend area of Florida, and especially at the shelf break off Texas and Louisiana—an area that includes the well-known Flower Gardens. Extensive areas of scattered banks and individual coral heads also occur in very shallow shelf regions around south and central Florida.

Flower Garden Banks of Texas

Beneath indigo blue waters approximately 100 miles southeast of Galveston, Texas, lie the East and West Flower Garden Banks—the northernmost coral reefs on the continental shelf of North America. Consisting of two separate reefs 12 miles apart, these submarine banks rise from depths of 328 feet and crest in water 60 feet deep. They were designated as the Flower Garden Banks National Marine Sanctuary in 1992.

The Flower Gardens are topped by an assemblage of 28 species of reef-building corals and associated organisms. Dominant species include boulder star coral, symmetrical brain coral, mustard hill coral and the great star coral. A wide array of other marine life—including rays, sharks, sea turtles



Among the creatures living in reefs in the Gulf of Mexico is elkhorn coral, which is listed as threatened under the Endangered Species Act. Already beset by climate change, disease, bleaching and other problems, this rare coral is now jeopardized by the oil spill from the BP Deepwater Horizon disaster.

and marine mammals—also frequent the shallow, warm waters here. More than 170 species of fish and approximately 300 species of reef invertebrates inhabit these banks. Colorful corals and a diversity of marine life associated with them are unique for this latitude, so far north from where most coral reefs occur. The Flower Garden Banks are among the least disturbed coral reefs anywhere in the Caribbean and western Atlantic.

Within a radius of about three miles of this sanctuary, there are currently 10 oil production platforms with approximately 100 miles of pipeline. Within the boundary of the East Flower Garden Banks, there is a gas production platform.

Coral reefs of Florida

There are three main areas of coral reefs and banks in Florida: the Florida Keys; the southeastern coast from northern Monroe County to Palm Beach County; and the Florida Middle Grounds in the eastern Gulf of Mexico, south of Apalachicola and northwest of Tarpon Springs. In addition, there are many coral habitats scattered along Florida's west coast shelf. New coral communities are still being discovered, such as those documented along Pulley Ridge in 150-200 feet of water off Florida Bay.

Arching southwest almost 230 miles from south of Miami to the Dry Tortugas, the reef tract of the Florida Keys is the third-longest barrier reef in the world. Most of the reef tract lies inside the 3,700 square miles of Florida Keys National Marine Sanctuary. Dominant corals here include the great star coral, massive starlet coral, fire corals, mustard hill coral, finger coral and lettuce coral.

Coral reef ecosystems in Florida are extremely diverse, supporting a total of more than 6,000 species—including 520 types of fish; 128 varieties of starfish, sea urchins, sand dollars and sea cucumbers; 55 species of soft corals; and 63 species of stony corals. These are the nation's only coral reefs adjacent to the continent, and they also shelter one of the largest sea grass communities in this hemisphere.

Reefs are important to the economy, with reef-related tourism in the United States generating $17.5 billion each year. In just a four-county area of south Florida, natural reefs are estimated to be worth $7.6 billion. This capital value generates $228 million in economic dividends each year, including a reef-related catch of commercial fish ranging from $22 million to $32 million, $35 million to $52 million in local sales related to ecotourism and income of $22 million to $33 million to local residents; and reefs support as many as 2,300 local jobs.

Endangered corals

Branching species like elkhorn and staghorn corals are now highly imperiled. Elkhorn coral populations have declined at least 90 percent since 1980. Threats to these corals include disease, coral bleaching, predation, climate change, storm damage and human activity from boating, pollution and sedimentation. Both of these corals were listed as threatened under the Endangered Species Act in 2006. Pillar coral is listed as endangered by the state of Florida.

IMPACTS OF OIL

Direct exposure from oil smothers corals, killing reefs. Intertidal corals are the most vulnerable, since oil on the surface of the water falls directly onto the reef at low tide. Branching corals also are more susceptible to damage from oil than are the larger plate-like corals. All corals are vulnerable, however, because oil can mix with sediment or thin out from sun exposure and then sink to the top of the reef. A 2-million gallon oil spill on the Caribbean coast of Panama in 1986 led to chronic oil exposure that reduced by up to 95 percent the numbers of corals, total coral cover and species diversity for years afterward.

Spilled oil must be prevented from reaching coral reefs. Flexible booms can be used to isolate oil floating on the surface, preventing it from spreading, while skimmers collect it. This technique is effective, however, only if the oil is on the water surface and only in fair weather. A particular concern with the BP Deepwater Horizon spill is the unknown size and trajectories of oil plumes beneath the ocean surface.

Indirect effects

Harm to corals from oil can be substantial. Coral tissue can swell from oil exposure, lead to copious mucous production and prompt a bacterial infection. Oiling can also impair the reproduction of corals by harming adults, decreasing the viability of larvae or polluting the reef flats upon which the larvae settle to mature.

Researchers have found that oil dispersants are more toxic to coral than the oil itself. In a study in the Red Sea, all Indo-Pacific branching coral samples were killed by dispersants applied in concentrations recommended by the manufacturers. As a result, the use of oil dispersants is not recommended anywhere near reefs.

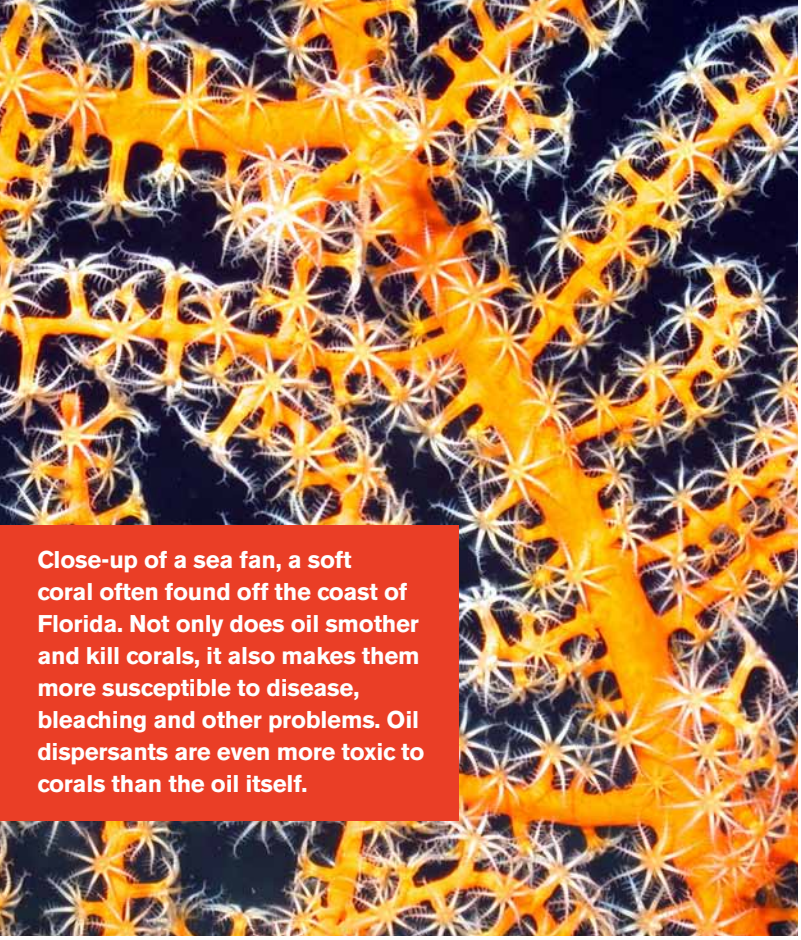
Pollution associated with oil spills also makes coral more susceptible to bleaching. Bleaching—the loss of coral's symbiotic algae—has occurred in reefs worldwide because of warmer water temperatures, hazardous material spills, boating accidents and other environmental stresses. Bleaching can kill corals, and those that are able to survive have impaired reproduction, slowed growth and reduced healing capability.

Impacts of oil spills combined with climate change and other threats

Mounting evidence suggests that climate change exacerbates disease threats to corals. Other important effects from climate change include more high-temperature anomalies, changes in wind patterns, increases in extreme weather events and ocean acidification. Corals have a fairly narrow water-temperature tolerance. High temperatures stress coral and lead to bleaching. High water temperatures also directly benefit disease organisms like bacteria that attack corals. Furthermore, higher temperatures allow these bacteria to thrive in more acidic conditions, which overcome the coral's main defense mechanism, an outer protective coating. Indeed, both factors may work to reinforce the damage, with warm temperatures both stressing the coral and exacerbating disease.

COURTESY G.P. SCHMAHL/FLOWER GARDEN BANKS NATIONAL MARINE SANCTUARY

Coral reefs are known as the rainforests of the sea because they support such a rich diversity of life. Here a red night shrimp perches on the reef in Flower Garden Banks National Marine Sanctuary. This unique reef is located about 100 miles southeast of Galveston–perilously close to the source of the Gulf oil spill.



Close-up of a sea fan, a soft coral often found off the coast of Florida. Not only does oil smother and kill corals, it also makes them more susceptible to disease, bleaching and other problems. Oil dispersants are even more toxic to corals than the oil itself.

COURTESY FGBNMS/NATIONAL UNDERSEA RESEARCH CENTER AT THE UNIVERSITY OF NORTH CAROLINA WILMINGTON

WHAT CITIZENS CAN DO

- When boating and diving around coral reefs, keep boats, anchors, anchor lines and diving equipment away from vulnerable sites to eliminate the risk of entangling and breaking corals.
- Select safe and biodegradable household cleaners, lawn, and garden fertilizers, and reduce water use in coastal areas near corals to limit water run-off that can harm corals.
- Purchase only corals and live reef species that have been certified as sustainably and humanely acquired, whether from the wild or from mariculture businesses.
- Adopt sustainable recreational fishing practices that don't deplete unique reef fish communities.
- Urge your elected officials to pass comprehensive climate change legislation that addresses the impacts of global warming on wildlife and our natural resources.

WHAT POLICY MAKERS CAN DO

- Ensure that BP funds long-term research necessary for documenting impacts to coral reefs in all areas affected by the spill, including mitigation for the long-term damage caused to corals from nonlethal exposure.
- Support coastal management practices that minimize the harmful effects of beach renourishment, channel deepening and channel maintenance.
- Advocate shipping practices that eliminate hull fouling and release of ballast water that introduces harmful, non-native species to reef ecosystems.
- Impose greater safety and environmental standards and develop comprehensive spill response plans on existing offshore drilling operations.
- Prevent expanded drilling operations off the coast to limit future spill risks.
- Enact comprehensive energy and climate change policies to transition away from harmful oil and fossil fuels.

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DEFENDERS OF WILDLIFE
1130 17th Street, N.W.
Washington, D.C. 20036
202.682.9400
www.defenders.org

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