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Gulf of Mexico Oil Blowout Increases Risks to Globally Threatened Species

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Fourteen marine species in the Gulf of Mexico are protected by the US Endangered Species Act, the Marine Mammal Protection Act, and the Migratory Bird Treaty Act. As the British Petroleum oil spill recovery and remediation proceed, species internationally recognized as having an elevated risk of extinction should also receive priority for protection and restoration efforts, whether or not they have specific legal protection. Forty additional marine species—unprotected by any federal laws—occur in the Gulf and are listed as threatened on the International Union for Conservation of Nature's (IUCN) Red List. The Red List assessment process scientifically evaluates species' global status and is therefore a key mechanism for transboundary impact assessments and for coordinating international conservation action. Environmental impact assessments conducted for future offshore oil and gas development should incorporate available data on globally threatened species, including species on the IUCN Red List. This consideration is particularly important because US Natural Resource Damage Assessments may not account for injury to highly migratory, globally threatened species.

Keywords: IUCN Red List, Gulf of Mexico, oil spill, threatened species

A primary concern following the British Petroleum Deepwater Horizon oil well blowout and the resulting oil pollution in the Gulf of Mexico is the damage to marine plants and animals—especially to those already considered vulnerable. Several US federal and state statutes protect coastal and marine species of special concern found in the Gulf of Mexico, including 14 marine species protected by the US Endangered Species Act (ESA), the Marine Mammal Protection Act, and the Migratory Bird Treaty Act. Additionally, species protected by Mexican and Cuban laws must be considered.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN 2010) results from a rigorous scientific process to assess the relative extinction risks of species globally, using widely accepted standards (Mace et al. 2008, Hoffmann et al. 2010). As such, the IUCN Red List categories and criteria are the most respected international system for classifying global extinction risk at the species level (De Grammont and Cuarón 2006, Rodrigues et al. 2006, Carpenter et al. 2008, Mace et al. 2008, Schipper et al. 2008). In addition to the 14 species protected by US law, the IUCN Red List identifies a further 39 species in the Gulf (table 1) as belonging to one of three threatened categories: critically endangered, endangered, or vulnerable (IUCN 2001). All species in Red List threatened

categories have an elevated risk of extinction, and we argue they should receive priority for protection and restoration efforts in the Gulf, whether or not they have specific legal protection from any government entity in the region. The Gulf oil blowout is likely to worsen the threat status of some of these species as more of the spill's impacts manifest.

United States law requires restoration to prevent conditions of natural resources damaged by the oil pollution, and restoration is overseen by NOAA's (the National Oceanic and Atmospheric Administration) Natural Resource Damage Assessment (NRDA; NOAA 2010a). The primary legal authority for assessing damages and providing for recovery of coastal and marine species is the Oil Pollution Act, which is implemented by the NRDA. Under the Damage Assessment Remediation and Restoration Program, NRDA trustees determine whether injury to public trust resources has occurred, as well as the type, amount, and methods of restoration needed.

According to the most recent revision of the Mexican list of threatened and protected species (NOM 2002, 2006), all marine mammals and marine turtles are accorded some degree of protection status in Mexico (e.g., classified as in danger of extinction, as threatened, or under special protection). Other than mammals and turtles, only three species are protected in Mexico: subspecies of two seabirds present in

Table 1. Marine species in International Union for Conservation of Nature threatened Red List categories (critically endangered, endangered, or vulnerable) that have a distribution directly overlapping the area of the oil spill, or that are found in the greater Gulf region extending from Texas to Miami, Florida.

Red List category species name	Common name	Protection status	Red List category species name	Common name	Protection status
Critically endangered			Vulnerable (continued)		
<i>Lepidochelys kempii</i>	Kemp's ridley turtle	ESA-E	<i>Epinephelus flavolimbatus</i>	Yellowedge grouper	
<i>Eretmochelys imbricata</i>	Hawksbill turtle	ESA-E	<i>Epinephelus niveatus</i>	Snowy grouper	
<i>Dermochelys coriacea</i>	Leatherback turtle	ESA-E	<i>Mycteroperca interstitialis</i>	Yellowmouth grouper	
<i>Thunnus thynnus</i>	Atlantic bluefin tuna, western stock		<i>Lachnolaimus maximus</i>	Hogfish	
<i>Epinephelus drummondhayi</i>	Speckled hind		<i>Alopias superciliosus</i>	Bigeye thresher shark	
<i>Epinephelus itajara</i>	Atlantic goliath grouper		<i>Alopias vulpinus</i>	Common thresher shark	
<i>Epinephelus nigritus</i>	Warsaw grouper		<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	
<i>Pristis pectinata</i>	Smalltooth sawfish	ESA-E	<i>Carcharhinus obscurus</i>	Dusky shark	
<i>Pristis perotteti</i>	Largetooth sawfish		<i>Carcharhinus plumbeus</i>	Sandbar shark	
<i>Narcine bancroftii</i>	Lesser electric ray		<i>Carcharhinus signatus</i>	Night shark	
<i>Acropora cervicornis</i>	Staghorn coral	ESA-T	<i>Centrophorus granulosus</i>	Gulper shark	
<i>Acropora palmate</i>	Elkhorn coral	ESA-T	<i>Cetorhinus maximus</i>	Basking shark	
Endangered			<i>Carcharodon carcharias</i>	Great white shark	
<i>Balaenoptera borealis</i>	Serving whale	ESA-E, MMPA	<i>Isurus oxyrinchus</i>	Shortfin mako	
<i>Balaenoptera musculus</i>	Blue whale	ESA-E, MMPA	<i>Isurus paucus</i>	Longfin mako	
<i>Balaenoptera physalus</i>	Finback whale	ESA-E, MMPA	<i>Carcharias taurus</i>	Sand tiger shark	
<i>Pterodroma caribbaea</i>	Jamaica petrel		<i>Odontaspis ferox</i>	Small-tooth sand tiger shark	
<i>Pterodroma hasitata</i>	Black-capped petrel	MBTA	<i>Rhincodon typus</i>	Whale shark	
<i>Caretta caretta</i>	Loggerhead turtle	ESA-T	<i>Sphyrna zygaena</i>	Smooth hammerhead	
<i>Chelonia mydas</i>	Green turtle	ESA-E, ESA-T (by range)	<i>Squalus acanthias</i>	Spiny dogfish	
<i>Sphyrna lewini</i>	Scalloped hammerhead shark		<i>Gymnura altavela</i>	Butterfly ray	
<i>Sphyrna mokarran</i>	Great hammerhead shark		<i>Agaricia lamarcki</i>	Lamarck's sheet coral	
<i>Montastraea annularis</i>	Boulder star coral		<i>Montastraea franksi</i>	Montastraea coral	
<i>Montastraea faveolata</i>	Mountainous star coral		<i>Dendrogyra cylindrus</i>	Pillar coral	
Vulnerable			<i>Dichocoenia stokesii</i>	Elliptical star coral	
<i>Trichechus manatus</i>	Manatee	ESA-E, MMPA	<i>Mycetophyllia ferox</i>	Rough cactus coral	
<i>Physeter macrocephalus</i>	Sperm whale	ESA-E, MMPA	<i>Oculina varicose</i>	Large ivory coral	
			<i>Halophila baillonii</i>	Clover seagrass	

ESA-E, endangered under the Endangered Species Act (ESA); ESA-T, threatened under the ESA; MBTA, listed on the Migratory Bird Treaty Act; MMPA, listed on the Marine Mammal Protection Act.

Source: IUCN 2010. See the supplementary table online at [dx.doi.org/10.1525/bio.2011.61.5.8](https://doi.org/10.1525/bio.2011.61.5.8).

the Gulf of Mexico (*Pelecanus occidentalis* and *Oceanodroma leucorhoa*) and the smalltooth sawfish (*Pristis pectinata*). No species-level protection occurs in Cuba comparable to the US ESA, but there are laws protecting biodiversity (e.g., Ley No. 81 Del Medio Ambiente; Ministerio De Ciencia, Tecnologia Y Medio Ambiente Resolucion No. 111/96).

The Gulf of Mexico has exceptionally high marine biodiversity, with 15,419 recorded species, of which 10% (1511) are endemic (Felder and Camp 2009). This diversity is partly attributable to the Gulf's geographic position within the transition zone between temperate and tropical waters. Some threatened species in the Gulf (e.g., whale shark, *Rhincodon typus*; loggerhead turtle, *Caretta caretta*) occur globally but

have significant populations, spawning aggregations, or nesting sites in the Gulf region. Therefore, greater threats in this region may have implications for the species' global survival. Other species (e.g., Kemp's ridley turtle, *Lepidochelys kempii*; the western Atlantic population of bluefin tuna, *Thunnus thynnus*) breed only in the Gulf, and oil spill damage exacerbates previously existing threats to these species.

IUCN Red List assessments are being expanded to evaluate more marine species (<http://sci.edu.edu/gmsa/>), including some in the Gulf of Mexico. The IUCN has assessed 322 species in the Gulf of Mexico to date, 53 of which are in threatened categories (table 1); an additional 29 are listed as near threatened (see the supplementary table online

at [dx.doi.org/10.1525/bio.2011.61.5.8](https://doi.org/10.1525/bio.2011.61.5.8)). The IUCN assessments include all Gulf marine mammals (5 of 28 species threatened), sea turtles (all 5 species threatened), seagrasses (2 of 9 threatened or near threatened), mangroves (0 of 6 threatened), reef-building corals (11 of 60 threatened or near threatened), wrasses (1 of 20 threatened), sharks and rays (43 of 131 threatened or near threatened), seabirds (3 of 40 threatened or near threatened), and groupers (11 of 22 threatened or near threatened). Groupers are of particular concern; three species are classified as critically endangered on the Red List and the Atlantic goliath grouper (*Epinephelus itajara*) is listed as near extinction.

An oil spill of this magnitude threatens many species already listed under IUCN threatened categories—more species than are currently protected by the ESA. In 1996, the IUCN assessed the western stock of the Atlantic bluefin tuna as critically endangered, and the Convention on Biological Diversity recently petitioned the US Department of Commerce to protect the species under the ESA (CBD 2010). There are two spawning populations of bluefin tuna, one in the Gulf of Mexico and the other in the Mediterranean Sea. Although there is extensive mixing of the populations on both sides of the Atlantic, particularly on the feeding grounds off the eastern coast of North America, individuals hatched in the Gulf of Mexico return there to spawn (spawning site fidelity). Peak spawning in the Gulf occurs from mid-April to June, unfortunately during the period of the British Petroleum oil spill in 2010. Like tuna, many other species in threatened Red List categories—that are not protected by the ESA—require protection and remediation from the oil spill.

Seagrasses are a unique group of 72 undersea flowering plants found in coastal seas globally. In the Gulf of Mexico, there are nine seagrass species, and these plants provide crucial structural habitat and nursery grounds for many recreationally and commercially important fish and invertebrates (including Gulf pink shrimp and brown shrimp), as well as waterfowl. Some seagrasses, as indicated by their common names (e.g., turtle grass and manatee grass) are the primary food for already threatened species of sea turtles and manatees. The seagrass habitat, and the proliferation of the species it supports, may be at risk as a result of the oil spill; three diminutive seagrass species of the genus *Halophila* are most threatened. *Halophila baillonii* is listed as vulnerable and *Halophila engelmanni* is listed as near threatened on the Red List (Short et al. 2011), and *Halophila johnsonii* is listed on the ESA. The limited global distributions of these species, restricted primarily to Gulf and Florida waters in the cases of *H. engelmanni* and *H. johnsonii*, mean their risk of global extinction could be elevated by the oil spill. *Halophila baillonii*, already rapidly declining in the Caribbean, is the fourth most threatened seagrass species in the world. Potential damages to these seagrasses from the oil pollution in the Gulf should be assessed, and recovery actions for these species should be aided by funding available from the Oil Pollution Act and other sources.

The whale shark is listed as vulnerable on the IUCN Red List but is not protected by the ESA. Found worldwide in tropical and warm temperate waters, many individuals aggregate in the Gulf of Mexico in the summer months. The whale shark is the largest fish in the world; it feeds almost entirely on plankton, crustaceans, and small fishes. It is one of only three filter-feeding species of shark, sieving zooplankton as small as 1 millimeter in diameter through the fine mesh of its gill rakers. The shark's feeding behavior puts it at high risk from the oil itself and the oil dispersants used in the Gulf. Although relatively little is known about the biology of the whale shark, populations will probably be slow to recover from disturbances given the species' estimated long life span, slow reproductive rate (Pauly 2002), and naturally low abundance outside of mating aggregations.

The Kemp's ridley sea turtle is listed as critically endangered on the Red List and is also protected by the ESA. This turtle nests exclusively in the Gulf and is the rarest sea turtle in the world. Of the threatened marine species that frequent the Gulf, only the Kemp's ridley depends on Gulf shores for nesting, and most of its young develop in Gulf waters. Although it appears that the 2010 hatchlings did not encounter the spill directly, the timing of the oil spill could not have been worse for this species, clashing as it did with the turtles' key reproductive period. The vast majority of sea turtles found dead since the spill were Kemp's ridleys (NOAA 2010b). The Kemp's ridley was just on the road to recovery after a population collapse a few decades ago that drove it near extinction; the species now faces a new environmental hurdle.

The West Indian manatee (*Trichechus manatus*) is listed as vulnerable by the IUCN and is considered endangered under US law. Manatees are found in the Gulf and around the coastline of Florida, in the range of the oil spill. Manatees may be affected by air quality and oil at the surface, which they encounter as they emerge to breathe; oil irritating their skin and eyes; the consumption of seagrass species—their primary food—that are covered in oil; and chemical oil dispersants that may also have a toxic effect. The Florida manatee (*Trichechus manatus latirostris*), a subspecies of the West Indian manatee, is additionally threatened by loss of habitat, entanglement with fishing gear, and increased boating activity, as well as extreme cold temperatures that killed 10% of the population during the winter of 2009–2010. The Florida manatee subspecies was listed as endangered in 2008 by the IUCN.

The trends in species declines are clearly worrying, particularly because the Gulf was already a system affected by various risk factors before the oil blowout occurred. How can we adequately address the threats of oil and gas development and steward the Gulf's biological diversity? Priorities at this stage must focus on species with high commercial value, species critical to the integrity of coastal and marine ecosystems in the Gulf, species with populations in decline before the blowout, and species now recognized as in greater danger of extinction. Because marine species in particular

may be underrepresented by the ESA (Wilcove and Master 2005), the ongoing NRDA in the Gulf of Mexico—as well as environmental impact assessments conducted for offshore oil and gas development—should include available data on globally threatened species, including the expanding species data sets on the IUCN Red List. Species information on the Red List can serve as a standardized mechanism to identify and coordinate conservation and mitigation priorities, especially for highly migratory and transboundary species. The US Department of the Interior must reevaluate the “low risk” status currently attributed to pollution from routine operations of oil and gas development, as well the potential impacts of catastrophic events such as oil spills, in its compliance with the National Environmental Policy Act, the ESA, and other applicable domestic and international laws.

Species identified as threatened with extinction on the IUCN Red List may become even more threatened as a result of the oil spill. Such elevations in threatened status are part of the spill's impacts and as such are damages that must be recognized and compensated. The six threatened grouper species on the Red List that occur in the Gulf, for example, currently receive no protection under the ESA or Mexican law, despite their status as a major food resource in the region and a high-value restaurant menu item.

Gulf-occurring animals and plants protected by the ESA (and other US laws) should be priorities for federal damage assessments; as such, these laws should help restore the natural resources injured by the release of oil or hazardous substances. Although the methodology of assessment and the names of threatened categories may differ among laws, assessments, and criteria, the IUCN Red List is a highly credible source of species requiring particular attention—both for damage assessment and for special consideration for future regulations of oil and gas development. As a result of the rapid increase in IUCN assessments during the last few years, we now know there are many threatened marine species in the Gulf that are not currently protected by US law (table 1). Threatened species not yet listed in national legislation should nevertheless be the subject of damage assessments, targeted research, and monitoring, as well as recovery efforts when needed.

Although understanding has improved of the medium- and long-term impacts from oil pollution on animal and plant physiologies, there is still much we do not know. Globally, countries must improve risk assessments of offshore oil and gas development, and seek to expand and regularize damage and impact assessments, domestically and internationally. These impacts must be systematically considered to establish priorities for research and monitoring that will best ensure effective species and system recovery. Although the research agenda should focus on the United States' immediate needs, its development should also support similar efforts in other regions of the world in identifying species of priority concern. The IUCN Red List is continually improved and revised under strict standards and criteria, and its value in assessing the global conservation status of biological diversity steadily expands.

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