February 3, 2011

BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT
Via www.regulations.gov and *Federal Express*

Department of the Interior
Bureau of Ocean Energy Management, Regulation and Enforcement
Attention: Regulations and Standards Branch (RSB)
381 Elden Street, MS-4024
Herndon, Virginia 20170-4817.

Re: Shell Offshore Inc.
Supplemental Exploration Plan S-7445
Lease OCS-G 7493 (GB 427)

This letter provides comments by the Natural Resources Defense Council, the Center for Biological Diversity, Defenders of Wildlife, the Southern Environmental Law Center, the Gulf Restoration Network and the Sierra Club on whether the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) should proceed by way of an Environmental Assessment (EA) to permit the Shell Offshore, Inc. Supplemental Exploration Plan referenced above. We believe that a full Environmental Impact Statement is required for this project, and that use of an EA violates NEPA. The Supplemental Exploration Plan also violates the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), the Outer Continental Shelf Lands Act (OCSLA), Oil Pollution Act of 1990 (OPA), and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for reasons we will discuss below.

The Proposed Project

Shell Offshore Inc. (Shell) proposes to drill up to three exploratory wells in roughly 2,700 feet of water, approximately 137 miles off the coast of Louisiana. Shell's estimate of the worst case blowout scenario for one of these wells is 12.3 million barrels, around 2 ½ times the size of the BP Deepwater Horizon spill. Shell estimates that it will take 109 days to drill a successful relief well, and relies on the multi-party Marine Well Control System apparatus which, as of this writing, is still in the design stage.

Several threatened and endangered species occur in the project area, including sea turtles and sperm whales, and are likely to be directly and adversely affected by drilling activities generally, and potentially catastrophically affected by a major oil spill. Additionally, there are deepwater benthic communities in the vicinity of the proposed exploratory drilling that are likely to be impacted by Shell's proposed activities. More detail on these species and the project's likely effects are provided below.

The Report of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling

The final report of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (the Commission) was released on January 11, 2011. The Commission reached numerous conclusions and recommendations regarding exploration and drilling in the Gulf of Mexico, including:

- Deepwater energy exploration and production, particularly at the frontiers of experience, involve risks for which neither industry nor government has been adequately prepared, but for which they can and must be prepared in the future.

- To assure human safety and environmental protection, regulatory oversight of leasing, energy exploration, and production require reforms even beyond those significant reforms already initiated since the Deepwater Horizon disaster. Fundamental reform will be needed in both the structure of regulatory oversight and related internal decisionmaking processes to ensure political autonomy, technical expertise, and full consideration of environmental protection concerns.

- Because regulatory oversight alone will not be sufficient to ensure adequate safety, the oil and gas industry will need to take its own, unilateral steps to increase safety throughout the industry, including self-policing mechanisms that supplement governmental enforcement.

- The technology, laws and regulations, and practices for containing, responding to, and cleaning up spills lag behind the real world risks associated with deepwater drilling into large, high-pressure reservoirs of oil and gas located far offshore and thousands of feet below the ocean's surface. Government must close the existing gap and industry must support rather than resist that effort.

- Scientific understanding of environmental conditions in sensitive environments in deep Gulf waters, along the region's coastal habitats, and in other areas proposed for drilling, such as the Arctic, is inadequate. The same is true of the human and natural impacts of oil spills.

The Commission also made a number of recommendations about reorganization of the former Minerals Management Service, including this one:

> The leasing and environmental science office would include two distinct divisions: a leasing and resource evaluation division and an environmental science division. To provide an important and equitable voice for environmental concerns during the five-year planning process and lease awards, the environmental science division would be structured with a separate line of reporting to the Assistant Secretary overseeing offshore drilling and the environmental science division would be led by a Chief Scientist. The Chief Scientist's responsibilities would include, but not be limited to, conducting all NEPA reviews and coordinating other environmental reviews when appropriate and administering the Environmental Studies Program. The Chief Scientist's expert judgment on environmental protection concerns would be accorded significant weight in the leasing decision-making process, including on questions concerning whether and where leasing should occur and what environmental protection and mitigation conditions should be placed on leases that are issued. The new organization and process would also include enhanced review of environmental decisions and enforcement by the safety authority. It should track all mitigation efforts from NEPA documents and other environmental reviews to assist the new safety authority in its environmental enforcement duties.

Neither this recommendation, nor any of the Commission's other findings, has been adopted by the Department of the Interior or by BOEMRE. Accordingly, the fundamental reforms found necessary and the scientific oversight contemplated by the Commission have not been applied to the Shell project. Nor is there any indication that Shell or BOEMRE have consulted with NOAA or the U.S. Fish and Wildlife Service, as required under the MMPA, ESA and Magnuson-Stevens Fishery Conservation and Management Act.

The Impacts of Drilling On the OCS

Oil and gas activities produce a variety of negative impacts or have the potential to produce negative impacts to marine and coastal ecosystems and species. As we have seen in the aftermath of the BP blowout, these activities can have catastrophic consequences. These impacts are detailed in the attached report "Environmental impacts of offshore oil and gas exploration and development," which is incorporated here by reference. [1]

Oil Spills

As we are still witnessing in the Gulf of Mexico, the impacts of offshore drilling pose the risk of oil spills ruining the country's coastal and ocean resources – beaches and rich ocean waters that belong to the public – and threatening the jobs, health, and recreation of people who live, work, and vacation along the coasts.

Oil spills quickly travel vast distances. Even before the Gulf disaster, estimates showed that a spill in the eastern Gulf of Mexico that got into the Gulf's Loop Current could travel around the Florida Keys to wreak havoc on

1 The studies cited in this document will be provided to BOEMRE on a CD.

estuaries and beaches from the Everglades to Cape Canaveral. Contamination from the massive 1989 *Exxon Valdez* oil spill reached shorelines nearly 600 miles away. Such a spill occurring on the East Coast of the United States could extend from North Carolina to Massachusetts.

Spilled oil can have a dramatic effect on marine mammals and other species. The effects of an oil spill can last for many years, causing long-term impacts at the population level. The most immediate harm to marine mammals may be from oiling and inhaling and ingesting toxic fumes, which can cause brain lesions, disorientation, and death. Some 300 harbor seals are thought to have died from inhalation alone during the *Exxon Valdez* disaster. In the Gulf, the most vulnerable animals may be bottlenose dolphins, whose dozens of small populations fill the bays, passes, and channels along the northern shore. Some of these dolphin groups have only a few dozen members, and under the right conditions, an oil slick could devastate them. A dead sperm whale was observed in the area of the Gulf oil spill; as NOAA stated: "Sperm whales spend most of their time in the upper Gulf offshore area, live at depth in areas where subsurface dispersants and oil are present, and feed on deepwater squid, which may also be impacted by the oil and dispersants." [2]

Oil can affect sea turtles in a number of ways. Ingestion of oil through contaminated food and absorption through direct physical contact can lead to damage to the turtle's digestive tract and other organs. Oil can also cause inflammation of mucous membranes in the eyes, nose, and throat, which can lead to infection. Eggs laid in oil-contaminated sand — or by an oil-contaminated mother — may not develop properly, while newly hatched turtles may become oiled while crossing a contaminated beach. Over 1,000 sea turtles have been found injured or dead in the area affected by the *Deepwater Horizon* spill since it began. As of September 8, 2010, 634 sea turtles had been stranded, including 562 found dead. Another 458 sea turtles were captured offshore because they were either oiled or debilitated. The turtles that rescuers identified included nearly 800 Kemp's ridley sea turtles, 198 green sea turtles, 85 loggerheads and 16 hawksbills. The majority of Kemp's ridleys and loggerheads were dead at the time they were collected.

Further, once oil gets into the sediment along the beaches, it works its way up the food chain through zooplankton, invertebrates, and fish. In Prince William Sound, chronic oil exposure has had the worst impacts on species that feed on bottom-dwelling invertebrates and along the shore.

And as we have seen, oil spills exact a serious toll on coastal economies, including our approximately $35 billion commercial fishing and $60 billion ocean and coastal tourism and recreation industries. The damage and clean up costs following the *Exxon Valdez* spill were so extensive that Exxon paid over a billion dollars to the federal and state governments for damages and clean up costs – and still owes fishermen, Alaska Natives, business owners and others a billion dollars to redress the spill's harm. Such a toll has already been felt in the Gulf of Mexico. For example, just seven weeks after the BP Deepwater Horizon disaster, 32 percent of the Gulf's federal waters were closed to fishing – 88,182 square miles. This and future closures will impact a significant portion of the Gulf's 5.7 million recreational and commercial fishermen, who harvested more than 1 billion pounds of fish and shellfish in 2008.

In addition to spills, oil and gas exploration activities contribute to the release of oil, drilling fluids, and other toxic compounds into the environment thus exposing marine life and threatened and endangered species to toxins. Chronic oil exposure has been known to have a wide array of biological effects including: behavioral responses, suppressed growth, induced or inhibited enzyme systems and other molecular effects, physiological responses, reduced immunity to disease and parasites, histopathological lesions and other cellular effects, tainted flesh, and chronic mortality.

Noise

The ocean is an acoustic world. Unlike light, sound travels extremely efficiently in seawater; and marine mammals and many fish depend on sound for finding mates, foraging, avoiding predators, navigating, and communicating – in short, for virtually every vital life function. When loud sounds are introduced into the ocean, it degrades this

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2 http://www.cbsnews.com/8301-501465_162-20008193-501465.html (accessed on January 31, 2011).

essential part of the environment. Some biologists have analogized the increasing levels of noise from human activities as a rising tide of "smog" that has industrialized major portions of the marine environment off our coasts. This acoustic smog is already shrinking the sensory range of marine animals by orders of magnitude from pre-industrial levels.

Acoustic impacts from oil and gas activities have two main sources: seismic exploration, which accounts for the vast majority of impacts, and drilling and production activities. With respect to seismic exploration, the oil and gas industry typically relies on arrays of airguns, which are towed behind ships and release intense impulses of compressed air into the water about once every 10-12 seconds. A large seismic airgun array can produce effective peak pressures of sound higher than those of virtually any other man-made source save explosives; and although airguns are vertically oriented within the water column, horizontal propagation is so significant as to make them, even under present use, one of the leading contributors to low-frequency ambient noise thousands of miles from any given survey. The amount of seismic exploration that takes place in the Gulf of Mexico is enormous; millions of line miles of seismic exploration have taken place in the Gulf of Mexico over the last decades and millions more will occur in the coming years.

With respect to non-seismic activities, drilling and production activities produce noise at and above levels of concern for marine mammals. For example, the National Marine Fisheries Service (NMFS) has found that, depending on their timing, location, and number, drilling, construction, and support activities can "produce sufficient noise and disturbance that whales might avoid an area of high value to them and suffer consequences of biological significance."

Well Safety

In 1969 (Santa Barbara), 1979 (Ixtoc I, in the Gulf of Mexico), and again in 2009 (Timor Sea), shallow-water wells blew out with devastating consequences. The Ixtoc I well took nine months to cap. The BP Deepwater Horizon disaster is still fresh in everyone's mind. BOEMRE has responded by tightening well safety regulations, but it would be imprudent not to expect another massive spill to occur.

Cleanup and Containment Resources

The Deepwater Horizon incident shows that even a huge multi-national oil company cannot contain a major spill in the open ocean. Shell admits that it would take 109 days to mobilize assets and drill a relief well, with a wild well venting up to 143,000 barrels per day into the Gulf. In the interim, Shell is relying on the Marine Well Control System apparatus which, as of this writing, is still in the design stage. *See* http://marinewellcontainment.com/index.php (accessed on January 31, 2011) (stating that the system will be ready "within 18 months"). Until that system is tested and in place, Shell has not shown that it could perform any better than BP did following the Deepwater Horizon blowout. This failure puts the entire Gulf ecosystem and economy again at risk.

Additionally, Shell's oil spill response plan includes the use of dispersants and subsea dispersants. The environmental impacts of dispersants must be examined.

The Law

OCSLA

The Outer Continental Shelf Lands Act (OCSLA), 43 U.S.C. Section 1344 et seq., regulates in part the Bureau of Ocean Energy's compliance with the National Environmental Policy Act (NEPA). Under OCSLA, oil and gas exploration on the OCS is governed by a five-step process: (1) the Secretary's promulgation of a five-year leasing program, 43 U.S.C. § 1344; (2) lease sales, 43 U.S.C. § 1337; (3) exploration, 43 U.S.C. § 1340; (4) development and production, 43 U.S.C. § 1351; and (5) sale of recovered oil and gas, 43 U.S.C. § 1353. Before a lease holder may commence exploratory drilling, it must submit an exploration plan to BOE for approval. 43 U.S.C. § 1340(c)(1).

Under OCSLA, the Secretary may allow exploration to proceed *only* if he finds that the lessee's plan "will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or architectural significance." 43 U.S.C. § 1340(g)(3).

Here, the Shell project cannot be approved under OCSLA because the activities proposed in the Shell EP application will "create hazardous or unsafe conditions" and may well be unduly harmful to aquatic life in the area, result in pollution, and unreasonably interfere with other uses of the area.

NEPA

NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA]." 42 U.S.C. § 4332. As the Supreme Court explained, NEPA's instruction that all federal agencies comply with the impact statement requirement – and with all the requirements of § 102 – "to the fullest extent possible" [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle. *Flint Ridge Development Co. v. Scenic Rivers Ass'n*, 426 U.S. 776, 787 (1976).

Central to NEPA is its requirement that, before any federal action that "*may* significantly degrade some human environmental factor" can be undertaken, agencies must prepare an environmental impact statement (EIS). *Steamboaters v. F.E.R.C.*, 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action – at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. *See* 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained. Federal agencies may prepare an Environmental Assessment (EA) prior to preparing an EIS if it needs to determine whether the federal action has the potential to significantly affect the environment. If the answer is no, the agency must issue a finding of no significant impact (FONSI), which may include mitigation measures the agency will institute to ensure that the federal action will not significantly affect the environment. If the answer is yes, the agency must prepare an EIS.

The bar is set low as to how much potential impact it takes to require an EIS. For purposes of determining if an EIS is required, "[s]ignificance is determined by looking at both the context of the action and its intensity." *Middle Rio Grande Conservancy Dist. v. Norton*, 294 F.3d 1220, 1229 (10th Cir. 2002) (citing 40 C.F.R. § 1508.27). "Context" means that the significance of an action must be analyzed from several perspectives, such as "the affected region, the affected interests, and the locality." 40 C.F.R. § 1508.27(a). "Intensity" "refers to the severity of the impact." Id. § 1508.27(b).

In assessing "intensity," the CEQ regulations direct agencies to consider ten factors, including the degree to which the proposed action affects public health, id. § 1508.27(b)(2); unique characteristics of the geographic area such as proximity to park lands, wetlands, or prime farmlands, id. § 1508.27(b)(3); the degree to which the effects on the quality of the human environment are likely to be highly controversial, id. § 1508.27(b)(4); the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks, id. § 1508.27(b)(5); whether the action is related to other actions with cumulatively significant impacts, id. § 1508.27(b)(7); and whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment, id. § 1508.27(b)(10). The presence of any one of the ten factors enumerated in section 1508.27(b) may trigger the duty to prepare an EIS. *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846, 865 (9th Cir. 2005).

In addition, "[s]ignificance exists if it is reasonable to anticipate a cumulatively significant impact on the environment." *Airport Neighbors Alliance v. U.S.*, 90 F.3d 426, 430 (10th Cir. 1996) (quoting 40 C.F.R. § 1508.27(b)(7)). Cumulative impacts are defined as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.7. Here, the events leading up to and following the Deepwater Horizon blowout, as described in the Commission's Report, compel the issuance of an EIS for the Shell proposal. Should there be any doubt, Table 2 on page 6 of Shell's October 27, 2010 Environmental Impact Analysis contains a frightening list of impacts expected from Shell's worst case oil spill scenario, including significant negative impacts to seafloor habitats and biota, endangered and threatened species, coastal and marine birds, fisheries resources, coastal habitats and socioeconomic resources. To proceed by way of an EA given this information would make a mockery of NEPA.

Additionally, BOEMRE may not rely on earlier Programmatic EIS, deepwater EA, or lease sale NEPA documents in reviewing Shell's EP due to the significantly changed circumstances brought about by the *Deepwater Horizon* oil spill, and which rendered the analyses in these documents woefully inadequate. As BOEMRE recently acknowledged in its Notice of Intent to prepare a supplemental EIS for its 2007-2012 5-year leasing program in the Gulf, it is necessary and appropriate "to consider new circumstances and information arising, among other things, from the *Deepwater Horizon* blowout and spill." 75 Fed. Reg. 69122 (Nov. 10, 2010). In addition to altering baseline conditions for the Gulf of Mexico offshore marine and coastal environments, this incident also dramatically altered assumptions regarding both the risk and likely environmental consequences of a major blowout and oil spill such as the one that recently occurred. All other pre-*Deepwater Horizon* analyses are similarly flawed and may not be used to avoid a searching stand alone NEPA analysis regarding Shell's current EP.

MMPA

The Marine Mammal Protection Act was adopted more than thirty years ago to ameliorate the consequences of human impacts on marine mammals. Its goal is to protect and promote the growth of marine mammal populations "to the greatest extent feasible commensurate with sound policies of resource management" and to "maintain the health and stability of the marine ecosystem." 16 U.S.C. § 1361(6). A careful approach to management was necessary given the vulnerable status of many of these populations (a substantial percentage of which remain endangered or depleted) as well as the difficulty of measuring the impacts of human activities on marine mammals in the wild. 16 U.S.C. § 1361(l), (3). "[I]t seems elementary common sense," the House Committee on Merchant Marine and Fisheries observed in sending the bill to the floor, "that legislation should be adopted to require that we act conservatively—that no steps should be taken regarding these animals that might prove to be adverse or even irreversible in their effects until more is known. As far as could be done, we have endeavored to build such a conservative bias into the [Marine Mammal Protection Act]." Report of the House Committee on Merchant Marines and Fisheries, reprinted in 1972 U.S. Code Cong. & Admin. News 4148.

The heart of the MMPA is its so-called "take" prohibition, a moratorium on the harassing, hunting, and killing of marine mammals by any private or public party. *See* 16 U.S.C. §§ 1371 (take prohibition); 1362(13) (defining take). Under the law, NMFS (or the U.S. Fish and Wildlife Service (FWS)) may grant exceptions to the take prohibition, on application from a government agency or third party, for small numbers of marine mammals, provided it determines, using the best available scientific evidence, that such take would have only a negligible impact on marine mammal populations and stocks. There are two types of general exemptions available through the MMPA for activities that incidentally take marine mammals: five-year permits and one-year incidental harassment authorizations. Regardless of which process is used, NMFS must prescribe "methods" and "means of effecting the least practicable impact" on protected species as well as "requirements pertaining to the monitoring and reporting of such taking." 16 U.S.C. §§ 1371(a)(5)(A)(ii), (D)(vi).

BOEMRE is violating the MMPA by failing to obtain the necessary authorization from NMFS for the taking of marine mammals in connection with the Shell project. The MMPA prohibits, in most circumstances, the "take" of a marine mammal without a permit from the Secretary of Commerce. 16 U.S.C. § 1371(a); 50 C.F.R. § 216.107. The term "take" is defined broadly to include acts of harassment, which are in turn defined to include acts of "torment" or "annoyance" that have the potential to injure a marine mammal or marine mammal stock in the wild or have the potential to "disturb" them "by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, breeding, feeding, or sheltering." 16 U.S.C. § 1362(18).

There is no doubt that seismic surveys, drilling, and other noise-generating activities in the Gulf of Mexico OCS harass marine mammals. For example, BOEMRE wrote in its Programmatic Environmental Assessment for Geological and Geophysical Exploration for Mineral Resources on the Gulf of Mexico Outer Continental Shelf that "[l]iteral interpretation of the MMPA and the definitions of harassment suggest that there may be a technical violation of the law if sperm whales (a listed species) realize injurious auditory effects…or changes in behavior (*e.g.*, avoidance behavior, moving away from a seismic noise source) from exposure to G&G surveys." Final Programmatic EA (July 2004) at B-16. Furthermore, NMFS has quantified substantial numbers of marine mammal take in authorizing and proposing to authorize both seismic exploration and drilling activities in Alaska.

Shell's EP application states that the sperm whale "is commonly found in the project area." Shell states that 28 other marine mammal species occur in the Gulf, seven of which are endangered. While BOEMRE applied to NMFS for authorization to take marine mammals incidental to conducting seismic surveys in 2002, that authorization has never been granted. In addition, BOEMRE has not applied to NMFS for authorization to take marine mammals incidental to the Shell EP application. Thus, BOEMRE will violate the MMPA if it approves the Shell EP application without first obtaining authorization from NMFS for the incidental take that will result.

ESA

Congress passed ESA in 1973 in response to growing concern over the extinction of fish, wildlife, and plants stemming from human activities "untempered by adequate concern and conservation." 16 U.S.C. § 1531(a)(1). Recognizing the aesthetic, ecological, educational, historical, recreational, and scientific value of these species, Congress enacted ESA with the express purpose of "provid[ing] a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] … provid[ing] a program for the conservation of such endangered species and threatened species." *Id.* § 1531(b). The FWS and NMFS share responsibility for administering ESA. 50 C.F.R. § 402.01(b).

At its core, ESA prohibits any person from taking species listed as endangered unless authorized pursuant to certain limited exceptions. 16 U.S.C. §§ 1538(a), 1536(b), 1539(a) "Take" is defined by ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C. § 1532(19). For any actions "authorized, funded, or carried out by [a federal] agency," take may be allowed only after such agency has ensured that its action "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary [of the Interior or of Commerce]…to be critical." 16 U.S.C. § 1536(a)(2).

BOEMRE's approval of the Shell EP application will constitute "agency action" under ESA. Thus, BOEMRE is required to undergo Section 7 consultation with NMFS and FWS before it approves the plan so as to ensure that the authorized activity will not jeopardize any listed species. We understand that this required consultation has not yet occurred with respect to the project here under discussion. We also note that BOE may not rely on any consultation and resulting Biological Opinion (BiOp) that may have occurred for the leasing program that these activities relate to as this consultation did not address the site-specific activity proposed here.

Furthermore, as noted above, BOEMRE must not engage in or authorize any activity that is likely to result in the take of any listed species until it receives authorization pursuant to the Section 7 process. 16 U.S.C. § 1536(b)(4) & 1538. Although BOEMRE has never received ESA take authorization for any listed marine mammals – particularly the small population of endangered sperm whales whose habitat lies at the epicenter of the Gulf spill – it continues to approve Gulf of Mexico offshore exploration and development activities. These approval and permitting activities, including the activity now under discussion, harm, injure, and harass threatened and endangered marine mammals, thus resulting in take. Offshore oil and gas activities harm, injure and kill marine mammals through pollution – including oil spills as well as routine discharges and marine debris – and marine mammals are also victims of vessel strikes that can result in serious injury or mortality. In addition, the noise resulting from such activities harms, injures, and harasses threatened and endangered marine mammals.

In addition to marine mammal impacts, Shell's EP application states that five species of sea turtles are found in the Gulf of Mexico: Hawksbill, Green, Kemp's Ridley, Leatherback and Loggerhead. In its worst case oil spill scenario, Shell projects significant negative impacts on endangered and threatened sea turtles in the Gulf. Several other threatened and endangered species including whales, sea birds, and fish occur in the Gulf of Mexico and may be affected directly or cumulatively by Shell's exploratory drilling and associated activities.

Finally, any consultations and resulting BiOps that occurred for BOEMRE's various leasing program activities are inadequate because they did not properly address the likely impacts from on oil spill, including the oil and gas industry's inability to contain and clean up a major oil spill, the changed environmental conditions and impacts on species that have occurred since the *Deepwater Horizon* oil spill, and impacts from noise associated with offshore exploration and drilling/production activities. As in the NEPA context, BOEMRE has admitted the inadequacy of the previous analyses and has taken steps of requesting to reinitiate consultation on its insufficient 2007-2012 5-year leasing program Biological Opinion. [3]

OPA

The Oil Pollution Act of 1990 (OPA), was passed in response to the *Exxon Valdez* accident. Among other things, it requires companies to address procurement, logistical, and deployment challenges related to spill response. *See* 30 C.F.R. § 254.23 (operator must describe emergency response action plan procedures it expects to follow in the event of a spill or a substantial threat of a spill); *id*. at § 254.24 (requiring inventory of spill-response materials, supplies, services, equipment, and response vessels available locally and regionally). It requires plans for "ensur[ing] that containment and recovery equipment as well as response personnel are mobilized and deployed at the spill site." 30 C.F.R. § 254.23(g)(5); *see also* 30 C.F.R. § 254.26 (requiring detailed discussion of worst case discharge scenario, including response in "adverse weather conditions" and "description of the response equipment that you will use" that must include "the types, location(s) and owner, quantity, and capabilities of the equipment" and estimates of the time needed for procurement and deployment of equipment and personnel).

The response to the BP disaster in the Gulf of Mexico and the Commission Report leave little doubt that the oil and gas industry has failed to meet requirements under OPA for planning and preparing an adequate response to a major spill that could result from certain OCS activities. Shell fails to acknowledge that there is no proven means of effectively cleaning up spilled oil resulting from a major catastrophe like the BP disaster. Its containment plan is no better than BP's until the Marine Well Control System is built, tested and operating – whenever that occurs. This is not consistent with OPA.

Magnuson-Stevens Act

When amending the MSA in 1996, Congress noted that one of the greatest long-term threats "to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States." 16 U.S.C. § 1801(a)(9). Thus, one of the purposes of the MSA is to "promote the protection of essential fish habitat in the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat." 16 U.S.C. § 1801(b)(7).

In order to fulfill the substantive purposes of the MSA's protections for essential fish habitat, federal agencies are required to engage in consultation with NMFS "with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat." 16 U.S.C. § 1855(b)(2). Likewise, NMFS has a mandatory duty to recommend "measures that can be taken by [an] agency to conserve" essential fish habitat whenever NMFS receives information that an action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any State or Federal agency would adversely affect any essential fish habitat. 16 U.S.C. § 1855(b)(4)(A).

The EFH regulations (50 C.F.R. §§ 600.905–600.930) outline the process for federal agencies, NMFS, and the fishery management councils to satisfy the EFH consultation requirement under section 305(b) of the MSA. As part of the EFH consultation process, when an agency action may adversely impact EFH, the regulations require federal action agencies to prepare a written EFH assessment describing the effects of that action on EFH. 50 C.F.R. § 600.920(e)(1). All EFH assessments must include the contents stated in 50 C.F.R. § 600.920(e)(3), however they

[3] Letters from BOEMRE to National Marine Fisheries Service and Fish and Wildlife Service requesting consultation under the ESA are included on the CD.

may be incorporated into documents prepared for other purposes (such as National Environmental Policy Act ("NEPA") documents). *Id.* § 600.920(f).

BOEMRE has a duty to engage in essential fish habitat consultation prior to approving Shell's exploration plan. Accordingly, BOEMRE must take prudent measures to conserve fisheries resources and essential fish habitat in the Gulf of Mexico.

Conclusion

Thank you for your consideration of these comments. In summary, we believe that NEPA requires a full EIS for the proposed Shell EP. Until BOEMRE complies with the legal requirements described above, it may not approve Shell's EP. BOEMRE should rescind its decision to "deem submitted" Shell's EP until it completes these environmental reviews.

February 2011

ENVIRONMENTAL IMPACTS OF OFFSHORE OIL AND GAS EXPLORATION AND DEVELOPMENT

BEFORE THE BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT

CENTER for BIOLOGICAL DIVERSITY
Because life is good.

I. Gulf of Mexico Biodiversity

The Gulf of Mexico is home to 15,419 described species (Felder et al. 2009) and many important coastal and marine habitats. The Gulf coast supports one of the most extensive estuary systems in the world, stretching from the Rio Grande River to Florida Bay (MMS 2008 at 4-10), comprised of coastal marshes, mud and sand flats, and forest wetlands. These wetland habitats and more than three million hectares of seagrass beds provide habitat for numerous plants, invertebrates, fishes, reptiles, birds, and mammals and are a critical nursery grounds for fish and shellfish (MMS 2008 at 4-33, 4-46). One of the world's most important bird migration corridors, the Mississippi Flyway, passes through the Gulf coast and across the Gulf of Mexico, bringing approximately 1 billion birds of more than 300 species through the region each year.[1] The Gulf also supports diverse continental slope and deepwater communities, including soft-bottom and hard-bottom benthic communities, deepwater coral banks, and shallow coral reefs (Ritchie and Keller 2008).

II. Threatened and Endangered Species

The Gulf of Mexico supports numerous threatened and endangered species of marine mammals, sea turtles, fish, and birds. Six endangered whales inhabit the Gulf including sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), sei whale (*B. borealis*), humpback whale (*Megaptera novaeangliae*), and North Atlantic right whale (*Eubalaena glacialis*). A resident sperm whale population estimated at 1700 individuals[2] inhabits the northern Gulf close to the Mississippi delta (Jochens et al. 2008). The endangered West Indian manatee (*Trichechus manatus*) frequents shallow coastal waters of the Gulf. Five of the world's seven sea turtles species occur in the Gulf, and all are protected under the Endangered Species Act. The Kemp's ridley (*Lepidochelys kempii*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) are listed as endangered. Green sea turtles (*Chelonia mydas*) are listed as endangered in Florida and threatened elsewhere. Loggerheads (*Caretta caretta*) are currently listed as threatened, but the Northwest Atlantic distinct population segment, which is being affected by the *Deepwater Horizon* spill, is being considered for endangered status (75 Fed. Reg. 12598 (March 16, 2010)). Loggerheads and Kemp's ridley sea turtles use habitats within the Gulf at virtually every stage of life. For example, subadult and adult loggerheads rely upon the shelf waters of the eastern Gulf as important year-round foraging habitat.[3] Adult loggerheads nest along the Florida Keys, west coast of Florida, Florida panhandle, and Alabama and Mississippi coasts.[4]

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[1] http://www.scientificamerican.com/article.cfm?id=oil-spills-toll-on-birds
[2] Gaskill, M. What will get sick from the slick? Published online 30 June 2010, Nature 466: 14-15, doi:10.1038/466014a, at http://www.nature.com/news/2010/100630/full/466014a.html
[3] *See, e.g.,* Witherington et al. 2009; Letter from Gil McRae, Fish and Wildlife Research Institute, to Roy Crabtree, NOAA Fisheries Southeast Region (Dec. 9, 2008); Letter from Gil McRae, Fish and Wildlife Research Institute, to Roy Crabtree, NOAA Fisheries Southeast Region (Dec. 9, 2008); Letter from Gil McRae, Fish and Wildlife Research Institute, Fla. Fish and Wildlife Conservation Comm'n, to Roy

Protected fish species include the Gulf sturgeon (*Acipenser oxyrinchus desotoi*) which inhabits the rivers and coastal waters off Louisiana to Florida and smalltooth sawfish (*Pristis pectinata*) now restricted to the waters off Florida. Protected elkhorn *(Acropora palmata)* and staghorn corals *(A. cervicornis)* occur in the Florida Keys. Coastal Gulf species which are vulnerable to the spill include the piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), wood stork (*Mycteria americana*), Alabama red-belly turtle (*Pseudemys alabamensis*), and four beach mice: Alabama (*Peromyscus polionotus ammobates*), Choctawhatchee (*P. polionotus allophrys*), St. Andrew (*P. polionotus peninsularis*), and Perdido Key (*P. polionotus trissyllepsis*) beach mice.

III. Overall Impacts of Offshore Oil and Gas Exploration and Development

Impacts to threatened and endangered species can occur from all phases of offshore oil and gas exploration and development. Acute and chronic oil spills present the greatest concern for threatened and endangered species and their critical habitat. However, routine activities of oil and gas exploration and development can impact listed species through industrial noise pollution, vessel strikes, marine debris, water quality impacts, and destruction of habitat. Oil and gas production also translates into higher greenhouse gas emissions which increase the impact of climate change on Gulf species and ecosystems.

IV. Impacts of Crude Oil on Wildlife

Acute and chronic oil spills have a wide array of lethal and sublethal impacts on marine species, including immediate and long-term effects. Petroleum oil is a complex mixture of hundreds of different compounds, mostly hydrocarbons, with different levels of toxicity to wildlife. Polycyclic aromatic hydrocarbons (PAHs) are among the most toxic oil components and have been documented to cause significant impacts on wildlife. Direct impacts to wildlife from exposure to oil include behavioral alteration, suppressed growth, induced or inhibited enzyme systems and other molecular effects, physiological responses, reduced immunity to disease and parasites, histopathological lesions and other cellular effects, tainted flesh, and chronic mortality (Holdway 2002). Oil can also exert indirect effects on wildlife through reduction of key prey species (Peterson et al. 2003). As detailed below, the persistence of toxic subsurface oil leading to chronic exposure, even at sublethal levels, can impact wildlife species and ecosystems for decades (Peterson et al. 2003).

A. Oil Impacts on Fish and Sharks

Crabtree, NOAA Fisheries Southeast Region (May 11, 2009); Letter from Tony Tucker, Sea Turtle Conserv. and Research Program, Mote Marine Lab, to Roy Crabtree, NOAA Fisheries Southeast Region (May 14, 2009) (letter misdated as May 2008)..

[4] WIDECAST, Sea Turtle Nesting Beach Atlas: Loggerhead Sea Turtle Nesting Habitat in the Wider Caribbean Region (2007), *available at* http://www.widecast.org/Resources/Docs/WCR_Loggerhead_Nesting_24Sept2008.jpg.

Exposure to crude oil adversely affects fish at all stages (Carls et al. 1999, Bernanke and Kohler 2009). Early life stages of fish are particularly sensitive to the toxic effects of PAHs which can cause larval deformation and death. Laboratory experiments found that PAHs from partially weathered crude oil at concentrations as low as 1 part per billion (ppb) are toxic to the developing eggs of Pacific herring (*Clupea pallasi*) and pink salmon (*Oncorhynchus gorbuscha*) (Carls et al. 1999, Heintz et al. 1999). Pacific herring embryos experienced mortality, malformations, genetic damage, decreased size, and inhibited swimming when exposed for 16 days at PAH concentrations of 0.7 ppb while concentrations of 0.4 ppb caused sublethal responses including edema and reduced growth (Carls et al. 1999). Adult fish exposed to oil can suffer from reduced growth, enlarged liver, changes in heart and respiration rates, fin erosion, and reproductive impairment (Bernanke and Kohler 2009, USFWS 2010). Additionally, fish and sharks are at risk from lethal coating of their gills with oil, and declines in and contamination of their food sources.

Exposure to crude oil has been linked to long-term population effects in fish. Pink salmon embryos exposed to oil under conditions similar to those observed after the *Exxon Valdez* spill exhibited delayed effects of reduced growth and significantly lower marine survival (Heintz et al. 2000). Crude oil from the *Exxon Valdez* spill is thought to have caused the elevated mortality of pink salmon eggs in oiled streams for at least four years after the spill (Peterson et al. 2003) and to have contributed the crash of Pacific herring populations which were exposed during the spawning season and which have yet to recover (Thorne and Thomas 2008).

Oil spills in the Gulf of Mexico pose a particularly high risk to fish species that are already imperiled like the Atlantic bluefin tuna (*Thunnus thynnus*), Gulf sturgeon, and smalltooth sawfish. The western population of the Atlantic bluefin tuna, which has been decimated by overfishing, returns each spring to spawn in the same regions of the northern Gulf (Teo and Block 2010). Offshore oil and gas development has proliferated in the tuna's critical spawning areas. The *Deepwater Horizon* oil spill invaded the bluefin's spawning grounds during its peak spawning months in April and May. Because oil is toxic to tuna eggs which float near the surface and to young fish which hide in floating *Sargassum* seaweed that collects oil, the *Deepwater Horizon* spill may push the bluefin tuna even closer to extinction. Whale sharks, which inhabit the northern Gulf in summer to filter feed plankton at the surface, are also in jeopardy from oil contamination of their gills and plankton prey.

B. Oil Impacts on Corals and Other Invertebrates

Oil affects virtually all invertebrate taxa (Suchanek 1993). It is toxic to bottom-dwelling, pelagic and intertidal invertebrates such as corals, lobsters, crabs, oysters, clams, and zooplankton (USFWS 2010, Peterson et al. 1996 Table 1). Widespread mortality of marine invertebrates generally occurs in the immediate vicinity of oil spills due to chemical toxicity and smothering, and additional mortality can result when toxic components of oil are remobilized from sediments (Suchanek 1993, Peterson et al. 1996, Peterson et al. 2003, Haapkyla 2007). Sublethal effects to invertebrates from oil exposure include impairment of reproduction, growth, respiration, excretion, chemoreception, feeding, movements, stimulus response and disease resistance (Suchanek 1993). In corals, laboratory experiments have documented broad impacts from oil exposure including reduced growth, tissue damage and death, zooxanthellae expulsion, abnormal feeding behaviors, increased susceptibility to bacterial infection, damaged reproductive function (e.g. lower gonad numbers, sterilization of gametes), impaired larval metamorphosis and recruitment, and bioaccumulation of toxic compounds in exoskeletons. Due to these chronic impacts, invertebrate populations and community structure can take years to decades to recover after oil exposure (Suchanek 1993). For example, suspension-feeding clams and mussels, which concentrate but only slowly metabolize hydrocarbons, have exhibited exposure and chronic impacts from oil many years after a spill. Two bivalves (*Mya arenaria* and *Mytilus trossulus*) from oiled areas in Prince William Sound still exhibited physiological stress from chronic PAH exposure ten years after the *Exxon Valdez* spill (Downs et al. 2002). The clam *Protothaca staminea* exhibited elevated tissue contamination at least seven years after the spill (Peterson et al. 2003).

C. Oil Impacts on Sea Turtles

Oil is hazardous to sea turtles of all ages and the avenues of exposure are numerous. Egg mortality is increased in eggs exposed to oil due to the oil's toxicity and smothering effects (NMFS 2003 at 38). Eggs may be exposed during oiling of a nesting beach or during the course of egg-laying by an oiled female. Hatchlings are even more vulnerable to oil spill effects because of their small size, tendency to swim at the surface, and inability to escape convergence zones that collect small turtles, seaweed, and oil (NMFS 2003 at 38-39).

Juvenile and adult turtles encounter oil, tar, and other spill-related chemicals in the water column, at the surface, and through contaminated prey. Laboratory tests of the effects of oil on 15- to 18-month old loggerheads found that both acute and chronic exposure to oil adversely affects all of a sea turtle's major physiological systems (Lutcavage et al. 1995). Among these effects are declining red blood cell counts and increased white blood cell counts, impaired ability to regulate the internal balance of salt and water, and sloughing of the skin that can lead to infection (NMFS 2003 at 40-43). Sea turtles inhale very deeply before diving and thus can inhale large concentrations of toxic fumes at the surface of an oiled area, which in turn can lead to respiratory impairment (NMFS 2003 at 40). Because sea turtles generally do not avoid oil-contaminated areas, they are very vulnerable to harmful contact with oil and its byproducts. Turtles are particularly prone to ingest oil and tar. Sea turtles are known to indiscriminately ingest tar balls that are about the size of their normal prey. Ingested tar interferes with digestion, sometimes leading to starvation, and can cause buoyancy problems, rendering the turtle more vulnerable to predation and less able to forage. In addition, tar and oil remain in the digestive system for several days, increasing the turtle's absorption of toxins (NMFS 2003 at 39-40).

Oil spills also affect sea turtles in less direct ways. Oil spills can reduce food availability, and ingestion of contaminated food can expose turtles to harmful hydrocarbons. Because they eat invertebrates that tend to bioaccumulate hydrocarbons, loggerheads and Kemp's ridleys are most vulnerable to toxic exposure via prey. Finally, oil exposure may render turtles more vulnerable to fibropapilloma, a condition that can degrade the turtle's overall condition and interfere with feeding and other behaviors (NMFS 2003 at 44).

Actions taken to contain, remove, or disperse oil pose their own threats to sea turtles. Dispersants contain components that can interfere with lung function, respiration, digestion, excretion, and salt gland function to a degree "similar to the empirically demonstrated effects of oil alone" (NMFS 2003 at 53). Burning oil at the surface can directly harm turtles at the surface, particularly those that are trapped in *Sargassum* mats, and indirectly harm turtles by causing lung irritation from smoke and formation of ingestible, sinking globs of oil (NMFS 2003 at 55). Setting booms to protect beaches from oil can have the unintended effect of preventing females from reaching nesting beaches and/or preventing hatchlings from leaving the beach (NMFS 2003 at 59). Finally, efforts to clean oiled beaches can change the profile of the beach, rendering it less suitable for nesting (NMFS 2003 at 57).

D. Oil Impacts on Birds

Because oiled seabirds often return to shore, the impacts of oil spills on seabirds are among the most visible and well-documented. Seabirds, shorebirds, and wading birds are vulnerable to becoming coated with oil at the water surface and shoreline. Oiling destroys the water-proofing and insulating properties of the feathers, thereby compromising their buoyancy and ability to thermoregulate (Jenssen 1994). Oiled birds rapidly deplete their fat reserves due to their inability to forage and regulate their body temperature, and quickly become emaciated, dehydrated, and hypothermic, often leading to mass die-offs (Jenssen 1994). The *Exxon Valdez* spill, for example, killed an estimated 250,000 seabirds in the days after the spill (Peterson et al. 2003). If spills occur during the breeding season, oiled adults returning to the nest can contaminate their eggs and chicks with oil. Studies on the effects of oil on eggs have shown significant mortality and developmental defects in embryos (Jenssen 1994). Oiled birds are also at high risk of ingesting oil when they preen their feathers (Briggs et al. 1997). Ingested oil can damage the gastrointestinal tract, evidenced by ulcers, diarrhea, and a decreased ability to absorb nutrients, and inhibit proper hormone function (Jenssen 1994). Inhalation of volatile hydrocarbons can result in pneumonia, neurological damage, and absorption of chemicals that can lead to cancer.[5]

In addition to the immediate effects from oiling, birds experience many chronic effects from oil spills, particularly those related to PAH toxicity. PAHs can continue to contaminate the tissues of oiled birds, particularly the liver, for several months following initial exposure (Troisi et al. 2007). Documented long-term effects on birds include

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[5] Oiled Wildlife Care Network, http://www.owcn.org/about-oiled-wildlife/effects-of-oil-on-wildlife

anemia, inflammation, low weight gain, liver and kidney damage, immunosuppression, reduced reproductive success, and lower survivorship (Alonso-Alvarez et al. 2007, Troisi et al. 2007). Oiling may also indirectly affect seabirds by reducing the availability of key food species (Velando et al. 2005). These chronic impacts can suppress the recovery of seabird populations (Troisi et al. 2007).

Studies conducted in the years immediately following major oil spills illustrate the wide range of chronic impacts on seabirds across a variety of species. Common guillemot (*Uria aalge*) over-winter mortality doubled following major oil pollution incidents in the North Atlantic (Votier et al. 2005). Black-legged kittiwakes (*Rissa tridactyla*) in an oiled colony showed significant evidence of anemia and reduction in breeding success (resulting from missed breeding years and disrupted social structure) compared with unoiled colonies following the *Braer* tanker spill in Scotland (Walton et al. 1997). European shags (*Phalacrocorax aristotelis*) suffered lower reproductive success and chick condition via reduced availability of a highly preferred forage-fish compared to unoiled colonies following the *Prestige* oil spill in Spain (Velando et al. 2005). Adult yellow-legged gulls (*Larus michahellis*) breeding in oiled colonies also suffered sublethal health impacts seventeen months after the *Prestige* spill (Alonso-Alvarez et al. 2007).

Even more striking, long-term studies illustrate that impacts from oil spills can last for decades. Nearly a decade after the *Exxon Valdez* spill, female harlequin ducks (*Histrionicus histrionicus*) suffered significantly reduced winter survival in oiled areas of Prince William Sound, Alaska, compared to unoiled areas (Esler et al. 2002). Harlequin ducks continued to be exposed to residual *Exxon Valdez* oil up to 20 years after the spill, as evidenced by higher EROD enzyme activity in ducks from oiled areas compared to unoiled areas (Esler et al. 2010). Ten years after the Exxon Valdez spill, pigeon guillemots (*Cepphus columba*) at oiled sites still suffered delayed population recovery, including lower adult mass, body condition, and nestling survival due to continued exposure to residual oil and the reduced availability of a key prey species (Golet et al. 2002).

E. Oil Impacts on Marine Mammals

Whales, dolphins, and manatees can be exposed to oil internally by inhaling volatile compounds at the surface, eating or swallowing oil, and consuming oil-contaminated prey, and externally by swimming in oil (NOAA 2010b). The inhalation of toxic hydrocarbons can cause respiratory irritation, inflammation, emphysema, and pneumonia (Geraci and St. Aubin 1988, NOAA 2010b). If absorbed into the lungs and bloodstream, toxic hydrocarbons can accumulate in tissues like the brain and liver causing neurological disorders and organ damage, result in anemia and immune suppression, and lead to reproductive failure or death (Geraci and St. Aubin 1988, NOAA 2010b). Baleen whales that filter-feed at the surface are vulnerable to coating and fouling their baleen plates with oil, thereby decreasing their ability to eat (Geraci and St. Aubin 1988, NOAA 2010b). Manatees are at risk from fouling the sensory hairs around their mouths which are important for detecting edible seagrasses. Cetaceans may ingest oil-contaminated zooplankton and fish prey, leading to gastrointestinal inflammation, ulcers, bleeding, diarrhea, and maldigestion (Geraci and St. Aubin 1988, NOAA 2010b). Long-term studies of killer whales impacted by the *Exxon Valdez* spill indicate that oil spills can have long-term, population-level effects on marine mammals. A resident killer whale pod that suffered a 33% loss in the year following the *Exxon Valdez* spill had not recovered to pre-spill numbers sixteen years after the spill, while a transient pod that experienced a 41% loss, including reproductive-age females, has continued to decline toward extinction since the spill (Matkin et al. 2008).

V. Impacts of Dispersants on Wildlife

Dispersants and dispersed oil have been shown to have significant negative impacts on many forms of marine life, including plankton, turtles, fish, corals, and birds. Dispersants release toxic break-down products from oil that, alone or in combination with oil droplets and dispersant chemicals, can make dispersed oil more harmful to marine life than untreated oil. Both the short-term and long-term impacts of dispersants on marine life have not been adequately tested. As acknowledged by the EPA, the "long term effects [of dispersants] on aquatic life are unknown."[6]

Species in the Gulf can be affected by dispersants through a number of pathways. For example, humpback, fin, blue, and sei whales feed by skimming plankton, small fish, and squid from the surface. This feeding mechanism puts them at risk of ingesting dispersants and dispersed oil, as well as food contaminated with these chemicals. In addition, both whales and sea turtles must surface to breathe, and in doing so can breathe in fumes from or ingest dispersants and dispersed oil. According to the Minerals Management Service, dispersant components absorbed by sea turtles can affect their organs and interfere with digestion, excretion, and respiration (MMS 2007 at 4-282). Birds diving into the water to feed may be exposed through direct contact with dispersants and dispersed oil as well as through contaminated prey. Studies have found that dispersed oil, including oil dispersed by Corexit 9527 used in the *Deepwater Horizon* spill response, damages the insulating properties of seabird feathers more than untreated oil, making the birds more susceptible to hypothermia and death (Jenssen 1994). Dispersants and dispersed oil have also been shown to have toxic effects on bird eggs and chicks that are similar or worse than from untreated oil (MMS 2007 at 4-287). Birds exposed to dispersed oil that return to their nests risk contaminating their eggs, which can lead to the death of those eggs (Albers 1979).

Dispersants and dispersed oil in the water column are of equal concern. Sea turtles, whales, and fish may all be exposed to dispersants and dispersed oil as they swim and feed in the water column. While the effects of such exposure are not well known for whales and sea turtles, studies have shown that dispersants create a toxic environment for fish by releasing harmful oil break-down products into the water. Dispersed oil has been shown to be toxic to fish at all life stages, from eggs to larval fish to adults, according to numerous laboratory studies that have tested a variety of species (Khan and Payne 2005,

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[6] EPA, http://www.epa.gov/bpspill/dispersants.html

Anderson et al. 2009). Dispersants and dispersed oil are particularly toxic to corals (Haapkyla et al. 2007), leading scientists to call for a ban on dispersant use near coral reefs (Shafir et al. 2007). Dispersants and dispersed oil harm the early stages of corals by increasing death rates, reducing settlement on reefs, and altering behavior (Shafir et al. 2007). One of the dispersants being used in the *Deepwater Horizon* spill response, Corexit 9527, has been shown to prevent fertilization of mature eggs and hinder the development of young life stages of reef-building corals (Haapkyla et al. 2007, Venn et al. 2009). Monitoring data have indicated that the use of the Corexit dispersants killed up to 25% of all organisms living 500 feet below the surface in areas where the dispersant was used.[7]

Moreover, the use of dispersants underwater, as permitted by the Environmental Protection Agency in the *Deepwater Horizon* spill response, can result in the formation of massive deepwater oil plumes extending many miles from the spill site (NOAA 2010a). Species that frequent and feed in deep water, like the pod of sperm whales residing in the northern Gulf, could suffer serious adverse impacts from this deep water contamination by swimming through dispersed oil plumes and feeding on contaminated prey. The effects of these plumes are unlikely to remain isolated to deep water habitats, and have the potential to harm the entire ecosystem from the bottom up. In addition, significant reductions in dissolved oxygen have been reported in the vicinity of underwater dispersed oil plumes, resulting from oil digestion by microbes.[8] Oxygen depletion is likely to lead to reductions in plankton, fish, and other prey species upon which listed species – and their ecosystems – depend. The northern Gulf of Mexico already experiences the annual formation of a hypoxic "dead zone"—a large area of oxygen-poor conditions that can barely support life—and the oxygen deprivation caused by the deep-sea oil plumes could increase the size of this zone.[9]

VI. Impacts of Noise Pollution

Oil and gas exploration and development activities that produce anthropogenic noise under water include seismic surveying, drilling, offshore structure emplacement, offshore structure removal, and production-related activities, including ship and helicopter activity for providing supplies to the drilling rigs and platforms (Ocean Studies Board 2003). Although all of these activities can impact marine life, seismic surveys used to detect oil and gas deposits underneath the ocean floor are particularly harmful. For offshore exploration, the oil and gas industry typically rely on arrays of airguns which are towed behind ships and release intense impulses of compressed air into the water about once every 10-12 seconds. Although airguns are vertically oriented within the water column, horizontal propagation is so significant as to make them one of the leading

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[7] Farren, L. and B. Blackburn, May 21, 2010, "EPA May Not Force BP to Change Dispersants," ABC World News,

avail. at http://abcnews.go.com/WN/epa-bp-dispersants/story?id=10711367.
[8] http://www.pbs.org/newshour/rundown/2010/06/government-confirms-undersea-oil-in-gulf-of-mexico.html
[9] http://www.noaanews.noaa.gov/stories2010/20100628_deadzone.html

contributors to low-frequency ambient noise thousands of miles from any given survey (Nieukirk et al. 2004). A large seismic airgun array can produce effective peak pressures of sound higher than those of virtually any other human-made source save explosives (Ocean Studies Board 2003). Noise from a single seismic survey can affect a region of ~300,000 km^2 and raise noise levels two orders of magnitude higher than normal continuously for days (Weilgart 2007). The highest energy levels produced by seismic airguns fall within the frequency range from 10 to 200 Hz (MMS 2004) and can extend up into the 1-10 kHz band (Ocean Studies Board 2003). Seismic airgun noise is well-within the audible range for Gulf of Mexico marine species including highly migratory fishes (MMS 2004), toothed whales (odontocetes) which hear well between 1 and 150 kHz, and baleen whales (mysticetes) which are thought to hear in the 5–20 Hz to 20–30 kHz range (Weilgart 2007).

It is well established that the high-intensity pulses produced by seismic airguns can cause a range of impacts on marine mammals, fish, and other marine life, including abandonment of important habitat, masking of important natural sounds, disruption of vital behaviors essential to foraging and breeding, increased stress, temporary or permanent hearing loss, loss of biological diversity, and injuries and mortalities (Weilgart 2007). For cetaceans, which are particularly reliant on sound, lethal and sublethal impacts are well-documented. Strandings and mortalities, especially of beaked whales, have been linked to seismic surveys and are thought to have caused prolonged and serious population impacts in at least one case (Weilgart 2007). In the Gulf of Mexico, sperm whales exposed to a seismic airgun survey reduced their foraging rates by up to 60% in some individuals, while one whale ceased foraging dives altogether until the airgun transmission stopped (Jochens et al. 2008). Sperm whales in the Gulf also reduced their vocalization rates, an indication of prey-capture attempts, by an average of 19% during seismic airgun surveys (Weilgart 2007). Impacts from seismic surveys in other regions include cessation of singing by 250 male fin whales for months; displacement of western gray whales off Sakhalin Island, Russia, from their primary feeding area, returning only days after seismic activity ceased; avoidance of active arrays by odontocetes, killer whales, and mysticetes in UK waters (including reduced feeding, faster swimming by smaller odontocetes, and increased surface activity by mysticetes); and avoidance of seismic airgun noise by bowheads, humpbacks, and harbor porpoises (Weilgart 2007).

Studies indicate that seismic surveys can alter behavior and cause injury to fish and invertebrate species (MMS 2004, Weilgart 2007). Seismic airguns damaged fish ears at distances of 500 m to several kilometers from seismic surveys, with no recovery apparent 58 days after exposure (Weilgart 2007). Even under moderate levels of noise exposure, some fish experience temporary hearing loss, with fish occasionally requiring weeks to recover their hearing (Weilgart 2007). Noise has been shown to produce a stress response and behavioral reactions in some fish that include loss of coherence, dropping to deeper depths, milling in compact schools, ‘‘freezing’’, or becoming more active (Weilgart 2007). For example, tuna schools in pens were less coherent in the presence of boat noise. In addition, fish have also been reported to flee from seismic shooting areas as inferred from decreased catch rates for both long lines and trawler fisheries (Slabbekoorn et al. 2010). Reduced catch rates of 40%–80% and decreased abundance have been reported near seismic surveys in species such as Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), rockfish (genus *Sebastes*), herring (*Clupea harengus*), sand eel (*Ammodytes marinus*), and blue whiting (*Micromesistius poutassou*) (Weilgart 2007). Slabbekoorn et al. (2010) concluded that "if fish sounds serve a communicative function in a reproductive context, problems of detection and recognition due to the presence of anthropogenic noise could have fitness consequences."

The impacts of seismic surveys on invertebrates are illustrated by the mass stranding of giant squid (*Architeuthis dux*) in the presence of air gun surveys, in which animals were observed with internal organ damage, bruised ovaries, and injuries to the equilibrium receptor system or statocysts (Weilgart 2007). Snow crabs (*Chionoecetes opilio*) exposed to seismic noise conditions exhibited bruised organs and abnormal ovaries, delayed embryo development, smaller larvae, sediments in their gills and statocysts, and changes consistent with a stress response (Weilgart 2007). Brown shrimp (*Crangon crangon*) reared in tanks showed an increase in metabolic rate with moderate increases in continuous background noise, leading to significant reduction in growth and reproduction over several months (Weilgart 2007).

VII. Vessel Strikes and Marine Debris

Routine activities from oil and gas development can cause impacts to Gulf wildlife including vessel strikes, marine debris, water quality impacts, and destruction of habitat. Vessel strikes pose a particular risk to the six endangered whales in Gulf, particularly to the resident population of sperm whale. For leases between 2007 and 2012, MMS estimated that there will be 119,000-241,000 trips by service vessels in the Central Planning Area and an additional 94,000-155,000 trips in the Western Planning Area (MMS 2008 at 4-87-88; MMS 2007 at 4-112). This significant increase in vessel traffic will contribute to collisions with protected whales. NMFS estimated that 7-8 sperm whales may be harassed annually by vessels (NMFS BiOp at 17). Vessel strikes can cause serious injuries and death of whales. In its EIS for Gulf of Mexico lease sales, MMS concedes:

> Increased traffic from support vessels involved in survey, service, or shuttle functions will increase the probability of collisions between vessels and marine mammals occurring in the area. These collisions can cause major wounds on cetaceans and/or be fatal (e.g., northern right whale, Kraus, 1990, and Knowlton et al., 1997; bottlenose dolphin, Fertl, 1994; sperm whale, Waring et al., 1997).

(MMS 2007 at 4-107). Additionally, marine debris from discarded plastic used during offshore drilling and production can harm listed whales and sea turtles by entangling them, causing injury or impaired mobility that can interfere with feeding and reproduction.

VIII. Climate Change Impacts

Oil and gas production results in higher greenhouse gas emissions which increase the impacts of climate change and ocean acidification on Gulf species and ecosystems. Climate change and ocean acidification represent the most significant long-term threat to the future of biodiversity in the Gulf, affecting both terrestrial and marine species. In the Gulf, sea level rise, stronger hurricanes, and higher storm surge (Knutson et al. 1998, Easterling et al. 2000, Scavia et al. 2002, Komar and Allan 2008, Saunders and Lea 2008) will inundate and degrade the habitat of coastal species. Coral reefs, including those in the Florida Keys National Marine Sanctuary and Flower Garden Banks National Marine Sanctuary, are at risk of disappearing entirely due to increasing ocean temperatures and ocean acidification from increased levels of dissolved carbon dioxide (Donner 2009, Veron et al. 2009). Public health will be severely impacted from increased incidence of disease and more frequent heat waves (Epstein and Mills 2005). In order to avoid truly unacceptable consequences of climate change, we must stop the growth of greenhouse gas emissions, and, in relatively short order, begin reducing them.

Leading scientists and numerous scientific studies have warned that current warming and the warming commitment "in the pipeline" already constitute "dangerous" climate change[10] with regard to species and ecosystems (Warren 2006, Hansen et al. 2008, Lenton et al. 2008, Jones et al. 2009, Smith et al. 2009). The updated Intergovernmental Panel on Climate Change (IPCC) Reasons for Concern reflect that current warming is already at a point where significant risks to species and ecosystems are occurring, and that these risks will become "severe" at a ~1°C rise above preindustrial levels (Smith et al. 2009). The 0.7°C surface temperature rise that has occurred since the pre-industrial era have been linked to significant impacts including population declines and species extinctions (Parmesan 2006); the increased frequency of mass coral bleaching events (Donner et al. 2007); a 50% decline in Arctic summer sea-ice extent and thickness since 1980 (Stroeve et al. 2008, Kwok and Rothrock 2009); the near-global retreat of alpine glaciers (IPCC 2007); the accelerating mass loss from the Greenland and west Antarctic ice sheets (Richardson et al. 2009); and a 4° poleward latitudinal shift in subtropical regions leading to increased aridity in many regions (Hansen et al. 2008).

As the world's oceans absorb carbon dioxide from the atmosphere, ocean surface waters have become 30% more acidic relative to preindustrial levels, and scientists predict that if carbon dioxide emissions continue unabated seawater acidity will increase 100-150% by the end of the century (Orr et al. 2005). One of the main impacts of ocean

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[10] A key objective of the United Nations Framework Convention on Climate Change (UNFCCC) set forth in 1992 is to stabilize greenhouse gas concentrations in the atmosphere "at a level that would prevent dangerous anthropogenic interference with the climate system." In regard to species and ecosystems, UNFCCC Articles 2 and 3 specifically stated that "[s]uch a [concentration stabilization] level [to avoid DAI] should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change" and emphasized avoiding ''threats of serious or irreversible damage" (Solomon et al. 2009) where irreversible is measured on time frames relevant to contemporary society (Richardson et al. 2009). Avoiding dangerous anthropogenic interference (DAI) has been the key international policy goal for protecting the global climate since this objective was set forth in 1992.

acidification is that it impairs the ability of many marine organisms to build protective calcium carbonate shells and skeletons because carbonate minerals become less available (Feely et al. 2004, Orr et al. 2005, Fabry et al. 2008, Feely et al. 2009). Nearly all calcifying organisms studied, including species from the major marine calcifying groups and plankton at the base of the marine food web, have shown an adverse response of reduced calcification in response to elevated carbon dioxide in laboratory experiments (Kleypas et al. 2006, Fabry et al. 2008). In field studies, slower growth rates have already been observed in some corals (De'ath et al. 2009), and many corals could be lost within a few decades due to global warming and acidification (Hoegh-Guldberg et al. 2007, Veron et al. 2009). Pacific Coast oyster hatcheries are experiencing difficulties that may be related to acidification, and two of the largest hatcheries report production rates down by as much as 80% (Miller et al. 2009). Some plankton are growing thinner and weaker shells in polar regions which are more vulnerable to ocean acidification (Moy et al. 2009).

Ocean acidification also disrupts metabolism and other biological functions in marine life. Changes in the ocean's carbon dioxide concentration result in accumulation of carbon dioxide in the tissues and fluids of fish and other marine animals, called hypercapnia, and increased acidity in the body fluids, called acidosis. These impacts can cause a variety of problems for marine animals including difficulty with acid-base regulation, metabolic activity, respiration, and ion exchange, leading to impairment of growth and higher mortality rates (Ishimatsu et al. 2004, Pörtner et al. 2004, Royal Society 2005). In fish, high concentrations of carbon dioxide in seawater can lead to cardiac failure and mortality (Ishimatsu et al. 2004). At lower concentrations, sublethal effects can be expected that can seriously compromise the fitness of fish (*Id.*) Juvenile and larval stages of fish were found to be even more vulnerable (*Id.*). Some studies show that juvenile marine organisms are particularly susceptible to ocean acidification (Ishimatsu et al. 2004, Kurihara and Shirayama 2004). In conditions simulating future seawater with elevated carbon dioxide, larval clownfish lost their detection and homing abilities to find suitable habitat (Munday et al. 2009). Moreover, ocean acidification decreases the sound absorption of seawater causing sounds to travel further with potential impacts on marine life that may be sensitive to noise from vessel traffic, seismic surveys, and other sources of noise pollution (Hester et al. 2008, Brewer and Hester 2009).

The continuation of the current global emissions trajectory, which is tracking the most fossil-fuel intensive A1FI emission scenario of the IPCC (Raupach et al. 2007, Richardson et al. 2009), would increase the Earth's temperature by an average of 4°C by the end of the century (IPCC 2007). Given that a ~3.5°C rise would place up to 70% of species on earth at risk of extinction (IPCC 2007), the biodiversity consequences of a business-as-usual approach would be catastrophic. Dr. James Hansen, Director of the NASA Goddard Institute for Space Studies, and colleagues concluded that the safe upper limit for atmospheric CO_2 needed to avoid 'dangerous climate change' is at most 350 ppm (Hansen et al. 2008). Hansen et al. (2008) found that our current CO_2 level has committed us to a dangerous warming commitment of ~2°C temperature rise still to come and is already resulting in dangerous changes. Hansen et al. (2008) concluded that the overall target of at most 350 ppm CO_2 must be pursued on a timescale of decades since paleoclimatic evidence and ongoing changes suggest that it would be dangerous to allow emissions to overshoot this target for an extended period of time:

> If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO_2 will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less than that. (Hansen et al. 2008: 217)

With atmospheric carbon dioxide at ~390 ppm and worldwide emissions continuing to increase by more than 2 ppm each year, rapid and substantial reductions are needed immediately. Greenhouse gas emissions from offshore oil and gas development in the Gulf of Mexico clearly pose significant risks to biodiversity and human health and welfare in the Gulf and around the globe.

Authored by:

Shaye Wolf, Ph.D.
Center for Biological Diversity

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