

GULF FACTS



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The Gulf's Dolphin Die-Off

Over the last two years, an unusually high number of bottlenose dolphins have beached along the shores of Louisiana, Alabama, Mississippi, and western Florida, raising enormous concern—and for good reason. Even in a species known to experience mass mortalities—from brevetoxin and disease—the current die-off is unprecedented in its duration and magnitude. This winter, researchers found that bottlenose dolphins in Barataria Bay, Louisiana, an area that was heavily exposed to oil from the BP *Deepwater Horizon* spill, were underweight and anemic, with suppressed immune systems and signs of liver and lung disease. In this fact sheet, the Natural Resources Defense Council (NRDC) compares the new mortalities to prior strandings of Gulf dolphins and probes their connection to the BP spill.

WHAT IS HAPPENING IN THE GULF?

Since February 2010, hundreds of bottlenose dolphins in the northern Gulf of Mexico have died in a continuous series of mass mortality events, marked by bodies washing up, or “stranding,” along the shore (see figure: Bottlenose Dolphin Strandings from the Louisiana/Texas Border to Franklin County, Florida). The first event, troubling in itself, was underway two months before the spill began, and was declining when the *Deepwater Horizon* exploded; its cause remains unknown. But mortalities remained abnormally high during the spill, which happened at the beginning of the dolphins' reproductive cycle when much of the coastal population moves closer to shore.¹ A number of stranded animals were visibly marked with BP oil, but, for most, any connection with the spill was not nearly so obvious.²

The third spate of strandings came at the start of the dolphins' first post-spill calving season, in January 2011. Over the months that followed, a dramatically large number of stillbirths and newborns turned up along the shore, representing almost half of the roughly 175 dead dolphin bodies recovered that winter.³ While the stillbirths declined with the end of the 2011 calving season, dolphins continued to strand in numbers four to nine times the historic monthly average, at a rate that has rivaled and often surpassed the loss seen during the spill itself.⁴ Now, during the 2012 calving season, the number of stillbirths is rising once again.

In all, more than 600 bottlenose dolphins have stranded in the BP spill region between Louisiana and the Florida panhandle—nearly all of them (roughly 95 percent) found dead, and the remainder having a very low survival rate.⁵ By comparison, dolphin strandings in other parts of the northern Gulf remained at or below historic averages at least through 2010, and stranding rates in eastern Florida, in a region that was only marginally exposed to the spill, have long since returned to normal.⁶

IS THE DIE-OFF UNPRECEDENTED?

The National Oceanic and Atmospheric Administration (NOAA) began to systematically investigate unusual mortality events (UMEs) of marine mammals twenty years ago, after a number of highly publicized mass strandings. Since then, the Gulf's bottlenose dolphins have gone through 11 high-mortality events aside from the present ones—accounting for one-fifth of all the UMEs that NOAA has declared for marine mammals nationwide.⁷ The dolphins' involvement in so many of these events suggests how vulnerable they are to environmental disturbance, and perhaps how likely, as coastal mammals, they are to strand. **But never have the dolphins experienced a die-off that has lasted as long, involved as many animals, or afflicted as many calves.**



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Dolphins swimming in emulsified oil off the coast of Louisiana during the BP spill.

Until now, the longest UME involving Gulf dolphins lasted about 17 months, after a severe red tide developed off the west coast of Florida in 2005.⁸ Most previous events ran their course in much shorter time, like the three-month morbillivirus outbreak that hit Texas in 1994, or the nine-month biotoxin episode that occurred off the Florida panhandle between 1999 and 2000. Mortalities caused by biotoxins or infectious disease often have a single, pronounced spike, unless multiple populations are affected in succession. By comparison, the current die-off has persisted for 25 months, with two main spikes and considerable fluctuation, never once subsiding to normal rates. To be sure, other events have seen higher rates of strandings over shorter periods of time—a one-month biotoxin episode off the panhandle was associated with about 100 strandings—but none are potentially responsible for as many deaths. Increased monitoring efforts, such as aerial surveys run by Unified Command, may have improved reporting during the spill itself and at the height of the 2011 calving season, but is unlikely to account for the very high number of strandings seen during those months.⁹

With one exception, a 2007 episode along the east coast of Texas—whose cause was never determined—no prior event appears to have involved such a large proportion of calves.¹⁰ The extraordinary number of stillbirths reported since 2010 raises serious questions about the nature of the die-off, suggesting that the underlying stressors, whatever they may be, are having an outsized effect on maternal or fetal health.

WHAT ROLE HAS THE *DEEPWATER HORIZON* PLAYED IN THE DIE-OFF?

As oil from the BP spill spread into bays and estuaries, the Gulf's bottlenose dolphins were among the species of greatest conservation concern. Wild dolphins seem unable to detect sheen and sometimes enter areas that are slicked or moussed with oil,¹¹ and overflights and boat surveys off Louisiana reported animals swimming in affected waters.¹² The most immediate danger for the dolphins was from oiling and inhaling toxic fumes, which can cause brain lesions, disorientation, and death. Yet, only a small proportion of stranded dolphins (less than 15 percent of the total number since February 2010) stranded during the spill, meaning that the vast majority of known mortalities cannot be attributed to the immediate, acute effects of exposure.

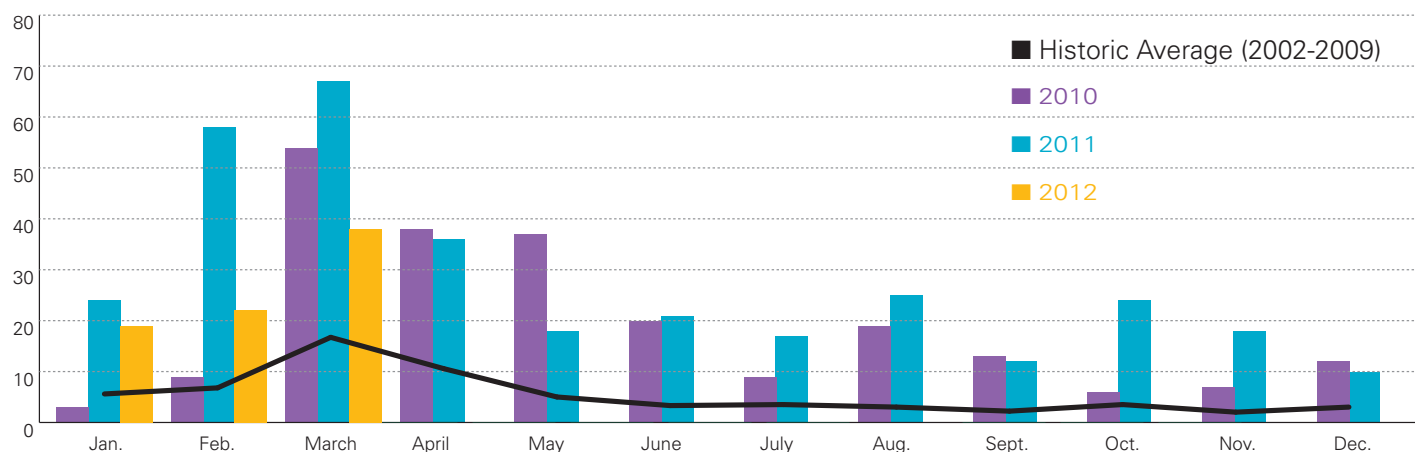
Bottlenose dolphins have an ecology that aggravates their long-term risk. Many of the Gulf's dolphins are shallow-water, coastal, or estuarine animals that seem attached to particular areas, which means they may resist abandoning even a highly degraded habitat. We know that some coastal areas in the northern Gulf were degraded by the BP spill, and when storms come, toxics that have accumulated in the bottom sediment could reenter the water column, as has been observed decades after the *Exxon Valdez* disaster.¹³ Moreover, dolphins feed high on the food chain, and toxins absorbed through fish consumption can bioaccumulate in their tissue. Some toxic compounds found in oil such as polycyclic aromatic hydrocarbons have been shown to cause birth defects in humans; it is conceivable that they are responsible for some of the recent stillbirths in dolphins.¹⁴

The spill could also be a contributing factor in a more complicated pathology. Last October, NOAA investigators reported that five of the 21 stranded dolphins they have analyzed thus far had severe brucellosis, a bacterial infection that, unlike morbillivirus, is not typically associated with mass dolphin death.¹⁵ Its occurrence in such a large percentage of examined animals suggests that some outside environmental stressor was at work. Perhaps, as some of the investigators suggested, the dolphins' exposure to oil or dispersants compromised their immune response and left them susceptible to the bacteria.¹⁶ Or perhaps the impact was indirect. Loss of prey can also undermine the immune system and can deplete the energy that mothers need to calve and nourish their babies, resulting in reproductive failure, lower birth weights, and smaller chances of survival.¹⁷ There exist several plausible mechanisms by which the *Deepwater Horizon* may be linked to the die-off, and none are mutually exclusive.

All of this makes investigation difficult. Many of our standard assays are good at detecting acute toxicity, but not as capable of picking up the complex compounds of weathered oil.¹⁸ Gestational problems and other physiological impacts related to exposure can be hard to diagnose. And investigators are not helped by the poor condition that most of the stranded animals' bodies are in, a state that NOAA classifies as "Code 4" decomposition, meaning that tissues and organs are too broken down for many of the available tests. The fact that unusual numbers of dolphins were stranding in February 2010 and March 2010 suggest that some populations were particularly vulnerable when the spill occurred, and that pre-existing factors may have contributed to some part of the die-off.

Yet, the evidence implicating the *Deepwater Horizon* is becoming more and more compelling. In August 2011, NOAA began an unusual effort to assess dolphin health in Barataria Bay, Louisiana. In this former spill battleground, biologists caught, examined, and released more than 30 individual dolphins, taking samples of skin blubber, urine, blood, and other material, and compared the results to a relatively unexposed and well-studied dolphin community off Sarasota, Florida. Their findings are extremely concerning. While the Sarasota dolphins were generally healthy, many of the animals from Barataria Bay exhibited signs of what NOAA described as *severe illness*: low body weight, low blood sugar, anemia, immuno-suppression, and disease—results

Figure: Bottlenose Dolphin Strandings from the Louisiana/Texas Border to Franklin County, Florida



Source: National Marine Fisheries Service Office of Protected Resources, 2010-2012 Cetacean Unusual Mortality Event in Northern Gulf of Mexico, available at www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm, accessed Apr. 2012.

that are consistent with the effects of oil exposure in other mammals.¹⁹ This comparative study—together with the high numbers of beachings and the unusual pathology seen in some of the bodies—point to the BP spill as at least a contributing factor, even if the causal links have not conclusively been found.

WHAT WILL BECOME OF THE DOLPHINS?

The Gulf's bottlenose dolphins do not belong to a single, solitary group. Biologists divide them into offshore, continental shelf, coastal, and estuarine, bay, and sound populations, which do not mate with one another and are genetically distinct. The near-coastal population breaks down further into more than 30 small and semi-isolated communities, some numbering fewer than 100 animals.²⁰ It is not clear how much interbreeding occurs among these communities, and the death of even a few individuals could have a significant effect on the whole. The shelf and offshore populations are larger but not vast, and the loss of hundreds would exceed the government's estimate of what they can reasonably sustain.²¹ How well the dolphins can weather this storm depends in part on how many animals are dying, and from which populations and communities.

Animals whose bodies are recovered in a die-off are sometimes said to represent only the tip of an iceberg: simply the ones that have happened to strand and been discovered and reported to authorities. For some species, the number of undiscovered bodies can run very high. A recent study estimated that only one in 50 (or possibly one in 250) whales and dolphins that die at sea are found on the Gulf's shores.²² Not surprisingly, the detection rate varies substantially by species, depending on such factors as habitat preference, physical size, and the sociality of the animals. The recent NOAA paper does not assign a number to bottlenose dolphins due to their complicated demographics in the Gulf. But presumably nearshore dolphins would have one of the very best detection rates (perhaps much better than the highest given in the paper, which is about one reported stranding for every 16 deaths), and offshore animals among the worst, with

dolphins on the shelf lying somewhere in between.²³ In any case, the die-off is consuming a substantially larger number of dolphins than the reported numbers suggest.

Small populations are often slow to recover from a mortality event. It was recently assumed, for example, that at least some bottlenose dolphin populations along the southeast coast remain depleted from a morbillivirus epidemic that struck more than twenty years ago, with recovery slowed in part by impacts from fisheries.²⁴ If and when the present die-off ends, Gulf dolphins will still have to contend with brevetoxins, infectious disease, and other stressors that have provoked the long string of mortalities that NOAA has already recorded.²⁵ And there remains the matter of the BP spill. As we have seen from the *Exxon Valdez*, breakdown products from oil can work up the food chain, accumulate in body tissue, induce cascading effects across an ecosystem, and impact wildlife populations for decades afterwards.²⁶ Some of that spill's most serious impacts on sea otters, killer whales, and shorebirds—including the decline of an entire killer whale population—took years to manifest themselves.²⁷

RECOMMENDATIONS

- Congress and the agencies should ensure that robust, long-term research and monitoring of the Gulf's bottlenose dolphin populations continue after the current, mandated Natural Resources Damage Assessment (NRDA) ends.
- NOAA and the Bureau of Ocean Energy Management (BOEM) should strictly manage ongoing industrial and commercial activities, including oil-and-gas activities and tourism, that are impacting dolphin populations already compromised by the *Deepwater Horizon* spill.
- NOAA and the BOEM should incorporate the die-off into all environmental analyses of prospective drilling activity in the Gulf, assuming conservatively, until more is known, that the *Deepwater Horizon* spill is a causal or contributing factor.

Endnotes

- 1 National Marine Fisheries Service Office of Protected Resources, 2010-2012 Cetacean Unusual Mortality Event in Northern Gulf of Mexico, available at www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm, accessed Apr. 2012.
- 2 Leigh Coleman, "Scientists link oil on dolphins to BP spill," *Reuters*, Apr. 7, 2011, available at www.reuters.com/article/2011/04/07/us-oilspill-dolphins-idUSTRE7367OP20110407, accessed Oct. 2011 (quoting NOAA press conference).
- 3 NMFS Office of Protected Resources, 2010-2011 Cetacean Unusual Mortality Event in Northern Gulf of Mexico.
- 4 Ibid.
- 5 Ibid.
- 6 Texas Marine Mammal Stranding Network, 2002-2010 TMMSN Stranding Statistics, available at www.tmmsn.org/research/statistics.htm, accessed Mar. 2012.
- 7 NRDC, "Unusual mortality events involving bottlenose dolphins in the Gulf of Mexico," available at <http://www.nrdc.org/wildlife/files/dolphin-dieoff-chart.pdf>.
- 8 Bottlenose dolphin (*Tursiops truncatus*): Gulf of Mexico Western Coastal Stock, pages 220-227 in G.T. Waring, E. Josephson, K. Maze-Foley, and P.E. Rosel, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2010 (2011).
- 9 Marine Mammal Commission, Assessing the long-term effects of the BP *Deepwater Horizon* oil spill on marine mammals in the Gulf of Mexico: A statement of research needs (2011), available at mmc.gov/reports/workshop/pdf/longterm_effects_bp_oilspill.pdf, accessed Oct. 2011.
- 10 Texas Marine Mammal Stranding Network, 2007 Texas Unusual Mortality Event – 1st Quarter 2007, available at www.tmmsn.org/news/texasume.htm, accessed Feb. 2012.
- 11 M.A. Smultea, M.A., and B. Würsig, Behavioral reactions of bottlenose dolphins to the *Mega Borg* oil spill, Gulf of Mexico 1990, *Aquatic Mammals* 21:171-181 (1995).
- 12 Marine Mammal Commission, Assessing the long-term effects of the BP *Deepwater Horizon* oil spill on marine mammals in the Gulf of Mexico: A statement of research needs (2011), available at mmc.gov/reports/workshop/pdf/longterm_effects_bp_oilspill.pdf, accessed Oct. 2011; R. Nelson, Dolphins and dispersants (blog with video), available at switchboard.nrdc.org/blogs/rnelson/video_dolphins_and_dispersants.html, accessed Oct. 2011.
- 13 G.E. Machlis and M.K. McNutt, Scenario-building for the *Deepwater Horizon* oil spill, *Science* 329:1018-1019 (2010); J.M. Neff, A.E. Bruce, K.R. Parker, D.S. Page, J.S. Brown, and P.D. Boehm, Bioavailability of polycyclic aromatic hydrocarbons from buried shoreline oil residues thirteen years after the *Exxon Valdez* oil spill: A multispecies assessment, *Environmental Toxicology and Chemistry* 25:947-961 (2006).
- 14 A. Ren, X. Qiu, L. Jin, J. Ma, Z. Li, L. Zhang, H. Zhu, R. H. Finnell, and T. Zhu, Association of selected persistent organic pollutants in the placenta with the risk of neural tube defects, *Proceedings of the National Academy of Sciences* 108:12770 DOI:10.1073/pnas.1105209108 (2011).
- 15 NOAA Fisheries Service, NOAA finds bacterial infection as cause of death for five northern Gulf dolphins; investigation continues, available at www.nmfs.noaa.gov/stories/2011/10/27_dolphin_bacterial_infection_cause_dolphin_death.html, accessed Oct. 2011.
- 16 Ibid.
- 17 D. Lusseau, L. Slooten, and R.J.C. Currey, Unsustainable dolphin-watching tourism in Fiordland, New Zealand, *Tourism in Marine Environments* 3:173-178 (2006); D. Lusseau, S.M. Lusseau, L. Bejder, and R. Williams, An individual-based model to infer the impact of whalewatching on cetacean population dynamics, International Whaling Commission document IWC/SC/58/WW7 (2008).
- 18 C.H. Peterson, S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, and D.B. Irons, Long-term ecosystem response to the *Exxon Valdez* oil spill. *Science* 302:2082-2086 (2003).
- 19 NOAA Fisheries Service, NOAA conducts dolphin health assessment in Barataria Bay, Louisiana, available at www.nmfs.noaa.gov/stories/2011/08/22_dolphin_health_assessment.html, accessed Oct. 2011; NOAA Fisheries Service, Study by NOAA and partners shows some Gulf dolphins severely ill, available at www.gulfspillrestoration.noaa.gov/2012/03/study-shows-some-gulf-dolphins-severely-ill/, accessed Mar. 2012.
- 20 Bottlenose dolphin (*Tursiops truncatus*): Northern Gulf of Mexico Bay, Sound, and Estuarine Stocks, pages 228-239 in G.T. Waring, E. Josephson, K. Maze-Foley, and P.E. Rosel, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2010 (2011).
- 21 Bottlenose dolphin (*Tursiops truncatus*): Gulf of Mexico Northern Coastal Stocks, Northern Gulf of Mexico Continental Shelf Stock, and Northern Gulf of Mexico Oceanic Stock, pages 212-219 and 505-513 in G.T. Waring, E. Josephson, K. Maze-Foley, and P.E. Rosel, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2010 (2011).
- 22 R. Williams, S. Gero, L. Bejder, J. Calambokidis, S.D. Kraus, D. Lusseau, A.J. Read, and J. Robbins, Underestimating the damage: Interpreting cetacean carcass recoveries in the context of the *Deepwater Horizon*/BP incident, *Conservation Letters* 4:228-233 (2011).
- 23 D. Lusseau, L. Slooten, and R.J.C. Currey, "Unsustainable dolphin-watching tourism in Fiordland, New Zealand," *Tourism in Marine Environments* 3:173-178 (2006); D. Lusseau, S.M. Lusseau, L. Bejder, and R. Williams, An individual-based model to infer the impact of whalewatching on cetacean population dynamics, International Whaling Commission document IWC/SC/58/WW7 (2008); W.F. Perrin, J.L. Thieleking, W.A. Walker, F.I. Archer, and K.M. Robertson, Common bottlenose dolphins (*Tursiops truncatus*) in California waters: Cranial differentiation of coastal and offshore ecotypes. *Marine Mammal Science*, doi: 10.1111/j.1748-7692.2010.00442.x (2010).
- 24 Bottlenose dolphin (*Tursiops truncatus*): Western North Atlantic coastal morphotype stocks, pages 89-99 in G.T. Waring, E. Josephson, C.P. Fairfield, and K. Maze-Foley, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2006 (2007).
- 25 NRDC, "Unusual mortality events involving bottlenose dolphins in the Gulf of Mexico," available at <http://www.nrdc.org/wildlife/files/dolphin-dieoff-chart.pdf>.
- 26 C.H. Peterson, S.D. Rice, J.W. Short, D. Esler, J.L. Bodkin, B.E. Ballachey, and D.B. Irons, Long-term ecosystem response to the *Exxon Valdez* oil spill. *Science* 302:2082-2086 (2003).
- 27 C.O. Matkin, E.L. Saulitis, G.M. Ellis, P. Olesiuk, and S.D. Rice, Ongoing population-level impacts on killer whales *Orcinus orca* following the *Exxon Valdez* oil spill in Prince William Sound, Alaska, *Marine Ecology Progress Series* 356:269-281 (2008).

