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

Rebuilding an Appetite for Gulf Seafood after Deepwater Horizon

Staff Working Paper No. 16

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"You can't truth your way out of it…"

"The oil didn't do us any good but it sure didn't hurt Florida fisheries," says Lee Schlesinger, spokesman for the Florida Fish and Wildlife Conservation Commission. "Still, the idea that our seafood may not be safe is stuck in people's minds. People saw the oil gushing every night on CBS and they saw that Florida was on the same map. You can't truth your way out of it."[1] Florida temporarily closed a small portion of state waters to fishing last summer due to the BP oil spill but Schlesinger says the closure had little *direct* effect on the Florida fishing industry: The closure was brief and did not occur in an area vital to commercial fisheries. Gulf seafood has since been subjected to months of testing pursuant to a seafood safety protocol established by state and federal agencies in response to the spill. So far, no sample has tested positive for contamination near the thresholds considered harmful to human health.*

Schlesinger's comment begs the question: What is the path to effective restoration of consumer confidence in the Gulf brand? If states suffering from a tarnished image cannot "truth their way out of it," what other tools do authorities have at their disposal? And who should bear the cost?

The purpose of this paper is to describe the evolution of the seafood safety debate and its impacts, to discuss ongoing federal and state efforts to diffuse the controversy, and to offer suggestions for avoiding such a crisis of public confidence in the future. Accordingly, the paper is divided into four parts. Part I tracks the development of the post-spill seafood policy from the first federal fishery closures through the implementation of the joint federal-state "Reopening Protocol." Part II describes the impact of the fishery closures on consumer perception and the ramifications for the Gulf economy. Part III highlights the experience of key Gulf States in trying to combat the perception gap through marketing and independent seafood testing efforts. Finally, Part IV presents the lessons learned and suggests that governments can help to rebuild public trust—now and in the future—by promoting greater transparency, citizen involvement, and more robust and independent seafood testing programs.

* As subsequently discussed in this paper, however, a coalition of non-profit groups challenge some of the fundamental assumptions of the seafood safety protocol, arguing that the standards employed are not sufficiently protective of human health.

AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

More than eight months after the *Deepwater Horizon* oil spill began and five months after the Macondo well was capped, Gulf seafood reaching the consumer market is arguably the safest in the world. The amount of testing by state and federal agencies, the layers of redundancy built into the system, intense public scrutiny and third-party audits, have all conspired to make Gulf seafood one of the most carefully vetted food products on the market today. Well in excess of 10,000 seafood specimens—including shrimp, crabs, oysters and fish—have been collected from affected waters to comprise the thousands of samples that have been tested.[*] State and federal authorities maintain that not a single sample has returned from the lab with contaminant levels surpassing the threshold concentrations considered dangerous to human health.[†] For all samples, in fact, the numbers returning from the lab are hundreds to thousands of times below the agreed upon thresholds.[2]

Nevertheless, a substantial portion of the American public remains skeptical, choosing to forego Gulf seafood in favor of "safer" alternatives.[3] A photo taken during the Summer 2010 Taste of Chicago event—more than 750 miles from the Gulf—shows a vendor sign assuring customers that the seafood for sale is not from the Gulf Coast. A national poll by the Associated Press in mid-August 2010 showed that more than half of respondents did not believe Gulf seafood was safe,[4] and a newspaper headline from December declared, "Safety of Gulf seafood debated 8 months after BP oil spill."[5]

Vendor Sign at Taste of Chicago 2010. Photo credit: Albert Ettinger

[*] In correspondence with Commission staff, NOAA officials reported that—in federal waters alone—investigators collected nearly 10,000 animals that comprise nearly 4,600 samples for re-opening purposes and 4,000 samples for baseline and surveillance investigations. Email from John Oliver, NOAA, January 18, 2010. See section I.B.2.for an explanation of the difference between seafood "specimens" and "samples."

[†] NOAA officials report that in conducting their analysis of seafood samples, finfish and shrimp, from federal waters, none of the samples had concentrations of polycyclic aromatic hydrocarbons (PAHs) exceeding the levels of concern. For all samples, the concentrations of PAHs were well below the PAH levels of concern.

This perception gap—between what the science shows and the people believe—is a big problem for Gulf states struggling to repair their bruised economies in the wake of the *Deepwater Horizon* disaster. Fishing and tourism, along with oil, are the lifeblood of the region, providing tens of thousands of jobs and billions of dollars in revenue each year.[6] Beyond the regional impacts, which can seem abstract and impersonal, are the individual struggles: Despite the fact that more than 99 percent of Gulf fisheries are now open and certain fish populations are soaring,[7] scores of fishermen remain hampered by low sales.[8] Locals spar over the truth of government assertions of seafood safety.[9] Restaurateurs and small business owners, in the Gulf and in surrounding states, continue to face a wary public.[10] Subsistence fishermen, who rely on seafood as part of their daily diet, remain anxious about the health of the waters that nourish them and question whether their catch is safe to eat.[11]

From a technical standpoint, the seafood safety debate derives from the processes of hydrocarbon bioaccumulation and biomagnification.[12] Bioaccumulation is the process by which plants and animals store chemicals—in this case, the building blocks of oil known as hydrocarbons—in their bodies. Biomagnification, in turn, is the process by which increasingly higher concentrations of chemicals are stored in animal tissues as you move up the food chain. Marine organisms in the vicinity of the *Deepwater Horizon* spill may have taken up hydrocarbons from the water, food, or sediments. How much oil a given organism potentially accumulates depends on the hydrocarbon concentration in the water, food or sediment the organism encounters, as well as the characteristics of the species, particularly how much lipid (fat) its tissues contain. Hydrocarbons that are not readily metabolized become stored in the organism's tissues. With additional or prolonged exposure, increasing concentrations may be stored. While oil and water do not mix, oil and lipids mix very well, so high concentrations of hydrocarbons may be found in lipid-rich tissues like the liver, brain, kidneys and ovaries. By contrast, lean muscle tissue generally has the lowest concentration of hydrocarbons.

The hydrocarbons of particular concern are polycyclic aromatic hydrocarbons (PAHs), which contain the most potentially toxic components of oil. PAHs can be passed to fish by direct exposure and through various routes in the food chain (e.g., from water to phytoplankton to zooplankton to fish) as smaller fish are eaten by larger ones. However, because animals that are several steps up the food chain, like small fish, have the capacity to metabolize PAHs fairly rapidly, their predators are not likely to accumulate large doses of PAHs from eating them. So while bioaccumulation of toxic oil components does occur in fish, biomagnification does not. This is one reason why the flesh of fish, which may have initially assimilated concentrations of PAHs that would be considered unsafe, may eventually test well below any levels of concern for human consumption. Nevertheless, the distinction between bioaccumulation and biomagnification is nuanced and can be hard for the public to distinguish, particularly in light of the common knowledge that certain kinds of toxins, including heavy metals such as mercury, can biomagnify as you move up the trophic scale. While smaller prey fish cannot readily eliminate mercury metabolically, they can readily metabolize PAHs. It is important to note that the ability to metabolize PAHs quickly only pertains to fish. Other staples of the Gulf seafood industry, including crabs, oysters, shrimp, clams, and scallops, do not as readily metabolize PAHs and may have elevated levels in their fatty tissues.

"Restoration" in the context of the Gulf oil spill generally refers to the need to restore the natural resources harmed by the spill. But the path to effective restoration requires restoring public confidence as well. The persistent controversy over the safety of Gulf seafood—and the associated economic and psychological effects—underscores the compelling need to restore public confidence and the challenges of doing so.

I. Developing a Policy on Seafood Safety

A. The Emergency Closures

1. Federal Waters

By June 2, 2010, thirty-seven percent of federal waters in the Gulf of Mexico had been closed to fishing in response to the *Deepwater Horizon* oil spill. Such a vast closure of federal fisheries was unprecedented; indeed, a federal fishery had been closed only once before as the result of an oil spill.[*] NOAA's National Marine Fisheries Service initially responded by closing parts of the Gulf exclusive economic zone (EEZ)[†] to all fishing through two emergency rules effective May 2 and May 7, 2010, respectively.[13] The closures covered 17,624 square miles of federal waters surrounding the Macondo well, or 7.5 percent of the total area of the Gulf EEZ. Each of the emergency rules was set to apply for a ten-day window but—before either rule expired—a new rule was passed that expanded the reach and duration of the former rule. The third emergency rule, published May 14, 2010, provided that all closures would "remain in effect until terminated by subsequent rulemaking, which will occur once the existing emergency conditions from the oil spill no longer exist."[14] This third emergency rule made explicit the need to protect the public from possible exposure to "adulterated" seafood, or seafood that had been contaminated by oil from the Macondo well.

The Oil Pollution Act of 1990 does not itself provide authority to close federal or state waters affected by an oil spill beyond that necessary to enable an effective spill response and clean-up. Rather the management of federal fisheries falls entirely under the purview of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).[15] The Act was originally passed in 1976 to promote the U.S. fishing industry's exploitation of coastal fisheries while simultaneously recognizing that overfishing will undermine that mission. A central role for fishery managers under the Magnuson-Stevens Act is to close fisheries as appropriate to allow depleted fish stocks to replenish themselves. The related provisions of the Act are not applicable to manmade disasters or oil spills, providing closure authority in response to overfishing only. However, the Act separately provides limited authority to close fisheries in the case of an "emergency" under Section 305(c), which provides:

> EMERGENCY ACTIONS AND INTERIM MEASURES.—
> (1) If the Secretary [of the Department of Commerce] finds that an emergency or overfishing exists or that interim measures are needed to reduce overfishing for any fishery, he may promulgate emergency regulations or interim measures necessary to address the emergency or overfishing.[16]

Under authority delegated by the Secretary of Commerce, NOAA invoked Section 305(c) to effect the temporary closures after the *Deepwater Horizon* well blowout. While this provision allows the agency to close federal waters in the case of an emergency, it does not enumerate any particular criteria for such closures. Thus, NOAA developed its own criteria and made the first emergency closure decisions based on areas of visible surface oiling. Other criteria for closure were developed over time, with input from the Food and Drug Administration (FDA) as well as the five Gulf States.

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[*] The Barge North Cape oil spill off the coast of Rhode Island on January 19, 1996 was the first time a federal fishery was closed due to oil pollution.

[†] Under the law of the sea, an exclusive economic zone (EEZ) is a sea zone over which a nation has special rights over the exploration and use of marine resources. It stretches from the seaward edge of the nation's territorial sea out to 200 nautical miles from its coast. As applied to the U.S., the EEZ is tantamount to "federal waters."

2. State Waters

In state waters,[*] marine resources—such as fisheries, oyster beds, and shrimp spawning grounds—belong to the state. If there is a threat of contamination to such resources, either from a manmade pollution event or natural causes, states retain authority to close affected waters until the danger has passed.[†] This authority is typically delegated to the relevant state health or environmental agency through law or regulation.[‡] Thus, the emergency closure rules promulgated by NOAA immediately after the spill began did not apply to state fisheries. But as new oil continued to gush from the Macondo well, and as existing slicks were pushed toward shore by wind and ocean currents, state authorities had to mobilize also to prevent the harvest of contaminated seafood from state waters.

Exactly one week after the *Deepwater Horizon* rig explosion, Louisiana announced the closure of select fishing areas and oyster harvesting beds as a precautionary response to the oil spill.[17] This first rule included a significant closure of state oyster grounds in the coastal parishes of Plaquemines and St. Bernard.[18] As the Gulf state nearest the Macondo well, and the one with the most extensive coastal waters —over eight million acres—Louisiana issued a spate of additional closings in May, June and July. In Louisiana, the Department of Wildlife and Fisheries and the Department of Health and Hospitals have primary control over the management of state marine resources: The former has jurisdiction over state fisheries, while the latter has specific authority over the state's oyster harvesting areas due to the human health risks posed by consuming raw oysters.[§] These agencies already conducted periodic sampling and testing as a matter of course before the spill, but the frequency of testing increased dramatically after the spill. In April and May, these agencies collected and tested samples from state fisheries and oyster beds to establish a baseline for comparison to samples collected after oiling.[**]

On May 3, the Mississippi Department of Environmental Quality and the Mississippi Department of Marine Resources announced they were "continuing comprehensive preparations," including the placing of protective boom around ecologically sensitive estuaries and marshes,[††] as well as baseline testing at multiple sites to document pre-spill conditions of coastal ecology.[19] In an early effort to combat negative public perception, the state issued a press release on May 7, emphasizing that all state waters were open to fishing and that "Mississippi seafood is safe to consume."[20] Nevertheless, Mississippi was forced to close some state waters on June 1 due to the presence of oil in state waters.[21]

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[*] State waters typically extend three miles from shore, after which federal waters begin. State waters from certain areas may extend further out to sea, depending on territorial arrangements. For example, the Florida fisheries closure in Escambia County extended out nine nautical miles from shore.

[†] In the case of an oil or hazardous substance spill, the U.S. Coast Guard retains primary authority over cleanup and response and can close off areas of state waters as needed to facilitate response. This type of closure is, however, distinct from a closure specifically applicable to marine resources—a fishery or oyster reef, for example—which is entirely the purview of the state environmental agency.

[‡] In Florida, for example, the state Constitution delegates authority for fisheries closures to the Florida Fish and Wildlife Conservation Commission.

[§] Oyster contamination is most often due to the presence of coliform bacteria, from human and animal waste. Such pathogens are generally killed off in the cooking process, but because oysters are consumed raw, there is a need for heightened surveillance by state health authorities.

[**] Such baseline tests can establish the threshold levels of contaminants for various marine organisms in the area. It is unclear to what extent Louisiana was able to complete such testing before oil hit and what a comparison to post-spill samples showed.

[††] Coastal estuaries and marshes are the natural nurseries for many kinds of marine life including shrimp, crabs, oysters, and fish

State authorities made eight additional closures decisions in June. On July 1, the state closed the Mississippi Sound to all recreational and commercial fishing activities.

On June 14, the Florida Fish and Wildlife Conservation Commission closed a relatively small portion of state waters—about 230 square miles—to the harvest of fish, shrimp and crabs, noting that it was "taking precautionary actions regarding harvest and consumption of these marine species, which may be affected by oil from the BP Deepwater Horizon spill." The closure area covered approximately 23 miles of coastline in Escambia County, where oil from the Deepwater Horizon spill was then present, and out nine nautical miles (10.36 miles) into the Gulf from the Alabama line east to Pensacola Beach.[22]

The Alabama Department of Conservation and Natural Resources closed a portion of state waters to all fishing activity from the east end of Dauphin Island to the Mississippi state line on June 2.[23] Additional waters were closed on June 10, including Mississippi Sound, Heron Bay, Portersville Bay and Grand Bay.[24] Mobile Bay remained open to fishing for the duration of the spill, except for a small area at the mouth of the bay.

With the possible exception of tar balls and very light oil sheens, oil from the Macondo well never made landfall in Texas and no state fisheries were closed. An "Emergency Notice" was posted on Texas Parks and Wildlife Department website on July 28, noting that "[Department] biologists are aware of the spill and its potential impact on fishing in Texas waters, and will work with partner agencies to take action if needed to manage fisheries and safeguard public health."[25]

B. State and Federal Collaboration

While states are autonomous over their sovereign waters, the unprecedented scope of the *Deepwater Horizon* oil spill militated in favor of a joint approach. As mentioned above, Louisiana began closing its state waters to fishing just days after the spill began, according to its own criteria, before oil ever reached state waters. Other Gulf States followed suit.[26] It quickly became clear that a coordinated effort was needed to avoid a patchwork of disparate state closure rules after the spill.

In May 2010, a working group was formed, including public health and environmental agency officials from the five Gulf States, NOAA, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA), to devise a uniform protocol to guide Gulf fishery closures and reopening decisions in federal and state waters. Through a series of meetings and conference calls over the next weeks and months, the working group hammered out protocols for fishery closures, seafood testing, and fishery reopenings.[27]

State and federal officials have since used a multi-pronged approach to try and ensure seafood harvested from Gulf waters is not contaminated by oil. The strategy includes precautionary closures, market surveillance and a reopening protocol.[28]

1. Precautionary Closures

On June 14, 2010, NOAA and FDA—with input from the Gulf States—published a "Fishery Area Closure and Surveillance Plan" that required the following areas to be closed:

- Areas where there is any visible oil on the surface;
- Areas where there is clearly detectable levels of subsurface oil from the BP oil spill;
- Areas that do not currently have surface oil but where NOAA projects there will be surface oil based on its 48-72 hour surface oil trajectory forecasts and subsurface oil locations;

- A five mile buffer surrounding any closed area as a precautionary measure to account for "uncertainties in the actual boundaries of the oil and movement of fish."[29]

These remain the operative criteria for closure in federal and state waters today, allowing NOAA and state authorities to close additional areas as needed. As described below, NOAA was forced to make an additional closure as late as November 2010, when shrimpers pulled up subsurface oil in their nets.

2. Dockside Sampling and Market Surveillance

The Fishery Area Closure and Surveillance Plan also set forth the parameters of a new working relationship between NOAA and the FDA. As the lead federal agency on food safety, FDA's input was critical to developing the standards for seafood testing that would be used as a basis for reopening closed fisheries. The plan further provided that NOAA would take the lead on ocean surveillance and dockside sampling, while the FDA would take steps to ensure seafood safety further along the supply chain.

As a first line of defense, NOAA uses vessel tracking systems and information from on-board observers to verify that fishermen are not operating in closed areas.[30] NOAA conducts limited dockside sampling as a further check—collecting, at random, seafood samples at the dock for laboratory analysis. FDA provides another layer of protection by testing samples further along the supply chain. During the summer of 2010, for example, the FDA collected and tested samples from each of the roughly 65 primary seafood processors handling Gulf seafood at the time.[31*] A primary processor buys seafood directly from the fisherman, so surveillance at this stage is especially crucial. FDA also helps seafood processors review their own individual source controls to ensure proper documentation and to prevent seafood obtained from unknown sources from entering commerce. To date, neither NOAA's dockside sampling nor FDA's market surveillance programs have turned up any evidence of contaminated seafood due to the BP oil spill.[32]

3. The Reopening Protocol

The purpose of the Fishery Area Closure and Surveillance Plan was to ensure that contaminated seafood did not make it to market and that closure areas could be expanded as necessary to keep consumers safe. At the same time, there was significant pressure on government to keep commerce moving and to reopen closed fisheries as soon as practicable. To help guide this determination, the interagency working group also developed a "Reopening Protocol," which was published on June 18, 2010.[33] The Protocol—applicable to both federal and state waters—sought to strike a balance between protecting consumers and unnecessarily crippling the seafood industry. It sets forth the following background principles:

- NOAA and the FDA are working with other federal and state agencies to protect consumers from adulterated and unsafe seafood, while minimizing undue economic burden on any impacted seafood industries.
- Once oil or chemical contaminants are visually observed on the ocean surface, it is recommended that the fishery be closed until free of sheen, and subsequent testing has been

[*] There are roughly 300 primary processors working along the Gulf Coast, but many of these temporarily closed their doors or were securing their seafood from non-Gulf sources during the height of the spill. As of January 2011, the FDA was in the process of conducting a second round of sampling from Gulf seafood processors; agency representatives expected a significantly larger sample pool in light of the fact that many of the processers had returned to work.

completed to confirm that seafood from affected areas are wholesome and safe for human consumption and use in animal feed.

- After the initial fishery closure, the best approach for determining the safety and acceptability of seafood from oil-contaminated areas is one that involves organoleptic analysis of products (i.e. sensory testing) followed by chemical analysis.
- Fishery closure areas also include areas that NOAA predicts will have surface oil as well as, a precautionary buffer zone around known contaminated waters to account for uncertainty. After confirming through subsequent evaluation that oil did not enter an area, the area may be re-opened without subjecting seafood samples to evaluation under this protocol. This protocol is an added layer of protection being applied to seafood only in areas known to have been contaminated.[*]

Beyond this prefatory guidance, the Protocol lists four specific criteria that must be satisfied before a closed area can be reopened:

1. *Low threat of exposure*: The area must be free of oil and oil sheen on the surface;
2. *Evaluation of oil movement*: There is low risk or threat of future exposure to oil based on the current predictions;
3. *Sensory testing of seafood*: Seafood must pass sensory sampling (small and taste) for oil exposure (taint);[†]
4. *Chemical analysis of seafood*: Sensory testing is just the first step in the analysis: Any sample that passes sensory testing must also pass chemical analysis for oil concentration (toxicity).[34]

Seafood testing is central to the reopening analyses, and the part of the Protocol that has attracted considerable public attention. According to the Protocol, oil exposure presents two kinds of risks to consumers. The first is the presence of petroleum "taint" (a smell or taste of oil), which renders seafood unfit for human consumption. The second concern is the presence of PAHs, which, as described in the primer on bioaccumulation, can pose a chemical hazard to humans at certain concentrations.

The nuts and bolts of the seafood testing process are as follows: Seafood specimens are collected from the area being considered for reopening, and partitioned into samples for testing. Seafood first undergoes sensory testing, during which a minimum of ten experts trained to detect oil-tainted fish assess each sample.[‡] At least seventy percent of the assessors must find no detectable odor from the raw or cooked sample and no detectable taste from the cooked sample. If any sample fails sensory testing, then the entire site slated for reopening fails and the area remains closed. If a sample passes sensory analysis, it must then undergo a more rigorous laboratory chemical analysis. The purpose

[*] The fact that seafood from only certain areas of the Gulf is subject to sampling under the Protocol was a source of concern for some local fishermen, who worried about liability issues should consumers become sick after buying their catch. Interviews with Commission staff, August 2010. Several fishermen pointed to the need for more extensive dockside sampling and certification procedures, and suggested that if the government has made the determination that certain fishing grounds are safe and should be reopened, then the burden should be on NOAA/FDA to give its "stamp of approval" to Gulf seafood so that any potential liability can be shared.

[†] "Even at levels too low to affect human health, PAHs and other chemicals in oil can cause seafood to have an unusual smell or taste. This is called "taint." Taint does not necessarily mean that fish or shellfish are unsafe to eat, but tainted seafood is not allowed to be sold in interstate commerce." NOAA, Office of Response and Restoration, *Oil Contaminants in Seafood: Evaluating the Risk for People Who Eat Fish and Shellfish*, June 1, 2010.

[‡] This is the so-called "sniff test" which was widely ridiculed by critics. Nevertheless, unilateral focus on the sniff test is disingenuous because the Reopening Protocol required BOTH sensory evaluation AND chemical testing—not just one without the other.

of the chemical analysis is to measure the concentration of PAHs in the sample, and to ensure it did not exceed consumption thresholds deemed to pose an unacceptable risk to human health.

The absolute value of the consumption thresholds (e.g., 2 parts per million of PAHs in a daily portion) is pre-set according to standard risk assessment methods that require authorities to make assumptions concerning how much seafood consumers eat in order to give meaning to the absolute value.[*] Thus, the protocol necessarily incorporates a "fish consumption assumption" which guides the application of the risk thresholds. In the case of the Gulf oil spill, authorities agreed to assume that individuals eat no more than two six-ounce portions of fish per week and one three-ounce portion of shrimp (equal to about four jumbo shrimp) per week.[†]

To address the use of dispersants and how those might affect the safety of seafood, the Reopening Protocol—over the summer and into the fall—stated that:

> To date, available information indicates that the dispersants being used to combat the oil spill do not appear to accumulate in seafood and therefore, there is likely little public health concern from them due to seafood consumption. However, as per this protocol, sensory testing and further work to identify component compounds in known exposed fish will be conducted for dispersants.[35]

This disclaimer was cold comfort to community members convinced that dispersants pose a significant health danger, and who further doubted the value of sensory testing methods—aka "the sniff test."[‡]

On October 29, 2010, NOAA and FDA announced the addition of a new chemical test for dispersants as a condition precedent to reopening closed waters.[36] The new test targets one of the main chemicals building-blocks of the dispersants used in the *Deepwater Horizon* oil spill, a compound called dioctyl sodium sulfosuccinate (DOSS). The test is to be used in any future reopening decision, and is applicable to fish, oysters, crab and shrimp. The level of concern is 100 parts per million for fish and 500 parts per million for shrimp, crab and oysters, but official sources suggest the test is able to detect DOSS at levels of 2000 times below the lowest level of concern.[37] Past research suggests that finfish metabolize DOSS rapidly, and subsequent research at NOAA and FDA laboratories in Galveston, Texas and Dauphin Island, Alabama, respectively, provides further support that fish, crustaceans and shellfish quickly clear DOSS from their tissues.[38]

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[*] Scientists use a process called "risk assessment" to determine levels of chemical exposure that may cause health problems. For chemicals known to pose a threat to human health, scientists establish "safe" levels of exposure, taking into account sensitive populations such as children, the elderly, and people with weakened immune systems. Exposures below these set levels—or risk thresholds—are considered safe, while exposures above the risk thresholds should be avoided. With respect to PAHs, which are suspected to cause cancer, scientists have set an acceptable cancer risk level, which is extremely low as compared to cancer risks associated with lifestyle choices, such as smoking or poor diet. NOAA, Office of Response and Restoration, *Oil Contaminants in Seafood: Evaluating the Risk for People Who Eat Fish and Shellfish*, June 1, 2010.

[†] Each of NOAA's reopening decisions was accompanied by a memorandum entitled "Metabolism of PAHs by Teleost Fish" which highlighted the fact that teleost fish (fish with backbones such as grouper, snapper and tuna) are able to rapidly metabolize PAHs such that that these compounds do not become stored in their tissue in any significant quantity. The memorandum stated that even when fish are exposed to oil, there is little chance for PAHs to travel up the food chain to human consumers. Notably, similar claims were not made with respect to other, non-teleost, staples of the Gulf seafood industry, including crabs, oysters, shrimp, clams, and scallops.

[‡] Public comments at the Commission's Forum in New Orleans on January 12, 2011 revealed continuing apprehension and anecdotal observations that dispersants were making people sick. See video of New Orleans Forum, January 12, 2010, http://www.oilspillcommission.gov/forum.

When the new test was announced, NOAA and FDA had already used it to analyze 1,735 samples collected from June to September over a range of locations in the Gulf (including state and federal waters). The samples spanned a range of species, including grouper, tuna, wahoo, swordfish, gray snapper, butterfish, red drum, croaker, and shrimp, crabs and oysters. Of the 1,735 samples tested, 13 showed trace amounts of dispersants residue but they were well below the aforementioned safety thresholds for DOSS. As such, it was concluded that they did not pose a threat to human health. According to FDA Commissioner Margaret Hamburg, "The overwhelming majority of the seafood tested shows no detectable residue, and not one of the samples shows a residue level that would be harmful for humans. There is no question Gulf seafood coming to market is safe from oil or dispersant residue."[39]

In December 2010, FDA also began revamping its testing protocols to incorporate a fluorescence test requirement.[*] Fluorescence testing is more sensitive than traditional chemical analysis for PAHs. Additionally, authorities are considering incorporating additional tests for different contaminants found in oil aside from PAHs to the testing protocols. For instance, environmental and health NGOs have suggested that a test for heavy metals, such as mercury and arsenic, ought to be included.[40]

C. Community Concerns with Seafood Testing

The seafood testing components of the Reopening Protocol are under scrutiny by environmental and public health groups who claim that the chosen consumption risk thresholds are not sufficiently protective of vulnerable populations, such as subsistence fishermen, pregnant women and children.[41] Additionally, critics of the government protocols take aim at the underlying seafood sampling procedures—where seafood samples were collected and how many—as being opaque and insufficient. Joe Jewell, Deputy Director at the Office of Marine Fisheries at the Mississippi Department of Marine Resources, contends that these concerns stem from a misunderstanding of the process rather than any flaw in design.[42] Nevertheless, Jewell recognizes that authorities may have fallen short in communicating effectively with the public and clarifying misconceptions as they arose.[43]

1. PAH Risk Threshold Issue

The heart of the seafood testing procedure is a comparison of the PAH levels detected in samples to determined "risk thresholds"—namely the maximum concentration of PAHs authorities calculated humans could consume safely, any concentration above which is deemed unsafe.[44] These risk thresholds are based on assumptions regarding how much seafood people in the Gulf eat and how often. To recap, the thresholds assume average consumption of a 6 oz. piece of fish twice a week and a 3-oz serving of shrimp once a week, equal to about four jumbo shrimp. Some Gulf residents take issue with these consumptions assumptions, pointing out, for example, that "four shrimp don't even make a Po'boy."[45]

On October 1, 2010, a coalition of non-government organizations (NGOs) including the Natural Resources Defense Council, the Sierra Club, the Deep South Center for Environmental Justice, and many others sent a letter to the FDA asking it to adjust the PAH risk thresholds applied in the Gulf oil spill to better reflect the higher rates of seafood consumption among Gulf residents, particularly subsistence

[*] The FDA developed a high-performance liquid chromatography (HPLC) method with fluorescence detection to measure PAH levels in samples from state waters. Such a test is evidently more sensitive than the gas chromatography-mass spectrometry (GC-MS) method formerly in use. NOAA Marine Fisheries has also established this HPLC method at its laboratories in Pascagoula and Seattle, and it is being used in addition to the original GC-MS method. Email from John Oliver, NOAA, January 18, 2010.

fishing communities whose consumption rates can be an order of magnitude higher than the national average.[46] The groups maintain that the risk thresholds in use are based on surveys of national seafood consumption rates and, given the region's voracious appetite for seafood, are thus a poor barometer for the Gulf.[*] The letter suggests that the scientifically-validated consumption rates adopted by the EPA and the World Health Organization for high-volume seafood consumers are more appropriate and should be adopted.

The coalition followed-up with another letter on December 8,[47] which included the results of an informal survey of seafood consumption patterns among Gulf Coast residents conducted between August and October 2010.[†] The survey of 547 coastal residents in Louisiana, Mississippi, Alabama and Florida, found that many or most respondents reported consuming more fish, shrimp, oysters and crab than FDA risk thresholds presumed.[48] For example, for fish, the survey found that the average, median and 90th percentile consumption frequency of the study population was three, two and five times per week, respectively. By contrast, the FDA assumes residents consume only one meal of fish per week. Likewise, for shrimp, the consumption frequency among respondents was two, two and five times per week, respectively—substantially more than the FDA's assumption of one serving per week. Some subpopulations, moreover, had significantly higher consumption rates. The Asian/Pacific Islander ethnic group had a median shrimp consumption frequency of four times per week and a 90th percentile of six.

While not statistically rigorous, the survey suggests that Gulf residents may eat significantly more seafood than the risk thresholds assume, and highlights the vitality of this debate. As subsequently described, however, all of the laboratory tests conducted to date—for both federal and state waters—have shown PAH levels orders of magnitude below applicable risk thresholds. Thus, for this spill, even if the seafood consumption assumption thresholds were to be increased dramatically (e.g., from two meals per week to 20), potential PAH exposure still would not be judged harmful to human health. Nevertheless, this is not to say that the fish consumption assumption threshold would not be relevant in the case of a future oil spill, where concentrations of PAH's in tested samples may be much higher; every spill is different. Little would be lost if FDA were to commission a survey of seafood consumption patterns for the Gulf Coast in order to bolster public trust and put to rest this ongoing controversy.[‡]

Still, officials close to the process suggest that the standards in place are already sufficiently protective of Gulf populations. In the first instance, they point out that the applied seafood consumption assumption is the product of the collective best professional judgment of experts from the FDA, NOAA and the Gulf States. A common misconception is that the FDA simply applied a value based on the average national seafood consumption rates, but state officials make clear that they were involved in calculating the risk thresholds that would apply in the wake of the *Deepwater Horizon*: While it is true that the Reopening Protocol incorporates seafood consumption rates that are based on a national survey, the working group agreed to use the rates corresponding to the 90th percentile of that survey in order to better reflect Gulf realities.[49] In other words, 89 percent of the nation eats less seafood, on

[*] According to the NRDC, FDA's argument for using national numbers for calculating exposure thresholds in the Gulf was the absence of a reputable survey of seafood consumption patterns in the Gulf.

[†] It is important to note that the survey was not based on a random sample. Rather, the survey was made available online and paper copies were distributed by community representatives in English and Vietnamese. Thus, respondents were largely self-selected and the reliability and validity of the survey is compromised as a result.

[‡] It bears noting that—in light of current chemical test results—even if FDA and NOAA were to substantially increase the seafood consumption assumption, the detectable levels of PAH and dispersants in seafood harvested from the Gulf likely would remain below applicable risk thresholds.

average, than the value relied on by the Gulf seafood safety protocol, while 9 percent of the nation eats more.

2. Seafood Sampling Issue

Another oft-repeated criticism of the seafood testing protocol has to do with the sampling procedures used to collect seafood from affected waters. Each federal reopening decision is accompanied by a map identifying sampling locations as well as data reflecting the number and type of specimens collected. Critics portray the sampling process as haphazard and insufficient, leading to premature reopenings of fisheries before the safety of the catch is conclusively established. By way of example, NOAA's website indicates that for the 5,000+ square mile reopening of federal waters which took place on September 2, only 12 shrimp samples were tested, totaling 73 shrimp specimens.[50] While the subsequent analyses of these samples revealed no contamination at levels considered risky to human health, advocacy groups have questioned the paucity of the number of samples analyzed relative to such a large area.[*]

Similar criticisms have been leveled against sampling efforts in state waters, which also follow the federal regulations and protocols. In examining the sampling history for each of the Gulf States, the NRDC found that—by September 2—Louisiana had tested 53 shrimp, Alabama and Florida had each tested 42 shrimp, and Mississippi had tested 21 shrimp. Gina Solomon of NRDC explains why these numbers may be insufficient:

> Even in Louisiana, where more testing has been done, there are still questions: A total of 53 shrimp from Louisiana waters have been chemically analyzed and the levels reported as low. If those 53 shrimp really represent the full extent of the open territory, maybe that's OK, but this oil spill has lots of variability, with pockets of contamination appearing in many locations. As a scientist, I would feel better if I knew there was a robust sampling strategy to address this variability and to take enough samples - maybe several hundred - to assure that if there were contaminated shrimp out there, they would be detected.[51]

Concerns such as these are plausible, and are shared by a number of community groups and NGOs in the region. But state and federal officials suggest there are a variety of factors underlying the sampling protocols which were not well understood by the public, leading to confusion and propagation of misinformation. For example, Mississippi officials point out that the number of samples necessary to justify reopening depends on the location and extent of oiling: While the number of samples taken in Mississippi was low as compared to Louisiana, that is because Mississippi has significantly less shoreline—and state waters are correspondingly smaller in area.[52] Moreover, the extent of oiling in Mississippi state waters was relatively low. NOAA officials confirmed and elaborated on this point, noting that:

> In general, seafood was collected more intensely in areas that were more heavily oiled, for example, closer to *the Deepwater Horizon* wellhead. In addition, finfish and shellfish are not randomly distributed in the Gulf of Mexico; therefore, sampling of particular

[*] For example, Dr. Bill Walton, Professor of Marine Fisheries at Auburn University in Alabama, said "that the most recent federal opening was based on what sounds to me like a relatively small sample size, especially when those samples are spread across multiple species. . . . I believe that 1) the number of samples and replicates should be increased to address public concern and 2) the sampling, replication and results should be readily found by the public." Written Response of Dr. Bill Walton to Commission Staff Questionnaire on Fisheries, September 5, 2010.

species was more intense in locations where those species naturally occur. The species collected were also representative of the species targeted by commercial and recreational fishermen in that area.[53]

Commission staff also asked NOAA to comment on the criteria that guided the agency in deciding how many specimens to collect. In a written response, NOAA officials stated: "Sample numbers were based on statistical considerations derived from previous efforts in surveys of fish in the Gulf of Mexico, and variation in data in earlier studies using sensory and chemical testing of seafood."[54] Such an explanation is hardly likely to convince skeptics demanding specific information on sampling to allay their concerns.

Another source of confusion cited by officials is the difference between a specimen and a sample.[55] A specimen is what is collected from the sea—one shrimp for example—whereas a sample is what is subjected to sensory or chemical analysis. A specimen and a sample may not be the same. In order for a laboratory to conduct a chemical analysis on biological tissue, a certain volume of tissue is required in order to return confident results. With respect to certain small species, several specimens are needed to comprise a sample for analysis. Unfortunately, the distinction between specimens and samples is not always made explicit and often used interchangeably by authorities when speaking to the public. This lack of necessary precision causes confusion when state and federal authorities proclaim that thousands of samples/specimens were taken, while a significantly lower number is posted on official reports.[56]

Without access to official sampling rationales and methodology, the concerns of groups like NRDC are understandable. The sampling controversy is another example for greater care to public relations and communications would be a win-win situation for all concerned.

D. Reopening the Fisheries

By June 2, 2010, 37 percent of the federal waters in the Gulf of Mexico were closed to fishing due to the *Deepwater Horizon* oil spill.[57] Federal authorities announced the first reopening of federal waters on June 4, when approximately 12 percent of the closure area was reopened. Additional reopening decisions were issued throughout the summer and fall. As of this report, the most recent reopening took place on November 15, when NOAA opened an 8,403 square mile area that had been closed. By that time, 99.6 percent of federal waters were open to fishing.[58]

Each of the reopening decisions has been posted on NOAA's website[59] with extensive supplementary material, including: (1) seafood sample locations, (2) seafood testing data, (3) NOAA's letter to FDA providing the rationale for reopening (i.e., test results showing no contamination), (4) the associated FDA concurrence letter, as well as a copy of (5) the reopening protocol and (6) a background paper regarding the metabolism of PAHs by teleost fish. While the number of specimens collected and sample locations were posted for each reopening, there was no description of the underlying standards or methodology used to inform the sampling decisions. Publication of such a sampling protocol would have gone a long way in mollifying some of the concerns raised by groups such as NRDC concerned with the robustness of the seafood testing regime.

Louisiana began reopening its waters to fishing in early July. By mid-November 2010, over 98 percent of state waters were open to commercial fishing.[60] The most recent reopening decision (as of the printing of this report) on November 8th, applied to crab fisheries, which were historically among the last fisheries to reopen—second only to oyster grounds—due to their heightened sensitivity to oiling

impacts.[61] Such a species-specific reopening process was common across affected Gulf States, with waters typically opening to fin-fishing first, and subsequently to fishing for shrimp, crab and oysters.

In Mississippi, reopening also proceeded in stages, with one portion of the closure area reopening to the harvest of finfish and shrimp—but not crab—on July 30 and subsequent reopenings across all state fisheries in August.[62] State officials recoil at allegations that the independence of their seafood testing has been in some ways compromised or that its science is unsound. Officials describe multiple layers of testing: In addition to sending samples directly to NOAA for testing per the joint protocol, the state also sends samples to the State Chemical Lab, where they undergo a separate analysis using even more stringent standards than required by the NOAA protocol. The state inspection and monitoring process is also robust, with inspections beginning dockside and continuing almost to the grocer's shelves.

In Florida, there had been just one closure along the coast of Escambia County. Reopening of the area proceeded in three tiers, according to the marine species at issue: On July 31, the Florida Fish and Wildlife Conservation Commission reopened the area to the harvest of fish; on August 16, the area was reopened for shrimping; and on September 16, the area was opened to the harvest of crabs. With each reopening, state authorities stressed the extent of surface monitoring, seafood testing and analysis that were required before harvest of a given species would be permitted again.

The first reopenings of Alabama waters for fishing took place on August 7,[63] and all remaining Alabama waters were open to fin-fishing on August 16.[64] The August 16 reopening notice highlighted the latest round of test results—including results from new florescence testing methods. The reopening applied to fin-fishing only and subsequent notices provided for the reopening of closed waters to crab harvesting and shrimping. Like Louisiana, Alabama provided a hotline number for citizens to call should they suspect oil contamination.[65]

Seafood safety does not seem to have been a significant issue in Texas and there is no indication that the state is currently considering a request to BP for marketing funds. Calls from Commission staff to the listed media contact for the Texas Parks and Wildlife Commission have not been returned.

E. New Closure in Federal Waters

On November 24, 2010, new reports of subsurface oil forced NOAA to shut down 4,213 square miles of federal waters off Louisiana, Mississippi, and Alabama to fishing for royal red shrimp.[*] The closure came just nine days after NOAA announced that over 99 percent of previously closed Gulf waters were oil-free and open for business.[66] According to a NOAA press release, the closure decision was made "out of an abundance of caution . . . after a commercial shrimper, having hauled in his catch of the deep water shrimp, discovered tar balls in his net."[67] The tar balls were sent to the U.S. Coast Guard for "fingerprint" analysis to determine whether they contained oil from the Macondo well. NOAA officials have since reported that testing revealed that some of the tar balls were not related to the spill, while the testing of others was inconclusive.[68]

The royal red shrimping ban was lifted on February 2, 2011, after NOAA announced that "shrimp and finfish from the area are safe to eat,"[69]and that all seafood samples passed both sensory and

[*] The new closure was only applicable to royal red shrimping, which involves dragging trawl nets along the ocean floor at depths of over 600 feet. Fishing in shallower waters in the same area was still permitted. The impact of the closure was further limited because only about 250 fishermen currently hold permits to harvest this species.

chemical analysis.[*] As of February 2, an area immediately surrounding the Macondo wellhead—measuring 1,041 square miles—remains closed to fishing. All commercial and recreational fishing, including catch and release, is prohibited in this closed area.[70]

II. Impacts of the Fishery Closures

The American people were obviously relieved when the Macondo well was finally capped on July 15. The event marked the end of the acute phase of the *Deepwater Horizon* disaster, a three-month state of emergency which paralyzed industry and put tens of thousands of Gulf residents in limbo. But a lengthy period of restoration—of damaged ecosystems, battered businesses and faltering public confidence—was just beginning.

A. Persistent Doubts about Seafood Safety

A month after the well was capped and just as the Gulf white shrimp season was set to begin, a national poll conducted by Associated Press-GfK from August 11-16 found that 54 percent of the 1,007 respondents lacked confidence in the safety of Gulf seafood from areas affected by the spill, and 55 percent said they weren't confident that the beaches in affected areas were safe for swimming.[71] The results of a consumer perception survey conducted by the state of Louisiana in August were also sobering.[72] Of the 1,003 nationwide respondents, 53 percent believed, or were not sure whether, Gulf shrimp prices were up because they had to be cleaned of oil; 44 percent believed, or were not sure whether, fishing was allowed where oil is present; and 35 percent believed, or were not sure whether, regulations were in place to ensure that contaminated seafood is not sold. According to Lieutenant Governor Scott Angelle,[73] these weren't even the most serious issues: "The most devastating finding is that 48 percent still believe restaurants that serve Louisiana seafood put customers at risk."[†] Also troubling was the finding that consumer doubts on seafood safety were not improving over time: An identical survey conducted three months earlier found that roughly the same proportions of respondents reported the concerns above.[74] The report authors note that the study "confirms that despite passage of time, the nation's perception has not improved."[75]

National surveys by the University of Minnesota Food Industry Center corroborate that the consumer confidence problem is stubborn and resistant to change.[76] Of respondents surveyed in May 2010, 53.1 percent said they were eating less seafood based on the Gulf spill, with 24.2 percent saying they would only eat seafood that they knew did not come from the Gulf of Mexico. The percentage was virtually unchanged in subsequent surveys conducted in June, July and August with more than 50 percent of respondents each month stating that their seafood consumption patterns had changed due to the spill. In each of those three months, moreover, more than 21 percent of respondents said they would only eat seafood that did not come from the Gulf.

More recent polls conducted in September and October suggest minimal improvement in consumer confidence: In the September survey, 45.2 percent of respondents said they were eating less seafood due to the Gulf spill, with 17.5 stating categorically that they would not eat seafood from the Gulf. In November, the percentages increased slightly, with 48.3 percent of respondents reporting eating less seafood due to the spill and 18.4 stating they would not eat Gulf seafood. Thus, more than six

[*] The test results are available at http://sero.nmfs.noaa.gov/deepwater_horizon_oil_spill.htm.

[†] The figure cited by Lt. Governor Angelle is not entirely accurate in light of the fact that it combines the percentage of respondents who said that restaurants serving Louisiana seafood put their customers at risk with the percentage of respondents who said they were "not sure" whether such restaurants put their customers at risk.

months after the spill, nearly half of all respondents reported changing their seafood consumption patterns as a direct consequence of the *Deepwater Horizon* oil spill. Most recently, a national survey commissioned by Greater New Orleans, Inc. conducted in November showed slightly more favorable results—at least with respect to consumer perceptions of Louisiana seafood: Of the 1,007 registered voters polled across seven major U.S. media markets, 17 percent reported an unfavorable impression of Louisiana seafood while 58 percent had a favorable impression. Louisiana may have a head start in the recovery of consumer confidence due to their prior state-specific seafood branding and marketing efforts. The survey found that respondents were more favorable to the term "Louisiana seafood" (with 53 percent being likely to purchase) than "Gulf seafood" (with 53 percent being unlikely to purchase).[77]

B. Loss of Public Trust

At least regionally, declines in consumer confidence have been fueled, in part, by an eroding relationship between community groups and local government. During the summer, for example, a group of fishermen attracted public attention with persistent claims that they were discovering oil in reopened areas. None of these claims was ever publicly verified and many were puzzled by what they perceived to be fishermen speaking out against their interests. Passions ran high on both sides. In the most extreme cases, fishermen and their supporters cast themselves as whistleblowers working to uncover what they alleged was a vast government conspiracy. The government in turn painted the fishermen as being less interested in returning to honest work and more interested in continuing to collect BP money.

During the height of the response, when the Vessels of Opportunity Program was in full swing, it was common to hear reports from fishermen that they had discovered tar balls or oil in areas that had been reopened to fishing. In response to such reports, a NOAA Sea Grant agent said that "Skimming oil is a lot easier than trawling for shrimp."[78] The insinuation being that certain fishermen had an incentive to perpetuate concerns about the safety of the fishing grounds in order to extend their participation in the lucrative Vessels of Opportunity Program. Whether any fishermen actually had such ulterior motives or whether they were only voicing good-faith concerns may never be clear, but debates such as this one did create division and impact consumer perceptions on seafood safety.

The loss of public trust was also exacerbated by a slow government response to reports of seafood contamination. For example, Louisiana fielded a number of claims of contaminated seafood in the wake of the spill.[79] Initially, BP provided a hotline for consumers to call and report concerns of contaminated seafood. These calls went to a call center, and consumers were assured that someone would come to collect the samples for testing. However, the BP response to these calls was sporadic, so there were many occasions where no one came to collect the samples and the seafood spoiled before tests could be run.

In interviews with community members, Commission staff was told that even when samples were collected, individuals often were never apprised of the results. Rather, the whole testing process became just another black box, leaving citizens puzzled and feeling disenfranchised. To stem consumer frustration, Louisiana eventually provided its own 24-hour hotline through the Department of Wildlife and Fisheries. These calls were always answered, according to a state official close to the process, and state officials always traveled to collect the samples for testing. However, the state hotline did not go live until September, by which time many residents were fed up.[*] Officials admit the delay in creating a

[*] In describing the process instituted by Louisiana in September, Olivia Watkins of the Louisiana Department of Wildlife and Fisheries says that a state official would go to the caller's location to collect the sample, but that it was

reliable mechanism to follow-up on citizen reports of contaminated seafood contributed to the perception problem.

Beyond their own missteps in the public relations arena, authorities also blame the press for feeding the perception problem: For example, Watkins says that while reporters were quick to jump on stories of potential contamination, the same reporters often neglected to follow-up after testing was complete and the seafood in question was proved to be uncontaminated after all.

C. Injury to the Gulf Economy

Florida State University oceanographer Ian McDonald has called the Gulf of Mexico "the hardest working of our ocean basins."[80] The southern coast of the United States produces more than one-third of the nation's domestic seafood supply,[81] including most of the shrimp, crawfish, blue crabs, and oysters.[82] It produces one-third of all domestic oil,[83] claims four of the top seven trading ports by tonnage,[84] and receives runoff from nearly 40 percent of the nation's land.[85] The northern Gulf also provides diverse fish nursery and feeding grounds in the form of expansive marshes, mangrove stands, swamp forests, and seagrass beds, and boasts some of best beaches and waters in the United States for recreation and tourism.[86] Coastal tourism and commercial fisheries generate more than $40 billion of economic activity annually in the five Gulf States.[87]

In 2008, according to NOAA, Gulf commercial fishermen harvested 1.27 billion pounds of finfish and shellfish that earned $659 million in total landings revenue.[88] Other contributors to the total Gulf fishing economy are seafood processors, warehouses, distributors, and wholesalers. Further, the health of the fishing industry is intimately bound up with the wellbeing of innumerable other Gulf businesses, including dock owners, restaurants, hotels and tourism. A Louisiana survey reports that seafood-laden Louisiana cuisine is the most-cited reason for visiting the State.[89] But the health of the Gulf fishing industry is also vitally important to the nation: Gulf fishermen land 73 percent of the Nation's shrimp—half from Louisiana waters. Louisiana accounts for 67 percent of the nation's oyster production and 26 percent of the blue crab production.[90]

In testimony before the Commission in late September, Timothy Fitzgerald, a specialist on seafood safety at Environmental Defense Fund, summarized some of the economic challenges ahead:

> Based on federal and state testing, the public has been repeatedly reassured that Gulf seafood is safe to eat. However sales remain depressed in the region and around the country, and some fishermen are hesitant to return to work given poor markets and concerns over lingering toxins in the water. . . For Gulf fishermen and other members of the seafood industry, this lack of consumer confidence can be devastating. They not

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not uncommon for the caller to rescind their complaint once officials arrived on the scene. "To date, there has not been a single case of contaminated seafood brought up by any individual that was legitimate. Everything has PAHs in it – it's the level that determines whether or not [a sample] is contaminated." Watkins also says that a number of reports of contamination that initially seemed credible ended up being unrelated to the oil spill: For example, some callers reported shrimp with a black substance in their lungs but further testing revealed these shrimp were infected by "black gill disease," which shrimp can catch as a matter of course. Another issue arose when consumer groups began conducting independent testing and claiming contamination. One such initiative caused a stir after local activist Nancy Mackenzie claimed to have found above-threshold PAH contamination in Louisiana shrimp: But experts say those results are not credible because the lab tested only the digestive tracts of the shrimp, which contain significantly higher PAH concentrations than shrimp muscle yet comprise a relatively insignificant fraction of the shrimp humans consume.

> only face the pain of immediate financial losses, but must also struggle with the uncertainty of trying to regain the business they once had.[91]

Fitzgerald's concerns remain very much relevant more than four months later, as media reports continue to emphasize uncertain demand for Gulf seafood and related losses in tourism and market share.[92] Given the myriad factors driving consumer behavior, the true extent of the economic losses stemming from the spill-induced fisheries closures and related declines in consumer confidence may never be known. Nevertheless, a comparison of seafood and tourism revenues from 2010 to annual revenues from more prosperous times, past and future, should provide a rough indication.

It is currently not clear to what extent the enormous indirect economic impacts associated with loss of consumer confidence and injuries to the Gulf coast "brand" will ultimately be deemed compensable and that resulting uncertainty has generated intense debate among diverse government entities, local communities, interest groups, and BP. The federal Oil Pollution Act, for instance, does expressly recognize the appropriateness of compensation for "loss of profits or impairment of earning capacity resulting from property loss or natural resource injury."[93] But there is no easy legal answer to the question of how closely linked those lost profits or earnings must be to the spill before they should be deemed compensable. The search for such a rational endpoint for liability has already stymied the third Gulf Coast Claims Facility in its processing of claims.[94] The absence of clear and fair procedures for systematically evaluating such claims deserves focused attention as the lessons from the *Deepwater Horizon* oil spill are learned.

D. Impacts on Recreational and Subsistence Fishing

The *Deepwater Horizon* oil spill has also caused significant disruption to the recreational and subsistence fishing communities in the Gulf. Saltwater recreational fishing is an economically important activity in many coastal communities, contributing $41 billion dollars in economic output in the Gulf Coast region annually and supporting over 300,000 jobs.[95] It too was virtually shut down in the wake of the oil spill and is suffering a lingering brand apprehension effect, which in turn has consequences for the Gulf leisure tourism industry.[96] The seafood testing and reopening protocols have further caused confusion among subsistence fishing communities in the Gulf—many of whom do not speak English as a first language—who may not have understood or relied on public information on closure boundaries and seafood testing results. "If you can realize how difficult all this has been for the fishermen of the Gulf Coast since the day of this explosion, and then try to imagine going through it without understanding English, you will have some sense of what it has been like for the non-English proficient communities."[97]

III. Restoring Consumer Confidence: Current Efforts

The universe of Gulf seafood consumers can be conceptualized as spanning a bell-shaped curve. On the far left, you have those who continue to dispute the safety of Gulf seafood in the face of contrary evidence. These are the individuals who have dug in their heels, and most agree it makes little sense to expend additional resources trying to persuade them. On the far right of the curve, by contrast, are the individuals who trust the seafood is safe and have no compunction about enjoying the bounty of the Gulf. These are the converted. But the majority of seafood consumers are clustered closer to the middle of the bell, the midpoint between both extremes. These consumers don't have a firm opinion about whether Gulf seafood is safe, and their uncertainty offers the greatest opportunity for state and federal marketing efforts aimed at restoring confidence in the Gulf brand.

Most commercial Gulf seafood species seem to have emerged from the oil spill without any clear evidence of taint or contamination.[98] The real impact here is the reputational damage to Gulf seafood as a safe brand. Continued government testing, improvements in public outreach, and a coordinated marketing campaign are all needed to expedite its recovery. But it is also becoming increasingly apparent that time takes time—irrespective of marketing campaigns and pleas from state officials to visit their state, the consumer confidence problem has proven to be an intractable one.[99] And restaurateurs are following their customers' lead. When Commission staff asked a waiter in a prominent Washington DC seafood restaurant if their seafood was from the Gulf, the response: "We are waiting for the dust to settle."[100] There are some promising anecdotes from seafood restaurants and retailers that consumers seem to be moving beyond their apprehension,[101] but national polls conducted in late summer suggest that even the capping of the well was not sufficient to budge consumer fears, which were relatively constant since the spill began.

A. State Marketing Efforts

Even with the dawn of a new year, press reports and interviews with state officials and Gulf residents indicate that the Gulf seafood industry is far from economically restored. The most seriously affected states—Louisiana, Mississippi and Florida—have launched vigorous seafood testing and marketing campaigns aimed at rejuvenating the Gulf seafood brand. Two of these states—have requested and have received money from BP for this purpose. Alabama has requested funds from BP, which the company is considering as of January 2010. State officials in Mississippi suggest that they also have negotiations in play with BP. After several requests over several months, BP relented in early November and agreed to give Louisiana $48 million and Florida $20 million for seafood testing and marketing.[102] BP is considering a similar request from Alabama.[103] Each state's program for restoring consumer confidence is summarized below.

1. Louisiana

On May 29, 2010, Louisiana state officials sent a letter to BP, asking it to pay for a $457 million makeover of the "Louisiana brand" for injuries to consumer confidence and tourism occasioned by the oil spill. The letter highlighted the seafood industry's role as "one of Louisiana's staple economic engines," and argued that a long-term strategy grounded in marketing and better science was needed to restore eroding public confidence. In this spirit, the letter attached a proposal for a 20-year multi-agency initiative that would seek to accomplish three goals:

1. Implementation of a science-based seafood safety testing program with transparent metrics of safety and quality.
2. Implementation of a certification program for quality and processing of certified Louisiana seafood.
3. A successful short-term and sustained long-term consumer information campaign designed to reassert the Louisiana brand.[104]

After months of negotiation with BP, the State's proposal was reduced to a five-year, $173 million plan.[105] That proposal was subsequently pared down even more and, in the end, BP agreed to provide $48 million to the state over three years for seafood testing and marketing.[106] Of that amount, $18 million—or $6 million per year—will be used for seafood testing for oil, dispersant and other spill-related impacts. Independent testing would seem to be a crucial component of any plan to rebuild public confidence after the spill, as critics of the process have expressed concern that federal standards were too lax or that sampling and testing lacked transparency. Another $30 million—$10 million per

year—is being provided for marketing purposes. The plan provides that the funding commitment for both programs—seafood testing and marketing—would be reset upon any oiling that would trigger the closure of additional fishing areas.

By agreement with the state, BP will provide the marketing monies to the Louisiana Fisheries Foundation—an entity associated with state government but not part of it—to ensure that the funds are not spent for purposes other than seafood marketing. The Foundation will turn the monies over to the Louisiana Seafood Promotion and Marketing Board, a quasi-independent entity which has been working on state seafood marketing campaigns since the 1990s. The Board will use the money to fund marketing efforts through state purchasing and grants. According to Watkins, the goal is to hire a firm that specializes in intense marketing and build out a strategic plan for the next three years. Watkins also mentioned the burgeoning efforts of the "National Seafood Marketing Coalition" which would go beyond the Gulf to market American seafood.[*]

Louisiana has tested thousands of seafood samples since the *Deepwater Horizon* spill began and will continue to do so for the foreseeable future. Watkins reports that the state aims to test roughly 400 samples a month going forward. At the close of 2010, 98.5 percent of Louisiana state fisheries were open. The last remaining closure was in Barataria Bay, one of the most heavily oiled areas from the spill. State officials could not say when those waters would be reopened. Going forward, Watkins says that the "number one priority is giving folks easy access to test results—providing detailed information how tests are done and letting them see the numbers showing that everything is OK."[107]

2. Mississippi

The Mississippi Departments of Marine Resources and of Environmental Quality launched a seafood safety program in September 2010 in an effort to kick-start the state's lagging seafood sector.[108] In a brochure highlighting features of the plan, officials described the development of the inter-agency seafood safety testing protocol and sampling procedures, and also published results from seafood testing carried out to date. The reported test results showed the actual levels of detected PAHs in a given sample—if detectable at all—orders of magnitude below published levels of concern. The pamphlet further highlighted the state's efforts at rebuilding public trust, which at that point included a "safe seafood assurance" workshop, dockside visits and additional monitoring and inspections of seafood facilities and operations. Yet, despite these proactive efforts and favorable test results, Jewell says that public opinion is slow to shift.

Governor Barbour had previously convened a commission of scientists and business leaders to brainstorm solutions to the persistent crisis of confidence in August. [109] The commission published its draft plan on January 14, 2011, including a number of recommendations concerning seafood safety. The report maintained that "credible seafood sampling and testing protocols have been implemented," but that "these protocols must be better communicated to the public to restore consumer confidence."[110] The report further proposed the following action items: (1) Continue long-term testing and sampling of the Gulf waters, sand beaches, and seafood to produce reliable, ongoing scientific data regarding water quality and seafood safety; (2) Continue to focus on public outreach aimed at communicating all scientific findings; (3) Hire Mississippi fishermen to assist with the long-term testing and sampling

[*] In the spirit of the times, Louisiana's public relations program also employs the use of social networks: "When [reports of contamination] came out, I was on my Tweet deck, responding to each concern as it arose." Similar trends are apparent also: Commission staff observed that in contrast to traditional op-ed pieces, state officials are using the online comment forums available for articles posted in online newspapers to address citizen concerns.

process; and (4) Begin implementation of a seafood safety marketing program, utilizing all scientific data to date regarding seafood safety.[111]

Additionally, press reports suggest that Mississippi is currently in negotiations with BP to help spur economic recovery in the state.[112] The state hopes to forge an agreement on similar terms to those already established for Louisiana and Florida. "While BP PLC has made multimillion-dollar agreements with Florida and Louisiana to help spur economic recovery, no such agreement yet exists with Mississippi," said the Governor's press secretary Dan Turner. But negotiations are apparently moving forward: "We expect to have an agreement with BP in the near future on assistance to promote the Gulf economy and mitigate against possible future economic losses," said Turner."[113]

3. Florida

BP has pledged to provide Florida with $20 million dollars to assist the state in its seafood safety and marketing campaign. The money is to be evenly split between seafood testing and marketing, with $10 million committed to each effort. In a call with Commission staff in January, Paul Balthrop at the Florida Department of Agriculture and Consumer Services, Bureau of Seafood and Aquaculture Marketing, said that the state is busy crafting a marketing plan but not ready to divulge any details yet. "To be honest, we are in the very beginning of the process. It takes time to figure out how to spend $10 million responsibly—not to mention BP will be scrutinizing us. This isn't going to be like "Brewster's Millions," where Richard Pryor used priceless stamps to mail letters.[*] We are going to spend this money responsibly."[114]

Balthrop says that loss of consumer confidence in Florida seafood remains a significant drag on the State: "There is still a negative perception, which, in reality, is a misconception: We only had 23 miles of coastline closed—Florida was virtually open for business the entire time." Balthrop attended the seafood safety conference in Panama City last September, which brought together representatives from each of the five Gulf States, as well as from NOAA, FDA and other key federal agencies. "One of the guys—I think he was from NOAA—said that out of 28,000 samples of finfish tested, only one came back positive [for PAH concentrations above the levels of concern]."

As regards the seafood testing component of Florida's plan, state officials say the effort has been in high-gear since August. The state has not actually received any monies from BP yet, but is charging amounts spent on testing to a billing code per a Memorandum of Understanding with the company. Sampling and testing was initially limited to the western Panhandle but, since November, Florida has been testing seafood collected off both coasts—the Gulf and also the Atlantic.[115] Current efforts include testing in thirteen districts, averaging about 20 samples per week. State officials collect these samples from primary processors, which can provide trip tickets from the fishermen they buy directly from, allowing for verification of sampling locations and chain of custody. Roughly 400 samples have been tested since August, only ten of which have had detectable levels of PAHs.[†] Levels for each of these ten samples have been orders of magnitude below accepted risk thresholds. The state has hosted several town hall meetings in an attempt to apprise citizens of testing procedures and frequency, as well as to respond to citizen concerns.

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[*] "Brewster's Millions" is a 1985 comedy film starring Richard Pryor, in which the protagonist has to waste $30 million in 30 days in order to inherit $300 million.

[†] Florida is currently testing for twelve different PAHs commonly found in BP crude oil, as well as dispersant compounds. State protocols do not currently include testing for heavy metals, but state officials suggest such a test may be coming soon.

4. Alabama

Before he left office at the end of 2010, former Governor Bob Riley led efforts to rebuild the state's lagging seafood brand. The Governor established the Alabama Coastal Recovery Commission in the wake of the spill to propose steps to hasten the state's economic recovery. Among the commission's recommendations—published in a report in December 2010—was the creation of the Alabama Fisheries Marketing Board.[116] The Board would assume responsibility for marketing Alabama's seafood and would also fund scientific testing for contaminants resulting from the BP oil spill. The Board was not enacted before Riley left office and its fate is uncertain. Nevertheless, state officials say that they are working with the Gulf States Marine Fisheries Commission to develop marketing plans going forward and that a number of other initiatives are being considered.[117]

The state is currently in negotiations with BP to fund any such seafood marketing efforts going forward. In November, Alabama Senator Richard Shelby sent a letter to BP asking the company to provide as much money to Alabama for economic losses as it had to Louisiana: "The Deepwater Horizon spill has brought devastation to Alabama's Gulf Coast, and in particular has severely hurt our fisheries and tourism industries," wrote Shelby. The letter followed BP's announcement that it would pay $48 million to boost Louisiana's seafood industry and $30 million for tourism in the state.[118] More recent press reports suggest that BP is considering a significantly smaller award for Alabama, on the order of $9 million.[119]

B. Nongovernmental Marketing Efforts

1. American Chefs Rally for Gulf Seafood

In September 2010, more than a dozen chefs from across the country—including the Executive Chef of the White House—toured Louisiana's seafood industry in an effort to boost confidence in Gulf seafood.[120] The trip, which was organized by White House officials and the Louisiana Seafood Marketing and Promotion Board, included visits to a shrimp boat, a processing facility and a lunch briefing about Gulf seafood safety with the head of the U.S. Food and Drug Administration. Chefs followed up with "America's Night out for Seafood" on December 1, when more than 270 restaurants from New York to Los Angeles served Gulf shrimp, oysters, crayfish, redfish and other Gulf staples.[121] The White House also participated, and White House Executive Chef Cris Comerford reported in her blog: "Since the BP *Deepwater Horizon* oil spill, consumption of Gulf seafood has dropped, which is why we at the White House are so happy to play our part in reminding Americans that Gulf seafood is not only safe – but delicious." [122]

Political consultant and Louisiana native, James Carville, has recently criticized attacks on the validity of the Gulf seafood testing.[123] He notes that all of the tests conducted by a diverse array of public and private experts—ranging from the federal EPA and FDA to state and independent laboratories—has concluded that Gulf seafood is safe. "At some point, a mountain of evidence becomes overwhelming, and I don't know how many times we have to test something … and every independent agency, every person that's tested has come back with the same result," says Carville. "It's easy to manufacture fear, but it's hard to manufacture test results."

2. Gulf of Mexico Reef Shareholders Plan

Beyond the role for governments in mitigating the consequences of the public loss of confidence in Gulf seafood, there is a significant role for the non-profit and private sectors as well as academia.

While efforts by groups like NRDC are intent on bolstering the standards of seafood safety, sometimes their work has the unintended consequence of stoking public fears.

In testimony before the Commission, EDF's Timothy Fitzgerald noted his organization's efforts on behalf of the Gulf of Mexico Reef Fish Shareholders' Alliance, a group supporting commercial fishermen in the Gulf of Mexico. Fitzgerald reported that the Alliance has been making progress to address the overfishing and poor fishery management practices that previously brought Gulf fisheries to the brink of collapse,[*] but said that the lack of public trust in Gulf seafood after the oil spill "threatens to undermine the progress to date." The Alliance is presently developing a "Safe Seafood Initiative" to combat these concerns, comprised of three main pillars:

- A third-party seafood testing program that supplements that of NOAA and FDA;
- A rigorous chain-of-custody to track fish throughout the supply chain; and
- An aggressive public relations and marketing effort to highlight these efforts.

An independent third-party testing program will be an invaluable tool in combating public suspicion of government testing protocols. Additionally, EDF supports efforts to empower fishermen to conduct testing of their own catch and suggests government might play a role in this regard by providing financial and technical assistance. Particularly if independent testing corroborates government results, Gulf seafood should receive a significant boost. Verifying chain of custody from "Hook to Cook" is also important. The Alliance has already published its plan for a "Gulf Fresh Traceability System" which allows for real-time tracking of seafood throughout all stages of the supply chain.[124]

In his testimony before the Commission, Fitzgerald further emphasized the continuing role for government in testing seafood, urging authorities to "[a]rticulate and make public the details of a long-term testing plan." NOAA is taking steps towards this goal, and has indicated that it will maintain a seafood safety monitoring program in reopened areas, "continuing the collection and testing of seafood to ensure that Gulf seafood remains safe for consumers."[125] Additionally groups like EDF and NRDC support the expansion of seafood safety protocols to include tests for other contaminants in oil—such as heavy metals like arsenic, cadmium and mercury—in addition to the current analyses for PAHs and dispersants. With respect to dispersants, Fitzgerald says the public should receive more detailed information regarding NOAA's new chemical test to detect them in seafood and results to date: "This issue remains high on consumers' lists of concerns, despite continued assurances from FDA that they pose no health risks."[126] These common sense proposals provide a useful model for federal and state agencies seeking to restore confidence in Gulf of Mexico seafood.

C. Seafood Testing Going Forward

As the acute phase of the Gulf oil spill is receding in the public's mind, there is still much work to do. The frenzied pace of seafood testing efforts began dying down in December as agencies began the transition to a sustained longer-term monitoring effort to ensure samples continue to come back clean.

[*] "At its low point, [the fishermen's] fishing season had shrunk to only 54 days, and regulations forced them to throw back dead much of the fish they caught. But by working together and with federal regulators, these fishermen led the charge in transitioning their fishery to an innovative management program called 'catch shares.' Catch shares soon allowed the fishermen to fish year round while fish populations recovered – bringing better prices to fishermen and more economic stability to fishing ports." Written testimony of Timothy Fitzgerald, Environmental Defense Fund, Hearing before the National Commission, September 28, 2010.

States themselves began a transition too, with an eye towards focusing and intensifying marketing efforts to try to win back consumers that remain undecided. The uncertainty is fluid, with most consumers not convinced one way or the other that Gulf seafood is safe. And uncertainty can be just as damaging as doubt: As with any unknown, it is simply easier for people to select a noncontroversial alternative when strolling the grocery aisle.

In November, Louisiana officials met with FDA, EPA, NOAA and rest of Gulf States in New Orleans to discuss closures and reopenings, as well as testing methods.[127] At the top of the agenda was the kind of testing and surveillance process which would continue past the acute phase of the incident as part of a longer-term monitoring program. Though no samples from any of the Gulf States have returned from the lab with PAH concentrations above established levels of concern, everyone recognizes that testing must continue for the foreseeable future as part of the effort to restore consumer confidence. There is also a practical reason as well, given the threat of possible future contamination from unaccounted for subsea oil. NOAA is already conducting surveillance monitoring of reopened areas; those analyses are underway and will be posted soon. It remains to be seen whether the long-term testing protocol will include tests for other substances, aside from PAHs, such as heavy metals. Also agreement must be reached on the percentage of seafood samples that states will continue to send NOAA for analysis: Among the plans under discussion, states will continue to sample and test their own seafood but may be required to submit a random sample to NOAA on a periodic basis.[128]

IV. Lessons Learned

The oil spill plainly challenged existing government resources related to seafood safety: prompting an immediate need for on-the-fly interagency coordination, new protocols, public relations, and communication. Undoubtedly, the effort has been impressive, even if flawed. The interagency coordination and development of new protocols for testing seafood caught in the Gulf of Mexico has likely resulted in the most rigorously tested seafood in the world. Nonetheless, authorities have fallen short in public relations and communications arena. Slow to get ahead of public opinion, authorities have failed to go the extra mile to tackle consumer concerns.

While the success of the seafood safety monitoring and marketing schemes proposed by various Gulf States has yet to be borne out, it is apparent that loss of public confidence is rooted and resilient—neither likely to be resolved in the near-term nor susceptible to any quick fix. Nevertheless, there may be some options for speeding the healing process for this disaster as well as circumventing a similar crisis of confidence the next time. As several other Commission staff working papers have indicated, government needs to be responsive to citizen concerns from the beginning: providing clear lines of communication, updates as a situation unfolds, and open forums to air citizen concerns. At the end of 2010, the NRDC expressed concerns regarding the Gulf seafood testing protocols and were still awaiting a response from FDA and NOAA.[129]

There will always be challenges to a government's response in an emergency, and different stakeholders will have different priority areas that authorities will have to strive to balance. Nevertheless it is evident that many critical opportunities were missed this summer—occasions where concerns were raised that could have been quickly and effectively responded to, yet stakeholders felt they were ignored.[130] Commission staff did not evaluate the validity of the sampling process, which may be entirely sound. However, the fact that it has not been provided to stakeholders just clouds the process in unnecessary murk, and adds to the bad blood between government and community

members. It would behoove NOAA and the states to make the details of its sampling procedures and results available as soon as possible, and in a form that could be more readily understood by citizens.

The government response on the separate issue of the PAH risk thresholds has also fallen short of quelling citizen concerns. Citizen groups reasonably requested that Gulf seafood consumption patterns be further analyzed in determining safe levels of exposure. Authorities said they were forced to use national surveys because there was no credible survey specific to Gulf coast populations. When citizen groups offered a rational alternative, namely to use scientifically validated consumption rates adopted by the EPA and the World Health Organization for high-volume seafood consumers, authorities declined. FDA ought to either commission a survey of seafood consumption patterns along the Gulf coast, or adopt the EPA and the World Health Organization for high-volume seafood consumers. And, they should include straightforward communication as to whether the consumption rates would matter in any case, given the very low PAH concentrations that were generally found in analyzed samples.

Finally, there must be a rapid-response system for addressing reports of oiling or contamination by fishermen and other coastal residents. As Olivia Watkins of the Louisiana Department of Wildlife and Fisheries made clear, citizen frustration with the lack of response to such reports fueled the debate unnecessarily in the early months of the spill. The U.S. Environmental Protection Agency used effectively an analogous program to reassure local communities about concerns they had about air pollution in the immediate aftermath o the oil spill. In the weeks after the oil spill, coastal residents were reportedly bombarded with overwhelming odors of oil depending on the direction of the prevailing winds. Meanwhile, they were being told by authorities that air quality was just fine based on testing taking place at the time. This apparent disconnect between official reports and public perception heightened the mood of public distrust. In response, EPA established a system whereby residents could call a hotline if they had concerns about air quality and EPA would send someone out immediately to monitor air quality. Such a system is similarly needed with respect claims of seafood contamination. State and federal authorities generally improved their response in this regard as the BP oil spill wore on, making consumer hotlines available and following up on those calls.[131] Nevertheless, the immediate implementation of such a rapid-response program would be useful in stemming public concerns before they reach the kind of "tipping point" observed in the Gulf spill—a point after which winning back the public trust is exceedingly difficult. In sum, any strategy for rebuilding public trust in Gulf seafood would benefit from:

(1) Better transparency: For example, NOAA should consider publishing its seafood sampling protocols and warrant their validity to the public.
(2) Better science: For example, governments should consider facilitating citizen access to independent seafood testing programs; FDA should consider revising risk thresholds to incorporate assumptions that better track seafood consumption patterns of coastal residents.
(3) Better public relations: For example, federal and state agencies should consider creating a framework for addressing stakeholders concerns as efficiently as possible.

V. Conclusion

Seafood business interests, local community activists, national non-profit organizations, and federal and state governments prescribe different pathways out of the current seafood controversy but their voices arise out of a common concern: the potentially catastrophic harm caused by the *Deepwater Horizon* spill to the Gulf seafood industry. Federal and state government cannot solve the issue through unilateral pronouncements of safety. The crisis of public skepticism is too deep to be so easily

eliminated. Federal and state officials, along with business interests, community groups and NGOs, are going to have to take a series of significant and transparent steps to earn back the consumer's trust. So long as local residents, in particular, do not believe that government officials are listening, the actual scientific merits of the government's claims are unlikely to be sufficient or generate the support of vocal dissenters. Until the government can forge cooperation and consensus on seafood safety, the public will remain skeptical.

Government officials likely could go a long way in diffusing the tensions that have emerged by engaging more effectively with members of the local community, hearing their concerns, and addressing them head-on. A critical element of any such effort will likely be assurances of long-term and ongoing monitoring of reopened fisheries. Such monitoring can demonstrate to consumers the government's commitment to remain vigilant to ensure seafood safety as the longer term impacts of the spill are better understood.

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[1] Lee Schlesinger, Florida Fish and Wildlife Conservation Commission, interview with Commission staff, December 22, 2010.

[2] Email from John Oliver, NOAA, January 18, 2010. State officials from Louisiana, Mississippi and Alabama also confirmed this result for testing of samples collected in state waters. Olivia Watkins, Louisiana Department of Wildlife and Fisheries, interview with Commission staff, December 10, 2010; Joe Jewell, Mississippi Department of Marine Resources, interview with Commission Staff, December 9, 2010; Call with Chris Denson, Marine Resources Division of the Alabama Department of Conservation and Natural Resources, January 24, 2011. See also Editorial, "Best science says seafood safe to eat," *DailyComet.com*, December 15, 2010 ("[FDA] and [NOAA] have tested nearly 2,000 seafood samples for oil and chemical dispersants used to break up the spill. Officials say 99 percent tested clean of any chemicals. One percent had trace amounts of chemicals, but they were all well below the safety threshold of 100 parts per million of finfish and 500 parts per million for shrimp, crabs and oysters.").

[3] Bob Marshall, "Safety of Gulf Seafood debated 8 months after BP oil spill," *Times Picayune*, December 19, 2010.

[4] "Government Says Gulf Seafood Safe, Now Consumers Decide," *Associated Press*, August 24, 2010.

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[11] Ve Van Nguyen, interview with Commission staff, November 23, 2010; Grace Scire, interview with Commission staff, October 5, 2010.

[12] This primer on hydrocarbon bioaccumulation is courtesy of the Commission's environmental science advisor, Dr. Robert Spies.

[13] 75 Fed. Reg. 24822, May 6, 2010; 75 Fed. Reg. 26679, May 12, 2010.

[14] 75 Fed. Reg. 27217, May 14, 2010.
[15] 16 U.S.C. §§ 1801-1884.
[16] 16 U.S.C. § 1855(c).
[17] Press Release, Louisiana Department of Wildlife and Fisheries, In Precautionary Move, L.D.W.F. And D.H.H. Announce Closures Due To Oil Spill, April 29, 2010.
[18] Ibid.
[19] Press Release, Mississippi Department Of Environmental Quality, Mississippi Department Of Marine Resources, "MDEQ and DMR Continue Preparations," May 3, 2010.
[20] Press Release, Mississippi Department Of Environmental Quality, Mississippi Department Of Marine Resources, and the Mississippi State Department of Health, "Mississippi Waters Are Open, Mississippi Seafood Is Safe to Consume," May 7, 2010.
[21] Press Release, Mississippi Department of Marine Resources, "Precautionary Closure of Portions of Mississippi Marine Waters To All Commercial and Recreational Fishing, Effective Immediately," June 1, 2010
[22] The Florida Constitution delegates closure authority to the Florida Fish and Wildlife Conservation Commission.
[23] Press Release, Department of Conservation and Natural Resources, "Some State Waters Closed to Fishing," June 2, 2010.
[24] Press Release, Department of Conservation and Natural Resources, Additional State Waters Closed to Fishing, June 10, 2010.
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[26] Joe Jewell, Mississippi Department of Marine Resources, interview with Commission Staff, December 9, 2010.
[27] Ibid.
[28] Press Release, NOAA, NOAA, FDA Continue Ramping Up Efforts to Ensure Safety of Gulf of Mexico Seafood, June 14, 2010.
[29] *Protecting the Public from Oil-Contaminated Seafood: Fishery Area Closure and Surveillance Plan*, June 14, 2010, http://www.deepwaterhorizonresponse.com/posted/2931/NOAA_FDA_Surveillance_Plan_6_2_14_CLEARED_658415.658415.pdf
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[93] 33 U.S.C. § 2702(b)(2)(E). The Oil Pollution Act recognizes six broad categories of damages, of which lost profits is just one: (1) injury to natural resources (recoverable by federal or state trustees); (2) loss of real or personal property and any resultant economic losses (recoverable by an owner of that property); (3) loss of subsistence use of natural resources (recoverable by a subsistence user); (4) loss of revenues resulting from destruction of property or natural resource injury (recoverable by a government claimant); (5) loss of profits or impairment of earning capacity resulting from property loss or natural resource injury (recoverable by any claimant); and (6) costs of providing extra public services during or after spill response (recoverable by a government claimant). 33 U.S.C. § 2702(b)(2).

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