An Oasis in a Watery Desert? Discourses on an Industrial Ecosystem in the Gulf of Mexico Rigs-to-Reefs Program

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Abstract:

This article explores how in the years after 1980 a spectrum of historical actors came to see petroleum platforms in the Gulf of Mexico as a necessary part of the Gulf ecosystem and how such views affected platform removal policies. Through a discourse analysis of the Rigs-to-Reefs program, in which old offshore petroleum facilities were converted into artificial reefs, this article examines how actors presented to the public their notions of the relationship of the Gulf ecosystem with technological offshore structures. Through this case we see how ideas of technology and nature were mutually constructed via discourses and what affect that had on policies.

Keywords: offshore oil platforms, Rigs-to-Reefs, Gulf of Mexico, natural, artificial

Visitors stand in awe at the half million gallon Gulf of Mexico tank at the Aquarium of the Americas in New Orleans as shark, stingrays and schools of fish swim by (Figure 1). The recreated habitat mimics the seafloor of the Gulf of Mexico with its flat empty bottom and its sparsely placed rocks. And rising from the floor of the tank are the crisscross steel legs of an oil platform jacket. The algae-covered steel jacket section is displayed in the tank habitat as a seemingly unremarkable part of the ecosystem, as natural as the sharks swimming by and the fish darting around the tank. The exhibit, sponsored by oil and gas companies, reflects a specific historical development: the integration of the petroleum industry—its technologies and activities—into the ecosystem of the Gulf. As Tenneco Oil Exploration and Production vice president Bob Taylor stated at the announcement of Tenneco's funding for the exhibit in 1988: "The Petroleum Wing of this facility will help demonstrate the positive impact of oil and gas platforms on marine life, thus providing further opportunity to explain the relationship between the petroleum industry and the abundant aquatic life of the Gulf of Mexico."[1] Such a statement was

not simply an oilman's wishful thinking. Recreational fishermen and marine biologists also had come to view the offshore platforms as integral to the Gulf ecosystem. In the early 1980s as the first generation of platforms reached the end of their useful life as oil and gas producing facilities, this view led to a seemingly unusual political alignment. Instead of seeing these giant industrial structures as inimical to the Gulf ecosystem and rejoicing at their removal, many fought to keep them in place through a program called Rigs-to-Reefs in which obsolete offshore structures become artificial reefs.

This article explores how petroleum platforms came to be seen as a necessary part of the Gulf of Mexico ecosystem by four groups of regional actors – governmental agencies, fishing enthusiasts, industry, and scientists – and how those views in turn affected Gulf platform removal policies since the early 1980s. Because of the potential for recreational fishing around reefs, state-level departments in charge of hunting and fishing such as the Louisiana Department of Wildlife and Fisheries and recreational fishermen were most vocal in discussions around the benefits of artificial reef creation. Although commercial fishermen had a stake in the Rigs-to-Reefs idea, oil producers were the most visible industrial actors. Oil companies had some financial incentives for setting up a Rigs-to-Reefs program since they might avoid costly complete removal of offshore installations, but conversion also imposed additional costs and risks, leading most oil companies to only selectively pursue reefing options where available.[2] Scientists entered the arena both as purveyors of "neutral" information and as advocates for certain ecosystems as we will see later in the article. It is worth noting that environmentalist organizations are conspicuously absent from this accounting of actors. This is not an oversight, but rather a function of their minimal engagement in the issue until very recently.[3] Rather than exploring all of the background motives for these actors to support (or reject) Rigs-to-Reefs, I will look at how these actors publicly constructed the intersection of technology (the oil platform) and nature (the Gulf of Mexico and its sea life) in the print media. Newspapers are particularly important in this case as a public site where notions about what the Gulf of Mexico and the Rigs-to-Reefs program should be were created and elaborated.

This article offers a counterpoint to a narrative common in the environmental history literature: technology as polluter and defiler of nature. Rather this article seeks to relate a more nuanced story: How seemingly classic and historically important antagonists—energy producers and advocates for the environment—mutually constructed a view of ecology in which technological intervention into nature could not only be seen as beneficial but become an integral, constituent part of nature. This case, then, helps to recalibrate our understanding of the confrontation of cultural

values associated with industrial and technological developments and environmental preservation in the post-World War II years.[4] We will see that the actors' point of view was shaped by what they perceived as natural. Although political and economic interests in these positions cannot be ignored, this article delves deepest into how actors framed in public forums their notions of the relationship between the Gulf ecosystem and offshore structures as discussion and debate about platform removal and the development of Rigs-to-Reefs conservation programs took shape.[5]

From the outset, ocean life itself played a vital role for the historical actors in creating an account of technology and nature in the Gulf. Nature is an actor oftentimes outside of human control. STS studies have been one of the disciplines leading the way in this analysis. Michael Callon, for example, discusses how scallops in St. Brieuc Bay, France, thwarted scientific attempts to capture larvae that would have been used in population reseeding efforts.[6] In Callon's case, scientists believed they understood how scallops acted, only to discover that larvae catch experiments could not be reproduced. John Law likewise discovered that Portuguese mariners in the Age of Discovery struggled with specific wind and ocean currents over which they had no control.[7] These studies remind us that nature can be as important an actor in a technology story as humans and technologies. Humans constantly interpret nature's agency, thus the key question in this article is how particular historical actors in this Gulf of Mexico story came to understand that agency and incorporate it into their beliefs and practices.

When offshore oil producers initially installed their platforms in the Gulf of Mexico, they had no inkling that they would be creating new ecological conditions that sea creatures might affirmatively exploit. The Gulf of Mexico has a natural muddy bottom with very little hard substrate out to a depth of 1,500 feet. Barnacles, spiny oysters and other similar colonizers need some kind of hard material to which to attach. When something suitable is placed in the water, they quickly inhabit it. Platform jackets, which extend vertically hundreds of feet through the water, as well as oil pipelines that extend horizontally on the mud, provide exactly the kind of hard surface these colonizers need. Small fish soon follow, attracted by food sources and hiding places, and larger fish are not far behind, leading to viable recreational fishing catches within six months of facility installation. One 1984 study estimated that 28 percent of the hard bottom habitat of the Gulf was provided by oil and gas structures.[8] Clearly Gulf sea life has found offshore platforms suitable habitat – places to eat, find shelter, and reproduce – and this had nothing to do with the intents of those who installed the technology. One journalist characterized the presence of fish around the platforms as a bonus that had cost nothing, called *lagniappe* in Louisiana's Cajun French tradition, because although the oil companies had not intended to create homes

for fish with the platforms, they had done so.[9] This is not unlike Alfred Crosby's discussion of another large-scale unintentional ecosystem – weeds that paved the way for grains and grasses that would support European colonizers in the New World.[10] As this article will show, actors in the Rigs-to-Reefs debate argued that an unintentionally created ecosystem based on technological artifacts had ecological and financial benefits. They shaped the concept of Rigs-to-Reefs through these arguments.

This examination of actors' perceptions about the Gulf ecosystem relies on an analysis of the public discourse about the role of platforms. History of technology as a discipline has not often relied heavily on discourse analysis as a mode of inquiry, although there are some notable exceptions such as Jeffrey Meikles's examination of how doubts about the safety of plastic entered into media discussions and literature from the 1960s onward.[11] Yet it can be a valuable tool for understanding how people come to think about (and act on their thoughts about) technology. Discourse analysis rests on the premise that language constructs phenomena rather than simply revealing them. A discourse, understood to be "an interrelated set of texts, and the practices of their production, dissemination, and reception," creates culturally and historically situated concepts. [12] Instead of assuming a social world exists out there and looking for how people ascribe meaning to it, discourse analysis "tries to explore how the socially produced ideas and objects that populate the world were created in the first place and how they are maintained and held in place over time."[13] Scholars have viewed the environment, as a field of inquiry, as ripe for discourse analysis because of the ways in which new environmental concepts and policies constantly enter the public arena.[14] Discourse analysis is particularly apt for this case, historically situated at a ripe moment in the cultural dialogue on environmental issues.

Artificial Reefs and Recreational Fishing

Tenneco's sponsorship of the Aquarium of the America's Gulf of Mexico tank followed on the heels of several groundbreaking artificial reef projects by the company, which had been involved in oil and gas production since the 1950s. In September 1982, Tenneco donated a retired oil and gas production platform (minus all of the tanks, living quarters, and other used equipment) and jacket (the steel cross members holding up the structure) to the state of Florida. The massive structures were removed from an oil field off of the Louisiana coast and towed to their new home 22 miles from Pensacola. There, the structures were sunk to create an artificial reef. Only nine months later in May 1983 when the president of Tenneco Oil Exploration and Production invited a media group out on a fishing trip to the new reef, the catch was phenomenal. According to Lonnie Williamson who was on the excursion, "Within a few hours, we landed about 800 pounds of amberjack and several hefty baskets of red

snapper… The successful fishing was more evidence to me that artificial reefs do work."[15] This artificial reef was the first created from a petroleum production facility. Tenneco donated a second reef to Florida in 1985. It was made of multiple structures, which weighed a total of 912 tons and had a total surface area of more than 100,000 square feet.[16]

The impetus behind these projects came from the desire to improve recreational marine fisheries. Since the late 1950s, American recreational fishermen had been clamoring for artificial reef installations to improve catches. Anything and everything had been used: an artificial reef in the Bight of New York was made from stone, brick and concrete fragments; junkyards of auto bodies formed reefs in Chesapeake Bay and off the Texas and Alabama coasts; tires created fish habitat off Atlantic Beach; and World War II boats were scuttled to make reefs in Virginia.[17]

Because of the interest in artificial reefs and the ad hoc nature of reef creation in the 1960s and 1970s, a national program was first proposed in the U.S. House of Representatives in 1979. Two bills establishing a national marine artificial reef policy never got out of the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the Committee on Merchant Marine and Fisheries. The subcommittee did finally hold a hearing in 1981 to consider the establishment of a national artificial reef policy under two similarly worded bills (HR1041 and HR1897).[18] After the hearing, however, these bills were not acted upon. The cause was taken up in 1983 by the "Recreation, Environmental Enhancement and Fishing in the Seas" (REEFS) Task Force coordinated by James Watt, Interior Secretary. REEFS had representatives from the oil industry, commercial fishing industry, recreational fishing community, and various federal and state governmental agencies. The reuse of disused oil structures was clearly a key reason for setting up the task force; in the Department of the Interior press release announcing REEFS, Watt stated, "Extensive environmental analysis has demonstrated the value of converting offshore oil and gas structures and other appropriate materials into artificial reefs for everyone's benefit. Current removal and destruction requirements are wasting a national resource of tremendous public and private value."[19] In 1984, Congress finally passed the National Fishing Enhancement Act of 1984, which mandated a national plan for siting and developing artificial reefs. The possible conversion of oil production structures into artificial reefs was one of the drivers behind the legislation, but obsolete offshore installations were only one of many items included in the National Artificial Reef Plan of 1985 that came as a result of the National Fishing Enhancement Act.[20]

Offshore structures are in fact more suitable than many of the materials of the 1950s and 1960s chosen for reefs. The steel jackets, in particular, have been touted as

beneficial because of several design features: their high profile when placed upright in the water attracts mid-water and bottom dwelling fish; the large surface area encourages attachment by crustaceans; the frame provides numerous hiding and resting areas and permits water circulation; and the large size provides orientation for fish seeking solid objects.[21] The structures themselves were designed to resist ocean corrosion and storms and are thus much more stable on the seafloor than smaller items like automobile bodies and tires.[22] Their positive scientific properties, however, has not guaranteed their acceptability as reef material. In California, for instance, extremely vocal political opponents to oil development have consistently stressed potential pollution from oil structures left in water and therefore object to any reuse of the structures as part of a California Rigs-to-Reefs program.[23] A similar objection was raised very briefly during Texas' Rigs-to-Reefs proposal phase; however, the opposition quickly disappeared from the media discourse.[24]

Tenneco's early reef donations to Florida were intended to enhance fisheries through these inherent properties of the industrial structure. As Oxley said, "We feel it is much more useful and environmentally desirable to give a platform a second life as an artificial reef, which benefits society in many ways, rather than removing it to the shore and scrapping it." According to Oxley, the donations were given to Florida because, "We wanted to place the reef where it is needed most" since Texas and Louisiana have hundreds of producing platforms in place which serve as vertical reefs, compared to very few natural or artificial reefs off Florida's east coast.[25]

In the Tenneco president's statement, he hinted at the function of working platforms as artificial reefs in Texas and Louisiana. The area's recreational fishermen appear to have discovered early on that fish liked to congregate around offshore platforms. Two 1970s photographs in the collection of the State Library of Louisiana show the practice of tying fishing boats to oil platforms in order to increase catches (see Figure 2). A 1977 study on boating patterns in the Houston-Galveston area of Texas showed that half of all fishing trips in the Gulf were made to offshore platforms and 87 percent of all fishermen had fished off platforms.[26] According to Charles Wilson of the Coastal Fisheries Institute in 1985, "Oil rig fishing has become a way of life in Louisiana."[27]

Both commercial and recreational fishermen found fishing grounds around oil platforms highly productive. According to one Interior Department source, fishermen reported 20 to 50 times more fish around a platform than in the open water. Carl Sullivan, executive director of the American Fisheries Society, stated that commercial Gulf fisherman often followed ocean floor pipeline routes to increase their catch, and a commercial snapper/grouper fishery industry had developed around platforms.[28]

The National Artificial Reef Plan of 1985 likewise recognized that "Many de facto artificial reefs exist (shipwrecks, gas and oil structures, etc.) and, if appropriately sited, may need only to be located, enhanced, and publicized."[29]

The language surrounding the platform usage for fishing created a valid conception of offshore oil platforms as viable, living ecosystems. The discourse resonated throughout various levels of society, from the nationally-recognized scientists who drafted the National Artificial Reef Plan to the journalists writing newspaper articles. One journalist's comment shows the extent to which this discourse had constructed reality: "Marine life thrives around offshore structures. Platforms act as living reefs to sustain life. It's a simple fact. And the fishermen know it."[30]

Removals Prompt Rigs-to-Reefs

Offshore drilling has a long history in the coastal waters of Louisiana and Texas. The first large-scale offshore oil exploration activities came in 1933 in the coastal estuaries of Louisiana. In 1946, Magnolia Petroleum Company installed the world's first operating offshore platform five miles offshore of Morgan City, Louisiana.[31] These early successes started an offshore oil rush and firmly made the coasts of Louisiana and Texas oil territory. By 1983, there were 4,056 offshore structures installed in the Gulf of Mexico (whereas there were only 24 offshore platforms in California waters and 14 in Alaska). The Gulf platforms varied in water depth from less than 20 feet to more than 900 feet, with over half of them located in less than 50 feet of water.[32]

Yet Texas and Louisiana waters would not always have their rig fishing spots – not as platforms began reaching the end of their lifespan in the 1980s and would be removed. According to Minerals Management Service regulations, any offshore platform taken out of service for a year had to be completely removed to 15 feet below the mudline.[33] According to press reports in 1986, oil company plans called for the removal of about two-thirds of Louisiana's 3,600 platforms by the year 2000. [34] In the 1980s, scientific publications stressed the removal numbers in spite of estimates that the total number of installations would increase.[35] Even with new installations, the rig-fishing traditions would not go unchanged, because the newer installations tended to be further out to sea, making them less accessible to recreational fishermen.

In the mid-1980s, as older fields began to be depleted and platforms were removed from service, people began to talk of retaining the platforms through conversion to artificial reefs. The language used in the Louisiana press indicates the cataclysm some saw before them in the late 1980s: "when an abandoned rig is removed, that fishing area is destroyed"; "If the oil platforms go, so will the fish"; "Louisiana is fast losing

one of its greatest unnatural resources"; "an extraordinary loss of very valuable fish habitat."[36] Paul Driessen of the Minerals Management Service characterized lasting effect of platform removal this way: "These oil platforms are a resource, and once they're gone nobody is going to spend the money to re-create them."[37] In these comments we see a construction of the idea that not only did fish congregate around platforms, but that the platforms themselves had become fish habitat that was irreplaceable.

This discourse of rig fish habitat came at a point in the mid-1980s when the oil industry was facing some of its deepest economic woes. Beginning in mid-1981, the media began to talk of increased oil availability on the world market, leading to declining prices.[38] Prices continued to sag through the 1980s, and finally reached a low point in 1986, with prices falling that year by over 50 percent worldwide. Louisiana and Texas, whose state economies depended heavily on oil production and processing, were heavily affected by the downward spiraling oil prices, leading to dropping revenues, decreased offshore exploration activity, and job loss. As one scholar put it, "The year 1986 was the nadir of the oil industry in south Louisiana."[39]

By all accounts, residents of Louisiana and Texas have been overwhelmingly supportive of the oil industry in general. Sociologists Robert Gramling and William R. Freudenburg have correlated the early history of offshore development in Louisiana with the general widespread support for the oil industry in the region. They argue that Louisianans support the offshore oil industry because of the region's history, topography and social factors. First, in the historical realm, the initial developments took place during an age when resource extraction was seen as positive, the industry evolved slowly, and the technology was developed locally. Second, estuaries dominate the coastal topography of Louisiana, creating an environment where few people live on the coast, there are many potential harbors, and a broad tidal area minimizes spatial conflict. Third, Gramling and Freudenburg identified four social factors which have encouraged a positive view of the oil industry: low educational levels, a long history of offshore resource extraction such as fishing, favorable contact with oil personnel, and development (in terms of jobs, tools, networks, etc) centered on the oil industry.[40] The region's positive attitudes towards the oil industry significantly contributed to their ideas about the positive environmental effect of offshore oil platforms.

It is no wonder, then, that the discourse of rigs as valuable fishing areas emerged at the same time as the oil industry difficulties. The residents were seeing an alarming decline in the oil industry that they did not want repeated in the fishing industry. Fish catches in Louisiana account for a quarter of the US seafood production, with the state

serving as the country's largest producer of shrimp and oysters and as well as yielding large catches of menhaden, crab, butterfish, drum, red snapper, tuna and tile fish.[41] In constructing offshore oil platforms as vital fish habitat, the discourse had turned these technological artifacts into part of nature.

Thus when the fishing resources were threatened, some key players proposed a "Rigs to Reefs" program that would formalize methods of converting decommissioned rig structures into artificial reefs. Five agencies – the Environmental Protection Agency and the departments of Interior, Commerce, Defense and Transportation – had spent years drafting the Memorandum of Understanding on the creation of artificial reefs that became the National Artificial Reef Plan of 1985. Much of the discussion had centered on the Interior Department's unilateral decision to allow offshore structures to remain. In 1983, Interior issued a notice of interpretation stating that the Minerals Management Service Director could "permit, when appropriate, the conversion of platforms and other facilities on the OCS from their primary function to use as artificial reefs as habitats for fish and other aquatic life" as long as appropriate permits from relevant agencies such as U.S. Coast Guard were obtained to address safety, navigation and other concerns. The designation of appropriate reef location was left in the hands of federal and state agencies, including the National Marine Fisheries Service and the U.S. Fish and Wildlife Service.[42] The internal MMS decision to support a Rigs-to-Reefs program is evident in a MMS 1984 study showing significant use of offshore installations for recreational and commercial fishing. In the Manager's Introduction, the MMS Gulf of Mexico Regional Manager, John Rankin, affirmed the "wisdom of the Department's Rigs-to-Reefs program" based on the research findings of the report.[43]

At the same time that the National Artificial Reef Plan of 1985 was being drafted, the National Research Council undertook a study of alternate disposal options for offshore platforms in 1984 and published their final report in 1985. Although the report covered many various options, the report's preface specifically noted:

> At the time of the study, there was considerable national interest in an expanded program for planning, financing, and constructing artificial reefs to enhance fishing opportunities. … The committee considers its work to be a necessary and timely contribution to artificial reef planning – putting the potential use of petroleum platforms as reef-building materials into proper perspective.[44]

The report clearly acknowledges the viability of rig conversion, although it points out that legal liability issues and navigation hazards would have to be addressed in any

official programs.[45] The study paved the way for the foundation of state-level programs that would handle those kinds of specifics.

These initiatives were first picked up officially at the state level by Louisiana. The Louisiana Fishing Enhancement Act, Act 100 of 1986, established the state's artificial reef program and created a state committee to implement the plan. The Louisiana Artificial Reef Initiative (LARI) Committee was formed consisting of researchers at Louisiana State University, LA State Dept of Wildlife and Fisheries, Dept of Natural Resources, LA Geological Survey and MMS. LARI developed a plan under which the artificial reef sites would be chosen to avoid areas currently utilized as trawling or shipping lanes. The site locations would factor in fishing accessibility as well as oil company preferences. The program would pay for itself because oil companies would donate half of the cost savings realized by not having to remove and dismantle the rig to the Department of Wildlife and Fisheries, who would administer the program.[46]

In the "Louisiana Artificial Reef Plan," the discourse of reefs as vital fish habitat laid the foundation for the entire program's development. The "Executive Summary" of the plan highlighted the unintentional yet critical nature of offshore structure habitats:

> The development of the oil and gas industry in the Gulf of Mexico resulted in the creation of this country's most extensive artificial reef system. … For over 40 years, Louisiana fishermen have benefited from the increased biological activity associated with this unintentional artificial reef habitat. Since these platforms are so commonplace off the Louisiana coast, many citizens and management groups believe that they are permanent and will always be available for fishing. This is, however, not the case. … It was, therefore, imperative that Louisiana recognize this potential loss of habitat and plan to offset it by either creating new artificial reefs or preserving existing structures.[47]

In this passage, the scientists involved have constructed a clear vision of the offshore technological artifact as an integral part of the biology of the Gulf and highly valuable to fishermen.

But it was not only the fishermen who would benefit from a Rigs-to-Reef program. The combination of beneficiaries – oil companies, fisherman and the government – was reiterated in the language used by proponents. By the time the plan was ready for public comment in 1987, Bob Scearce, a lifelong fisherman and fishing correspondent for the *Baton Rouge Advocate*, called the plan "one of the most exciting projects ever undertaken along the coast" and praised it in glowing terms:

> The plan is considered ideal. It's good for the oil companies, it's good for the resource, it's good for habitat, and it's great for the fishermen, who otherwise would have been deprived completely of the standing platforms which get most of the credit for Louisiana's great fishing along the coast. The federal folks will get rid of the obsolete rigs, the oil companies will save money, and we'll continue the fishing opportunity.[48]

Another public proponent who frequently contributed articles on the Louisiana rigs-to-reefs program wrote, "Rigs-to-Reefs. Ever heard of the program? It's one that almost too good to be true. Simply put, the program involves an abandoned oil rig and the costs associated with its removal, studies by fisheries biologists, the acute need for fish-collecting stations - reefs - and the recreation and commercial need to catch fish. The program merges these various interests."[49] Gerald Adkins, fish biologist for the Louisiana Department of Wildlife and Fisheries echoed the sentiment:

> What we've wound up with is the best of all worlds. We're saving an industry money, given them an avenue for positive public relations, funded a program at virtually no public expense, and, what's most important, is that we'll keep, and even enhance, this valuable fisheries resource right here off Louisiana's coast."[50]

The monetary aspects of Rigs-to-Reefs – saving companies and the public money – entered into the discourse because of the concurrent economic woes in the oil industry (and thus the Gulf Coast states) discussed above. The economic incentives of the plans became integrated into the discourse of the plans' benefits.

Texas followed Louisiana's lead, establishing its own program in 1990 after the passage of the state's Artificial Reef Act of 1989. Although the plan might have addressed artificial reefs in general, it instead clearly limited itself to the use of preexisting technological artifacts for reef creation: "Artificial reefs should be constructed as benthic reefs using ships, oil platforms, or other similarly constructed materials… The Department should actively pursue acquiring offshore platforms for use as artificial reefs in the Gulf of Mexico, in deference to other structures."[51] The plan was thus officially targeted at retention of offshore structures which had been assigned value in contemporary thinking. This aligns with the discourse of Rigs-to-Reefs that had already become established by the actions in Louisiana.

Dominant Themes

Over time, three dominant themes appear in the language surrounding this naturalization of technology into the ocean ecosystem: that Rigs-to-Reefs structures

increase the availability of species preferred by fishermen, the structures improve upon nature, and the structures create unique and even endangered ecosystems. None of these was a given outcome of the Rigs-to-Reefs program. Rather, they were discourses that created the Rigs-to-Reefs program; they established the reasons for the program and its benefits.

Theme 1: Sought-after Species

From the onset, the Rigs-to-Reefs plans emphasized the creation of habitats that enhanced fishing opportunities. Their relationship with the National Fishing Enhancement Act of 1984, which aimed to enhance fishing opportunities by creating additional and diverse habitats, makes this quite clear. The goal was not to create habitat for just any ocean-faring species – but rather to enhance fishing by humans.

This goal is evident in the ways in which the newspapers and companies presented Rigs-to-Reefs projects. In 1987, one newspaper article touted the conversion process as a way "to hold sought-after species as red snapper, croaker, amberjack and grouper."[52] The long-time fisherman Scearce also stressed the recreational catches available at converted rigs, "The reef sites will be buoyed and publicized, and fishermen may then locate by sonar, loran, binoculars, etc. and simply go-to-fishin'… Red snapper, grouper, king mackerel, amberjack, lemonfish, barracuda, and a host of other smaller fish will gravitate quickly to the reef habitat."[53] Even recreational divers, who might have an interest in reef species such as sea cucumbers, starfish, and barnacles, showed a clear preference for the same large fish species. In an article in the magazine Skin Diver, the journalist diver described the reefs this way: "While these high profile artificial reefs will never have the natural beauty of a coral reef, they do support very large populations of grouper, snapper and several pelagic species, and make excellent diving sites."[54]

Oil companies tapped into this language in advertising, strengthening the discourse of rigs-to-reefs as the provider of sought-after species. Phillips Petroleum Company (now ConocoPhillips) ran two such ads in 1994 (Figures 3 and 4). The first features a "Catch of the Day" café blackboard listing popular Gulf fish dishes including red snapper. Using the catchline, "Every day, people seem to be writing about the work we've done in the Gulf of Mexico," Phillips has no qualms about claiming responsibility for the fish listed on the board. The text beneath explains that "an artificial reef created by a submerged Phillips Petroleum production platform" has created "a fisherman's paradise where red snapper, amberjack, silver sea trout and grouper are just a few of the hundreds of delectable species swimming far beneath the surface." The species listed are all top Gulf fish catches for human consumption. The

linkage between the submerged offshore rig and the provision of edible fish species is stressed in the use of words like "delectable" and "tasteful." The second ad shows a fishing boat out at sea with the question, "If fishermen come for the fish, who do the fish come for?" directly below the picture. The species list here includes red snapper, amberjack, mahimahi, and grouper – a list which once again highlights the main commercial and edible large fish species in the Gulf. But in this ad, Phillips reaches further than just helping fishermen with their catches; Phillips claims that participation in Rigs-to-Reefs is "part of an ongoing plan at Phillips to not just take from the earth, but to give back as well. And doing good things for the environment can only help all of us."[55] Thus Phillips is participating in creating a discourse of environmental benefit to the Gulf based on boosting populations of large edible fish.

The discourse emphasis on reefed rigs as providers of recreational/commercial large fish in the early 1980s was so strong that by the time Texas's Artificial Reef Plan was complete, their authors stated in bold letters: "By definition, artificial reefs are structures that are placed by man in areas to enhance fishing opportunities."[56] Yet there is no inherent link between artificial reefs and fishing. The National Artificial Reef Plan of 1985 had in fact listed three purposes for artificial reefs: recreational fishing enhancement, commercial fishing enhancement, and habitat enhancement and restoration.[57] That same year, scientists James Bohnsack and David Sutherland proposed in an article that more attention be given to reefs designed as breeding sites and juvenile growth habitat.[58] Later the linkage between artificial reefs and fishing would also be questioned. When the California legislature considered a measure to allow Rigs-to-Reefs conversions (1999 to 2001), the final version of the bill explicitly designated the reef sites as "no-take" marine protection zones off limits to fishermen even though fishermen groups had been the first to take an interest in having a Rigs-to-Reefs program there.[59] We see here that although there was some resistance, the discourse and the historical circumstance of the Gulf program had clearly tied reefs to fishable species.

Theme 2: Enhancing the Gulf

The second theme which emerges in the Rigs-to-Reefs discussion is the role of the oil equipment in creating "better" ecosystems than had previously existed in nature. As noted earlier, the continental shelf of the Gulf of Mexico has a flat, muddy bottom with little hard substrate like rocks and natural reefs. This leads to a dearth of places for colonizers such as oysters, corals, and barnacles to attach. Manmade technological equipment in the ocean, however, could change this. "A number of new species found in the Gulf previously lacked an adequate natural habitat and their presence may be attributed to platforms. 'Prior to installation of the platforms, these newest species had

no suitable habitat in which to expand their range,' [Dana] Larson [founder of Rigs to Reef Co.] notes."[60] The technology thus provided the habitat that normally did not occur in the region.

The language of improvement became clearly visible in the Rigs-to-Reefs discourse, particularly in the case of the Texas program. The Texas Artificial Reef Plan stated boldly, "Artificial reefs represent a tool by which man can elicit changes in the ecosystem to achieve benefits."[61] An article titled 'Artificial reefs could make desert-like Gulf come alive' in the *Houston Chronicle* commented on the marine enhancement inherent in the Plan, "With few exceptions, the bottom of the Gulf of Mexico is an underwater desert…. There is little we can do about the depth of the water, but plenty of room for improvement where undersea structure is concerned."[62]

The emphasis on Gulf's natural ecosystem as devoid of life led to the development of a metaphor stressing the life-giving qualities of reefed offshore platforms. As a Wall Street Journal article from 1988 noted, "Trouble is, what's flat and empty doesn't sustain much marine life. Fisheries experts portray such bottoms as underwater deserts. Shipwrecks, oil rigs or other man-made habitats quickly become oases in such surroundings."[63] The oasis metaphor was repeated by Hal Osburn, a marine ecologist overseeing the Texas Parks and Wildlife Department's Rigs to Reefs program, in 1993:

> Dropping one of these rigs in the middle of this vast expanse of mud bottom is like putting an oasis in the desert, really. … And the Gulf is- you know, is capable of sustaining the very same kind of ecosystems that you find in coral reefs off of Florida, in the Caribbean. All of those species can survive here, but they just need the hard structure to sustain themselves.[64]

An editorial published in the Houston Chronicle a few days after Osburn's television comments picked up on it as well, "The platforms are … toppled over at approved sites to create artificial reefs on the otherwise featureless Gulf floor. These toppled platforms, 17 so far, become permanent fertile oasises [sic] for fish and other sea creatures."[65] In this metaphor we see that recognition that the Gulf's ecosystem would not "naturally" support the desirable fish life, but the belief was that with the help of technology, this could be changed.

Theme 3: Endangered Ecosystems

The discourse even moved beyond enhancement to endangerment. In this arena, the technological artifacts – the oil platforms – were portrayed as not only helpful to the

ecosystem but in fact critical to it. According to the *Wall Street Journal*, even active environmentalists adopted this line of thinking:

> Just when you thought saving whales was enough, some people have discovered even bigger endangered things in the sea: oil rigs. Don't snicker. Offshore oil and natural-gas production platforms, yesterday's environmental bane, and today's ecological darlings. ... Concerned conservationists say that ripping out rigs means uprooting entire undersea communities, leaving thousands of mollusks, worms and starfish, anemones, corals, sponges and fish either dead or homeless. … Even environmentalists for whom homeless barnacles aren't major priorities argue that a gastropod's home is his castle. Blow it up and you kill bigger fish and animals, too.[66]

The endangerment language displayed in this 1988 article was not commonly called upon in the Gulf Rigs-to-Reef discourse until 2003.

In 2003, U.S. Representative David Vitter from Metairie, Louisiana introduced the Rigs to Reefs Act (HR 2654) in the House. The press conference for the Act took place with Aquarium of the America's Gulf of Mexico exhibit as the backdrop, taping into the visual linkage of reef and rig in the tank.[67] Although the bill itself was primarily concerned with financial tax incentives to offset the costs of Rigs-to-Reefs participation for oil companies (and was not passed by Congress), an endangered ecosystem discourse became heavily entangled with the bill.

Paul Sammarco, a scientist with the Louisiana Universities Marine Consortium, had found that working oil platforms provided habitat for coral growth, including hard corals which normally grow only in the small Flower Garden Banks reef in Texas waters. As of 2003 when Vitter introduced the Act, Sammarco had only completed two years of his three-year study, but his preliminary findings of coral colonies on Gulf platforms were brought in as an ecological reason to support the Act. Sammarco was quoted in 2003 as saying "Before the platforms, coral had precious few sites to settle on. I think that's important to point out at a time when coral reefs all over the world are on a serious decline." Sammarco even intimated that removed platforms are home to corals which are protected under the federal Fisheries Management Plan for Coral and Coral Reefs of 1982 – a plan which does not distinguish between natural and manmade habitats.[68]

When Sammarco finally published his findings with Amy Atchison and Gregory Boland in 2004, the team concluded that:

> The oil and gas platforms in the Gulf of Mexico that possess coral populations clearly appear to have positive environmental value. The corals themselves… have an intrinsic value, suggesting that the extent of coral colonization on a structure should be considered prior to decommissioning. … They may play some role in the broader ecology of coral community dynamics within the Gulf of Mexico as a whole.[69]

Press coverage of Sammarco's findings highlighted the ecosystem contributions of the rigs. "A rusting oil rig perched on the muddy bottom of the Gulf of Mexico, notorious for its vast "dead zone" off the Mississippi Delta, might seem an unlikely setting for a thriving ecosystem. But that is exactly what Paul Sammarco has found…" Sammarco himself argued that rig removal takes away the only hard bottom on which marine animals can feed: "Once a rig is moved in any way, an entire ecosystem is gone. … We've created these ecosystems, now it's up to us to keep them alive. Removing old oil rigs is 'pulling the plug' on many of the Gulf of Mexico's rare and important marine species."[70]

This linkage between ecosystem and rig was not limited to scientists. Allen Walker of the company Extreme Fishing Charters was quoted in one article as saying, "I have witnessed crimes against nature as an entire ecosystem changed with the removal of a single oil rig."[71]

During the 2003 Rigs-to-Reefs bill discussion, some environmentalist groups questioned the appropriateness of artificial reefs as substitutes for nature. Cynthia Sarthou, executive director of the nonprofit Gulf Restoration Network, said "My whole problem is that you make the argument that by creating an environment suitable for fish we have somehow improved on Mother Nature. I support the idea of these coral communities, but I'm also concerned that we've gotten totally hooked on using these artificial structures to create artificial communities." Jack Sobel, director of strategic conservation science and policy for the nonprofit Ocean Conservancy also expressed reservations, "For overfished species in heavily fished areas, the contribution of artificial reefs is at least questionable and may be negative. They're clearly not a natural environment. Do you want artificial ecosystems or natural ones?"[72] In these final statements, we sense a tension between the natural and the artificial. These dissenters asked a question that had so far been outside of the discussion: Converted platforms do create habitat, but is it a habitat we want? Others in the discussion did not pick up this argument. These few dissenters attempted to confront the well-established paradigm of Rigs-to-Reefs as positive for the Gulf but were not able to significantly affect the consensus view.

Under the theme of endangered ecosystems, we see that the actors turned to arguments in favor of Rigs-to-Reefs beyond the value of the fish habitat to fishermen. Here, they stressed the value of ecosystems, particularly hard coral which falls under national and international protectionist laws. This discourse thread was the last to develop in the Rigs-to-Reefs discussion and was related to an increasing awareness of threats to coral reefs. The discourse associating Rigs-to-Reefs with coral reef protection followed the establishment United States Coral Reef Task Force in 1998 and the passage of the Coral Reef Conservation Act of 2000 both of which targeted reef conservation. These broader discussions of coral reef protection promoted the development of a linkage between offshore oil structures and coral habitat and strengthened the position that standing and converted rigs were good for the Gulf ecosystem.

Is Artificial Nature Natural Enough?

The issues raised through this analysis of the development of the Rigs-to-Reefs program in the Gulf of Mexico should prompt historians of technology to be aware of how discourses create understandings of what is natural and what is artificial. There are two levels at which the historical actors here constructed the boundaries between technology and nature: the physical and the cultural.

First, at the physical level, the technological oil platforms have been incorporated into the ocean ecosystem by ocean creatures themselves, making it difficult to draw a line between the natural and artificial. Oilmen did not force creatures to live around their operating platforms; the barnacles, sea cucumbers, and fish found the platforms provided viable habitats. STS scholars have previously established the domestication model as a way of understanding the reciprocal processes involved in incorporating technological objects or scientific knowledge into daily life.[73] In the Rigs-to-Reefs case, non-human actors "domesticated" technology: the sea life used the oil platforms as habitat even though it was not a perceived function of the technology. The non-human actors in this story participated in defining the functions of the offshore oil platform as an artifact.

Second, and more importantly, the human actors interpreted this domestication and incorporated it into ideas about the Rigs-to-Reefs program. Discourse analysis lets us see how the main actors – policymakers, scientists, oil industry representatives, fishermen, and even environmentalist groups – constructed a particular vision of what the Gulf ecosystem should be. They consistently cited the creation (and maintenance) of fishing places for recreationally and commercially valuable species such as amberjack and red snapper as the most important reason for a Rigs-to-Reefs program.

The presence of offshore technological infrastructures made reaching this goal possible. Old oil equipment could turn a vast expanse of mud into a thriving reef, even one that supported endangered hard corals. Thus, the functions of the equipment as habitat provider made it worth conserving and the Rigs-to-Reefs programs of Louisiana and Texas continue to convert offshore structures. As a result, industry donated 147 structures for artificial reefs under Louisiana's plan between 1987 and 2006 and 91 structures to the Texas Artificial Reef program between 1991 and 2006.[74] The actors decided that a particular ecosystem was desirable and thus industrial artifacts that supported that ecosystem were also desirable. Because of this, the Rigs-to-Reefs discourse has largely cast oil platforms as a positive for the Gulf of Mexico environment.

Analyzing public discourses is thus valuable for understanding how humans interpret technology-environment constellations in particular historical contexts. Discourses create and maintain phenomena like the Rigs-to-Reef program. The Aquarium of the Americas exhibit integrating an oil structure into the ocean ecosystem is both a product of and a contributor to the discourse about what is natural (and desirable) in the Gulf. Such considerations should surely enter into the way historians of technology analyze the meeting of points of technology and the environment.

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Endnotes

[1] 'Tenneco Inc. announces $250,000 contribution to Aquarium of the Americas in New Orleans,' *Southwest Newswire*, 3 May 1988.

[2] To date, oil companies have converted only about 10 percent of the facilities which have been decommissioned since Louisiana and Texas established Rigs-to-Reefs programs. This low percentage reveals that it is not particularly financially beneficial to convert installations. Allan Pulsipher, Executive Director of the Center for Energy Studies at Louisiana State University, stated that the difference between Rigs-to-Reefs options and removal of structures to shore is "small change" to the oil industry. Since decommissioning is "not really their main business," there are risks with pursuing

alternatives. He believes that additional monetary incentives are necessary to get oil companies to donate more structures if they are wanted for artificial reefs. Allan Pulsipher, interview with author, 2 March 2009, Baton Rouge, Louisiana.

[3] The few times environmentalist organizations appear in the sources for the Gulf of Mexico Rigs-to-Reefs program, their positions are only briefly summarized. In testimony before the Louisiana House Committee on Natural Resources, Representative Sam The riot stated that House Bill 1111 to establish the Louisiana Artificial Reef Development Program had the support of the Sierra Club (Recorded testimony before the Louisiana House Committee on Natural Resources, 14 May 1986, Tape 1, Side 1, Louisiana State Archives, Baton Rouge, Louisiana). The National Wildlife Federation generally supported the creation of artificial reefs, including those made from oil rigs: James P. Sterba, "Save the Oil Rigs?" *Wall Street Journal*, 29 April 1988, 1. The lack of environmentalist involvement in the Gulf is in stark contrast to developments in California where local environmentalist organizations led the charge quite vocally against Rigs-to-Reefs legislation from 1999 to 2001.

[4] For discussions of agricultural technology and devastation of the land and its ecosystems, see Worster, *Dust Bowl*, Tucker, *Insatiable Appetite*, and Soluri, *Banana Culture*. Typical examples of the scholarly treatment of industries as polluters are Tarr, *Search for the Ultimate Sink* and Hurley, *Environmental Inequalities*. For a negative view of environmental change caused by large-scale resource management technologies, see Josephson, *Industrialized Nature*. There has, however, been a recent interest in providing more nuanced views of the relationship between technology and the environment, particularly in the areas of agriculture and nature experience, e.g. the essays in Schrepfer and Scranton, *Industrializing Organisms*; Mauch and Zeller, *The World Beyond the Windshield*; and Reuss and Cutcliffe, *The Illusory Boundary*. Extractive and heavy industries have not yet been incorporated in these discussions.

[5] Most previous studies of the Gulf of Mexico Rigs-to-Reefs programs have either focused on the program's legal aspects, regulatory history, or technical aspects. For legal issues, see Salcido, 'Enduring Optimism.' For regulatory and technical histories of the Gulf program, see Kaiser, 'Louisiana Artificial Reef Program' and Kaiser and Pulsipher, 'Rigs-to-Reefs Programs in the Gulf of Mexico.' Because the Rigs-to-Reefs program was hotly contested in California, several authors have focused on that

locale, e.g. Rothbach, 'Rigs-to-Reefs' and Schroeder and Love, 'Ecological and Political Issues Surrounding Decommissioning of Offshore Oil Facilities in the Southern California Bight.' McGinnis has also compared the California to Gulf context in 'Political Ecology.' The broadest study incorporating the Gulf is McGinnis, Fernandez, and Pomeroy, 'Politics, Economics, and Ecology,' which includes a short discussion of the perceived lack of fish habitat in the Gulf before addressing the legal developments of the program.

[6] Callon, 'Some Elements of a Sociology of Translation.'

[7] Law, 'Technology and Heterogeneous Engineering.'

[8] Gallaway, 'Assessment of Platform Effects on Snapper Populations and Fisheries.'

[9] 'Rigs-to-Reefs: rare program benefits all concerned,' *Baton Rouge Sunday Advocate*, 4 October 1987, 26-SPEC.

[10] Crosby, *Ecological Imperialism*.

[11] Meikle, *American Plastic*, Chapter 8 analyzes the discourse of plastic's dangers, although the author does not explicitly say he is doing discourse analysis. Similar examples could be cited for books within the cultural history strand, which often examine the cultural meaning of a technology without explicitly looking at the ways language creates the technology's meaning and even the technology itself. More explicit discourse analyses of technology include Storey, 'Guns, Race, and Skill in Nineteenth-Century Southern Africa,' which analyzes changing settler representation of firearms and shooting skills through discourse analysis, and Maguire, 'Co-Evolution of Technology and Discourse,' which identifies four discourses of construction and reconstruction of DDT.

[12] Phillips and Hardy, *Discourse Analysis*, 3.

[13] Phillips and Hardy, *Discourse Analysis*, 5.

[14] Phillips and Hardy, *Discourse Analysis*, 32-33. See Macnaughten, 'Discourses of Nature,' for an example of the use of discourse in an environmental conflict. Myerson and Rydin, *The Language of Environment*, identifies three types of environmental discourses: new information, such as the presentation of new statistics and data; new concepts, such as the idea of "sustainable development" or Gaia; and new practices including the introduction of new environmental policies and management ideas. Although I do not follow Myerson and Rydin's approach of distinguishing between

the three types in this paper, all three types contribute to the creation of the discourse of "Rigs-to-Reefs".

[15] 'Oil-rig reefs,' *Outdoor Life* 172 (Sept 1983), 8-9.

[16] 'Tenneco turns obsolete offshore rigs into large artificial reef off Florida,' *Oil Daily*, 9 October 1985, 5.

[17] 'City Debris to Form Fish-Luring Reef in Ocean,' *New York Times*, 18 August 1959, 31; 'Junked Autos to Serve as Fish Habitat,' *Washington Post*, 11 March 1960, D5; 'As America Beautiful Aid. Coastal Fish Reefs of Old Cars Urged,' *Washington Post*, 7 February 1966, C3; '15,000 Tires are Added to Artificial Reef,' *Washington Post*, 19 August 1969, B6; 'Old Navy Boats Scuttled to Aid Marine Life,' *Washington Post*, 24 April 1972, C1

[18] H.R.4413 and H.R. 4714 were both titled 'Marine Artificial Reef Development Act of 1979'; H.R.1041 ad H.R.1897 were both titled 'Marine Artificial Reef Development Act of 1981'.

[19] 'Secretary Watt Creates REEFS Task Force to Promote Recreational and Commercial Fishing,' Department of the Interior press release, 5 August 1983. Watt appears to have supported the initiative because of perceived benefits to both the recreational fishing and offshore oil industries. As Director of the Bureau of Outdoor Recreation (1972 to 1975) and Secretary of the Interior (1981-1984), Watt would have been heavily influenced by both of these interest groups.

[20] NOAA, *National Artificial Reef Plan*.

[21] 'Tenneco creating one of the largest artificial reefs,' *Southwest Newswire*, 2 October 1985.

[22] In 2007, the State of Florida was forced to allocate $2 million toward the clean up of a tire-based reef that was poorly constructed in the 1970s off Fort Lauderdale. Tires had broken free causing damage to natural reefs and washing ashore. The entire project is expected to cost $6.6 million when labor from the US Army and Navy divers who will retrieve the tires is included. 'Divers to Retire Reef of Tires,' *Miami Herald*, 2 May 2007.

[23] This was one of the reasons for the Environmental Defense Center's consistent objections to a California Rigs-to-Reefs program. See Environmental Defense Center to Senator Tom Hayden, Chair Senate Natural Resources and Wildlife Committee, letter dated 22 December 1999, California State Archives, LP383:334. It should be

noted, however, that all petroleum residues are removed before any structures are converted to reefs in the Gulf, and the proposed California program would have required the same. The emphasis by the California environmentalists on pollution from structures is part of a rhetorical strategy to associate Rigs-to-Reefs with past environmental damage from the oil industry like the 1969 Santa Barbara oil spill.

[24] Local chapters of the Sierra Club came out against the then-proposed Texas Rigs-to-Reefs plan saying that the materials might still have oil contamination: "Shrimpers oppose 'rigs-to-reefs' plan," *E&P Environment*, 19 April 1993 and Suzanne Gamboa, "Rigs to Reefs," *Austin American-Statesman*, 18 May 1993, A1.

[25] 'Tenneco creating one of the largest artificial reefs,' *Southwest Newswire*, 2 October 1985.

[26] Ditton, 'Fisherman Reaction to and Public Benefits of Artificial Reefs.'

[27] 'Abandoned Offshore Rigs Studied for Fishing Use,' *Baton Rouge Morning Advocate*, 21 February 1985, 7-D. The earliest mention I've found in a newspaper to the practice of oil rig fishing is 'Oil Rigs: Friend or Foe of Anglers?' *New York Times*, 12 March 1978, NJ1.

[28] 'Old Platforms Don't Have to Die, They Can Become Living Reefs,' *Oil Daily*, 6 May 1985, B23. Assistant director of the Louisiana Geological Survey and marine biologist Virginia Van Sickle also stated that rigs harbor up to 50 times the fish as other nearby habitats. 'La. Losing Artificial Reefs,' *Baton Rouge Morning Advocate*, 24 March 1986, 1-B.

[29] NOAA, *National Artificial Reef Plan*, 15.

[30] 'Old platforms don't have to die, they can become living reefs,' *Oil Daily*, B23.

[31] Gramling and Freudenburg, 'Attitudes Toward Offshore Oil Development,' 444.

[32] Committee on Disposition of Offshore Platforms, *Disposal of Offshore Platforms*, 9.

[33] *Code of Federal Regulations*, title 30, sec. 250.702, i.

[34] 'La. Losing Artificial Reefs,' *Baton Rouge Morning Advocate*, 24 March 1986, 1-B. From the 1970s through 2002, 2,230 structures were indeed removed from the Gulf, but these estimates as well as raw numbers of removals make the loss seem more dramatic than it has been because new installations were also put in place. In the 1990s for example, 1,261 decommissioned structures were removed while 1,428

structures were installed. 'Gulf Sanctuary,' *Times-Picayune*, 29 June 2003, National 1.

[35] See for example, Ditton, 'Platform Removal in the Gulf of Mexico' and Committee on Disposition of Offshore Platforms, *Disposal of Offshore Platforms*.

[36] Quotes from Charles Wilson in 'Abandoned Offshore Rigs Studied for Fishing Use,' *Baton Rouge Morning Advocate*, 21 February 1985, 7-D; Paul Driessen in 'Old Platforms Don't Have to Die, They Can Become Living Reefs,' *Oil Daily*, 6 May 1985, B23; first line of article 'La. Losing Artificial Reefs,' *Baton Rouge Morning Advocate*, 24 March 1986, 1-B; Gerald Adkins, fish biologist for the Louisiana Department of Wildlife and Fisheries in 'Rigs-to-Reefs: Rare Program Benefits All Concerned,' *Baton Rouge Sunday Advocate,* 4 October 1987, 26-SPEC.

[37] 'Save the Oil Rigs?' *Wall Street Journal*, 29 April 1988, 1.

[38] 'How the Oil Glut is Changing Business", *New York Times*, 21 June 1981.

[39] W. S. Borowski, 'Oil and Gas Developments in the Louisiana Gulf Onshore in 1986,' *AAPG Bulletin*, 71, no. 10B (1987): 75-82.

[40] Gramling and Freudenburg, "Attitudes Toward Offshore Oil Development.' See also Freudenburg and Gramling, *Oil in Troubled Waters*.

[41] Division of Administration, State of Louisiana, 'About Louisiana,' Available from http://doa.louisiana.gov/about_economy.htm.

[42] Interpretation Concerning Authority to Depart from OCS Requirements, *Federal Register* Vol. 48, No. 31357, 8 July 1983, Department of Interior, Minerals Management Service.

[43] Ditton and Auyong, 'Fishing Offshore Platforms Central Gulf of Mexico,' i.

[44] Committee on the Disposition of Offshore Platforms, 'Disposal of Offshore Platforms,' vi.

[45] Committee on the Disposition of Offshore Platforms, 'Disposal of Offshore Platforms,' 11-14.

[46] Louisiana Fishing Enhancement Act – Establishment and Maintenance of Artificial Reefs (Louisiana Act 100 of 1986); 'Rigs-to-Reefs: Rare Program Benefits All Concerned," *Baton Rouge Sunday Advocate*, 4 October 1987, 26-SPEC.

[47] Louisiana Department of Wildlife and Fisheries, *Louisiana Artificial Reef Plan*, vii.

[48] 'Everyone Will Benefit from Rigs-to-Reef Plan,' *Baton Rouge Sunday Advocate*, 22 February 1987, 22-D.

[49] 'Rigs-to-Reefs: Rare Program Benefits All Concerned,' *Baton Rouge Sunday Advocate*, 4 October 1987, 26-SPEC

[50] 'Rigs-to-Reefs: Rare Program Benefits All Concerned,' *Baton Rouge Sunday Advocate*, 4 October 1987, 26-SPEC

[51] Texas Parks and Wildlife Department, *Texas Artificial Reef Fishery Management Plan*, Executive Summary.

[52] 'Rigs-to-Reefs: Rare Program Benefits All Concerned,' *Baton Rouge Sunday Advocate*, 4 October 1987, 26-SPEC

[53] 'Everyone Will Benefit from Rigs-to-Reef Plan,' *Baton Rouge Sunday Advocate*, 22 February 1987, 22-D.

[54] Heyward Mathews, 'Rigs-to-Reefs, Obsolete Oil Platforms Find New Life as Artificial Reefs,' *Skin Diver* 34 (Nov 1985): 114-8.

[55] Phillips Petroleum Company advertisements from *New York Times*, March 16, 1994, A21 and *New York Times*, September 21, 1994, A23.

[56] Texas Parks and Wildlife Department, *Texas Artificial Reef Fishery Management Plan*.

[57] NOAA, *National Artificial Reef Plan,* 5-7. The habitat item was included despite the language of the National Fishing Enhancement Act of 1984 (which had required the development of the Plan) only including recreational and commercial fishing enhancement.

[58] Bohnsack and Sutherland, 'Artificial Reef Research.'

[59] California Senate Bill 1 of 2001, amendment to Section 6426.4 of the Fish and Game Code.

[60] 'Rigs-to-Reef advocates say platforms should provide protein as well as energy,' *Offshore*, November 1986, 28.

[61] Texas Parks and Wildlife Department, *Texas Artificial Reef Fishery Management Plan*

[62] 'Artificial Reefs Could Make Desert-like Gulf Come Alive,' *Houston Chronicle*, 4 May 1990, 1.

[63] 'Save the Oil Rigs?' *Wall Street Journal*, 29 April 1988, 1.

[64] 'Oil Rigs to Reefs,' CNN television broadcast, 11 September 1993.

[65] 'Rigs to Reefs,' *Houston Chronicle*, 14 September 1993.

[66] 'Save the Oil Rigs?' Wall Street Journal, 29 April 1988, 1. One article from 1995 specifically contrasted the environmentalist group support for the Gulf program with the environmentalist uproar against the deep water disposal of the Brent Spar in the North Sea. A spokesman for the U.S. Minerals Management Service was quoted as saying, "Environmental groups have been very supportive of the program." 'Gulf Rig Program Contrasts with Uproar in Europe,' *Houston Chronicle*, 25 June 1995, 7.

[67] 'Legislator Aiming to Keep Oil-platform Reefs Thriving, Vitter's Plan Would Protect Ecosystems,' *Times-Picayune*, 16 August 2003, 3.

[68] 'Gulf Sanctuary,' *Times-Picayune*, 29 June 2003, National 1

[69] Sammarco, Atchison, and Boland, 'Expansion of Coral Communities,' 140.

[70] 'Marine Life Complicates Removal of Old Oil Rigs,' *Washington Post*, 11 April 2005, A10. Mark Carr, a marine biology professor at the University of California at Santa Cruz, made some similar statements about the value of California's offshore oil facilities: "Some of these platforms support threatened rockfishes, and losses to those species [caused by removing the rigs] may be harmful to the regional ecosystem." Stephanie Greenman, 'From Rockfish to Rigfish', *California Wild*, Fall 2001, available online http://research.calacademy.org/calwild/2001fall/stories/habitats.html.

[71] 'Experts Debate Benefits of Offshore Oil, Gas Platforms', Gannett News Service, 19 September 2003.

[72] 'Gulf Sanctuary,' *Times-Picayune*, 29 June 2003, National 1.

[73] Lie and Sørensen, Making Technology Our Own.

[74] 'Louisiana Adds New Reef Sites for Storm-damaged Structures,' *Oil & Gas Journal*, 11 June 2007, 43.