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Use of Oil and Gas Platforms as Habitat in Louisiana's Artificial Reef Program

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Louisiana's offshore oil and gas industry began in 1947, when the first well was drilled out of sight of land south of Terrebonne Parish, LA. Today, over 3,837 offshore oil and gas platforms have been installed, producing 25% of the U.S.A.'s natural gas and approximately 13% of its oil. In addition to meeting the world's energy needs, these structures also form one of the world's most extensive de facto artificial reef systems. However, federal regulations require that these structures be removed within 1 yr after the mineral lease is terminated. Disposal of obsolete offshore oil and gas structures is not only a financial liability for private industry, but can also result in a loss of productive marine habitat. In 1986, the Louisiana Fishing Enhancement Act was signed into law in response to the National Fishing Enhancement Act, creating the Louisiana Artificial Reef Program. This program was designed to take advantage of fishing habitat opportunities offered by these obsolete platforms. Since the program's inception, 25 reef sites have been created off Louisiana's coast using the components (jackets and decks) of 71 obsolete platforms. The use of obsolete oil and gas platforms in Louisiana has proved to be highly successful. Their quantity, design, longevity, and stability have provided a number of advantages over the use of traditional artificial reef materials. Participating companies also save money by converting structures into reefs rather than abandoning them onshore. They then are required to donate a portion of the savings to the state to run the artificial reef program. One disadvantage, however, is that the large size of these platforms restricts the distance from shore where they can be placed. To achieve the minimum clearance of 16 m over a submerged structure, as required by the New Orleans (8th) Coast Guard District regulations, the platforms must be placed in waters deeper than 30 m. Waters of this depth are found between 22 km and 115 km from shore on Louisiana's gently sloping continental shelf, making them almost inaccessible to many anglers. Funds generated by the program, however, can be used to develop reefs to closer to shore if alternative low-profile materials are used. Due to the high maintenance costs of both the structure and aids to navigation, the increased liability exposure, and the undetermined cost of removing the structure once it becomes a hazard to public safety and navigation, leaving the structures standing in place has thus far proved not to be a viable option in Louisiana.

Offshore oil and gas platforms began functioning as artificial reefs in 1947, when Kerr McGee completed the world's first commercially successful oil well, out of sight of land in 5.6 m of water, 70 km south of Morgan City, LA. With the capability of drilling offshore and the development of new technologies, Louisiana's offshore oil and gas industry quickly expanded. In 1993, Minerals Management Service estimated that there were over 3,700 (Table 1) platforms in the northern Gulf of Mexico, in water depths up to 609 m. In addition to producing 25% of the U.S.A.'s natural gas and approximately 13% of its oil, the platforms also form the world's largest artificial reef system. Most of the Gulf's oil and gas platforms (Fig. 1) lie in federal waters off Louisiana's coast. A few lie east of the Mississippi River in waters off Mississippi and Alabama, and the rest are scattered off the Texas coast (505). The Gulf of Mexico Fisheries Management Council estimated in 1980 that the total natural reef habitat in the Gulf of Mexico covered approximately 39,900 km^2, only one-third of which is off Louisiana's and Texas' coasts, where approximately 99% of the Gulf of Mexico oil and gas platforms exist. Gallaway and Lewbel (1982) estimated that offshore petroleum platforms provide an additional 5,000 km^2 of artificial reef habitat, increasing the total amount of reef fish habitat by an estimated 27%. This habitat is particularly important in the northern Gulf of Mexico, where bottoms are typically clay, silt, or sand, with little or no relief. The addition of these platforms and other oil-and-gas-related facilities has undoubtedly

TABLE 1. Number of permitted artificial reefs using oil and gas platforms and existing oil and gas platforms and weight and anticipated removal costs by water depth in the Gulf of Mexico.[a]

Water depth (m)	Oil and gas structures[b]	Structures removed[b]	Artificial reefs, Gulf of Mexico[c]	Average total weight (tons)	Structure removal cost (millions of dollars)
0–6	380	168	0	<100	0.05–0.5
6.1–30.5	2,293	757	7	500–700	0.5–1.5
30.6–61	689	152	63	700–1,500	1–2.5
61.1–122	346	38	32	1,000–5,000	5–15
122.1–610	38	0	0	5,000–50,000	15–100
Total	3,746	1,115	102		

[a] Adopted from Reggio and Kasprzak (1991).
[b] MMS database on OCS structure removals and installations, 1993.
[c] From Lukens (1993) and Texas Parks and Wildlife (pers. comm.).

affected fish populations, although such effects are not well understood (Stanley, 1994).

Since installation, these platforms have been an important component of both the recreational and commercial fishing industries and have long been recognized as de facto artificial reefs. Nearly 20%–50% more fish occupy the area around an oil and gas platform than occupy the area around the neighboring soft mud of the Gulf of Mexico (Driessen, 1985).

Reggio (1987) estimated that 70% of all offshore saltwater fishing trips in the Exclusive Economic Zone (EEZ) off Louisiana were destined for one or more of these oil and gas structures. Furthermore, anglers who fished around platforms caught larger, more desirable, and greater numbers of fish than did marine recreational fishermen who fished other areas (Witzig, 1986). Avanti, Inc. (unpubl.), using data from the Marine Recreational Fisheries Survey, estimated that 30% of the entire recreational fishery catch of approximately 15 million fish off Louisiana and Texas were caught near platforms. Dimitroff (1982) conservatively estimated that 112 commercial snapper and grouper fishermen from the Florida panhandle landed approximately 450,000 pounds of reef fish with an economic value of approximately $2 million annually from around oil and gas platforms. Although these fishery resources are obviously important, there are few data on the effects of oil and gas platforms on fish populations due to the difficulty in sampling around these structures with traditional sampling gears, gear bias, limited visibility, diver/ROV avoidance, and lack of standard survey techniques.

Platform Faunal Studies

Despite these difficulties, investigators have found that abundance of fishes near a platform ranges from a few hundred to several thousand, depending on platform, size, location, and time of survey (Putt, 1982; Continental Shelf Associates, unpubl.). Gerlotto et al.

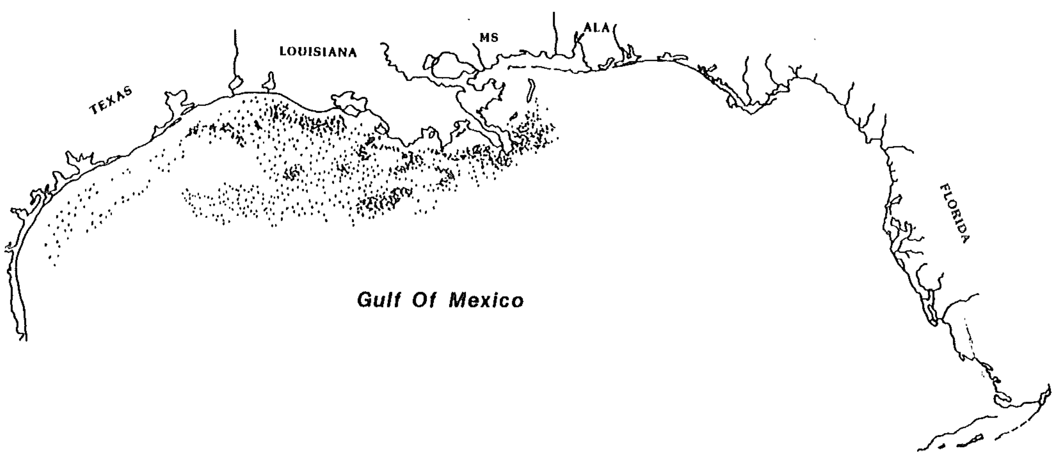

Fig. 1. General distribution of oil and gas production structures in the Gulf of Mexico.

(1989) found that fish densities were 5 to 50 times higher immediately adjacent to a platform than at distances 50 m away. The dominant species in water depths between 3 and 18.3 m included red snapper (*Lutjanus campechanus*), bluefish (*Pomatomus saltatrix*), Atlantic spadefish (*Chaetodipterus faber*), blue runner (*Caranx crysos*), gray triggerfish (*Balistes capriscus*), grunts (Haemulidae), greater amberjack (*Seriola dumerili*), sheepshead (*Archosargus probatocephalus*), and groupers (Serranidae) (Gallaway, 1980; Gallaway and Lewbel, 1982; Putt, 1982; Stanley and Wilson, 1990; Continental Shelf Associates, unpubl.). Putt (1982) found that June–Sep. fish populations varied in abundance near reefs by a factor of 2, while species composition remained constant. Stanley and Wilson (1990, 1991) examined catch records from recreational and charter boat anglers in the northern Gulf and found that catch rates and species composition varied with season, platform size, and water depth. Stanley (1994) estimated the sphere of influence around a platform in 22 m of water to be about 16 m in radius from the jacket. In a study conducted from Sep. 1990 to June 1992, Stanley estimated the monthly average number of fish in the sphere of influence to be approximately 12,000, with fishes ranging in size from 2.4 cm to 1.1 m. Fish densities varied not only seasonally, but also spatially, with the highest densities occurring on the north and east sides of the platform and the lowest densities occurring on the south and west sides (Stanley 1994).

It did not take long for Louisiana and neighboring states to recognize the bountiful fishery resources beneath these oil and gas platforms. Since these platforms are so commonplace in coastal Louisiana and Texas, many citizens and management groups believed that they were permanent and would always be available for fishing. However, this is not the case. From 1973 to 1993, over 1,115 structures (Table 1) have been removed from the Gulf of Mexico, as required by federal law. Since 1993, an additional 385 platforms have been removed. At present, there are 885 additional platforms in the Gulf of Mexico that are more than 25 yr of age, and these will probably be removed within the next 10 yr. This number does not include those platforms that will need to be removed because of damage, regulatory requirement due to lease abandonment, or economic circumstances. Removal of these structures will reduce artificial reef habitat and may have negative long-term impacts on reef fish populations. At a minimum, loss of these structures will result in the dispersal of fish populations away from traditional fishing locations (Gulf of Mexico Fishery Management Council, unpubl.).

Demonstration Projects

Coastal states recognized the vital fishery habitat these oil and gas structures provide and began permanently securing them for their coastal waters. In 1978, Exxon offered a 2,120-ton experimental subsea production system (SPS) to the state of Florida for use as an artificial reef. After 2 yr of negotiations, the SPS was severed from the sea floor in Louisiana's West Delta area and towed 483 km to a site in Florida.

In 1982, a Tenneco structure was removed from the coast of Louisiana, towed 442 km, and placed off the coast of Pensacola, FL, approximately 35.4 km offshore. A year later, Marathon Oil Company towed a 1,815-ton oil platform 354 km from Louisiana to a site 80.4 km south-southeast of Mobile Bay, AL. On 2 Oct. 1985, Tenneco towed two additional structures 1,480 km from Louisiana to a site 2.4 km off Dade County, FL.

In response to the success of these projects and in view the loss of hard-bottom habitat off Louisiana by the removal of offshore platforms, then Congressman John Breaux authored the National Fishing Enhancement Act (NFEA) of 1984 (PL 98-623). The NFEA mandates that the Secretary of Commerce and other support groups develop a long-term plan for siting, constructing, permitting, installing, monitoring, managing, and maintaining artificial reefs within and seaward of state jurisdictions. The initial version of the National Artifical Reef Plan (Stone, 1985) was drafted by state, federal, university, and private experts and published in 1985.

The Louisiana Program: A Working Model

To take advantage of the availability of obsolete oil and gas platforms that provide valuable reef fish habitat, Louisiana passed enabling legislation entitled The Louisiana Fishing Enhancement Act (Act 100) on 25 June 1986. This act sets up a mechanism to transfer ownership and liability of the platforms from oil and gas companies to the state when the platforms cease production. It has been estimated that cumulative removal costs will reach over $1 billion by the year 2000 (Lee, 1985). Allowing some of the obsolete structures to remain offshore could significantly reduce this estimate.

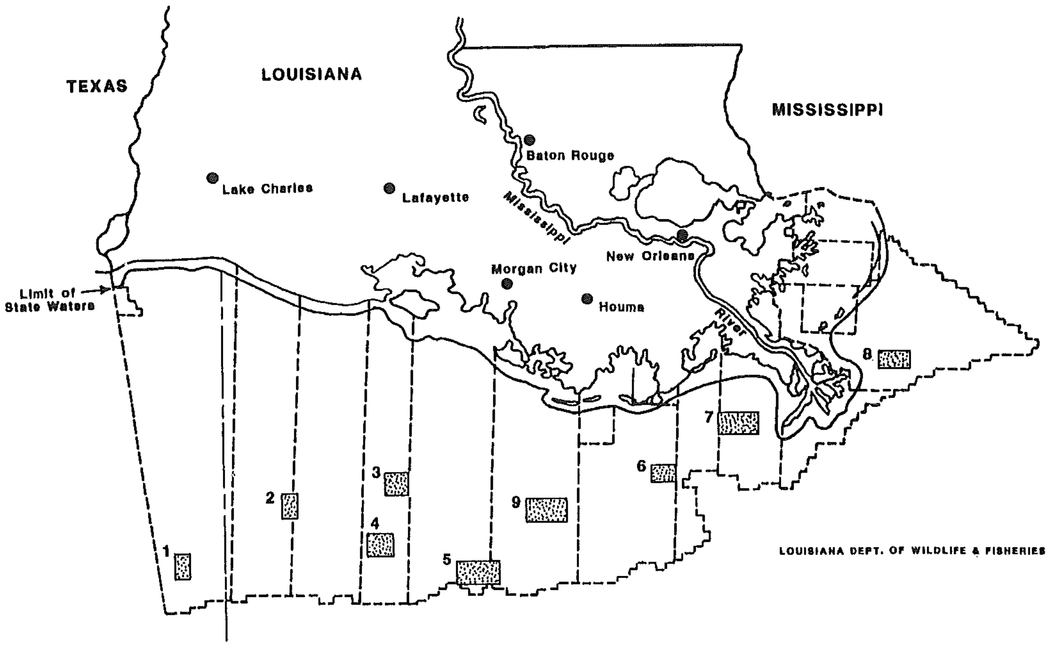

Fig. 2. Offshore Louisiana artificial reef planning areas: (1) West Cameron planning area, (2) East Cameron planning area, (3) South Marsh Island (76), (4) South Marsh Island (146) planning area, (5) Eugene Island planning area, (6) South Timbalier planning area, (7) West Delta planning area, (8) Main Pass planning area, (9) Ship Shoal planning area.

Act 100 established the state of Louisiana as the permittee for artificial reefs developed under the program's jurisdiction and appointed the Department of Wildlife and Fisheries as agent for the state. The state assumes responsibility for the reefs upon placement within the established reef permit area. The state, donors, and other participants constructing a reef under NFEA and Act 100 are absolved from liability, provided the terms and conditions of the authorizing federal artificial reef permit are met.

Act 100 also mandates that a plan be drafted to establish the rationale and operational guidelines for the program, including the siting criteria for Louisiana's artificial reefs. The plan was accepted and endorsed by the 1987 Louisiana legislature (Wilson et al., 1987).

With the plan in place for guidance, Louisiana began the lengthy process of identifying areas inappropriate for reef development. This process, known as "exclusion mapping," excluded areas such as shipping lanes, traditional commercial fishing areas, pipeline corridors, restricted military zones, existing live bottoms, and other areas deemed useable by other user groups (Christian, 1984; D'Itri, 1985; Myatt, 1985).

When exclusion mapping was completed, a series of public hearings were held across south Louisiana to outline the artificial reef program and to solicit public input in selecting areas where reefs should be located. As a result of those hearings, eight artificial reef planning areas (Fig. 2) were initially chosen in which specific artificial reef projects could be sited, as part of phase I of the program. These planning areas facilitate platform abandonment planning by oil and gas companies and provide flexibility in specific site selection within the planning areas, thereby encouraging industry cooperation. At the suggestion of local fishermen, a ninth planning area (Ship Shoal) was added seaward of the cities of Houma and Morgan City, LA.

Act 100 does not authorize state general funds for the artificial reef program but does establish the Louisiana Artificial Reef Trust Fund. Oil and gas companies that donate structures to the program are asked to contribute half of the disposal savings realized through program participation to the trust fund. Based on average removal cost of an oil and gas structure (National Research Council, 1985) and the locations of the artificial reef planning areas, Louisiana authorities estimate that the oil and gas industry may save up to $1 million per structure, depending on water depth and structure size, by converting it into an artificial reef compared with the cost of traditional onshore abandonment (Table 2). The interest earned by the Artificial Reef Trust Fund is designated for program operations and development. When interest earned exceeds operational expenses, marine fisheries research and habitat enhancement projects may be funded. Of particular interest is funding for projects involving alternative low-profile material closer to shore, where the use of oil and gas platforms would be inappropriate due to clearance requirements.

Platforms as Reef Habitat

Oil and gas platforms have proven to be excellent artificial reef material. The National Artificial Reef Plan cites five major characteristics or standards for artificial reef materials. These standards, together with siting and management, generally determine the success or failure of an artificial reef project. Standards include function, compatibility, durability, stability, and availability (Stone, 1985); oil and gas platforms appear to possess all of these characteristics.

"Function" refers to the selection of materials which are known to be effective in stimulating desired growth of micro- and macroorganisms and in providing habitat for target species. It is well documented that oil and gas platforms function well as artificial reefs by providing habitat for a variety of species that are otherwise associated only with coral reefs, since many of these species are habitat-limited (Moran, 1986; Parrish, 1987; Sale, 1991). This is further emphasized by the fact that over 70% of all recreational angler trips in the Exclusive Economic Zone in Louisiana are destined for one or more of these structures (Reggio, 1987). The steel members of the platform provide the necessary hard bottom substrate for many of the encrusting organisms that critically important in developing reef habitat.

These structures also have proven to be compatible with the marine environment, since generally only the jacket of the structure or that portion of the platform that has never come in contact with hydrocarbons or hazardous materials is used. When the deck portions are used in the Louisiana program, all of the processing equipment is either removed or cut open, and the piping and vessels are flushed clean. The residue and contaminants are then packed in drums and shipped to shore for disposal. Certification that the decks are clean is then generally performed by a third party, and a certification report is provided (Maher, unpubl.).

Reefs constructed of oil and gas platforms are also very durable and stable, rarely if ever moving from where they are placed. In August 1992, Hurricane Andrew (a class 4 storm with winds over 140 mph) entered the Gulf of Mexico and affected the federal (Minerals Management Service's) mineral leasing areas of Ship Shoal, South Timbalier, and West Delta. The storm destroyed or damaged over 181 active platforms and caissons, five of which subsequently entered the Louisiana Artificial Reef Program (Table 2). Side-scan surveys of two reefs in areas affected by the storm at ST-128 and ST-86 were conducted in 1993 and indicated no detectable movement (Wilson and Stanley, unpubl.). These platforms also appear to be relatively durable. Quigel and Thorton (1989) estimated a life span of approximately 300 yr.

Oil and gas platforms are also readily available, with over 3,800 in the Gulf of Mexico alone. However, it is not always economical to convert a platform into an artificial reef. The structure size, water depth, distance from shore, proximity to final reef site, and potential resale value will dictate whether or not an obsolete platform becomes a reef (Pope, 1988). From 1987 to 1994, of the over 800 platforms removed from Louisiana and Texas waters, only 90 platforms, or approximately 10%, became artificial reefs (Kasprzak, 1994). However, when the required clearance is considered, over 50 percent of the platforms in water depths of 100–300 feet have entered artificial reef programs (Table 1).

There are several disadvantages to using oil and gas platforms as artificial reefs. Individual U.S. Coast Guard districts are responsible for developing marking guidelines for obstructions to navigation. For instance, the 8th Coast Guard District, with jurisdiction from western Florida to the Texas–Mexico border, requires a minimum of 25.9 m clearance above the obstruction in order to be exempt from maintaining expensive lighting requirements. An exemption of the lighting requirements may be granted on a case-by-case basis if at least 15.2 m of clearance is maintained. Since many of these structures have a maximum relief of at least 15.2 m, a minimum water depth of at least 30.5 m is required to properly site and maintain oil and gas platforms as reefs. In Louisiana, the 30.5-m depth exists 48–120 km offshore, making some reefs inaccessible to many fishermen. Another disadvantage is the expense of removing the structures to relocate

TABLE 2. Louisiana Artificial Reefs utilizing oil and gas platforms. SMI = South Marsh Island, ST = South Timbalier, HI = High Island, MU = Mustang Island, SS = Ship Shoal, WC = West Cameron, EI = Eugene Island, VE = Vermillion, WD = West Delta, EC = East Cameron.

Date reefed	Reef site	Original location	Donor company	Water depth (m)	Distance towed (km)	Donation ($)
10/30/87	SMI-146	SMI-146	Oxy	72.5	0	250,000
09/27/88	ST-128	ST-128	Chevron	31.4	0	50,000
11/20/88	WC-616/617	HI-343A	Exxon	72.2	43.4	150,000
12/15/88	WC-616/617	HI-342B	Exxon	71.9	46.7	100,000
12/29/88	WC-616/617	MU-A90A	Mobil	55.2	402.3	50,000
07/15/90	SS-320	SS-320	CNG	102.1	0	250,000
08/01/90	WC-616	WC-624	CNG	100.6	38.6	300,000
08/22/90	ST-128	ST-134	Chevron	39.6	9.7	25,000
08/25/90	SMI-146	EI-392	CNG	106.7	33.8	300,000
07/19/91	SS-320	VE-381	Mesa	107.6	96.5	150,000
07/21/91	WC-616/617	VE-372	Exxon	90.5	88.5	250,000
09/20/91	ST-86	ST-86[a]	Odeco	27.7	0	500,000
11/15/91	WC-595	WC-595	Unocal	74.7	0	392,870
01/21/92	WD-134	WD-134A[b]	Shell	85.3	0	0
01/21/92	WD-134	WD-134B	Kirby	85.3	0	364,611
05/15/92	WC-595	WC-543B	Kerr-McGee	56.4	56.3	44,132
05/16/92	WC-595	WC-543A	Kerr-McGee	56.4	56.3	44,132
06/04/92	WD-134	WD-122C	Shell	83.8	4.8	150,000
06/29/92	WC-616/617	WC-617	Mobil	93.0	0	300,000
07/18/92	EI-366	SS-296	Forest	82.9	14.5	145,000
09/23/92	EI-366	EI-260	Delmar	57.3	40.2	35,000
10/13/92	SS-230	SS-230[c]	Kerr-McGee	36.6	0	50,000
10/16/92	WC-608	WC-541	Chevron	56.1	29.0	44,000
10/18/92	EC-272	VE-260	Chevron	45.7	16.1	150,000
02/05/93	WC-608	WC-597	Chevron	79.2	13.0	150,000
04/17/93	WD-134	WD-138	Elf	85.3	9.7	105,000
07/07/93	EC-273	VE-250B (D&P)–	Chevron	43.3	48.2	69,800
07/15/93	WC-616/617	WC-616	Exxon	93.0	0	350,000
08/17/93	WD-89	WD-89C	AGIP	59.7	0	111,621
09/04/93	EC-273	EC-273A (D&P)[b]	Texaco	54.3	0	70,000
10/13/93	SS-214	SS-214B[e1]	Kerr-McGee	32.9	0	26,924
10/13/93	SS-214	SS-214C[e1]	Kerr-McGee	32.9	0	28,482
10/13/93	SS-214	SS-214C[e1]	Kerr-McGee	32.9	0	0
10/15/93	SS-230	SS-242	Kerr-McGee	41.1	4.8	21,750
11/29/93	SS-215	SS-215[c]	Unocal	32.6	0	200,000
05/12/94	ST-151	ST-151H[c]	Chevron	42.7	0	45,800
05/12/94	ST-151	ST-152E[c]	Chevron	43.6	0	70,000
05/12/94	ST-130	ST-130A[c]	Chevron	42.7	0	113,574
05/13/94	EC-272	EC-281B (D&P)[d]	Chevron	52.1	35.4	96,800
08/06/94	WC-608	EC-638B	Chevron	106.7	12.9	106,400
08/17/94	EC-270	EC-270	Pennzoil	53.0	0	117,228
09/04/94	WD-89	WD-41C	Chevron	25.3	29.0	75,000
09/05/94	ST-135	ST-135V	Chevron	36.6	0	110,000
09/28/94	SS-320	SS-225(JACKET)[e2]	Sonat	102.1	40.2	35,000
09/07/94	SS-230	SS-225 (DECK)[e2]	Sonat	36.6	24.1	5,000
09/06/94	ST-134	ST-134F	Chevron	42.0	0	70,000
09/06/94	ST-134	ST-128A+	Chevron	31.4	4.8	52,000
10/05/94	EC-273	EC-267	Dalen (PG&E)	51.2	13.0	20,000
10/23/94	WC-586	WC-540	Marathon	57.6	24.1	78,500
11/22/94	WC-608	EC-347	Apache	86.9	61.1	211,140
05/27/95	WD-95	ST-146	Conoco	31.1	80.5	0
05/27/95	WD-95	WD-95	Conoco	46.6	0	87,500
07/27/95	SMI-146	SMI-154	CNG	74.7	4.8	160,000
09/20/95	EI-366	EI-380	Oryx	102.7	33.8	164,840

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TABLE 2. Continued.

Date reefed	Reef site	Original location	Donor company	Water depth (m)	Distance towed (km)	Donation ($)
09/20/95	EC-273	VE-320	Oryx	63.1	16.1	152,000
08/20/96	WC-608	WC-628	Apache	112.7	16	166,197.5
09/20/96	WD-76	WC-76	Amaco	55.2	0	196,110.5
09/29/96	WD-69	WD-69	Conoco	41.7	0	213,630
11/11/96	SC-608	WC-563	Amoco	58.5	19.3	160,342.5
06/05/97	EI-366	EI-343B	Delmar	86.8	16	64,729
08/12/97	SS-214	SS-214J	Kerr-McGee	32.9	0	175,000
08/12/97	SS-214	SS-214D	Kerr-McGee	32.9	0	77,300
10/23/97	ST-134	ST-134N	Chevron	39.6	0	187,139
10/23/97	ST-134	SS-134T	Chevron	40.5	0	187,139
10/23/97	ST-130	SS-130E	Chevron	42.6	4.8	130,156
10/30/97	SS-320	SS-246B	CNG	50.3	32.2	64,000
11/04/97	EI-367	EI-367	Amoco	106.4	0	218,322

[a] Destroyed by Hurricane Juan, 1985.
[b] Destroyed by Hurricane Betsy, 1965, while being installed.
[c] Destroyed by Hurricane Andrew, 1992.
[d] D&P = drilling and production jackets.
[e] 1, 2 bid as one project.

them to an approved site. Currently, derrick barge rates are between $50,000 and $100,000, depending on the lifting capabilities of the barge. The size of the structure to be removed determines the size of barge required (J. Ray McDermott, Inc., 1994, pers. comm.). A third disadvantage is the method of removal. Currently, state-of-the-art techniques required to sever these structures from the sea floor involve the use of explosives. The concerns about

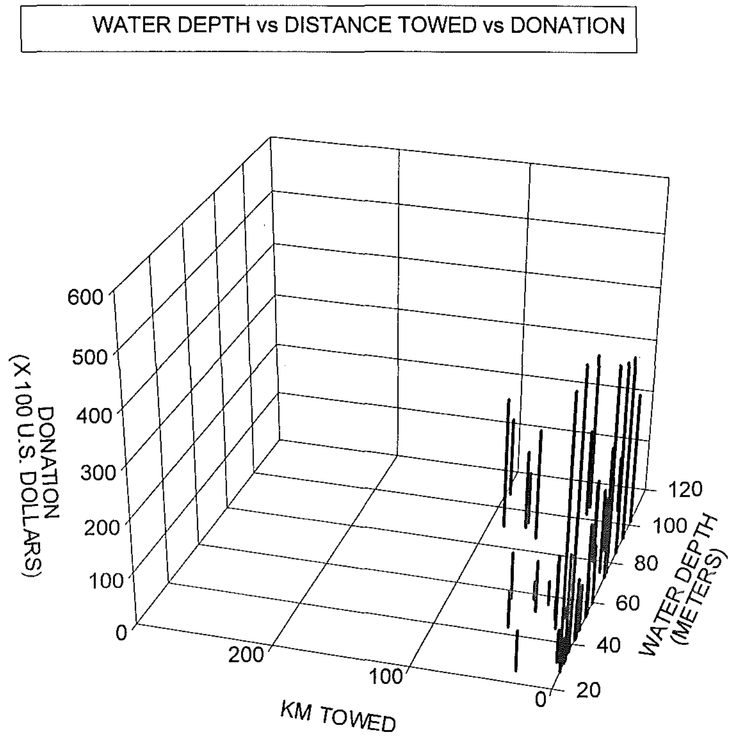

Fig. 3. Louisiana artificial reefs constructed of oil and gas platforms by water depth of removed structure (m), distance towed (km), and donation to the program. Donations received reflect one-half of savings realized by participating companies.

the use of explosives include the potential impact on endangered sea turtles and marine mammals. To address this issue, Minerals Management Service and National Marine Fisheries Service require a review of the operator's abandonment plan under section 7 of the Endangered Species Act. Recently, the Gulf of Mexico Fishery Management Council has also become concerned about the impacts of explosives on red snapper, a commercially and recreationally important species (Gulf of Mexico Fishery Management Council, unpubl.).

The oil and gas industry has attempted to find alternatives to the use of explosives, such as cryogenic cutting, hydraulic abrasive cutting, mechanical cutting, and torch cutting. Most of these techniques either have proven to be ineffective or are successful only in limited situations. At present, the industry maintains that the use of explosives is by far the safest, most reliable, and most cost-effective method of platform removal.

To date, the components of 71 obsolete platforms are located at 25 reef sites contributed by 23 operators (Table 2) in Louisiana. Donations to the program range from $20,000 for a small 3-pile well protector removed from 51.2 m of water and towed 13.0 km to a reef site to $500,000 for a large 28-pile platform toppled on location as a result of Hurricane Juan in 1985 (Table 2). In some instances, projects have actually cost the participating companies more or have resulted in little or no savings. These projects, however, have generally been combined with other abandonments in the same area that offset the loss of revenues. It appears that structure size, distance of tow, and (more particularly) water depth, play important roles in determining the donation to the state and resulting cost savings to the oil company (Fig. 3). As a result of this program, cost savings to the industry have exceeded $9 million since its inception.

Conclusions

Federal and state governments and the oil and gas industry, as well as commercial and recreational fishermen, have been beneficiaries of Louisiana's artificial reef program. However, it will take the continued cooperation of the various state and federal agencies involved and the support of the Gulf user groups to ensure that Louisiana's program will enjoy continued success.

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