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Exhibit G.3.a  
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**AN ECONOMIC ANALYSIS OF A RIGS TO REEFS PROGRAM  
FOR THE CALIFORNIA OUTER CONTINENTAL SHELF**

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## EXECUTIVE SUMMARY

This paper compares the economic costs and benefits of converting obsolete oil and gas platforms into artificial reefs with the alternative of full rig removal. Advocates claim that “rigs-to-reefs” programs provide important habitats for fish, crustaceans, and marine mammals as well as direct economic benefits. Opponents argue, among other things, that artificial reefs can hinder commercial fishing and may pose liability risks.

Using data from California, we construct an economic framework that assesses benefits and costs of a rigs-to-reefs program. Our principal finding is that a well-designed rigs-to-reefs program for California would likely result in direct and indirect benefits far in excess of costs. Based on our analysis, we recommend that a state and/or federal program be established that would enable the citizens of California and elsewhere to reap these benefits.

# AN ECONOMIC ANALYSIS OF A RIGS TO REEFS PROGRAM FOR THE CALIFORNIA OUTER CONTINENTAL SHELF

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## I. INTRODUCTION

With over twenty oil and gas platforms off its shores due for removal within the next few years, California stands at an important policy crossroads. Federal law requires oil and gas companies to remove their offshore platforms within one year of terminating an outer-continental shelf land lease.<sup>1</sup> The Minerals Management Service (MMS), the federal agency overseeing removal or “decommissioning,” can waive the full removal requirement in order to accommodate converting a platform to an artificial reef.<sup>2</sup> In brief, conversion involves modifying a rig so that it can continue to support marine life while not posing any undue threat to other ocean users; ownership and maintenance of the structure is passed from the oil and gas company to a governmental agency. Policy makers must decide whether an artificial reef program serves ecological and economic goals better than the status quo of complete rig removal.

In 2001, State Senator Dede Alpert (D-San Diego) sponsored a bill that would have established a rigs-to-reefs program in California.<sup>3</sup> The bill passed the state legislature, but was vetoed by Governor Gray Davis. The main concern Governor Davis raised in his veto was the lack, at the time, of “conclusive evidence that converted platforms enhance marine species or

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<sup>1</sup> See generally, 30 C.F.R. Part 250, subpart Q, §250.1700 *et seq.* Removal guidelines specify that platforms must be cut down to fifteen feet below the ocean mud line.

<sup>2</sup> Waiving is subject to certain restrictions, such as approval by the Army Corp of Engineers and acceptance of liability by a responsible state agency. MMS policy states “The MMS supports and encourages the reuse of obsolete offshore petroleum structures as artificial reefs in U.S. waters.” (As quoted by Milton S. Love, Donna M. Schroeder & Mary M. Nishimoto, “The Ecological Role of Oil and Gas Production Platforms and Natural Outcrops of Fishes in Southern and Central California: A Synthesis of Information,” U.S. Department of the Interior, U.S. Geological Survey, Biological Resources Division, Seattle Washington (2003), at 4.5.) Any artificial reef must conform to the National Artificial Reef Plan (NARP).

<sup>3</sup> For information on the bill and its legislative history, see the California State Senate website (visited Aug. 4, 2003) <[http://info.sen.ca.gov/cgi-bin/postquery?bill\\_number=sb\\_1&sess=PREV&house=S&site=sen](http://info.sen.ca.gov/cgi-bin/postquery?bill_number=sb_1&sess=PREV&house=S&site=sen)>.

produce net benefits to the environment.”<sup>4</sup> If California does not reverse this decision on establishing a state program, the Federal Government may consider such a program for platforms within its jurisdiction in the California Outer Continental Shelf. As a matter of necessity, any program would need to designate an entity to assume ownership and maintenance of the structures once they are reefed. A designated state or federal agency or a responsible third party could fill this role.

This paper compares the economic costs and benefits of converting obsolete oil and gas platforms into artificial reefs with the alternative of full rig removal.<sup>5</sup> Advocates claim that rigs-to-reefs programs provide important habitats for fish, crustaceans, and marine mammals as well as direct economic benefits. Opponents argue, among other things, that artificial reefs can hinder commercial fishing and may pose liability risks.

We use an economic framework to compare these two opposing points of view. In Section II, we describe the key operational details of an artificial reef program, including how the oil companies’ monetary savings might be divided. We assume that either a state or federal program is enacted to cover the 23 platforms due for decommissioning in federal waters offshore California. In Section III, we identify the potential costs and benefits of establishing a rigs-to-reefs program in California, providing quantification where possible. Section IV concludes the paper with our recommendation that a rigs-to-reefs program would be economically beneficial for California.

## **II. HOW A RIGS-TO-REEFS PROGRAM WOULD WORK**

Rigs-to-reefs programs are already well established in the Gulf of Mexico, where the first large-scale offshore oil and gas drilling took place.<sup>6</sup> Both Texas and Louisiana passed laws

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<sup>4</sup> See the “Veto Message” link at the California State Senate Website (visited Aug. 4, 2003) <[http://info.sen.ca.gov/cgi-bin/postquery?bill\\_number=sb\\_1&sess=PREV&house=S&site=sen](http://info.sen.ca.gov/cgi-bin/postquery?bill_number=sb_1&sess=PREV&house=S&site=sen)>.

<sup>5</sup> For a description of cost-benefit analysis, see Edith Stokey & Richard Zeckhauser, *A Primer for Policy Analysis* (1978).

<sup>6</sup> As of 2001, there were more than 150 permitted artificial reefs off Alabama, Florida, Mississippi, and Texas. See Michael McGinnis, Linda Fernandez & Caroline Pomeroy, “The Politics, Economics, and Ecology of Decommissioning Offshore Oil and Gas Structures,” Final Technical Summary and Study Report, U.S.

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in the late 1980s that established state trusts to oversee oil and gas offshore platform decommissioning and conversion to artificial reefs.<sup>7</sup> To date, over 188 platforms have been converted to artificial reefs in the Gulf.<sup>8</sup> This figure represents around 8 percent of all decommissioned platforms. The primary reason for the low take-up rate rests on the economics of the obsolete Gulf platforms: most were in shallow water where the cost of complete removal (with subsequent salvage and scrap sales) was less than the cost of artificial reef conversion.<sup>9</sup>

Converting a rig to an artificial reef can take one of several forms. Most simply, the platform can be left entirely in place. In this scenario, the wells are abandoned and the upper portion of the structure is cleaned and stripped and navigational aids, such as lights and signals, are installed for the benefit of any ocean traffic.<sup>10</sup> Thus far, none of the Gulf rig conversions have chosen this option, due to the high maintenance costs.<sup>11</sup>

Another conversion alternative is “toppling.” Here, the wells are abandoned, the upper portions of the rig are removed, the platform connections are severed at the base, and the resulting structure is pulled to a horizontal position on the ocean floor. Depending on the depth of the water, toppling may require navigational aids, as well. Related to toppling, another decommissioning option involves towing the rig to another site for reefing. This option has been exercised on a majority of the rig conversions in the Gulf, most notably when two

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Department of the Interior, Minerals Management Service, Pacific OCS Region, OCS Study MMS 2001-006, (Mar. 2001), at 11.

<sup>7</sup> For example, the Louisiana Fishing Enhancement Act of 1986 (LA. Rev. Stat. § 56:639.1 *et seq.*; Act 100) creates a process by which ownership and liability pass from the oil and gas companies to the state for obsolete platforms that meet the Act’s criteria. The Texas Artificial Reef Act of 1989 (Tex. Parks & Wildlife Code § 89.001 *et seq.*) is similar.

<sup>8</sup> Love et al., *supra* note 2, at 4.9.

<sup>9</sup> *Id.*

<sup>10</sup> For a description of each decommissioning option described here, see *Id.*, at 4.1-4.4.

<sup>11</sup> *Id.*, at 4.4.

platforms were removed from offshore Louisiana and hauled to waters off Dade County Florida, some 920 miles away from the original site.<sup>12</sup>

Finally, a platform can be partially removed and the remaining structure converted into an artificial reef in place. In this scenario, the wells are abandoned and the upper portion of the platform is removed. The amount of removal varies, but the remaining platform could be over 100 feet below the ocean surface, just beneath the surface, or anywhere in-between. The ultimate depth of the artificial reef is determined by a Coast Guard assessment and by the willingness of the liability holder to pay for any required navigational aids. Around 10 percent of the decommissioned rigs taking advantage of artificial reef programs in the Gulf of Mexico have been partial removals.<sup>13</sup>

The artificial reef programs established by Louisiana and Texas do not receive state or federal funding.<sup>14</sup> Instead, they are funded by lump-sum oil and gas company contributions and the interest paid on those donations. In particular, companies decommissioning platforms donate one half of the cost savings from reefing the rigs as opposed to completely removing them. In turn, the state assumes liability for the artificial reef and the fund handles any maintenance. Currently, the Louisiana artificial reef fund has a balance of \$18 million and earns approximately \$1 million in interest annually; the Texas fund has at least \$4 million.<sup>15</sup>

We assume that an artificial reef conversion program in California would be largely based on programs already operating in the Gulf of Mexico states. In particular, we assume that oil and gas companies would apply for rigs-to-reefs status when a platform was due for decommissioning. The rigs then would be evaluated on a case-by-case basis, with the company supplying cost savings estimates (likely to be independently verified) and the appropriate state

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<sup>12</sup> C.A. Wilson, V.R. Van Sickle & D.L. Pope, "Louisiana Artificial Reef Plan," Louisiana Department of Wildlife and Fisheries Technical Bulletin No. 41, Louisiana Sea Grant College Program (1987).

<sup>13</sup> Les Dauterive, "Rigs-to-Reefs Policy, Progress, and Perspective," Minerals Management Service, OCS Report MMS 2000-073 (2000).

<sup>14</sup> Love et al., *supra* note 2, at 4.9.

<sup>15</sup> The Louisiana balance was obtained from authors' interview with Rick Kasprzak, Artificial Reef Coordinator for Louisiana's Department of Wildlife and Fisheries, Aug. 11, 2003. The Texas balance is cited in Love et al., *supra* note 2, at 4.9.

or federal agencies determining whether an individual platform was eligible for the program. Once eligibility is determined, the offshore platform would be partially removed to a depth determined by the appropriate agencies. The reef conversion project would be subject to review under the National Environmental Policy Act.

For each rig accepted in the rigs-to-reefs program, we assume that the oil and gas company would remove the upper portions of the rig to some depth below the ocean surface. The company would donate fifty percent of the cost savings resulting from partial rig removal (as compared to full rig removal) to a trust fund.<sup>16</sup> The money would be invested by the fund and the interest used as needed for reef maintenance and liability costs.<sup>17</sup> Interest remaining after covering necessary expenses could be available for marine research and conservation projects.

### **III. THE ECONOMICS OF PARTIAL RIG REMOVAL**

In this section we present the potential costs and benefits of converting an offshore platform into an artificial reef. We start with the costs, reviewing the relevant literature for a rigs-to-reefs program in California and quantifying costs where data are available. We then turn to the benefits, again reviewing the available documents relevant for measuring the gains an artificial reef program could bring.

#### **A. Potential Costs**

California has been deliberating on a rigs-to-reefs program for well over five years, and a number of concerns have been raised in that time. For example, certain commercial fishermen's groups oppose the program,<sup>18</sup> due primarily to concerns over equipment damage. In testimony before the California State Lands Commission in December of 1999, a representative of one of California's trawlers associations noted that trawlers do not want reefs

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<sup>16</sup> Alpert's bill proposed that the California Department of Fish and Game be responsible for managing the rigs-to-reefs program, although some critics of the bill suggested others, such as adjacent county governments.

<sup>17</sup> In Louisiana, company donations are made to the general fund, but artificial reef dollars are tracked separately.

<sup>18</sup> Other commercial fishermen appear to support the program, as we discuss below.

of any kind, and instead prefer a “clean ocean bottom” to reduce the risk of snagged nets and damaged gear.<sup>19</sup> It is our understanding, however, that in the Gulf of Mexico only one incident of trawler equipment damage has been reported in over 15 years of artificial reef operation.<sup>20</sup> While damage of this nature may go unreported, it is likely that any significant problems would be reported. Moreover, with the proper navigational aids installed around the reef, trawlers would be able to avoid gear damage by maintaining an appropriate distance. Shrimp trawlers in the Gulf evidently drag their nets within a quarter mile of reefed platforms and report that these areas tend to be more productive than others.<sup>21</sup> As a result, we view trawler gear damage as a problem that is unlikely to generate economically significant losses.<sup>22</sup>

Other concerns revolved around the expense of creating and maintaining an artificial reef. The bill proposed by Senator Alpert in 2001 provides an estimate for the cost of creating a rigs-to-reefs program. For instance, the agency responsible for coordinating the program would need to establish operational guidelines for evaluating and accepting rigs into the program and for maintaining them once converted to reefs. Alpert’s bill estimated the one-time cost of creating guidelines at \$250,000.<sup>23</sup> As for ongoing maintenance and operations for the program as a whole, Louisiana spends approximately \$250,000 each year to monitor and maintain the 111 converted platforms remaining off its coast.<sup>24</sup>

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<sup>19</sup> See the testimony of Mike McCorkle, Senior Representative of the Southern California Trawlers Association, before the California State Lands Commission, Dec. 3, 1999 (visited Aug. 4, 2003) <[http://www.slc.ca.gov/Division\\_Pages/MRM/RigsToReefs.htm](http://www.slc.ca.gov/Division_Pages/MRM/RigsToReefs.htm)>.

<sup>20</sup> The shrimper filing the claim failed to heed the warning placed on buoy markers around the artificial reef, and as a result, his claim was thrown out. Authors’ interview with Rick Kasprzak, Artificial Reef Coordinator for Louisiana’s Department of Wildlife and Fisheries, on Aug. 12, 2003.

<sup>21</sup> Wilson et al., *supra* note 12. See also, Love et al., *supra* note 2, at 4.6.

<sup>22</sup> Removing the platforms completely would increase the fishable area for trawlers by clearing current obstructions from the ocean. However, the scientific evidence discussed in the next section suggests that trawlers would incur costs from platform removal in that fish stocks would be depleted, both from the immediate damage caused by explosives used to sever the platform base, as well as long-term effects from loss of habitat and spawning grounds. As neither of these effects is easy to quantify, the net impact on trawlers is unclear.

<sup>23</sup> See the bill text (visited Aug. 4, 2003) <[http://info.sen.ca.gov/pub/01-02/bill/sen/sb\\_0001-0050/sb\\_1\\_bill\\_20010914\\_enrolled.pdf](http://info.sen.ca.gov/pub/01-02/bill/sen/sb_0001-0050/sb_1_bill_20010914_enrolled.pdf)>.

<sup>24</sup> Louisiana has 34 artificial reef sites, with a total of 111 converted oilrigs. As noted earlier, many of the reefed Louisiana rigs were hauled to other sites. The rigs are a minimum of 85 feet from the ocean surface. Costs

(continued...)



Some opponents have expressed concern over liability issues as well.<sup>25</sup> Any structure in the ocean extending relatively close to the surface, whether man-made or natural, poses a potential hazard for ocean vessels. Under a rigs-to-reefs program, ownership and liability would pass from the original lease owner to a state or federal agency, although the original owner would provide indemnification. Critics worried that up-front indemnification may prove to be inadequate.<sup>26</sup> Note that as part of artificial reef maintenance, a rigs-to-reefs program (following the Gulf model) would include the installation and upkeep of navigational devices. While this would reduce accidents, some liability issues may remain.<sup>27</sup> Insurance broker and risk management advisor Marsh & McLennan estimates that annual insurance premiums, per rig, would run around \$25,000, although they anticipate that the premiums would decline as more rigs are added to the program.<sup>28</sup>

A few opponents have voiced concerns that the structures would corrode, and thus, cause pollution or prove unstable. Generally, offshore platforms are made of steel, which over time corrodes into iron oxide (rust). However, if the steel is covered with crustaceans, it is

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relayed in authors' interview with Rick Kasprzak, Artificial Reef Coordinator for Louisiana's Department of Wildlife and Fisheries, Aug. 11, 2003.

<sup>25</sup> A report by MMS prepared in 2001 expressed concern over liability issues. See McGinnis et al., *supra* note 6, at 57. The assumptions made by MMS—that rigs would be left in place and not partially removed—differ from the assumptions we make here. As a result, liability issues differ between the two reports. More importantly, MMS did not examine the liability experience of the Gulf of Mexico, nor did it attempt to estimate liability costs for California.

<sup>26</sup> See, e.g., the testimony of Warner Chabot, Director of the Pacific Region of the Center for Marine Conservation, before the California State Lands Commission, Dec. 3, 1999 (visited Aug. 4, 2003) <[http://www.slc.ca.gov/Division\\_Pages/MRM/RigsToReefs.htm](http://www.slc.ca.gov/Division_Pages/MRM/RigsToReefs.htm)>. See also, Christopher Chatto, Program Director for Citizens Planning Association of Santa Barbara, Inc, "Letter to Chairperson Kuehl and Members of the Senate Natural Resources Committee," Mar. 20, 2001.

<sup>27</sup> As the NARP observes "when a reef has been properly located, marked on navigational charts if necessary, and any required surface markers are affixed, there should be very little potential for liability." R.B. Stone, "National Artificial Reef Plan," NOAA Technical Memorandum NMFS-OF-6, U.S. Department of Commerce, *cited in* Love et al., *supra* note 2, at 4.5.

<sup>28</sup> Correspondence between Mary R. Berry of Marsh & McLennan and George Steinbach, Executive Director of the California Artificial Reef Enhancement program, July 23, 2003. Berry notes that Marsh does not have off-the-shelf policies or pricing guidelines for insurance of this type, so the estimate is a rough one.

sealed off from oxygen and will corrode more slowly.<sup>29</sup> Moreover, the rate of corrosion in the ocean is low and most experts believe that oil platforms would last upwards of two to three hundred years without maintenance before collapsing.<sup>30</sup> Corrosion does not appear to be a problem in the Gulf of Mexico, where platform reefs have lasted over 15 years thus far. For instance, the Louisiana Department of Wildlife and Fisheries notes that, “The use of obsolete oil and gas platforms in Louisiana has proved to be highly successful. Their large numbers, design, longevity and stability have provided a number of advantages.”<sup>31</sup>

Finally, some of the early complaints made concerning a California rigs-to-reefs program centered on the uncertainty of the scientific research. Many worried that artificial reefs had unproven benefits, and thus may not warrant maintenance and liability costs. This was, in fact, one apparent reason for Governor Davis’s veto of Senator Alpert’s bill. Since 2001, however, additional studies have yielded new scientific evidence. In the next section, we discuss the most recent study of oil platforms as marine habitats and note that there now appears to be evidence that rigs acting as artificial reefs produce environmental benefits.

## **B. Potential Benefits**

While difficult to quantify, the impact of converted rigs on marine life is likely to be one of the most pivotal benefits. Without at least some suggestion that decommissioned offshore platforms can act to benefit the marine environment, contributing to fish stocks and providing suitable habitat, there is likely to be far less support for establishing a rigs-to-reefs program.<sup>32</sup> At the time of Senator Alpert’s bill, the scientific research on this question was

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<sup>29</sup> See the Aug. 23, 1998 talk by James Wiseman, a deepwater engineer with Winmar consulting (visited Aug. 25, 2003) <[http://www.reefs.org/library/talklog/j\\_wiseman\\_082398.html](http://www.reefs.org/library/talklog/j_wiseman_082398.html)>.

<sup>30</sup> See the discussion of reefed platform life span in Love et al., *supra* note 2, at 4.11.

<sup>31</sup> See Louisiana Department of Wildlife and Fisheries website (visited Aug. 25, 2003) <[www.wlf.state.la.us](http://www.wlf.state.la.us)>. Jon Dodrill, a representative from the Florida Wildlife Commission, echoes this confidence: “We consider the obsolete energy jacket units safe, and environmentally sound.” Correspondence between Jon Dodrill and George Steinbach, Executive Director of the California Artificial Reef Enhancement program, Feb. 24, 2003.

<sup>32</sup> The Gulf of Mexico and California coastal habitats are sufficiently different that the clear success in increased marine life in the Gulf was not enough to establish environmental benefits in California. See Linda Krop, Chief Counsel, Environmental Defense Center, “Letter to Senator Alpert and the Senate Appropriations Committee,” May 11, 2001.

evidently incomplete and mixed. As a result, some parties felt that a state law allowing for rig conversion was premature.<sup>33</sup>

In the last two years, additional research studying offshore platforms as artificial reefs has been completed. The detailed six-year study prepared by Milton Love, Donna Schroeder, and Mary Nishimoto (released June 2003) supports the hypothesis that “platforms act as de facto marine refuges.”<sup>34</sup> In particular, oil platforms appear to be “functionally more important as nurseries” than natural rock outcrops.<sup>35</sup> Some juvenile rockfish, several species of which are officially “over-fished” in California,<sup>36</sup> were found in higher densities at several of the platforms as compared to nearby natural reefs.<sup>37</sup> The Texas rigs-to-reefs program supports this finding: “By providing food and shelter, artificial reefs can enhance over-fished populations of resident reef fish... rigs make ideal artificial reefs because they are environmentally safe, are constructed of highly durable and stable materials that withstands displacement or breakup, and already support a thriving reef ecosystem.”<sup>38</sup> Thus, while research questions remain,<sup>39</sup> it appears that sufficient evidence now exists to move forward with a rigs-to-reefs program.<sup>40</sup>

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<sup>33</sup> See, e.g., Joni Gray, Board of Supervisors for Santa Barbara County, “Letter to Chairperson Kuehl and Committee Members,” Mar. 26, 2001.

<sup>34</sup> Love et al., *supra* note 2, at vii.

<sup>35</sup> *Id.*

<sup>36</sup> Of the approximately 60 species of rockfish, at present 16 have been fully assessed by government biologists and nine have been found to be over-fished. See Glen Martin, “West Coast Rockfish Stocks: U.S. Likely to Impose Bottom-Fishing Ban,” *San Francisco Chronicle*, June 3, 2002.

<sup>37</sup> The authors suggest three reasons for the finding: first, platforms physically occupy more of the “water column” than most natural outcrops; second, because there are fewer large fish in the midwater habitat where the platforms are located, predation is likely lower; and third, the offshore location and extreme height of the platforms “provide greater delivery rates of planktonic food for young fishes.” See, Love et al., *supra* note 2, at vii.

<sup>38</sup> See Texas Parks and Wildlife Department website (visited Aug. 25, 2003) <[www.tpwd.state.tx.us](http://www.tpwd.state.tx.us)>.

<sup>39</sup> Love and his colleagues list several, in fact. See, e.g., Love et al., *supra* note 2, at ix-x.

<sup>40</sup> Note also that full rig removal would require the use of explosives, killing any surrounding fish and potentially damaging the auditory systems of nearby marine mammals. Complete removal would kill all the invertebrate life attached to the platform legs as well. See Love et al., *supra* note 2, at ix. The MMS reported that on average 850 dead fish were observed floating at the surface after each reviewed platform removal in the Gulf of Mexico during 1986-1998. Not all of the killed fish float, however, so these counts underestimate the total impact (note they also represent samples, not complete censuses). The MMS also estimated annual mortality of red snapper, the species most acutely affected by the explosives, based on their above and below surface samples. The estimates ranged from 29,046 to 82,400 dead fish per year due to explosives used in platform removal. These

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The research on offshore platforms improving fish populations, apart from its environmental importance, is also relevant to certain commercial interests in California. Commercial fishing in the state has been on the decline since 1970. In that year, California's share of the U.S. harvest, based on the dollar value of commercial landings, was 14 percent; by 1990 the state's share had dropped to 4 percent; and by 2001 it had further declined to 3 percent.<sup>41</sup> The declining catch in California is especially clear for certain species, including several species of rockfish. As Figure 1 illustrates, both the pounds caught and the economic value of the total rockfish catch (in 2002 dollars) has declined steadily from 1982 to 2001.<sup>42</sup>

In 2002, federal fishery authorities instituted an offshore rockfish closure along the continental shelf off California's coast.<sup>43</sup> Intended to head off the "plummeting rockfish populations," the closure will push the rockfish catch to zero in the short term, but will improve the rockfish catch in the long term after populations are reestablished and restrictions lifted.

The Love report suggests that oil platforms could contribute to an increase in rockfish populations. As the authors note, "In some locations, platforms may provide much or all of the adult fishes of some heavily-fished species and thus contribute disproportionately to those species larval production."<sup>44</sup> And, as noted earlier, the Love report found that "Platforms usually harbored higher densities of young-of-the-year rockfishes than natural outcrops and thus may be functionally more important as nurseries."<sup>45</sup> Observations on oil structures acting

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counts do not cover marine mammals or invertebrates. See Gregg R. Gitschlag, Michael J. Schirripa & Joseph E. Powers, "Estimation of Fisheries Impacts Due to Underwater Explosives Used to Sever and Salvage Oil and Gas Platforms in the U.S. Gulf of Mexico, Final Report," OCS Study MMS 2000-087 (2001), at 23 and 13-14, respectively.

<sup>41</sup> Based on the pounds of commercial landings, the state's share had declined from 19 percent in 1970 to 7 percent in 1990 to 5.5 percent in 2001. Annual Commercial Landing Statistics, National Oceanic and Atmospheric Administration (visited Aug. 25, 2003)

<[http://www.st.nmfs.gov/st1/commercial/landings/annual\\_landings.html](http://www.st.nmfs.gov/st1/commercial/landings/annual_landings.html)>.

<sup>42</sup> *California Statistical Abstract* (various years). Similar declines are evident for tuna and crab catches, as well.

<sup>43</sup> NOAA Fisheries Notices, 67 Federal Register 44778 (July 5, 2002) and 68 Federal Register 23901 (May 6, 2003).

<sup>44</sup> Love et al., *supra* note 2, at vii.

<sup>45</sup> *Id.*

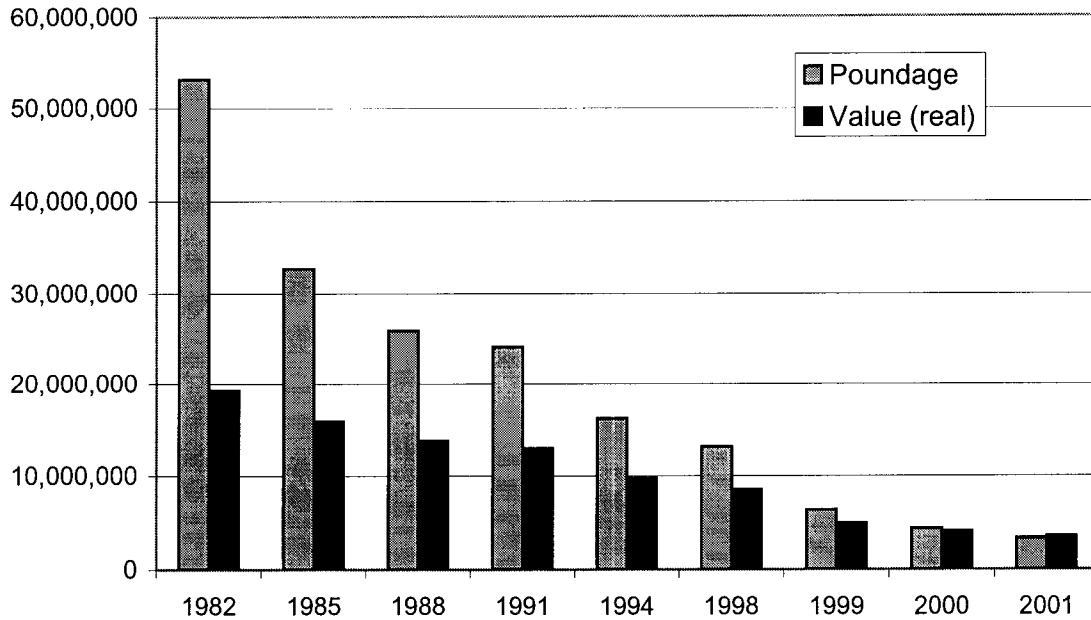
to replenish some species are also echoed in the support for a rigs-to-reefs program from certain commercial fisherman, such as lobster trawlers.<sup>46</sup> Combined with the severely over-fished and depleted state of these fish species, the platforms could be making economic contributions to the rockfish fishery that would be lost if the platforms were completely removed upon decommissioning.<sup>47</sup> The full impact of platform removal would be to slow the recovery versus what is estimated and therefore to lengthen the time during which fishing restrictions would be imposed.

It is worth highlighting that the offshore platform structures are already in place. Other forms of artificial reefs that could be used to enhance over-fished species population growth must be designed and installed, and thus funded. Existing platforms, however, are already in the ocean, providing marine habitats and contributing to fish stocks.

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<sup>46</sup> Chris Miller, Vice President of the California Lobster and Trawling Fisherman's Association and the Vice President of Commercial Fisherman of Santa Barbara, observed that Rincon Oil Island provides excellent lobster fishing grounds and that pipelines and rigs provide spawning and producing habitats for abalone. *See* testimony of Chris Miller, before the California State Lands Commission, Dec. 3, 1999 (visited Aug. 4, 2003) <[http://www.slc.ca.gov/Division\\_Pages/MRM/RigsToReefs.htm](http://www.slc.ca.gov/Division_Pages/MRM/RigsToReefs.htm)>.

<sup>47</sup> McGinnis et al. attempt to calculate the habitat value attributable to platforms. Their assumption of \$5 per species as the value of species diversity is unsubstantiated and appears to be simply a guess. As a result, their estimate of a habitat value of \$83,000 for nine platforms seems to be little more than speculation. *See* McGinnis et al., *supra* note 6, at 52.



Note: Value of landings were converted to constant 2002 U.S. dollars using the GDP implicit price deflator available from the U.S. Department of Commerce, Bureau of Economic Analysis (<http://www.bea.doc.gov>).

Source: *California Statistical Abstract* (various years).

**Figure 1. Poundage and Value of Landings of Rockfish in California**

A related economic benefit of platform reef conversions could come through certain tourism effects.<sup>48</sup> While the dollar value is likely to be small for California, recreational scuba divers favor rigs-to-reefs programs because they offer dense marine life and provide underwater photography opportunities.<sup>49</sup> Sport fishermen, another source of tourism dollars,<sup>50</sup> also tend to support artificial reef programs.<sup>51</sup>

<sup>48</sup> In total, ocean and coastal tourism contributed almost \$10 billion to the California's economy in 1992. See, "California's Ocean Resources: Tourism and Recreation (Chapter 5)," California Research Bureau (Mar. 1997), at 5G-1.

<sup>49</sup> In Florida, artificial reefs offshore Miami are estimated to contribute around \$20 million each year to the local economy. Statistics cited by testimony of Kristin Valette, Professional Association of Diving Instructors (PADI), before the California State Lands Commission, Dec. 3, 1999 (visited Aug. 4, 2003) <[http://www.slc.ca.gov/Division\\_Pages/MRM/RigsToReefs.htm](http://www.slc.ca.gov/Division_Pages/MRM/RigsToReefs.htm)>. Note that California's waters are not as hospitable for diving as southern Florida's so the economic impact is likely to be considerably lower. A study (continued...)

While the tourism effects may be important to some narrowly defined communities, the largest dollar benefit would come from the cost savings contributed by oil companies to the designated responsible agency. Winmar, a consulting company that managed the decommissioning of over 250 platforms in the Gulf of Mexico, prepared estimates of the decommissioning costs for California's oil and gas platforms located in federal waters.<sup>52</sup> Table 1 below reports their main findings.

**Table 1. Estimated One-Time Cost Savings From Partial Rig Removal\***

<b>Decommissioning Method</b>	<b>Low Cost</b>	<b>Median Cost</b>	<b>High Cost</b>
Complete Removal	\$875M	\$1,200M	\$1,600M
Rigs-to-Reef In-Place Partial Removal**	\$375M	\$540M	\$600M
Potential Savings	\$500M	\$660M	\$1,000M

Source: Winmar CA POCS Decommissioning Costs Final.

Notes: \* Assumes 23 rigs are decommissioned. \*\* Assumes the remaining rig would extend from the seafloor up to a depth of 85 to 100 feet below the waterline.

(...continued)

conducted by MMS in 2001 estimates that converted oil platforms near Channel Islands Harbor could provide \$10,000 a year in scuba diving value, based on a travel cost estimate (that is, based on willingness to pay). See McGinnis et al., *supra* note 6, at 51.

<sup>50</sup> The United Anglers of Southern California estimate that recreational fishermen contribute tens of millions of dollars (or more) to the state economy each year. See Robert Southwick, "The Economic Effects of Sportfishing Closures in Marine Protected Areas, The Channel Islands Example," Prepared for the American Sportfishing Association, United Anglers of Southern California (Mar. 2002).

<sup>51</sup> See, e.g., testimony of Tom Raftican, United Anglers of Southern California, before the California State Lands Commission, Dec. 3, 1999 (visited Aug. 3, 2003) <[http://www.slc.ca.gov/Division\\_Pages/MRM/RigsToReefs.htm](http://www.slc.ca.gov/Division_Pages/MRM/RigsToReefs.htm)>. See also, Love et al., *supra* note 2, at 4.7. Bear in mind that if the rigs were designated as "no take" zones, fishermen would incur the cost of avoiding these areas in the short term. However, in the long term as over-fished species' populations' rebound and fishing restrictions are lifted, fishermen would benefit from improved fisheries.

<sup>52</sup> Winmar Consulting Services, Inc., "Removal Cost Estimate, Pacific OCS Platforms," (May 2003).

A striking feature of the table is that estimated savings could range from one half to one billion dollars. These estimates exceed the savings experienced to-date in the Gulf by several orders of magnitude. Driving the difference in cost savings generated is the fact that oil and gas platforms off California's shore are vastly different from those that have been removed so far in the Gulf of Mexico. While the total number of platforms in the Pacific is much smaller than in the Gulf (just under 30 as compared to around 4,000), the California rigs are, on average, in much deeper water. Although there are deep-water platforms in the Gulf, the vast majority of them (and almost all of those removed to-date) are in shallow water, typically 100 feet of water or less. In contrast, most of the Pacific rigs are in deep water, reaching depths of over 12,000 feet. As a result, complete removal of the California platforms will be more complicated to design and implement than typical Gulf platform removals, more risky for the workers conducting the removal,<sup>53</sup> and will require the development of new technology.<sup>54</sup> The complicated nature of California platform decommissioning implies that the average cost savings from partial removal and conversion to an artificial reef are likely to be higher than in the Gulf. Moreover, Winmar notes that, due to the complexity of decommissioning many of the Pacific rigs, the average cost savings are more likely to exceed the median reported in Table 1 than fall short of it.

In an earlier report, Winmar decomposed the cost savings estimates by rig type. They split the 23 California offshore platforms into five groups, based on platform depth. Table 2 presents the cost savings by depth group for four of the five groups.

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<sup>53</sup> For example, while partial rig removal would necessitate professional divers to work at depths of 85 to 100 feet, full rig removal would require special equipment, such as specially designed submersible craft capable of descending over 10,000 feet. Full rig removal would also involve underwater explosives (to sever the platform at its base), whereas explosives would be unnecessary with partial rig removal.

<sup>54</sup> Authors' interview with George Steinbach, Executive Director of the California Artificial Reef Enhancement program, July 2, 2003.



**Table 2. Estimated One-Time Cost Savings From Partial Rig Removal By Platform Depth**

<b>Depth</b>	<b>Number of Platforms</b>	<b>Median Cost Savings Per Platform</b>	<b>Partial Rig Removal Total Cost Savings</b>
100 to 225 Feet	10	\$6.4M	\$64.0M
225 to 450 Feet	6	\$14.0M	\$84.0M
450 to 850 Feet	5	\$54.0M	\$270.0M
850 to 1,200 Feet	2	\$120.0M	\$240.0M
<b>Total</b>	<b>23</b>		<b>\$658.0M</b>

Source: Winmar Summary Report Update R2, 3/7/2000.

Notes: Assumes 6 rigs in less than 100 feet of water generate no savings (the fifth group). Assumes that all rigs would be partially removed, with the remaining rig extending from the seafloor up to a depth of 85 to 100 feet below the waterline. Savings are calculated as compared to full removal.

Table 2 highlights the strong positive correlation between a platform’s depth and the cost savings generated as a result of conversion to an artificial reef. The median savings generated from partially removing one of the deepest rigs (as compared to full removal) exceed those of shallower rigs by at least a factor of two.

The Winmar estimates strongly suggest substantial economic benefits from establishing a rigs-to-reefs program in California. Converting just one rig in shallow water (100 to 225 feet) would contribute approximately \$3.2 million to a rigs-to-reefs fund for reef maintenance, marine research, and conservation projects.<sup>55</sup> Another \$3.2 million would accrue to the shareholders of the rig’s lease owner, the company decommissioning the rig. If the rig were in 850 feet of water or more, converting just one rig would result in \$60 million in donations and \$60 million in shareholder gains. The remaining question is whether these benefits outweigh the costs identified earlier.

<sup>55</sup> The median cost savings of \$6.4 million multiplied by the company contribution of 50 percent.

Simple calculations demonstrate that creating an offshore platform conversion program for California would be economically beneficial to the state's residents. To summarize the quantifiable costs, it would cost around \$250,000 in one-time expenses to establish a rigs-to-reefs program and would cost around \$250,000 annually to cover maintenance plus another \$25,000 per rig for liability insurance.<sup>56</sup> Using a conservative starting point, assume for the moment that three of the 10 rigs in 100 to 225 feet of water that are due for decommissioning request and receive artificial reef status. Then the designated agency would receive \$9.6 million in donations. After covering program set-up costs, \$9.35 million would be available. Funding the first year's operational costs would leave just over \$9 million for investment. At an interest rate of 4.48 percent, the interest earnings for the first year would be in excess of \$400,000.<sup>57</sup> Thus the California program could spend interest earnings only, easily covering the annual operating expenses while still being able to devote over \$75,000 a year to marine research. With as few as three of the shallowest platforms participating, the program would be able to fully fund its own operations and liability expenses and would contribute to environmental research funding. Added to these benefits, the oil and gas company's stockholders would benefit from \$9.6 million in cost savings.

As Table 2 illustrates, however, cost savings from deeper rigs are substantial. Oil and gas companies would have much to gain from donating additional platforms, implying that rigs-to-reefs participation rates in California would likely be quite high. Based solely on potential cost savings, it seems reasonable to assume that 100 percent of the deepest rigs, those in 450 feet of water or more, would be donated. Participation rates for platforms in less than 450 feet of water could be lower, but are still likely to be significant. Even if none of these relatively shallower rigs participated, however, the program would receive \$255 million in donations from the 7 deep rigs, benefiting the state, its residents, and its researchers. After accounting for set-up costs and the first year's operating costs, the remaining \$254 million

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<sup>56</sup> We ignore volume discounts for the insurance premiums and use the estimate of \$25,000 per rig.

<sup>57</sup> The current rate for 10-year Treasury bills is 4.48 percent. Federal Reserve Statistical Release, Aug. 25, 2003 (visited Aug. 25, 2003) <<http://www.federalreserve.gov/releases/h15/current/h15.pdf>>. We assume interest is compounded daily.

would yield over \$11 million a year for annual operations, marine research, and conservation projects. Company shareholders would benefit from an additional \$255 million in cost savings.

Company participation rates will, of course, be sensitive to the designated donation rate. The economic motivation for oil and gas companies to participate in a rigs-to-reefs program is the expected cost savings from partial rig removal as opposed to full rig removal. If donation rates are set too high, companies will have little incentive to participate, as they will see little in the way of savings. A delicate balance must be maintained between ensuring that rigs will be available for conversion and ensuring funding for the program, research, and conservation projects.<sup>58</sup>

#### **IV. CONCLUSIONS AND RECOMMENDATIONS**

Our principal finding is that a well-designed rigs-to-reefs program for California would likely result in direct and indirect benefits far in excess of costs. There would be benefits for residents of the state, tourists, researchers, the marine environment, and equity owners.

The potential costs of a program appear to be manageable. Even conservative estimates of program donations indicate that a rigs-to-reefs program in California would be self-sufficient. More realistic estimates indicate that substantial funds could be available for marine research and conservation programs.

There is a growing body of evidence that suggests that offshore platforms converted to reefs do result in environmental benefits. Rigs converted to reefs help provide nursery grounds for juvenile fish and appear to assist in replenishing the population of over-fished species such as some rockfish. Increased fish stocks, in turn, benefit commercial and sport fishermen, as well as scuba divers. As artificial reef managers in the Gulf of Mexico have noted, offshore platforms create stable reefs with slow corrosion rates.

Based on our analysis, we recommend that a state and/or federal program be established that would enable citizens in California and elsewhere to reap the benefits of a rigs-to-reefs

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<sup>58</sup> This point is underscored by the experience in the Gulf of Mexico. While the donation rates are not aggressive, set at 50 percent, shallower rigs generate lower cost savings from partial removal and thus participate less frequently.

program. This program could be modeled along the lines of successful programs in the Gulf of Mexico. The gains from a well-designed program in California could be expected to be even greater than those achieved in the Gulf of Mexico thus far, largely because of differences in the economics of offshore platform removal in the two areas.