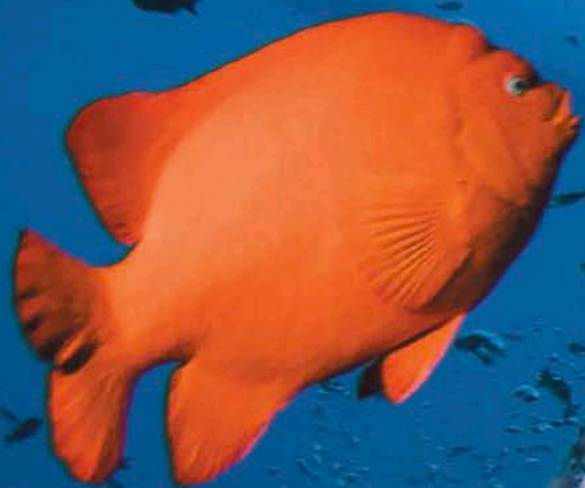


# The Afterlives of Oil Rigs



The steel "jackets" that support California's offshore oil platforms are covered in millions of organisms and provide habitat for thousands of fishes.





#### SUSTAINABILITY

**Off the California coast, decommissioned oil platforms are some of the most productive marine fish habitats in the world. Should they be removed or allowed to stay?**  
**BY ASHER RADZINER**

**Asher Radziner** is a freelance writer from Venice, Calif. He recently graduated from Brown University with a degree in environmental science.

**E**VEN BEFORE I COULD MAKE OUT THE SILHOUETTE of Platform Holly on the foggy horizon, I could see and smell oil. Ripples of iridescent liquid floated on the sea's surface, reflecting the cloudy sky. But the oil wasn't coming from a leak or some other failure of the rig. Milton Love, a biologist at the Marine Science Institute at the University of California, Santa Barbara, explained that it was "kind of bubbling up out of the seafloor." Our boat, less than two miles from the central California coast, was sailing above a natural oil seep where the offshore energy boom first began.

For thousands of years the Chumash, an Indigenous group native to the region, identified these oceanic seeps and their naturally occurring soft tar, known as *malak*, which washed up on the shore. Sixteenth-century European explorers noted oil off the coast of modern-day Santa Barbara, and in the 1870s the U.S. oil boom reached California. In the late 1890s the first offshore oil wells in the world were drilled from piers off of Summerland Beach; 60 years later the state's first offshore oil platform was deployed to drill the Summerland Offshore Field.

Since then, 34 other oil platforms have been installed along the coast, and more than 12,000 have been installed around the world. These hulking pieces of infrastructure, however, have finite lifetimes. Eventually their oil-producing capacities tail off to the point where it is no longer economically viable to operate them—that, or there's a spill. Today 13 of California's 27 remaining offshore platforms are what's known as shut-in, or no longer producing oil.

Platform Holly is among the dead platforms awaiting their afterlives. At the time of its installation in 1966, everyone knew a platform situated directly over a natural oil and gas seep was going to be a success. And for nearly five decades it was. Then, in 2015, a corroded pipeline near Refugio State Beach owned by Plains All American Pipeline cracked, spilling 142,800 gallons of crude oil into the Santa Barbara Channel. The spill killed sea lions, pelicans and perch, among other creatures; closed fisheries and beaches; and

permanently severed Platform Holly from its market.

Venoco, the oil company that owned Holly at the time, was not responsible, but it was bankrupted by the event. Because Holly is positioned within three miles of the coast, it was transferred into the hands of the California State Lands Commission (SLC) in 2017. The SLC is now responsible for managing the process of decommissioning the platform and determining its fate.

According to platform-decommissioning consultant John Bridges Smith, a former leasing specialist with the Bureau of Ocean Energy Management who counts ExxonMobil, ConocoPhillips and Chevron among his clients, Holly and the eight other platforms whose leases are terminated or expired will be decommissioned by the end of the decade. Based on the original contracts between the oil companies and the state and federal governments, which date to the 1960s, this means the structures will have to be fully removed. In December 2023 the Bureau of Safety and Environmental Enforcement recommended that all 23 California platforms standing in federal waters be fully removed.

Doing so will incur a great expense. That's true everywhere but especially in California, where some of the platforms are in very deep water. According to one conservative estimate, completely removing all of California's platforms would cost the responsible oil companies \$1.5 billion. Smith says these companies would prefer to delay that process for as long as possible. Some environmental groups in California, meanwhile, are pushing to hold them to the speediest timeline.

Joe Platko (preceding pages); Milton Love (opposite page)





Offshore oil infrastructure in California acts as a nursery for certain fish species.

Platform Holly, located off the coast of Santa Barbara, Calif.

Love, who has spent the past three decades studying the aquatic life that now calls southern California's oil platforms home, would prefer a third alternative.

In the decades since they were installed, the steel support structures of California's oil platforms have become vibrant ecosystems isolated from fishing pressures—*de facto* marine sanctuaries. Rather than being removed, aging fossil-fuel infrastructure and its serendipitously associated habitats can be salvaged in the ocean as state-managed artificial reefs. The entire topside—the above-water portion of steel, offices and cranes—and shallow section of a rig are removed, but part of the submerged base may remain. A pathway for doing so already exists in the U.S. and has been successfully followed 573 times in the Gulf of Mexico. Similar examples can be found around the world, from Gabon to Australia. Because Holly is already owned by the state, not an oil company, its transition could illuminate how to evaluate the fate of rigs worldwide based on science, not politics.

**W**HEN AN OIL PLATFORM is decommissioned, the process goes like this: First, in a phase known as plugging and abandoning, its oil wells are filled with concrete and sealed. Next, scientists conduct an environmental review and consider the

various merits and risks of different removal strategies. The results determine a platform's final resting place, which in most cases has been in a scrap metal yard. A platform's support structure is called its jacket—hundreds of vertical feet of woven steel that is affixed to the bottom of the ocean. Most of the time engineers will use explosives to sever a platform jacket from the seafloor. The steel is then hauled to shore for disposal and recycling. Decommissioning is considered complete when a platform has been removed down to 15 feet below the mud line and the seafloor has been returned to preplatform conditions.

Most of the offshore oil platforms that have ever been built were installed in the Gulf of Mexico—more than 7,000 since 1947. More than 5,000 of those have since been removed. In the 1980s oil companies and recreational fishing associations pushed for an alternative outcome that would both be cheaper and help to bolster struggling fish populations. In 1984 the U.S. Congress passed the National Fisheries Enhancement Act, providing for the creation of the National Artificial Reef Plan, which allowed oil platform operators to donate decommissioned rigs to states as “artificial reefs.”

In the following years Texas, Louisiana, Mississippi, Florida and Alabama each passed the necessary legislation and established their own State Artificial Reef Pro-

Bob Evans



grams. These were, and still are, funded by oil and gas contributions and the interest earned on those payments. The program hasn't replaced full removals; between 1987 and 2017 only 11 percent of all decommissioned oil platforms off Louisiana were partially removed. But in deeper waters, the story is different: of the 15 structures decommissioned in depths greater than 400 feet, 14 have been partially removed, or "reefed."

When a platform is partially removed, its topside is taken to shore. To avoid creating a navigational hazard, the first 80 to 85 feet of its jacket closest to the surface are either brought ashore or laid along the sea bottom. Finally, the remaining jacket—whether it is 15 feet of steel or hundreds—is either left in place or severed from the seafloor and towed to an approved reefing site. Liability for the reefed structure gets transferred from the oil company to the state, and the oil company donates 50 percent of its cost savings (from doing a partial removal versus a full removal) to the state. This process, colloquially referred to as rigs-to-reefs, has successfully bolstered fish populations in the Gulf.

Ann Scarborough Bull, a U.C.S.B. biologist who studies the ecology of offshore oil platforms and renewable energy installations, worked in the Gulf of Mexico on offshore oil and gas regulation for 14 years. She arrived in 1975, when her husband took a job in the highly profitable offshore oil industry. When it came to oil platform ecology, "the Gulf of Mexico hadn't been studied," Bull says. She took a job as a chief scientist for the U.S. Minerals Management Service, which has since been reorganized into the Bureau of Ocean Energy Management, and received funding to research the communities of fish and invertebrates dwelling underneath the platforms. On her frequent trips offshore, it became clear to her that the rig jackets provided habitat that was vital to the region's economy.

Lutjanus campechanus, commonly known as the northern red snapper, is one of the most frequently caught species in the Gulf's recreational fishing industry. A long-lived apex predator, it is mostly sedentary in its adult phase and restricted to reef habitats. Until the mid-20th century, the primary fishing grounds for red snapper were off the western coast of Florida and in the waters south of the Florida Panhandle.

Just as populations in the fish's historical range were being depleted by overfishing and trawling, red snapper began to shift and expand west across the entirety of the Gulf. Thousands of oil platforms were being installed across the northwestern and north-central Gulf. Decades of research have shown that with natural reefs few and far between, red snapper were using the oil platforms as a kind of outpost, which allowed their population size to expand significantly.

As drilling operations multiplied, commercial and recreational reef-fishing industries grew in tandem. Surveys from the early 1980s indicated that one quarter of fishing trips were associated with oil and gas structures. "This whole society in the Gulf of Mexico grew

up with two ways to make a living: one, be a fisherman, and the other, be connected with oil and gas," Bull says.

In 2001 Bull moved back to her native California, and she arrived at U.C.S.B. in 2016. Her experience studying the state's platforms and coming to understand the surrounding politics has shown her that the differences in platform strategy between California and Louisiana are multifold. "There are factions, especially in Santa Barbara, that absolutely despise oil and gas companies," Bull says. This animosity, she explains, makes the rigs-to-reefs process a harder sell.

It's not unwarranted. On January 28, 1969, a blowout at Union Oil's Platform A in the Santa Barbara Channel spilled 100,000 barrels of crude oil into the Pacific Ocean. Black tar covered beaches for dozens of miles and killed thousands of birds and marine mammals. At the time, it was the largest oil spill in U.S. history.

The spill prompted the first Earth Day and the creation of the U.S. Environmental Protection Agency. It also spawned numerous environmental nonprofits in the Santa Barbara region, including Get Oil Out! and the Environmental Defense Center. Development of new oil fields off the coast of California halted and didn't resume until 1982.

Then California's first decommissionings began. In 1988 Texaco successfully removed Platforms Helen and Herman. In 1996 Chevron removed Platforms Hope, Heidi, Hilda and Hazel from the Santa Barbara coast—but not completely. The cuttings piles—gigantic mounds of rock debris, mud, and other hydrocarbon detritus discharged by the drilling process—underneath all four platforms were allowed to remain.

Linda Krop, now chief counsel for the Environmental Defense Center, was then a law clerk with the organization. The group wasn't too happy that Chevron had seemingly gotten around the obligations of its original contracts, which required full removal of its platforms and restoration of the local environment to its natural condition.

In the nearly three decades since, Krop has worked as an attorney holding oil companies accountable for their environmentally destructive actions. She had her greatest court victory in 2016, achieving the termination of 40 federal oil leases offshore. Krop is firmly against the prospect of reefing off California. "The fish are going to be fine if the platforms go away," she says. "They're not going to disappear."

IN JULY 2023 I VISITED Holly with Milton Love on an especially foggy morning. After a 30-minute boat trip from the Santa Barbara Harbor, its skeletal outline began to emerge from the mist. From a distance Holly resembled a skull with barred teeth and low, hollow eyes, but up close it was an eight-story scaffolding of steel beams, pylons and old shipping containers.

Holly hasn't produced oil for a decade, but the whirring and beeping of generators and cranes was still too loud to speak over. People in construction vests milled about the upper decks, ostensibly monitoring the

wells' recent plugging procedure and shoring up the platform. Brown sea lions were flinging themselves from the ocean onto the platform's lower decks, howling and jostling for space. Love told me that what we were seeing was only a small piece of the action. The real story, he said, was hidden below the waterline, where the mechanical noise dims and is replaced by the crackle of shrimp and fish nibbling at the reef.

The platform jackets are covered in millions of organisms and provide habitat for thousands of fish. Some of California's 27 platforms are relatively small; Holly stands in only 211 feet of water. Others, such as the Exxon-built Harmony, stand in depths up to 1,198 feet. Imagine the Empire State Building extending up from the ocean floor, blossoming with mussels and scallops and sea anemones, providing food to legions of fish. According to a 2014 paper co-authored by Love, these platforms are among the most productive marine fish habitats in the world and, per cubic meter of seafloor, are more productive than any natural reef.

In 2019 the Gulf recreational fishing community took more than 50 million trips and caught 332.5 million fish. But recreational fishing off the coast of California is nowhere near as big. And because of the more than 120,000 acres of natural rock reef along the state's coast and Channel Islands, the amount of habitat area generated by the rigs does not significantly alter the total regional habitat area or increase the carrying capacity of the fish population. In contrast, the Gulf platforms contribute 30 percent of their region's total "reef" habitat area.

Love argues that California's platform ecosystems are vital for different reasons. After finishing his Ph.D. and landing at U.C.S.B. as a research biologist, Love received funding from the National Biological Survey; he wrote a book called *The Rockfishes of the Northeast Pacific* and set out to study how oil platforms functioned as fish habitats. "Most of the money has always been from the federal government," Love says. But a "small percentage" came from Chevron and ExxonMobil.

Love's early work laid the foundations for others to research the structures as well. In a 2014 study, quantitative marine ecologist Jeremy T. Claisse, now at California State Polytechnic University, Pomona, and his colleagues revealed that along the coast of southern California, jacket habitats don't just support millions of tunicates, barnacles, rock scallops and shrimp; they can be sites of fish production. That means many fishes living on and around the legs grow up there and may either spend the entirety of their lives at one platform or travel elsewhere, bolstering fish populations nearby.

Bocaccio and cowcod rockfish of southern California's natural reefs are economically important and at one point were considered overfished. In 2006 Love found that California's offshore oil platforms contribute 20 percent of the young bocaccio rockfish that survive each year across the species' entire geographic range, which stretches from Alaska to Baja California. The platforms operate essentially as nurseries, he says, incubating the next generation.

Mussels dominate the platform jacket in the first 40 feet of water, forming three-inch crusts around the submerged legs and beams. Barnacles and bivalves extend even deeper. When these creatures die or are dislodged by a storm, they sink to the feet of the gargantuan structures and form shell mounds up to 220 feet in diameter and rising upward of 20 feet from the seafloor. Both among the decaying shell mounds and throughout the crisscrossing beams of the platforms' midwater sections, juvenile rockfish of the region proliferate.

Trapped within these shell mounds, however, are the piles of toxic drill cuttings. Until the late 1970s, regulation to properly dispose of cuttings was fairly loose, and operators would often deposit the debris on the seafloor. In a 2001 study, surface sediments from the shell mound of Platform Hazel, installed in 1958, were found to be lethal to 50 percent of tested shrimp within 96 hours of exposure. Recently installed platforms don't appear to have the same problem, perhaps because most cuttings must be hauled to shore. In one study, cuttings piles below platforms installed before stricter regulation were found to contain 100 times more volatile organic compounds than a newer platform, Gina, installed in 1980.

Love and his colleagues wanted to know if the contamination from cuttings extended to the water column around the shell mound. In 2013 they published a paper that found California's platforms—regardless of age—were not contaminating their associated fish populations. "We looked at fishes that live around platforms—not just Holly but throughout southern California—and compared the heavy metal concentrations with fishes of the same species on nearby natural reefs," he says. "There was no statistical difference between what we saw."

Still, people like Krop at the Environmental Defense Center are not convinced any oil infrastructure should be allowed to stay in the ocean. "If we need to build some [more] artificial reefs, then let's do it the right way," she says. California has been building its own artificial reefs since 1958, when the state's Department of Fish and Wildlife placed 20 automobile bodies in the waters of Paradise Cove off Malibu. Such artificial reefs tend to be spread over many acres in relatively shallow waters. Platform jacket reefs, in contrast, are not even technically artificial reefs and exist as habitats of extreme vertical complexity and dimension. They are smaller in area yet more productive on average.

In 2003 Mark Carr of the University of California, Santa Cruz, wrote that there are few natural rock reefs at the depths of the California oil platforms and none with comparable physical characteristics. If the goal is to contribute to overall reef area, their value is "minuscule." If, however, the intent is to preserve their unique habitats, their value is "100 percent."

Love has a more irreverent perspective on their value. "As a biologist, I just give people facts," he says. "But I have my own view as a citizen, which is: I just think it's criminal to kill huge numbers of animals because they settled on a piece of steel instead of a rock."





**M**ANY COUNTRIES AROUND THE WORLD are coming up on the decommissioning of their platforms for the first time. According to Amber Sparks of Blue Latitudes, a company that consults for governments worldwide regarding the environmental effects of their platform-decommissioning practices, there is no international standard for how an oil platform should be reefed.

Globally, the process is often ad hoc. Off the coast of Gabon, for instance, high-biodiversity habitats underneath more than 40 active oil platforms are included in a system of marine national parks. In Malaysia, an oil platform has been converted into a resort for scuba divers. With the assistance of Chevron, Thailand established an artificial reef program and reefed seven platforms near Koh Pha-Ngan in 2020. In waters off the U.K., five platforms have been approved for partial removal, but no full platform jacket has been reefed, and no rigs-to-reef program exists. A 2017 study evaluated the possibility of transforming one U.K. rig into a hub for harvesting wave energy.

According to Francis Norman, managing director of the nonprofit Center of Decommissioning Australia, there is large demand from recreational fishing communities for artificial reefs—at least off the coast of Western Australia, where more than 40 platforms are

stationed in shallow waters. But in the eastern state of Victoria, 23 Exxon platforms in the Bass Strait are in depths up to 525 feet—these structures are too far from land to be seen over the horizon and are not fished because of rough water conditions.

Norman says Australia does not have an official rigs-to-reef program, but in 2023 Exxon applied for permits to partially remove 13 of its platforms. The company, he says, withdrew its application this summer after a wave of media reports featured criticism of partial removal.

As of August 2024, all of Holly's 30 wells were fully plugged and abandoned. Jennifer Lucchesi, executive director of the California State Lands Commission, says the facility is being "hardened" so it won't need 24-hour staffing as it moves into "caretaker" status. Now studies of Holly's subsurface biology are looking at the platform's effects on its local marine environment to inform the creation of an environmental impact report, which will review the likely net outcomes of full removal versus partial removal versus no action. The "biological study" component is being prepared by Love, Bull and their colleagues at U.C.S.B.

Oil companies are interested in platform reefing because of money, not fish. Partial removal is far cheaper than full removal. Reefing the California platforms instead of eradicating them would net the companies a

Sea anemones live on the shell mounds that form under the platform legs.

savings of \$150 million and generate \$600 million for the state. (Actual costs and savings for removal are likely to exceed these projections by at least a factor of four.) Still, not a single California platform operator has applied to begin the rigs-to-reef process. Smith believes the hesitancy results from differences in policy. Legislation in the Gulf States asks for 50 percent of an oil company's cost savings to be paid to a state in most cases; in California, it's 80 percent. And whereas in the Gulf liability transfers to the state, in California it essentially stays with the responsible oil company. Previous attempts, in 2015 and 2017, to amend the legislation in California failed. Krop says groups like hers "would not support making the state liable," and Smith says that would make reefing "unworkable" for the oil companies. When approached for a comment, Chevron wrote: "We are still finalizing our decision on this issue."

Smith believes the most likely outcome for California's aging offshore infrastructure will be not full removal or partial removal but indefinite delays. Operators are supposed to submit decommissioning plans two years before a lease ends, but operators for six offshore platforms whose leases ended in 2015 still have not followed through.

Oil platforms were designed to be productive for 20 to 30 years, but some are still producing oil after 45 years. No one knows how long they might stand. In one scenario, maintenance may not be properly kept up. This isn't hard to imagine: Platform Holly fell into a state of disrepair following its operator's bankruptcy, and ExxonMobil, a prior operator, paid millions to refurbish the platform so it could support the equipment required to plug and abandon its dormant wells.

In a soon-to-be-published paper on the topic of delay, Smith discusses a worst-case scenario in which poor maintenance and corroded steel cause a platform to collapse during an earthquake or storm. A pile of steel legs, crossbeams and submerged topside offices would rest like a shipwreck on the seafloor. Most of the midwater organisms would be gone, as would those associated with the lengthy vertical water column. But Love says organisms associated with complex bottom habitats would perhaps flourish. Rockfish and lingcod would swim around the jagged, anemone-covered pieces of broken platform legs and rusted steel, past scurrying crabs, exploring their reconfigured home.

In another world, you could see oil companies keeping up with maintenance indefinitely. To prevent the steel legs from rusting and collapsing, they could continue applying zinc anodes to the steel bars, allowing the zinc to rust instead of the legs. "The marine habitat will change with climate change, of course, as everywhere will," Love says. But the sea lions would stick around on the lower decks, as would the blacksmith damselfish in the shallow waters. The platforms' topsides, steadfast off the Santa Barbara coast, would be a reminder of an oil-ridden past. ●

**FROM OUR ARCHIVES**  
**Advanced Offshore Oil Platforms.** Fred S. Eilers; April 1982. [ScientificAmerican.com/archive](https://www.scientificamerican.com/archive)







When a decommissioned platform is removed, so, too, goes habitat area for sea lions and certain fish species.