Scientists uncover startling concentrations of pure DDT along seafloor off LA coast

March 24 2023, by Rosanna Xia

Credit: Pixabay/CC0 Public Domain

First it was the eerie images of barrels leaking on the seafloor not far from Catalina Island. Then the shocking realization that the nation's largest manufacturer of DDT had once used the ocean as a huge

dumping ground—and that as many as half a million barrels of its acid waste had been poured straight into the water.

Now, scientists have discovered that much of the DDT—which had been dumped largely in the 1940s and '50s—never broke down. The chemical remains in its most potent form in startlingly high concentrations, spread across a wide swath of seafloor larger than the city of San Francisco.

"We still see original DDT on the seafloor from 50, 60, 70 years ago, which tells us that it's not breaking down the way that (we) once thought it should," said UC Santa Barbara scientist David Valentine, who shared these preliminary findings Thursday during a research update with more than 90 people working on the issue. "And what we're seeing now is that there is DDT that has ended up all over the place, not just within this tight little circle on a map that we referred to as Dumpsite Two."

These revelations confirm some of the science community's deepest concerns—and further complicate efforts to understand DDT's toxic and insidious legacy in California. Public calls for action have intensified since the Los Angeles Times reported in 2020 that dichlorodiphenyltrichloroethane, banned in 1972, is still haunting the marine environment today. Significant amounts of DDT-related compounds continue to accumulate in California condors and local dolphin populations, and a recent study linked the presence of this once-popular pesticide to an aggressive cancer in sea lions.

With a $5.6-million research boost from Congress, at the urging of Sen. Dianne Feinstein, D-Calif., numerous federal, state and local agencies have since joined with scientists and environmental nonprofits to figure out the extent of the contamination lurking 3,000 feet underwater. (Another $5.2 million, overseen by California Sea Grant, will be distributed this summer to kick off another 18 months of research.)

The findings so far have been one stunning development after another. A preliminary sonar-mapping effort led by the Scripps Institution of Oceanography identified at least 70,000 debris-like objects on the seafloor.

The U.S. Environmental Protection Agency, after combing through thousands of pages of old records, discovered that other toxic chemicals—as well as millions of tons of oil drilling waste—had also been dumped decades ago by other companies in more than a dozen areas off the Southern California coast.

"When the DDT was disposed, it is highly likely that other materials—either from the tanks on the barges, or barrels being pushed over the side of the barges—would have been disposed at the same time," said John Lyons, acting deputy director of the EPA's Region 9 Superfund Division. He noted that the new science being shared this week is critical to answering one of the agency's most burning questions: "Is the contamination moving? And is it moving in a way that threatens the marine environment or human health?"

In recent months, Valentine, whose research team had first brought this decades-old issue back into the public consciousness, has been mapping and collecting samples of the seafloor between the Los Angeles coast and Catalina.

Analysis of the sediment so far shows that the most concentrated layer of DDT is only about 6 centimeters deep—raising questions about just how easily these still-potent chemicals could be remobilized.

"Trawls, cable lays could reintroduce this stuff back up to the surface," Valentine said. "And animals feeding—if a whale goes down and burrows on the seafloor, that could kick stuff up."

On a chilly winter morning in between two storms, Valentine and a team of students boarded the RV/Yellowfin and set out to collect more seafloor samples along key points of a hot-spot map that they've been piecing together.

As his students sliced and cataloged each layer of mud, they gasped in wonder at the tiny worms, snails and sea stars that lived so deep under the sea. They squinted at each tube that came out of the water and laughed apprehensively when asked about all the chemicals they were possibly holding in their hands.

"The goal is to collect as much mud as possible so that we don't have to come back out every time we have a question," Valentine explained as the ship's mechanical pulley churned for the eighth time that day. "We are starting to build a really exceptional data set … that will help us understand the time history of how things were transported, how they were transformed, and what their ultimate fate is."

Other scientists have also been chipping away at the many pieces to this deep-ocean puzzle.

Thursday's research updates included plans for the next Scripps mapping expedition, which will scan the seafloor with advanced sonar technology and also take hundreds of thousands of photos. Microbiologists shared their latest studies into whether deep-sea microbes could possibly help biodegrade some of the contamination, and chemical oceanographers discussed the many ways they've been trying to identify "fingerprints" that could help determine where the DDT is coming from—and how and if it's moving.

Biological oceanographers, marine ecologists and fisheries scientists also started to connect some dots on the various organisms they've found living in the contaminated sediment, as well as the midwater species that

could potentially move the chemicals from deeper waters up closer to the surface.

All of them noted that there were uncomfortably high concentrations of DDT and DDT-related compounds in the samples they studied. Even the "control" samples they tried to collect—as a way to compare what a normal sediment or fish sample farther away from the dumping area might look like—ended up riddled with DDT.

"This suggests to us, very preliminarily, that there's some connection potentially—there's connectivity in these deep food webs across the basins and across the system," said Lihini Aluwihare, a marine chemist at Scripps.

On top of all this research, the EPA has been developing its own sampling plan, in collaboration with a number of state and federal agencies, to get a grasp of the many other chemicals that had also been dumped into the ocean. The hope, officials said, is that the groundbreaking science now underway on the deep-ocean DDT dumping will ultimately inform how future investigations of other offshore dump sites—whether along the Southern California coast or elsewhere in the country—could be conducted.

Mark Gold, an environmental scientist at the Natural Resources Defense Council who has worked on the DDT problem since the 1990s, said that as he listened to the latest research discoveries, he couldn't help but think that "our nation's ocean dumpsites all have horrible contamination problems. And yet they are unmonitored."

There are also more shallow areas off the Palos Verdes coast and at the mouth of the Dominguez Channel that have been known DDT hot spots for decades. Figuring out how to clean up those contaminated areas in an underwater environment has been its own complicated saga.

For Katherine Pease at Heal the Bay, an environmental group that has been making sure the public remains engaged on this issue in substantive ways, these latest revelations have been eye-opening.

This is, after all, what it truly means to live with a forever chemical. After all these decades, scientists are still uncovering new and unsettling surprises about the full extent of the contamination.

"We're still grappling with this legacy of treating the ocean as a dumping ground," said Pease, Heal the Bay's science and policy director.

"And the public—whether they're folks that like to fish ... or people who like to swim and visit the ocean—we all need to understand the history that went on, as well as the impacts. And partly that's to learn ... to make sure that we're able to protect our public health, but also to think about how we are treating the ocean now, as well as into the future."