Mind Open Media Presents the Loop

Episode 1: Overview of C-IMAGE

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Levin: You're listening to The Loop, an audio series from the University of South Florida's College of Marine Science. I'm Ari Daniel Shapiro.

Murawski: The breadth of the oil spill is enormous. It impacted organisms and ecosystems from the deep sea to the marshes, from marine mammals to plankton…

Levin: That's Steve Murawski. a biological oceanographer at the University of South Florida. He's referring to the Deepwater Horizon spill, one of the worst oil spills in U.S. history.

Murawski is leading a new team of researchers trying to figure out the long-term impact of the spill—not just on the surface, but in the deep ocean.

Producer David Levin has the story.

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Levin: On April 20, 2010, something went horribly wrong onboard the Deepwater Horizon, a drilling rig operated by BP about 50 miles off the Louisiana coast. Just before 10pm, a burst of methane gas from the well rushed up and out of the drill pipe. And ignited.

News clip #1: 126 workers were doing routine drilling on the oil platform before it was engulfed by smoke and flames.
News clip #2: "I woke up and then I heard an explosion, I just heard a loud boom."
News clip #3: It was the first in a series of explosions that set the rig aflame, claiming 11 lives…

[news clips duck under DL]

Levin: Two days later, the rig sank, and the broken well gushed oil into the Gulf for three straight months. The result: almost 5 million barrels spilled, covering an area the size of Oklahoma.

But it wasn't a spill in the classic sense—oil didn't flow overboard, or trickle up from a sunken ship.

Murawski: This was basically an eruption, almost like a volcano of oil coming up from the bottom of the ocean. This is an absolutely unique spill in the annals of oil spills.

Levin: Steve Murawski studies the long-term impact of the oil spill on the environment. Some of the effects of the oil are obvious, like tar-covered beaches and wetlands, or pelicans caked in brown goo. But Murawski says that's just the visible stuff. The source of the oil was at the sea floor, so the worst damage took place out of sight, that is, underwater. Some of the early evidence came from deep-sea fish.

Murawski: Well, in the winter of 2010, 2011, fishermen and others started to report fishes with large skin lesions on them. Skin lesions are basically a large area rubbed raw, or in some cases, open, bleeding sores.

Levin: The insides of those fish were also in bad shape. They had tumors growing in vital organs. In their the livers and spleens.

Murawski: You know, the questions started popping up…What's going to happen over time?

Levin: And what exactly was the oil *doing* to these fish? How long would its effects last? To get some answers, Murawski says he needs to understand how the oil impacts the entire Gulf ecosystem, because the fish are part of a bigger picture.

So he's studying the biology at every level, from the tiniest microbe to the biggest whale. And he's learning about the oil itself—how it spread from a deep water blowout. How it mixed with the water.

Murawski: We need to understand // how bacteria degrade these oil products. We need people that are trying to understand the impacts on the smallest components of the marine environment, where the food chain begins. It requires a healthy dose of different disciplines to understand this.

Levin: And that's where a research group Murawski helped found at the University of South Florida comes in. It's called C-IMAGE, which stands for the Center for Integrated Modeling and Analysis of the Gulf Ecosystem. It's a collaboration of chemists, engineers, biologists, even computer scientists. Together, they're trying to figure out exactly what a deepwater blowout does to the marine ecosystem… And what to expect in future blowouts.

Since August 2012, the C-IMAGE team has been collecting samples in the Gulf of Mexico, kicking off what will be up to nine years of research.

Murawski: Right from the get-go, we envisioned a center that would try to work as much in the integration of disparate sciences as we could. If we want to put it all together, we need to work across these domains.

Levin: He's attracted scientists from across the U.S., Canada, and Germany. And Murawski says this collaboration is key to understanding the spill, since oil is way more complex than it looks.

Murawski: People talk about oil as if it was a single entity, but oil is really a very complex mixture of 40,000 different compounds. It has many, many different elements in it, rare elements like nickel and vanadium...

Levin: Gasses like methane. Solid stuff, too…

Murawski: Things like asphalt…

Levin: And toxic chemicals like benzene and naphthalene…

Murawski: …which we all recognize probably as that smell from mothballs. So it's just a whole variety of compounds that all interact differently when they're exposed to the open ocean environment, and the plants and animals that are there.

Levin: One big challenge for the C-IMAGE scientists will be tracking how all the different ingredients of this chemical brew move through the environment. It's especially tricky because this spill is unlike any other.

Murawski: Prior to the oil spill, I think everybody's thought process said, well, oil floats, and so it's primarily a surface problem. And what we found is that there were, and are significant quantities that are trapped on the bottom.

Levin: After the Deepwater Horizon sank, oil sprayed out of the well kinda like a giant aerosol can. It left plumes of toxic chemicals and microscopic oil particles suspended in the water. In some areas of the Gulf, those plumes hit the sea floor and were trapped in the muck.

It's something scientists have never seen before.

Hollander: It's the story of two spills: the deep sea and the surface.

Levin: David Hollander is a chemical oceanographer at USF. He leads C-IMAGE with Murawski, and says those underwater plumes could have been responsible for the sick fish Murawski was seeing after the spill.

Hollander: The toxic compounds are incorporated into the deep sea, and impact the deep sea much more significantly than the surface. The fish that are coming up with a higher prevalence of disease have been linked to deeper water environments. It's quite likely that it's linked to the oil that they're living in.0

Levin: The next step, Hollander says, is knowing the long-term fate of the oily sediments at the bottom, and their effect on the animals nearby.

Which is why Hollander—a chemist—and Murawski—a biologist—joined forces to create C-IMAGE. Over the next few years, the pair will collect samples of marine life in the Gulf. And at the same time, in those same locations, they'll gather sediments from the ocean floor, where many of those creatures live.

Hollander: What we're doing is we're evaluating // what was happening during the spill and how those environments were impacted, but also now how they're recovering.

Levin: The research will also help predict what might happen with similar spills in the future.

Hollander: You can't use the Deepwater Horizon as the template for all future deep water spills. If you start to change water temperatures, change locations, change circulation, change the chemistry, change the pressure, *what happens*?

Murawski: This is a complex detective story for us.

Levin: Again, Steve Murawski.

Murawski: I think all of us feel that this represents an opportunity to actually put in place models, procedures, and data that will allow us to better understand what to do the next time this happens—Not if, but *when*.

Levin: In other words, it's a way of keeping an eye on the remaining 4,000 oil platforms in the Gulf.

Levin: For The Loop, I'm David Levin.

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Levin: Learn what life is like onboard a C-IMAGE research cruise. Check out our next podcast at http://www.marine.usf.edu/c-image/resources/media-player