The Loop: Episode 15

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David Levin: You're listening to The Loop, an audio series about the mud, microbes, and mammals in the Gulf of Mexico. I'm David Levin.

At the bottom of the Gulf of Mexico, some truly bizarre ecosystems are hiding in the darkness.

Ian MacDonald: Almost, you know, like life on another planet.

Oceanographer Ian MacDonald has been studying them for decades. So… what makes them so strange? Stay tuned.

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Levin: In the deepest parts of the Gulf of Mexico, the seafloor is not exactly scenic. Thousands of feet below the surface, there's a flat plain of mud stretching for hundreds of miles. The only things you'll see are the occasional fish or burrow. But every once in a while, it offers up something truly unexpected.

Levin: Ian MacDonald saw that firsthand.

MacDonald: Yes, um, this was back in 2003…

He's a Biological Oceanographer at Florida State University, and was towing a remote camera on a research cruise, looking at the seafloor.

MacDonald: It was about three in the morning, and we were watching the bottom go by. And this was particularly tedious and boring; there were almost no features, we saw no fish…

Levin: So he started taking bets with the other scientists aboard…

MacDonald: …whether this was *the* most boring seafloor anybody had ever seen, or if possibly there had been more boring places that had been explored.

Levin: When, suddenly, something really unusual drifted into view.

MacDonald: A huge, dark wall. And we saw this very strange, fractured substrate, very dark in color.

Levin: It looked a like a small volcano.

MacDonald: And // we all sort of gasped and wondered what this was.

Levin: As it turns out, it *was* a volcano. But the stuff erupting from it wasn't lava—it was *asphalt.* Like the black tar that covers your driveway. It's a heavy, viscous, degraded form of oil, and it was slowly oozing out of the sea bed, forming a mound that covered thousands of square yards.

MacDonald: [05:15] This was the first time this had ever been seen by science. // as our work progressed, we began to realize that we had discovered a unique and previously unknown type of oil seep and ecosystem.

Levin:. Since 2003, scientists have found dozens of other asphalt volcanoes in the southern Gulf of Mexico. Each of them support huge colonies of unique life, like giant tube worms and blind shrimp. animals exist in complete darkness, thousands of feet down, completely cut off from the surface. But here's where things get *really* interesting—they get their energy from the *asphalt itself.*

It's a process called "chemosynthesis." Inside the animals, there are specialized microbes that can use carbon and sulfur compounds that leach out of the tar. As they do, they spit out nutrients for all those worms, shrimp, and other life. It's how the ecosystem survives, and it's why…

MacDonald: 17:00 you can have lush biological communities in an otherwise sort of desert environment where there's generally // few foods.

Escobar Yes, [8:30] The large concentration of organisms is an indicator that there is high input of energy, which means food for the organisms.

Levin: That's Elva Escobar Briones.

Escobar: I'm a scientist and I work for the Institute of Marine sciences and Limnology at the // national university of Mexico.

Levin: She says asphalt volcanoes could be essential for these species' survival around the world. Why? Well, In order to thrive, they need two things: a steady source of chemical food, and solid ground to latch onto. That second part is actually kind of hard to come by in the deep ocean, which is made up mostly of soft clay and mud. So when solid things like asphalt volcanos pop up, they become almost like tiny islands.

Escobar: [18:00] …like islands in the middle of the ocean. Yes.

Levin: Animals that can use oily chemicals for food flock to them to settle down, And as they grow in number, thy use the volcanoes as a stepping stone to spread to other sites in the world's oceans. Their larvae can float around for hundreds of miles—and having a home base in the Gulf of Mexico puts them in a prime spot to catch currents that take them all over the world.

Escobar [13:13] ...currents that go from the Southern Gulf of Mexico to the Northern Gulf of Mexico into the Atlantic, and then to Africa, most probably, and then probably back through Brazil and the Caribbean sea.

Levin: That means on some level, chemosynthetic animals living in all those places are connected.

Escobar: Yeah, there is a big connectivity, and there are many other places that are stepping stones.

Levin: But no matter where those colonies are, they're going to be vulnerable to human activity in the future. Things like microplastics from our garbage are being released into the oceans at an incredible rate. Oil wells are being drilled in deeper and deeper sites each year. And in the future, mining companies might destroy huge swaths of the ocean floor.

Again, Ian MacDonald.

MacDonald 41:33 we do extend human impact into the deep ocean through energy exploration, through dumping. // the human impact is starting to extend to these places, these communities, these this biota that, until now, had been completely pristine and unimpacted.

Levin: If chemosynthetic communities are harmed, he says, it'll create a problem not just for tubeworms… but for *us.* That's because the microbes that power those communities don't just eat chemicals in oil or asphalt—they also eat up a lot of free-floating carbon. They turn it into mineral forms like calcium carbonate, the stuff that makes up seashells, corals, and limestone. In the process, they sequester carbon that would otherwise escape to the rest of the ocean… and eventually, get into the atmosphere, adding to global climate change.

MacDonald: [21:55]. So, you know, if // we take a sort of broad perspective, there have been trillions of tons of hydrocarbons that have escaped over geologic time returned into the ocean environment. They've been utilized by these ecosystems. So these ecosystems have prevented the return of this carbon source and the CO2 that would be generated as it broke down.

Levin: In their own way, he says, these ecosystems have helped keep the planet's climate stable over the long term—so *their* survival would have a big an impact on *ours.* That's especially important to remember today, when oil exploration and seafloor mining is being planned more than a mile below the ocean's surface. If sites like the Gulf's asphalt volcanoes are harmed, it's not really clear what the overall impact will be.

Escobar: [25:20] If we lose them, if we exploit them, if we // destroy them, how much are we losing out from those ecosystems? Those // are things that we have not evaluated everywhere and we have to consider them // now more than ever.

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For The Loop, I'm David Levin.

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