The Tragedy of the Abyss

by Elyse Hauser

In 1977, two researchers in a submersible called Alvin plunged into the Galápagos Rift, an underwater valley where Earth's geologic plates come apart, in search of a hydrothermal vent. They would become the first scientists to encounter these once-theoretical sources of superheated water on the ocean floor. Yet their voyage to the bottom of the sea became historic for an entirely different reason.

When they found their vent, one of the researchers picked up the sub's phone and made an unexpected call to the research vessel thousands of feet above.

"Isn't the deep ocean supposed to be like a desert?" he asked.

"Yes."

"Well, there's all these animals down here" ("The Discovery").

The Alvin researchers had discovered one of the globe's best-kept secrets—the presence of life in the deepest and most inhospitable part of the ocean (Kolbert).

Many of the animals they found were relatively mundane: brown mussels, white clams and crabs, a solitary purple octopus ("The Discovery"). But there were also inflorescent anemones and new-to-science tubeworms, which one researcher described as "absolutely stunningly beautiful" (Davis and Joyce). The bounty of life there was so diverse that the crew nicknamed the area the Garden of Eden.

This was, indeed, a revelation. While earlier explorations had discovered deep sea life (Golembiewski), scientists did not yet know just how extensive it was, nor how well it could thrive at extreme environments. The myth of a barren, desert-like deep sea had persisted, in spite of the odd creatures sometimes pulled to the surface.

Today, as our understanding of the deep ocean has grown, we are beginning to know just how much we don't know. Lifeforms like nothing else on Earth thrive at hydrothermal vents and cold seeps, in hadal trenches and along the abyssal plain. Many of them are still unknown to science—some estimate that 91 percent of ocean life has yet to be discovered (Golembiewski). One section of Pacific seafloor was recently found to contain over 5,000 unknown species (McVeigh). No one can say for sure how much is left for us to find.

What we've found in the abyssal zone so far, though, is often wondrous and fantastical. There's the "gummy squirrel," a sea cucumber discovered by a 2022 expedition ("Newly Discovered Deep Sea Species"): vivid yellow with a long, pert tail, silly-looking as a dog's chew toy. Or there's the "purple sock," the nickname for a creature as simple and crumpled as the name suggests. Though one was first described in 1949, scientists couldn't figure out what it actually was until 2016 (Gee). It turned out to be a flatworm—and a living fossil, one of the earliest branches on the evolutionary tree. The things that live on the seafloor

can hold the keys to understanding life on Earth.

We have photographs of each of these abyssal creatures and many more: you can find them in books, in documentaries, on Wikipedia pages. In the depths, alien-looking adaptations are common—translucence, weird hairy appendages, bioluminescent sparkles lighting up the black zones far below the sun's last rays. They're pleasingly absurd, like children's drawings come to life. At the same time they're vaguely haunting, so monstrously different are they from any living thing here on land. Looking into their weird visages feels like looking into the impossible—like staring into the abyss. And, indeed, that's exactly what it is.

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As a child, I used to draw elaborate maps of fantasy lands, assigning names to invented forests, mountains, and coastlines. I drew dragons and pegasi and other winged, toothy beasts, obsessed with the idea of encountering a creature so rare it was thought to be mythological, of being the first one to know the truth. I adored the type of hero's-journey tale in which an ordinary person stumbles upon an unknown world, filled with flora and fauna and thrills no other human has been privileged to see.

I also, like many of the other girls I knew, included "marine biologist" on my list of childhood dream jobs. I lived along a broken edge of continent where islands mixed with inlets, little pieces of land drifting among so much saltwater. So I knew well that proximity to the sea didn't make it any less of a mystery, and that because it was a mystery, it was worthy of attention.

Although I liked fishing, my favorite water activity was when my parents would take us out on the boat with the crab pots. Dropped empty to the bottom of Puget Sound, we would pull them up a few hours later filled with the beautiful and the absurd: fat red Dungeness crabs, yes, but also lanky orange starfish, spiny purple-black urchins, and the rare prize of a giant, wriggling golden sunstar. We'd put everything except the big crabs back in the water, but the images of the other creatures would remain imprinted on my mind long after the crabs had been boiled and eaten, shells cracked and discarded.

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I feel something exquisite and precious when I look at deep sea creatures captured in photographs, living far beyond the natural reach of humans. It's a privilege to see them at all, so lucky that an underwater camera managed to capture a giant isopod or a mysterious cusk eel. To desire ocean-floor treasures beyond these natural fantasies seems like hubris, an absurd refusal to be satisfied with what we've been given. But some do.

People have discovered that the abyss contains not just lifeforms, but commodities. You can't easily sell gummy squirrels or giant isopods, but there is a consistent market for the ocean's more static gifts: polymetallic nodules. Found only on the seafloor, polymetallic nodules contain rare earth metals, valuable for making things like solar panels and electric cars (Kolbert). (The name "rare earth" is actually something of a misnomer: even the rarest rare earths are some 200 times more common in Earth's crust than gold. Yet they're called rare because they're often found in small deposits that are hard to mine (King).)

Mining supporters say that the need for clean-energy tech should trump any hesitation. Environmental groups contend that the risks of deep sea mining outweigh the rewards: it could wound the seafloor environment, which we know so little about, causing unprecedented damage to nature. And polymetallic nodules, after all, are not a renewable resource. Once we've exhausted this option, we must scrabble yet again for new solutions.

Regardless, plans are underway to begin widely mining the deep ocean floor. Test operations have already begun (Arena). Some countries and companies are in hot pursuit of international mining permissions ("TMC Announces Corporate Update"). Others, such as Norway, are working toward mining local waters where international permissions aren't required (Fouche and Adomaitis).

Right now, scientists know less about the deep sea than they do about deep space (Watts). They estimate that there are anywhere from a few hundred thousand to over 10 million undiscovered species in the ocean (Solow). The prospect of mining stands to rip apart this mysterious environment before it's ever truly known, in order to obtain its pricier secrets: resources like tellurium and yttrium, copper and nickel (Kolbert).

A popular proposed mining process involves dredging the ocean floor, each company's machines removing thousands of square miles of seabed each year. Now, with testing and international discussions underway, mining interests are shuffling relentlessly toward their goal of vacuuming polymetallic nodules from the seabed. Underwater vehicles the size of trucks will make their way over the seafloor in slow, orderly rows, bulldozing the top five inches as they go: effectively, it's underwater strip mining. This removed layer of seafloor will be piped to the surface, sifted for valuable materials, and then dumped back into the ocean, vast quantities of sediment sinking slowly back to the abyssal zone (Hylton).

I cannot picture this without picturing the precious creatures, clams and weird worms and sea cucumbers and new and unknown species, that will inevitably meet their demise in the process. Many abyssal species

live not on the seafloor, but on the nodules themselves (Schlossberg). They can't flee. Others can. A recent analysis of a former mining test zone found that both inside and outside the mining area, swimming creatures had swum away. Some creatures that couldn't swim had been crushed by the mining equipment. Researchers believe sediment plumes polluted nearby food species, spreading tendrils of damage far beyond the mined area (Leach). A year after the test, life outside the mining zone had decreased by more than half (Washburn et al.).

The International Seabed Authority (ISA) exists to regulate seabed mining in parts of the sea not controlled by any specific country. That's the majority of the ocean, 80 percent of which is still unexplored ("Why Nasa Is Exploring the Deepest Oceans"). These wild and distant underwater places are referred to by the ISA, rather dismissively, as "the Area" ("Reserved Areas"). I wonder if this language makes it easier to march unquestioningly into a new era of oceanic destruction.

Since it's in charge of environmental protection as well as issuing mining contracts, the ISA says certain places will be off-limits to miners, to protect the natural seabed ("Regional Environmental Management Plans"). Yet with so much unknown about the ocean floor's environments, there's little to suggest that even selective mining won't have devastating consequences. If the seafloor is raked up in search of useful metals, we'll be left to wonder what else we might have discovered there, and what could we have learned. Once a deep sea environment is destroyed, of course, it cannot be replaced. The natural mysteries down there, billions of years in the making, will be gone forever.

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Only as an adult have I realized why marine biology held such sway over me and my childhood cohort: it fulfilled the same desire for fantasy worlds that made us love Harry Potter and The Lord of the Rings. It was a real-world example of ordinary people encountering extraordinary creatures, of learning about a mysterious place and reporting back with privileged information. It was a chance to know the unknown.

While I intellectually balk at the decimation of rainforests and marshlands, it doesn't hold the same pang for me as the possibility of destroying the deep seafloor. It's not merely the destruction of nature: it's the abandonment of an uncharted fantasy land. This seems to signify a loss of curiosity, which feels tantamount to the loss of humanity itself. Do the proponents of deep sea mining really not care what's down there? What does it mean to be a member of a species that could make such a choice?

I did not grow up to become a marine biologist (instead, I pursued an entirely different side of childhood fantasy and became a writer). But I am still enamored with the idea that there can be unknowns in this world of fervent documentation, of constant cameras, of real-time dispatches from across the globe. And I am fearful of destroying those unknowns without ever trying to know them. My alarm isn't only motivated by the practical reality that decimating ocean life could decimate life on Earth—it's a more romantic desire to rescue the strange and beautiful, like plucking a moth from a puddle to save it from drowning. And I fear what abandoning such unique lifeforms to their fate will say about humanity itself.

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The great irony of deep sea mining, of course, is that it has what some would call environmental benefits. Mining advocate Gerard Barron (chairman of the dystopian-sounding Metals Company) has said that transitioning to so-called clean energy will require "billions of tons of metal," and that taking this metal from the seafloor would be environmentally preferable to taking it from dry land (Kolbert). Without the transition away from fossil fuels, global warming will soon become unstoppable, and so will the rising seas, the droughts, the food shortages, the unsurvivable storms that follow.

Perhaps this is what it's come to. Maybe humanity will have to make devastating choices in order to survive—destroy one environment to save the one in which we live. Yet the idea that we need alternative sources of power for our electrified modern lifestyles, rather than changing the lifestyles themselves, feels like a dangerous lack of creativity. It's quite possible that destroying the abyssal ocean for new energy sources could create deadly consequences for us. Humans may not live underwater, but the ocean is still life-sustaining. Oceanic life, primarily plankton, produces at least half of the oxygen on Earth ("How Much Oxygen?"). The deep sea is far removed from those photosynthesizing surface-dwellers that make oxygen, but as grade-schoolers learn in science class, nature's web is interconnected. Touch one strand, and the reverberations will spiral far beyond where you may have guessed.

In 1968, ecologist Garrett Hardin warned of the tragedy of the commons. The tragedy is this: humans living under capitalism, with its incentives to maximize personal gain, will inevitably deplete their shared natural resources. (Hardin was a white nationalist with fascist tendencies who largely shouldn't be listened to, but on this one subject he did have a point.) In his famous example, cattle herders each try to keep as many cattle as possible on a common pasture, because more cattle equals more money. In the end, though, the pasture becomes overgrazed, and there's nothing left for anybody.

The sea is the largest commons we have here on Earth. (Over 70 percent of the planet's surface is ocean; the Pacific alone stretches over 5 times wider than the moon ("Ocean Science Fact").) Environmental arguments aside, there's a great deal of money to be made from extracting the resources beneath it. It's hard to picture a scenario in which this vast commons won't be depleted in short order once deep sea mining begins. And while the potential loss of many chimerical creatures feels immediately tragic, the reverberations of that damage could be even worse. What might it do to the rest of the ocean, to the parts that provide us with food and oxygen? Will we be left with the world's biggest overgrazed pasture?

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The prospect of destroying the abyssal sea doesn't so much terrify me as it confuses me, in a dystopian-horror way, the way I imagine I'd feel upon encountering actual aliens or learning that my friend is an android. I can't understand it. It doesn't make sense. It doesn't fit into the world I know, in which environmental destruction is real but sort of gradual, sort of "we didn't realize it until it was too late," like deforestation or overflowing landfills. Not blindly destroying what we haven't ever seen, will never see again. Not devastating the most interesting lifeforms on the planet, fantasies come alive on Earth. Like throwing away an unopened gift in order to make room for a stack of cash, it's a decision so bizarre, so coldly practical, as to seem inhuman.

But the truth is, even without deep sea mining, the creatures of the deep ocean are imperiled. They're threatened in the same way that all of nature is—the slow, creeping way that many will ignore until it's too late (like deforestation, and landfills). Oil spills, sinking plastics, acidification, global warming: so many other hazards face the deep sea that focusing on seafloor mining seems almost futile. Even if environmental protests can stop the mining, the ocean, as we know it, may soon be gone anyway.

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Here on land, over 500 species of animals are already near enough extinction to disappear within the next 20 years (Gittins). Insect populations are declining at a fast enough rate that they could be gone in 100 years (Carrington, "Plummeting Insect Numbers"). These are our pollinators, the foundation of our food sources and of countless ecosystems. When one species goes away, other species that depend on it tend to go away, too. The extinction snowball picks up speed as it rolls down.

The future this suggests is, I admit, beyond the reaches of my imagination. I have a vague sense of the possibilities: plagues of pests without natural predators, crop shortages, a mad dash for survival. Attempts to farm, to hunt and gather, to barter and scavenge. Yet I have no idea what this would look like in practice. How will we behave if our needs and wants are entirely divorced from money? If all the metals in the deep sea are worth less than a bag of potatoes in the end? Perhaps we'll wonder how we strayed so far from our own basic needs. But it seems more likely that the crush of mortality will be too heavy for reflection.

The future, whatever may happen, will be unprecedented. The planet has never seen anything like this rapid-fire extinction before. It's never seen anything like our modern scale of pollution and damage. The forces and agents of capitalism and colonialism have long been grasping clumsily at the Earth's resources, oblivious to what gets broken and destroyed in the process.

Extinction research tends to focus on land animals, which are easier to track. But the oceans are far from safe. Although deep ocean creatures are relatively far from much of the damage, trash and pollutants have an uncanny ability to make their way to sea, while overfishing and industrial noise pollution disrupt aquatic life cycles. Unknown underwater species are almost certainly going extinct already, no deep sea mining required, before science even has the chance to discover them.

Perhaps it's myopic to fret over losing deep sea life, when we face extinction's potential threats to humanity itself. But it feels unfair to so quickly dismiss lifeforms that have shared our brief time here on Earth. Even the tragic dodo, after all, had the chance to be known, to be recorded for posterity: a reminder that some things, once gone, are gone forever.

I lived in the Northeast from 2011 to 2015, and recently went back for the first time since. The firefly lightshows I remembered from summer nights, not so long ago, had been reduced to scattered twinkles, visual evidence of Earth's sixth mass extinction, in which even insects are faring poorly. My partner's nieces wanted to catch some, but they were so few and far between that the prospect seemed both cruel and impossible.

I picture the deep sea of coming years in much the same way. The bioluminescent sparkles in the blackness gradually being extinguished, flickering out, leaving behind only the impression of what might have been, like a camera flash reverberating in our closed eyelids.

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