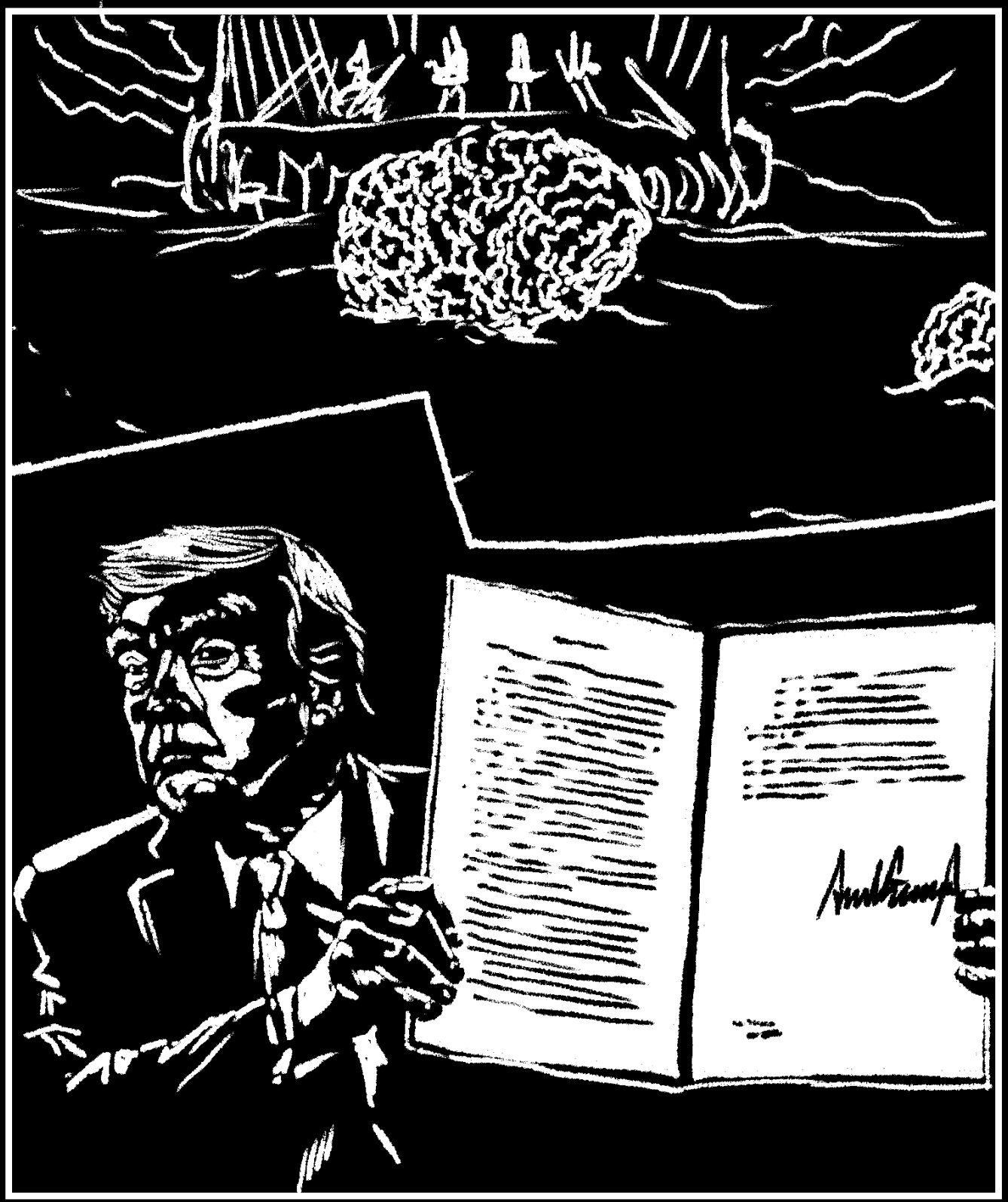
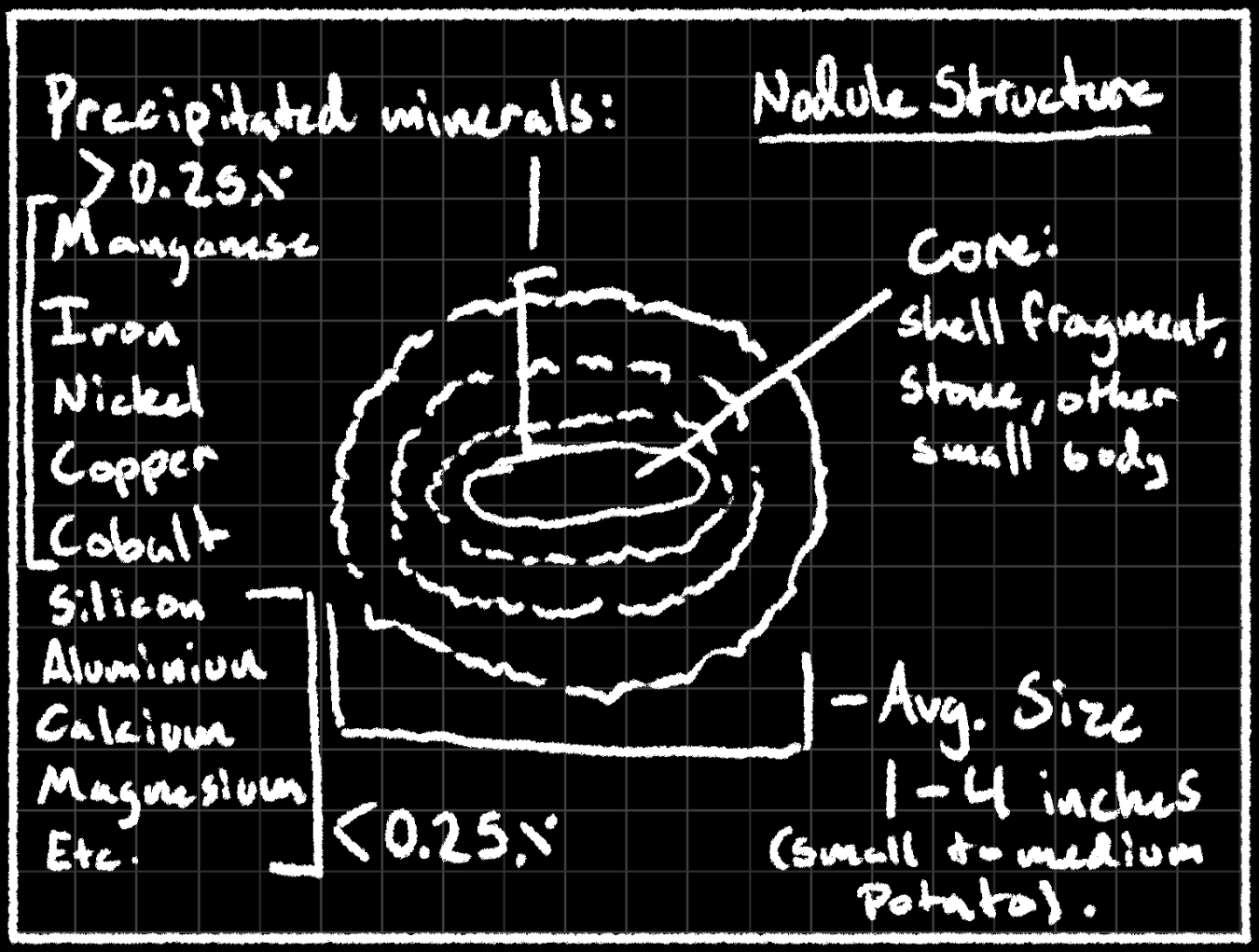

Nodule
Harvest
Avery Hargrove

On April 24, 2025 Donald Trump signed an executive order asking NOAA to begin issuing permits to deep sea mining companies allowing for the extraction of deep sea mineral resources.



The implications of this action are dire. The primary target of deep sea mining is a common sedimentary rock known as a polymetallic nodule. These nodules are formed over millions of years through the precipitation of metallic minerals around a core.



Many of these elements are needed for the production of EV batteries; expanding solar & wind energy. So, if nodule harvest is needed to fuel the expansion of clean, renewable energy, why is allowing that harvest something with 'Dire Consequences'?

There are 4 major issues with deep sea mining:

#1 The proposed method of extraction.

#2 We don't fully understand the ecosystems within nodule beds or the nodules' role in them.

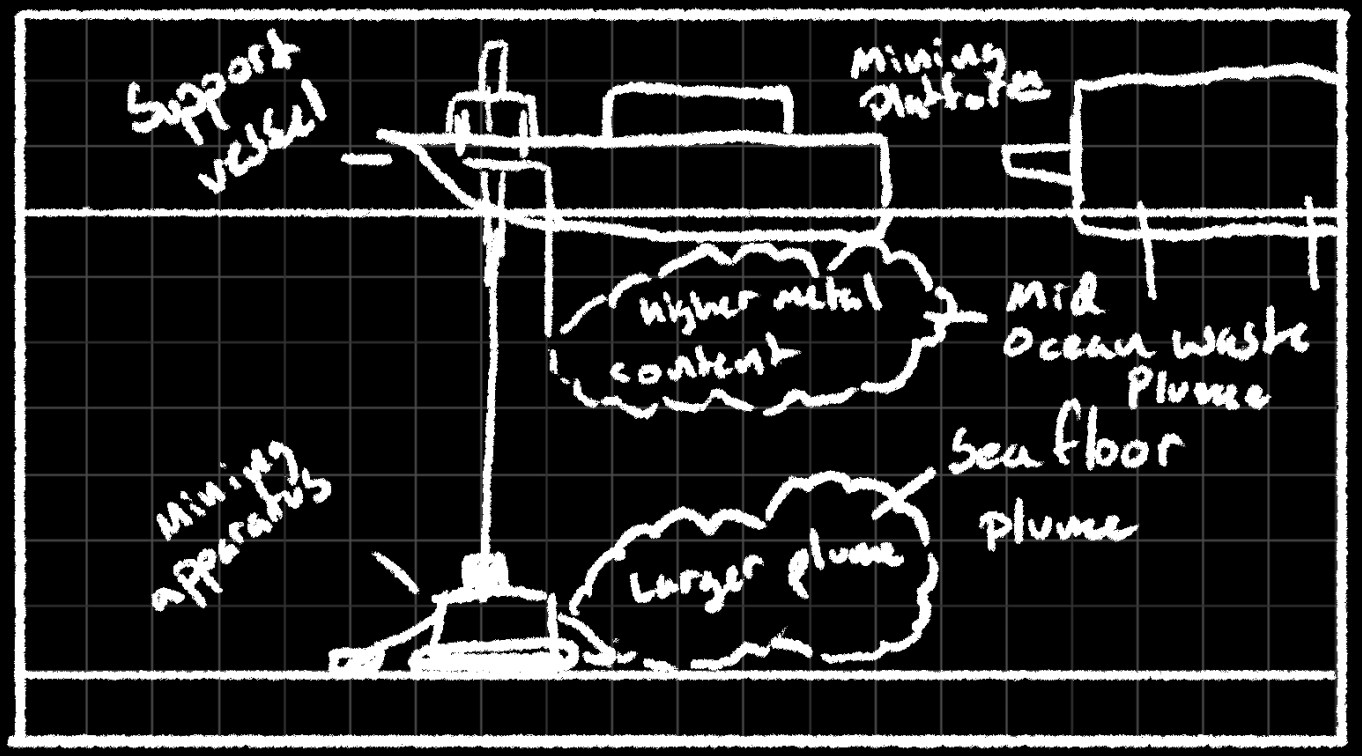
#3 The sedimentation rate of the abyssal plane.

#4 Technological advancement is reducing the need for the minerals we would harvest nodules for.

Let's break it down:

Issue #1: Mining techniques.

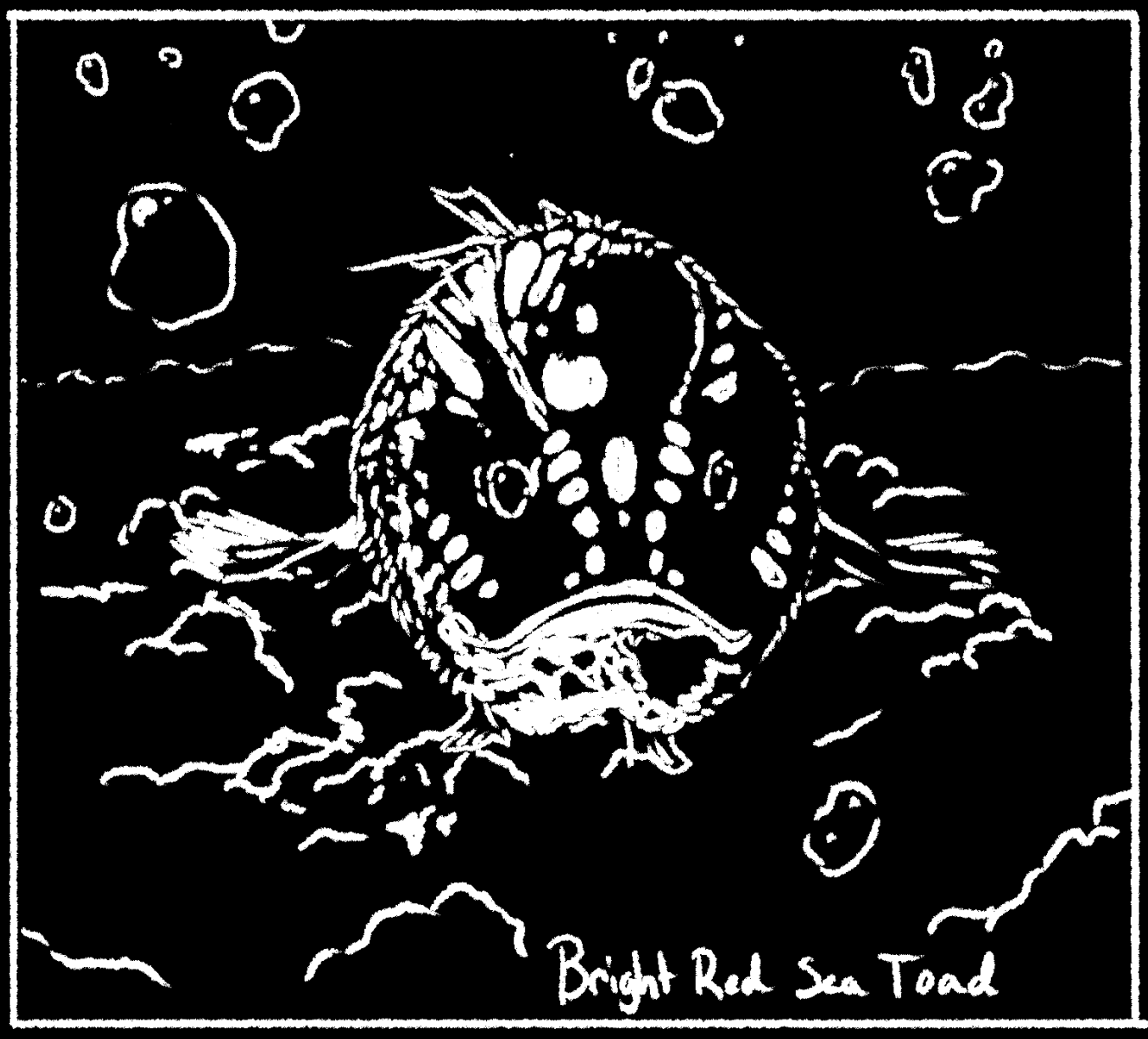
The current proposed nodule extraction method involves deploying a large vehicle on the seafloor that sucks up nodules not unlike a vacuum cleaner. The nodules are then sent up through a tube and deposited in a support vessel on the ocean surface.



Using this method, massive sediment plumes are generated both at the ocean floor from vehicle activity and in the mid ocean, where waste sediment is pumped back down from the support vessel. This means that up to the entire water column will be inundated with sediment. This can negatively impact sea life and make it difficult to carry out further mining.

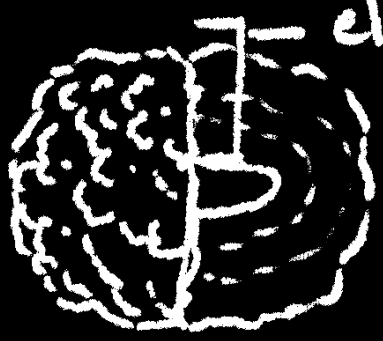
Issue #2: Ecosystem understanding

The Clarion Clipperton Zone (CCZ), the likely first place deep sea mining will occur, is host to a very diverse ecosystem (This is true of the entire water column), but also one that we know next to nothing about. Of the species that live in the CCZ over 90% remain unidentified. Of those that have been identified, ~15% of them live directly on the polymetallic nodules, & up to 50% of megafauna in the CCZ are only found on nodules.



Not only do we know next to nothing about what lives on & above nodule beds, but we also don't fully grasp the role of the nodules themselves in the ecosystem. On July 22, 2024 a group of researchers published an article in the Journal Nature detailing the discovery of "Dark Oxygen" in the abyssal plain of the CCZ. "Dark oxygen" refers to oxygen produced through means other than photosynthesis -- without light.

Dark Oxygen Production

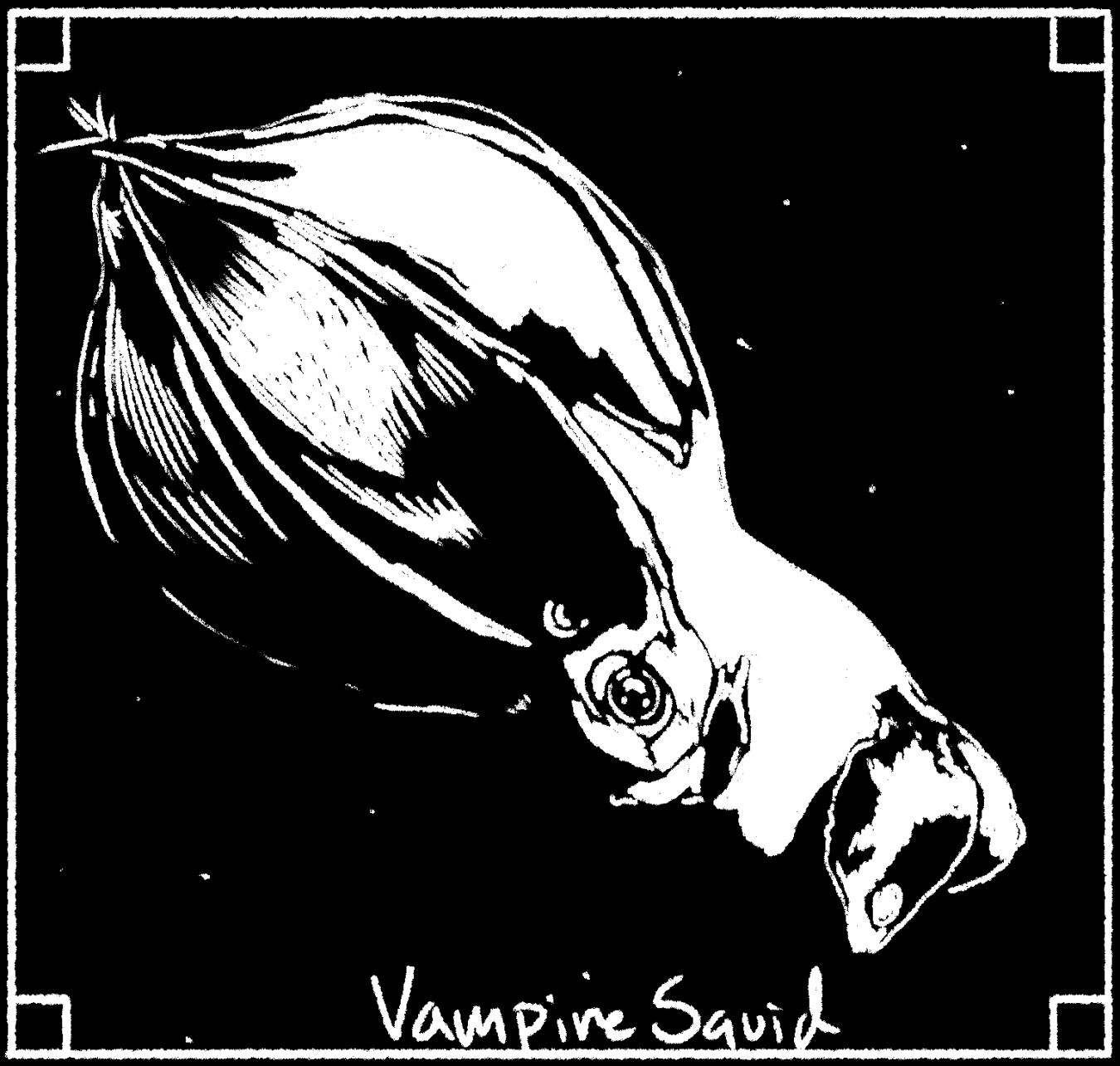


electric potential = 0.9v avg

$$2H_2O \rightarrow 2H_2 + O_2$$

The study in Nature suggests that it is the nodules themselves that create this dark oxygen. The theory goes that the assemblage of metallic ions attached to the nodule core have an electrical potential slightly less than a AA battery (.9v). This small amount of energy allows the nodules to perform electrolysis on the water around them, splitting water into its base elements.

This is significant. For a large part of human history, it has been believed that oxygen only reaches the deep ocean by sinking from above. If, however, nodules are a significant source of oxygen in the deep ocean, removing them could have catastrophic consequences.

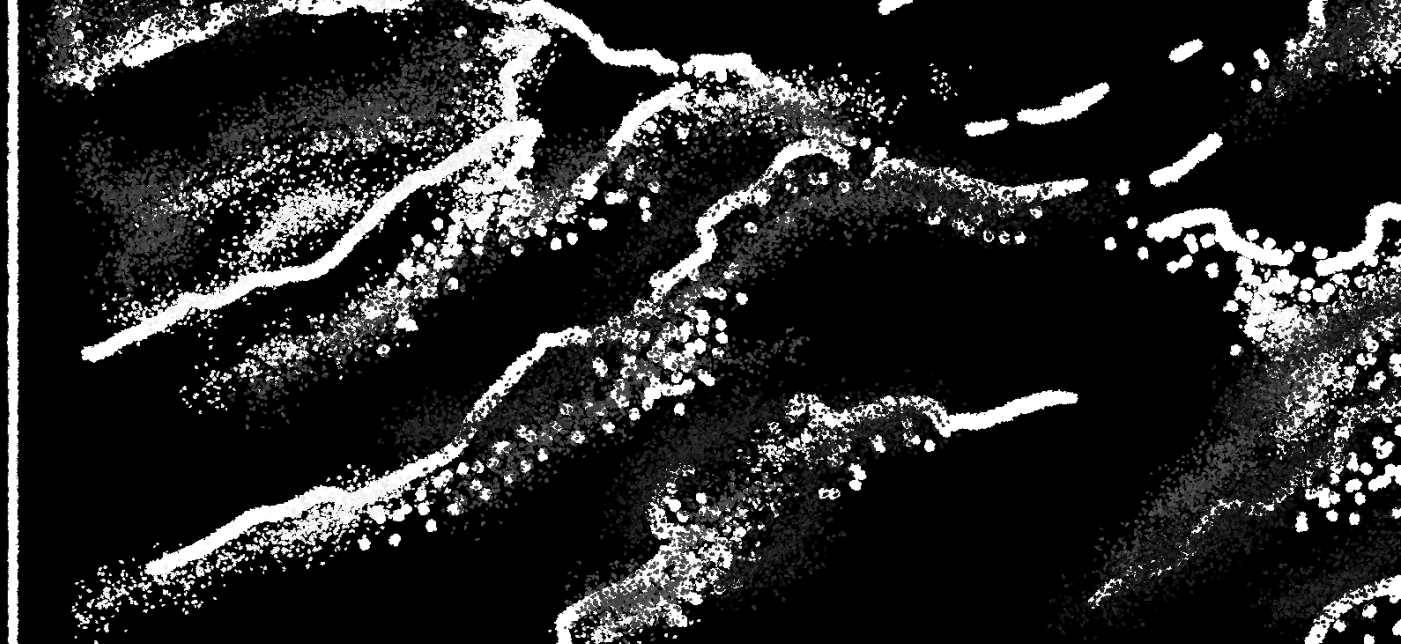


Vampire Squid

We simply don't understand what we're getting ourselves into.

Issue #3 deep ocean sediment

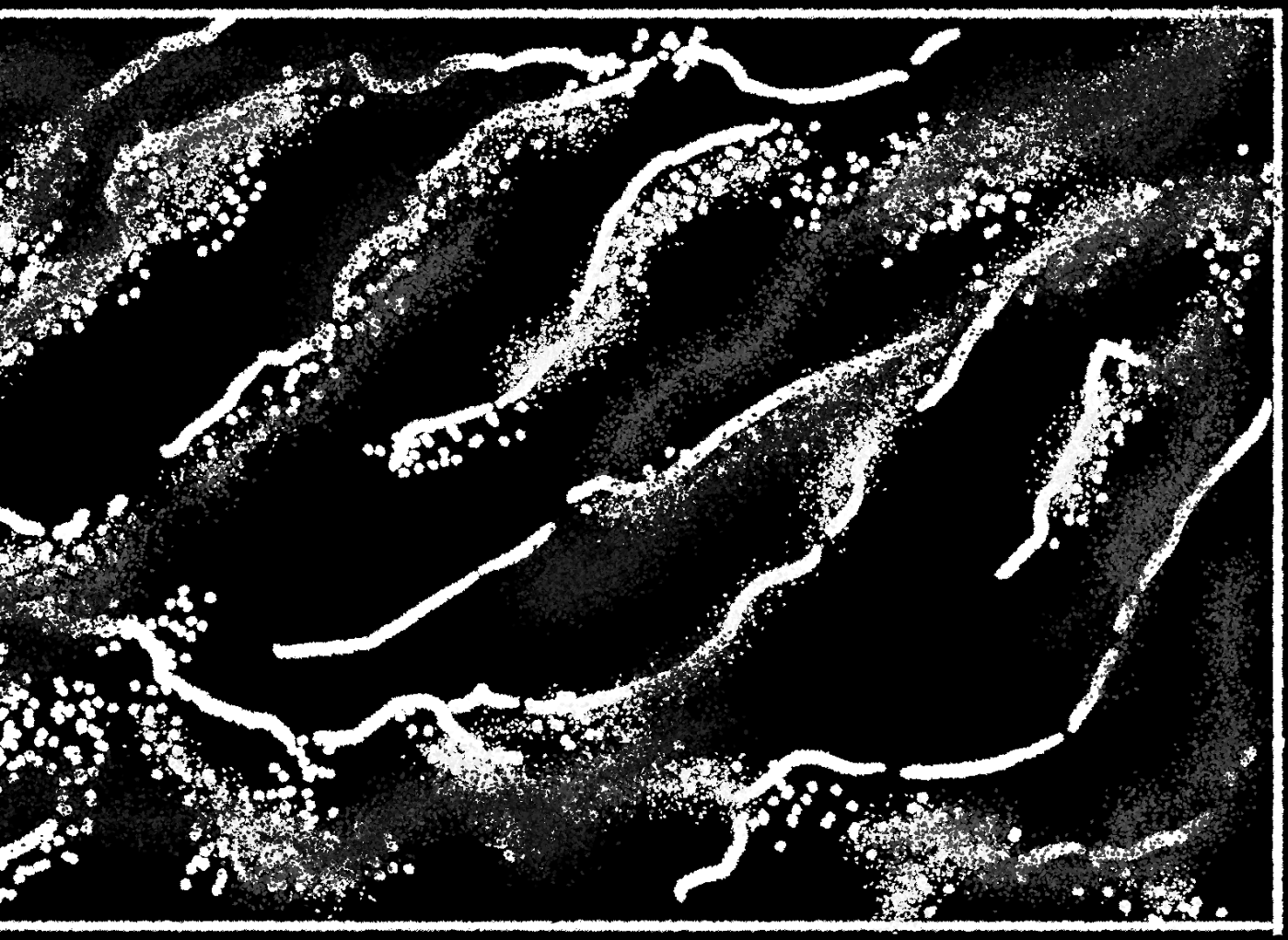
In 1979, a deep sea mining
CCZ. In 2023 a team of ocean
of the test. What they found
done to the seabed & its ecosystem
was left by the test. The min
were still clearly visible and none
live in the test zone. Only margin
observed. And it goes without saying no



The sedimentation rate in deep ocean
scale mining operations. Add on to this th
& you have a level of unrecoverable damag

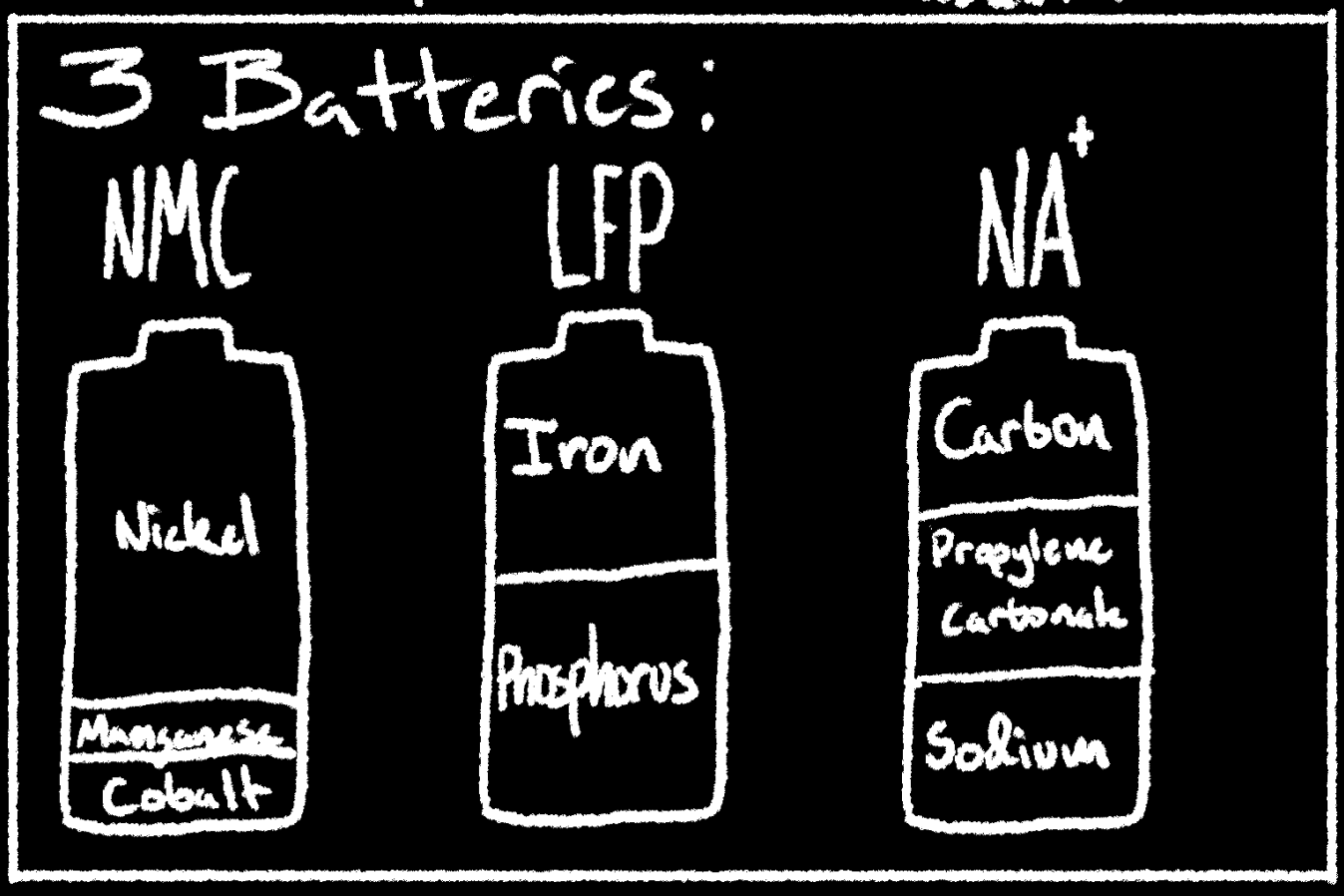
ation.

test run was carried out in the
nographic researchers returned to the site
is that nearly 50 years later, the damage
remained virtually unchanged from what
ing tracks from the collection vehicle
of the larger fauna had returned to
al increases in smaller fauna were
nodules were found in the test site.



is simply too slow to accomodate large-
e potential impacts of losing dark oxygen
e that is simply unfathomable.

Issue #4 technological advancement. The metals contained within nodules are important for the production of EV batteries. That is, the current dominant form of EV batteries, NMC (nickel manganese cobalt) batteries. NMC batteries are not the only batteries we can use in EVs. Recently LFP batteries (lithium iron phosphate) have risen in popularity & Sodium-ion batteries are also becoming available. Neither Sodium-ion nor LFP batteries require metals abundant in nodules. And the materials they use are much cheaper & more abundant.



Why take the risk?

Why take the risk?! Money! That is why. Deep Sea mining companies have dumped a veritable fuck-ton of money into pursuing this venture, why listen to all the signs telling you it's stupid + destructive to keep going when you've already lost so much? This is the gambler's fallacy with worldwide implications. With a decreased need for the metals in the nodules economics isn't even a good argument for deep sea mining in the long term.

Capitalism seeks infinite growth, but industries can never survive with this model unless they change and adapt to new market conditions. The refusal of Deep Sea mining companies to do this spells their doom + maybe ours too.

is being carried out 2000 miles away, under 18000 feet of water, and under the guise of 'a more environmentally friendly way to fuel a net-zero future'.

You & Jill alike may never even know it happened until the consequences of that act end your lives.

That's why you need to know and care about this. The most harmful events are the ones that are invisible until it's too late to avert the consequences. The farther from our perception an issue is, the harder it is to even comprehend the end result.

You should not allow this industry to slip by your gaze.

Is there any hope? Trump wants to fast-track this and as soon as one country bites the bullet others will follow suit right?!

Fear (less) (not) not! This action by president Trump came in the form of an Executive order, it will go through the courts.

Elsewhere, collective action has stalled & cancelled deep sea mining permitting. Visibility & hostility can change outcomes. The science & the law are on our side. We just need to play our cards right.

Sources:

https://www.iucn.nl/en/story/the-impact-of-deep-sea-mining-on-biodiversity-climate-and-human-cultures/

https://www.whitehouse.gov/presidential-actions/2025/04/unleashing-americas-offshore-critical-minerals-and-resources/

https://oceanographicmagazine.com/news/deep-sea-mining-test-site-shows-little-sign-of-life-40-years-later/

https://www.youtube.com/watch?v=qW7CGTK-1vA

https://www.nature.com/articles/s41561-024-01480-8

https://www.wri.org/insights/deep-sea-mining-explained

https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2023/deep-sea-mining-may-harm-thousands-of-species-before-they-are-even-discovered

https://www.pewtrusts.org/en/research-and-analysis/articles/2024/10/09/nations-discuss-deep-seabed-mining-in-international-waters-amid-growing-concerns

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