DSMC
Deep Sea Mining Campaign

Backgrounder:

Critical Questions About The Risks Of Radiation Toxicity From Deep Sea Mining

Deep sea mining (DSM) risks releasing unregulated radioactivity directly into global ocean commons and marine food chains. There are at least 10 critical knowledge gaps that must be answered before DSM is permitted. We call on the science community and regulatory authorities to undertake a focused investigative effort.

The Threat

Radioactive alpha emitters naturally concentrate in polymetallic nodules and seafloor massive sulphides, both of which are targeted by companies for mining. While marine ecosystems are adapted to natural background levels of radioactivity, deep sea mining will mobilise radioactive materials and expose marine life and food chains to elevated levels, possibly for extensive distances from deep sea mining sites.

Toxic Concerns

Alpha radiation is readily blocked by barriers such as skin or paper, but is extremely dangerous if swallowed or breathed in. If immersed in contaminated water, marine life would ingest and breathe in radioactive isotopes, and eat contaminated prey.

Our key research question

What are the likely ecological risks and effects of radioactive isotopes released by mining polymetallic nodules and seafloor massive sulphides, particularly in relation to impacts on marine species, ecosystems, and food webs?

A Scientific Blindspot

NO peer-reviewed studies have been published regarding deep sea mining induced radiation toxicity in marine ecosystems. The uptake, dose, and ecological effects of DSM-induced radioactivity are unknown.

No Safety Standards

Due to the lack of research it is not possible to set regulatory standards to safeguard the health of marine ecosystems and human consumers from DSM-induced radiation toxicity. Human safety standards are not relevant to marine species due to very different physiology, radiosensitivity, ambient environmental conditions, and routes of exposure and uptake.

The possible double threat

Deep sea mining will release both heavy metals and radioactive isotopes into the ocean simultaneously. Both radioactive isotopes and heavy metals can build up inside tissue of marine organisms and multiply up the food chain. Their combined ecotoxicological effects over decades-long mining of vast swathes of ocean floor, are completely unknown. Common sense dictates that the health of top predators will also be affected, including humans who eat seafood.

Contamination on two fronts

Mining operations will release radioactive alpha emitters and heavy metals in the sediment plumes generated by mining at the seafloor and in the waste water slurry some companies (such as The Metal Company - TMC) plan to dump at 1–2 km depths. While some DSM companies such as Impossible Metals or Deep Sea Mining Finance (PNG) do not intend to discharge waste water, their operations will leak contaminants all the way from seafloor to ocean surface as they haul up loads of crushed polymetallic nodules and seafloor massive sulphides.

Urgent Research Call: The 10 Critical Questions

The Deep Sea Mining Campaign calls for scientific investigation into these 10 unresolved areas before any commercial mining licenses are considered:

1. What are the chemical forms and concentrations of radionuclides released during the mining of polymetallic nodules and seafloor massive sulphides?
2. How would deep sea mining activities change the spatial distribution and dispersion of radionuclides?
3. What radiation doses would marine organisms be exposed to as a result of deep sea mining?
4. What are the short- and long-term impacts of such exposures on marine species, ecosystems, and food webs, including on the health of human consumers of seafood?
5. Which marine species are most suitable as indicators of ecological health, and what are the natural radioisotope levels within their tissues?
6. What are the bioavailabilities, uptake pathways, and trophic (food web) transfer of radionuclides within deep-sea ecosystems?
7. What are the biological effects of increased radiation doses in marine organisms under chronic exposures at both high and low dose conditions?
8. Could the ecotoxicity of radioactive isotopes, heavy metals, and other contaminants mobilised by deep sea mining combine to cause even greater ecological impact?
9. How do radionuclides bind to polymetallic nodules and to seafloor massive sulphides deposits, and how can this inform risk assessments?
10. Can theoretical frameworks and computational models be developed rapidly to simulate and address these critical knowledge gaps?