Deep Sea Mining

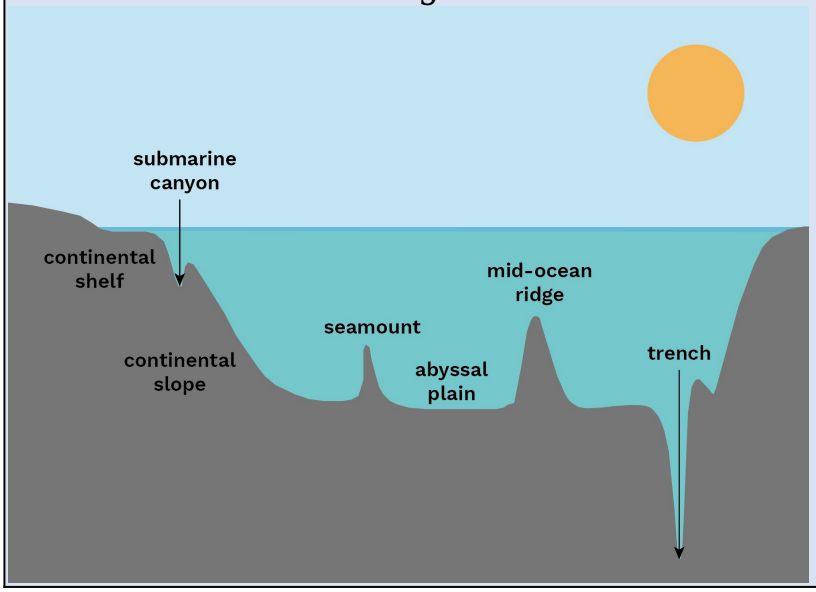
Prelims: *Current events of national and international importance | Science*

Why in News?

A recent study on deep-sea mining reveals significant biodiversity loss, with sharp declines in marine species following test operations.

- **Deep Sea Mining** – It is the process of retrieving mineral deposits from the ocean floor, hundreds or even thousands of meters below its surface (at depths ***greater than 200 meters***).
- **Targeted Minerals** – Like copper, cobalt, nickel, aluminium, manganese, zinc, silver, gold and rare earth elements are extracted from rocks called ***"polymetallic nodules".***
- **Key Mining Environments**
  - **Polymetallic Nodules** – Scattered across abyssal plains.
  - **Cobalt-rich crusts** – Found on seamounts.
  - **Hydrothermal vents** – Biologically rich but fragile ecosystems.

• **Abyssal plains -** The huge flat bottoms of the deep ocean. Covered by fine-grained sediment like clay and silt, abyssal plains are also peppered with "abyssal hills" and underwater mountains known as seamounts.
• **Seamounts-**A Mountain, usually formed of volcanoes, rising from the seafloor but not reaching above the surface of the water.



- **Current Status –** Despite decades of interest, ***no country or company*** has successfully launched sustained commercial deep-sea mining.
- Attempts by firms such as Nautilus Minerals (Papua New Guinea project) and Loke Marine Minerals collapsed financially, highlighting the high costs and risks involved.
- **Global Governance –** *International Seabed Authority (ISA)* regulates mining in international waters under UNCLOS.
- **Benefits –** Deep-sea mining minerals are essential for the green transition (renewables, batteries, smartphones).
- **Threat –** Research suggests that it could cause irreversible species loss and ecosystem degradation lasting generations.
- **India's Role –** India launched the Deep Ocean Mission (2021) to explore and develop technologies for sustainable ocean resource use, with a budget of Rs.4,077 crore over 5 years.

To know about Samudrayaan Mission, Click here

Quick Fact

Key findings of the study
• A large-scale test in the ***Clarion–Clipperton Zone (CCZ) of the Pacific Ocean*** recovered over 3,000 tonnes of nodules at a depth of 4,280 m. • The CCZ spans 6 million sq km and may hold ***21 billion tonnes of nodules***, making it the prime target for mining companies. • **Methodology –** Uses a *Before-After-Control-Impact design* over two years, comparing biodiversity before and after mining. • They found natural declines even before mining, but mining ***accelerated losses dramatically***. **Impact on Marine Life** • 37% decline in **macrofaunal density** (large invertebrates like worms, crustaceans, molluscs, annelid). • 32% reduction in **species richness**, showing significant biodiversity loss. • Researchers documented 788 species from 4,350 specimens, highlighting the immense diversity at risk. • Natural declines in species were already observed **even before mining** began (Nov 2020–Sept 2022).

References

1. The Hindu | Commercial deep-sea mining is killing marine life
2. Down to Earth | Commercial deep-sea mining will increase risk to blue whales, dolphins
3. DSMC | Deep Sea Mining

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