# Microplastics in Deep Oceans



## Why in News

Recently, researchers have observed that **deep sea hotspots of biodiversity** are also **likely to be microplastic hotspots.**

- Although microplastics are known to spread on the global seafloor, the processes that control their dispersal and concentration in the deep sea remain largely unknown.
- The researchers have studied the **spatial distribution and ultimate settling position of the microplastics** and its **effects on the biodiversity hotspots** in the deep oceans.

    There are above-ground biodiversity hotspots like the tropical rain forests, alpine tundra, etc. Likewise, there are landforms beneath the sea that provide rich marine diversity which include **Coral reefs**, Sea mounts, etc.

### Microplastics

- Microplastics are small plastic pieces of **less than five millimeters** in size.
- It includes microbeads (solid plastic particles of less than one millimeter in their largest dimension) that are used in cosmetics and personal care products, industrial scrubbers which are used for aggressive blast cleaning, microfibers used in textiles and virgin resin pellets used in plastic manufacturing processes.
- Apart from cosmetics and personal care products, most of the microplastics result from the **breakdown of larger pieces of plastic** that were not recycled and broke up due to exposure to the sun or physical wear.
- Microplastics damage aquatic creatures including turtles and birds. It blocks digestive tracts, and alters feeding behavior. Subsequently, it reduces the growth and reproductive output in marine animals.

### Deep Sea

The deep sea or deep layer is the **lowest layer in the ocean,** existing below the thermocline and above the seabed, **at a depth of 1000 fathoms or more.**

- Fathom is a unit of length **equal to six feet** (1.8 metres).
- A thermocline is a thin but distinct layer in a large body of fluid in which temperature changes more rapidly with depth than it does in the layers above or below.
- In the ocean, the thermocline **divides the upper mixed layer from the calm deep water below.**

## Key Findings

- **Role of Thermohaline Circulations:**
  It has been observed that **thermohaline-driven circulations** can **control the distribution of microplastics** by creating **hotspots of accumulation,** analogous to current's role in depositing seafloor sediments.
  - The ocean currents are usually driven by the winds in the upper 100 meters of the ocean's surface. However, ocean currents also flow thousands of meters below the surface.
  - The ocean currents may be **classified based on their depth** as
    - **Surface Currents :** The surface currents constitute about 10 % of all the water in the ocean, these waters are the upper 400 m of the ocean.
    - **Deep Ocean Currents:** These currents make up the other 90 % of the ocean water. These currents are driven by **differences in the water's density,** which is controlled by **temperature (thermo) and salinity (haline).** This process is known as **thermohaline circulation.**
  - In the Earth's polar regions ocean water gets very cold, forming sea ice. As a consequence the surrounding seawater gets saltier, because when sea ice forms, the salt is left behind.
  - As the seawater gets saltier, its density increases, and it starts to sink. Surface water is pulled in to replace the sinking water, which in turn eventually becomes cold and salty enough to sink. This initiates the deep-ocean currents driving the global conveyor belt.
- **Vulnerability of Benthos:**
  Further, these thermohaline currents **supply oxygen and nutrients** to deep-sea **benthos,** so deepsea biodiversity hotspots are also likely to be microplastic hotspots.
    Benthos is the community of organisms that live on, in, or near the seabed, river, lake, or stream bottom, also known as the benthic zone.

## Way Forward

- There is a need to prioritise the **reduction of single-use plastic** such as multi-layer packaging, bread bags, food wrap, and protective packaging which are major and dangerous sources for plastic pollution.
- The **economical support** including tax rebates, research and development funds, technology incubation, public-private partnerships and support to projects that recycle single-use items and turn waste into a resource can be enforced.
- Also, the **expansion of the use of biodegradable plastics** or even edible plastics made from various materials such as bagasse (the residue after extracting juice from sugarcane), corn starch, and grain flour should be encouraged.