Ocean Darkening

Mains Syllabus: GS I - Important Geophysical phenomena such as earthquakes, Tsunami, Volcanic activity, cyclone etc., geographical features and their location-changes in critical geographical features (including water-bodies and ice-caps) and in flora and fauna and the effects of such changes.

Why in the News?

Over 21% of the world's oceans have darkened significantly in the last two decades.

What are the causes of Ocean darkening?

Ocean darkening refers to the reduction in water clarity that limits how far sunlight can penetrate into the ocean.

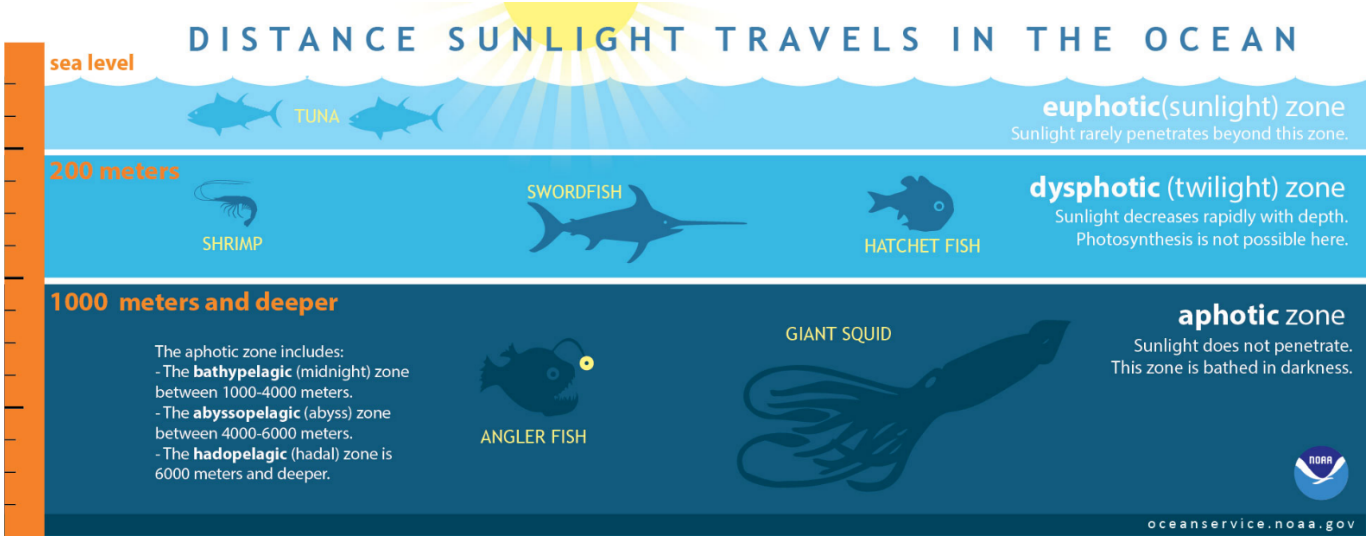
Status of Ocean Darkening
• 21% of ocean area darkened, totalling over 75 million square kilometres • 9% of the ocean saw photic zones shrink by over 50 metres • 2.6% saw declines of more than 100 metres. • While 10% of the ocean became lighter, the darkening trend dominates • Geographically, some of the most significant changes were observed in the Arctic and Antarctic regions, and in areas influenced by the Gulf Stream.

- **Heavy Rainfall** – It causes high sedimentation run into ocean and reduces the transparency and increases the opaqueness along the coastal waters.
- **Land Use Changes** – Deforestation, urbanization along the coastal areas can significantly contribute to ocean darkening by increasing the runoff of sediments, nutrients, and organic matter into the ocean.
- **Algal Bloom** – Nutrient run off from agricultural field ,industrial effluents through river and drainage discharge from cities causes algal bloom along the coastal areas.
- **Rising Sea Surface Temperatures** - Warming oceans affect the distribution and productivity of marine organisms, including phytoplankton, which can influence water clarity.
- **Altered Ocean Circulation** - Changes in global ocean currents can redistribute nutrients and organic matter, impacting the concentration of particles that scatter or absorb light.

What are the impacts of ocean darkening?

- **Shrinkage of Photic Zone** – Darkening of ocean affects the penetration of light into the photic zone and reduces it's width.

  The photic zone in the ocean is the upper layer where sunlight penetrates, which typically extends to about 200 meters (656 feet) below the surface, though the exact depth can vary depending on water clarity and other factors.



- **Threatens Marine biodiversity** – The sunlit upper layer is where the photosynthesis happens and supports over 90% of marine life and the darkening of ocean weakens the ocean's ability to support life.
- **Disruption in Marine Food Web** - If the photic zone is reducing by around 50m in large swathes of the ocean, animals that need light will be forced closer to the surface where they will have to compete for food and the other resources they need.
- **Planetary Impact** – Photic zone underpins key planetary processes such as oxygen production and carbon cycling.
- Hence the shrinkage of this zone will have impact at planetary level and disrupts the role of ocean regulating climate, and producing oxygen.

What needs to be done?

- Protecting the marine ecosystem along the coast and in the open waters is essential for the survival of entire planetary ecosystem.
- Land use changes near the coastal land needs to be regulated focusing on the marine ecosystem.
- Coastal zone regulations can be updated to include the changes in optical properties of coastal waters.
- International collaboration is essential for protecting marine ecosystem in the open waters.

References

Times of India | Ocean Darkening

