Geography · GS - I

How do ocean currents and water masses differ in their impacts on marine life and coastal environment? Give suitable examples.

EXAM YEAR	PAPER	SUBJECT
2019	GS - I	Geography

MARKS	WORD LIMIT
15	~250 words

Answer Hint

Ocean currents; water masses; temperature and salinity; nutrient circulation; marine productivity; fisheries; coastal climate; upwelling; coral ecosystems; oxygen distribution; coastal hazards

Model Answer

Introduction

Ocean currents are large-scale movements of seawater, driven by winds, density differences, Earth's rotation and other forces. Water masses are large bodies of water with relatively distinctive temperature and salinity characteristics formed under particular conditions. Both influence marine ecosystems, but currents primarily redistribute water, heat and nutrients, while water masses influence the physical and chemical environment in which marine life exists.

Impacts of Ocean Currents

- **Marine productivity:** Cold currents and associated upwelling bring nutrient-rich deep water to the surface. The Humboldt Current supports productive fisheries off Peru and Chile.
- **Climate regulation:** Warm currents transport heat towards higher latitudes, moderating coastal climates. The Gulf Stream influences western Europe.
- **Species distribution:** Currents transport larvae, plankton and nutrients, influencing migration and marine food webs.

- **Coastal hazards:** Current patterns can influence fog, sediment movement and the distribution of pollutants.

Impacts of Water Masses

- **Temperature and salinity:** These properties determine density, stratification and habitat suitability for marine organisms.
- **Oxygen availability:** Water masses with limited ventilation can contain low dissolved oxygen, restricting marine life.
- **Nutrient distribution:** Deep water masses store nutrients that may reach surface waters through upwelling and mixing.
- **Coral ecosystems:** Reef organisms generally require suitable temperature and salinity conditions; unusual changes can cause stress and bleaching.

Key Difference

Currents describe movement, whereas water masses describe bodies of water with characteristic properties. Currents transport and mix water masses, and the properties of those masses influence the effects of circulation.

Conclusion

Ocean currents and water masses jointly regulate marine biodiversity, fisheries and coastal environments. Understanding their interaction is essential for fisheries management, climate prediction and the conservation of marine ecosystems.

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