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Q14

What are the forces that influence ocean currents? Describe their role in fishing industry of the world.

UPSC Civil Services Mains 2022 · GS I · 15 marks · Natural Resources and Industries

Distribution of key natural resources across the world (including South Asia and the Indian sub-continent); factors responsible for the location of primary, secondary, and tertiary sector industries in various parts of the world (including India).

Core demand of the question

- What are the forces that influence ocean currents? Describe their role in the fishing industry of the world
- Link planetary winds, Coriolis, density, and coasts to upwelling and the great fisheries
- Keep a 15-mark length

Revision summary

Surface currents are driven mainly by winds, turned by Coriolis, and steered by coasts.

Density differences drive slower deep thermohaline flow; monsoons reverse the north Indian Ocean.

Upwelling eastern-boundary currents feed the great anchovy and sardine industries.

Warm-cold mixing off Japan and the **Grand Banks** feeds rich mixed fisheries.

El Niño and overfishing show that current wealth is not a guaranteed harvest.

Introduction

Ocean currents are slow rivers of seawater driven by wind, earth rotation, density, and the shape of basins. Where they lift nutrients or mix warm and cold water, the world's great fisheries gather.

Body

Forces that drive currents

- Prevailing winds, especially the trades and westerlies, drag the surface and set gyres in each ocean basin.
- The **Coriolis force** turns moving water to the right in the north and to the left in the south, which closes those gyres and sets western boundary currents such as the Gulf Stream and Kuroshio.
- Temperature and salinity make density differences, so thermohaline flow moves deep water in a slower global conveyor.
- Continents, narrow straits, and the equator deflect and pile water, which creates coastal currents and equatorial counter-currents.
- Seasonal monsoon winds reverse surface flow in the north Indian Ocean, which is why the **Somali current** can flip with the year.

- Tides and storms matter locally; they do not replace the planetary wind-and-density engine.

How currents feed fisheries

- Wind-driven upwelling along eastern ocean boundaries lifts nitrate-rich water, which grows plankton and then small pelagic fish.
- The Humboldt (Peru), Benguela, Canary, and California systems are the classic upwelling fisheries of anchovy, sardine, and related stocks.
- Mixing of warm and cold currents, as where the Kuroshio meets the Oyashio off Japan, or on the **Grand Banks** where the Gulf Stream system meets Labrador water, creates fog, plankton blooms, and dense demersal fisheries.
- Monsoon upwelling off Somalia and the south-west Indian coast supports seasonal pelagic catches in the Arabian Sea.
- Warm currents also carry tuna and other migratory species along predictable highways that industrial fleets follow.

Industry, risk, and climate

- The world's largest industrial catches historically clustered on these current edges, not on still tropical lagoons.
- El Niño can shut Peru's upwelling, crash anchovy, and ripple fishmeal and food prices, which shows that the fishery is a climate-current couple.
- Overfishing, not the current, now limits many stocks; the current only sets where biology could be rich.
- For India, the monsoon current and coastal upwelling matter for oil sardine and related west-coast fisheries, while the open Bay is a different current regime.

Flow diagram

Winds Coriolis density -> Gyres upwelling
Gyres upwelling -> Humboldt Benguela Canary
Gyres upwelling -> Kuroshio Oyashio Grand Banks
Humboldt Benguela Canary -> Plankton pelagic fish
Kuroshio Oyashio Grand Banks -> Plankton pelagic fish

Conclusion

Winds, Coriolis, density, and basin shape make ocean currents. Their role in fishing is to create upwelling and mixing zones where plankton and fish concentrate; climate swings and overfishing then decide whether that gift is landed or lost.

Facts & figures

Coriolis force

Earth-rotation effect that turns currents and helps form subtropical gyres.

Humboldt Current

Peru-Chile upwelling system, historically among the world's richest anchovy fisheries.

Benguela Current

South-west African upwelling fishery corridor.

Kuroshio and Oyashio

Warm and cold western-Pacific currents whose meeting supports Japanese fisheries.

Grand Banks

North-west Atlantic mixing zone, long a cod fishery, later collapsed by overfishing.

Somali Current

Monsoon-reversed current with seasonal upwelling in the Arabian Sea.

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