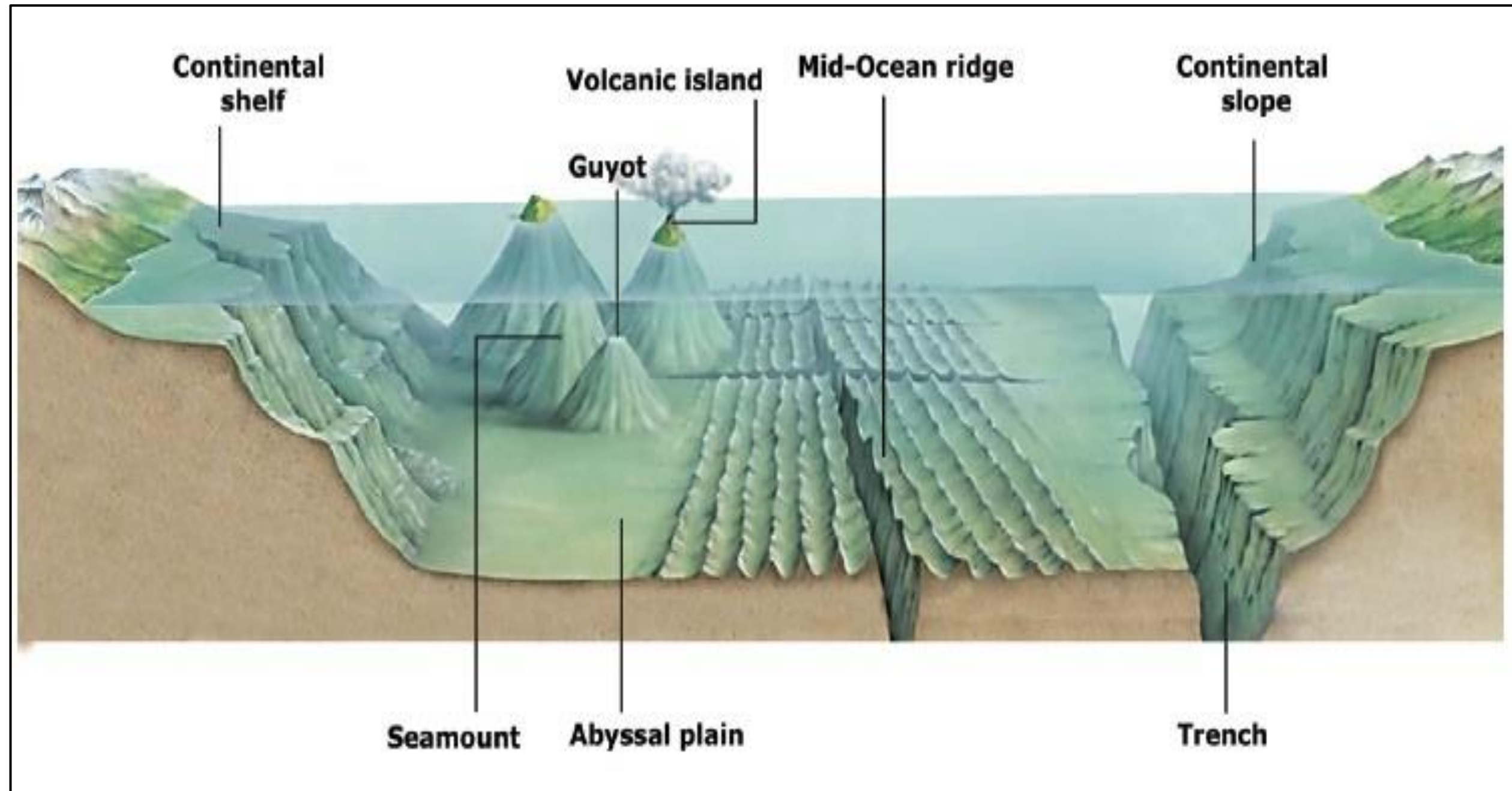




# Indian Ocean: Bottom Relief

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# Ocean Bottom Relief



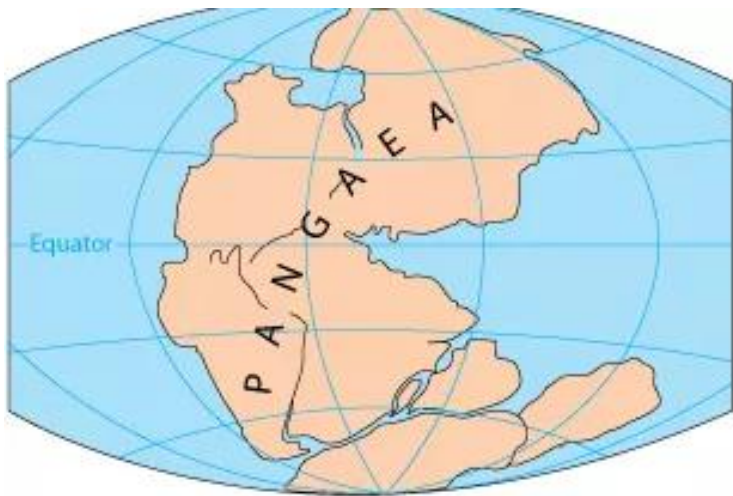
# Introduction

- Indian Ocean covers approximately one-fifth of the total ocean area of the world. It is the smallest, geologically youngest, and physically most complex of the world's three major oceans.
- It stretches for more than 6,200 miles (10,000 km) between the southern tips of Africa and Australia and, without its marginal seas, has an area of about 28,360,000 square miles (73,440,000 square km). The Indian Ocean's average depth is 12,990 feet (3,960 metres), and its deepest point, in the Sunda Deep of the Java Trench off the southern coast of the island of Java (Indonesia), is 24,442 feet (7,450 metres).
- The Indian Ocean is bounded by Iran, Pakistan, India, and Bangladesh to the north; the Malay Peninsula, the Sunda Islands of Indonesia, and Australia to the east; Antarctica to the south; and Africa and the Arabian Peninsula to the west. In the southwest it joins the Atlantic Ocean south of the southern tip of Africa, and to the east and southeast its waters mingle with those of the Pacific Ocean.

## ORIGIN

The origin and evolution of the Indian Ocean is the most complicated of the three major oceans. Its formation is a consequence of the breakup, which began about 180 million years ago, of the southern supercontinent [Gondwana](#) (or Gondwanaland); by the movement to the northeast of the Indian subcontinent (beginning about 125 million years ago), which began colliding with Eurasia about 50 million years ago; and by the western movement of Africa and separation of Australia from Antarctica some 53 million years ago. By 36 million years ago, the Indian Ocean had taken on its present configuration. Although it first opened some 140 million years ago, almost all the Indian Ocean basin is less than 80 million years old.

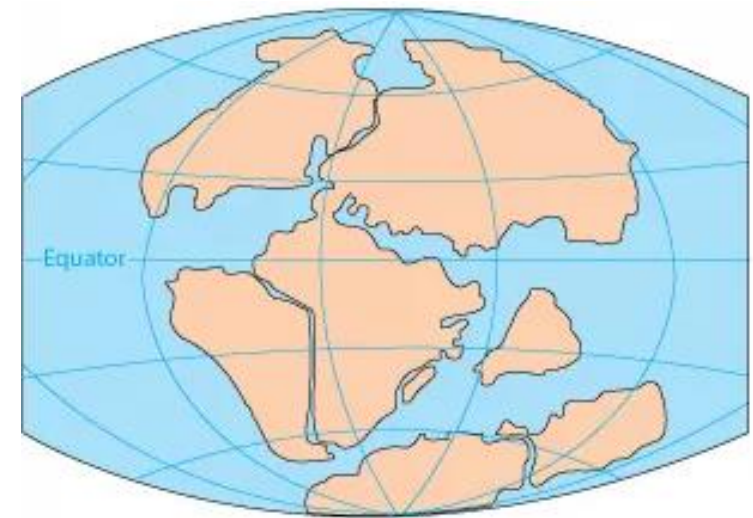




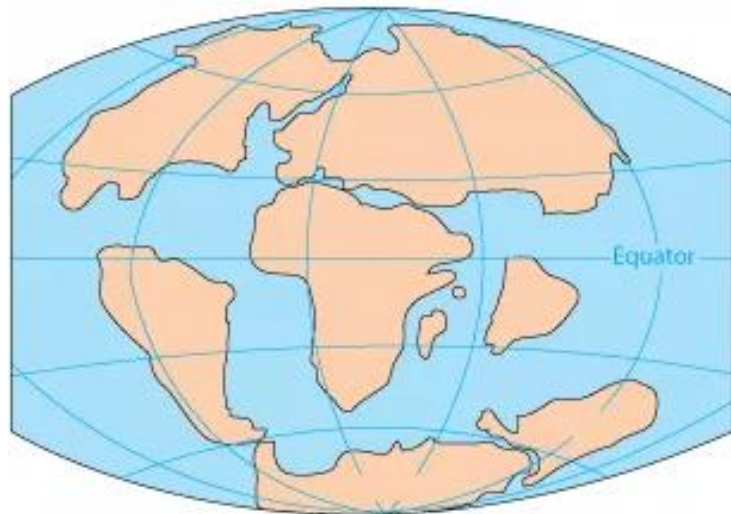
**PERMIAN**  
250 million years ago



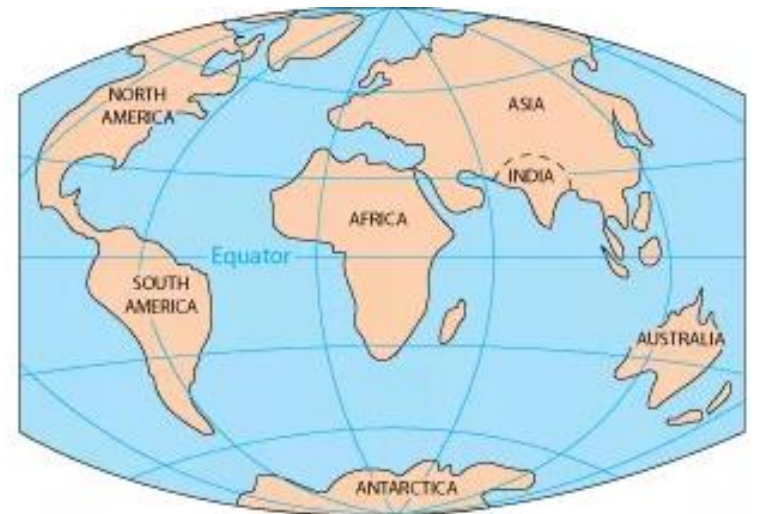
**TRIASSIC**  
200 million years ago



**JURASSIC**  
145 million years ago

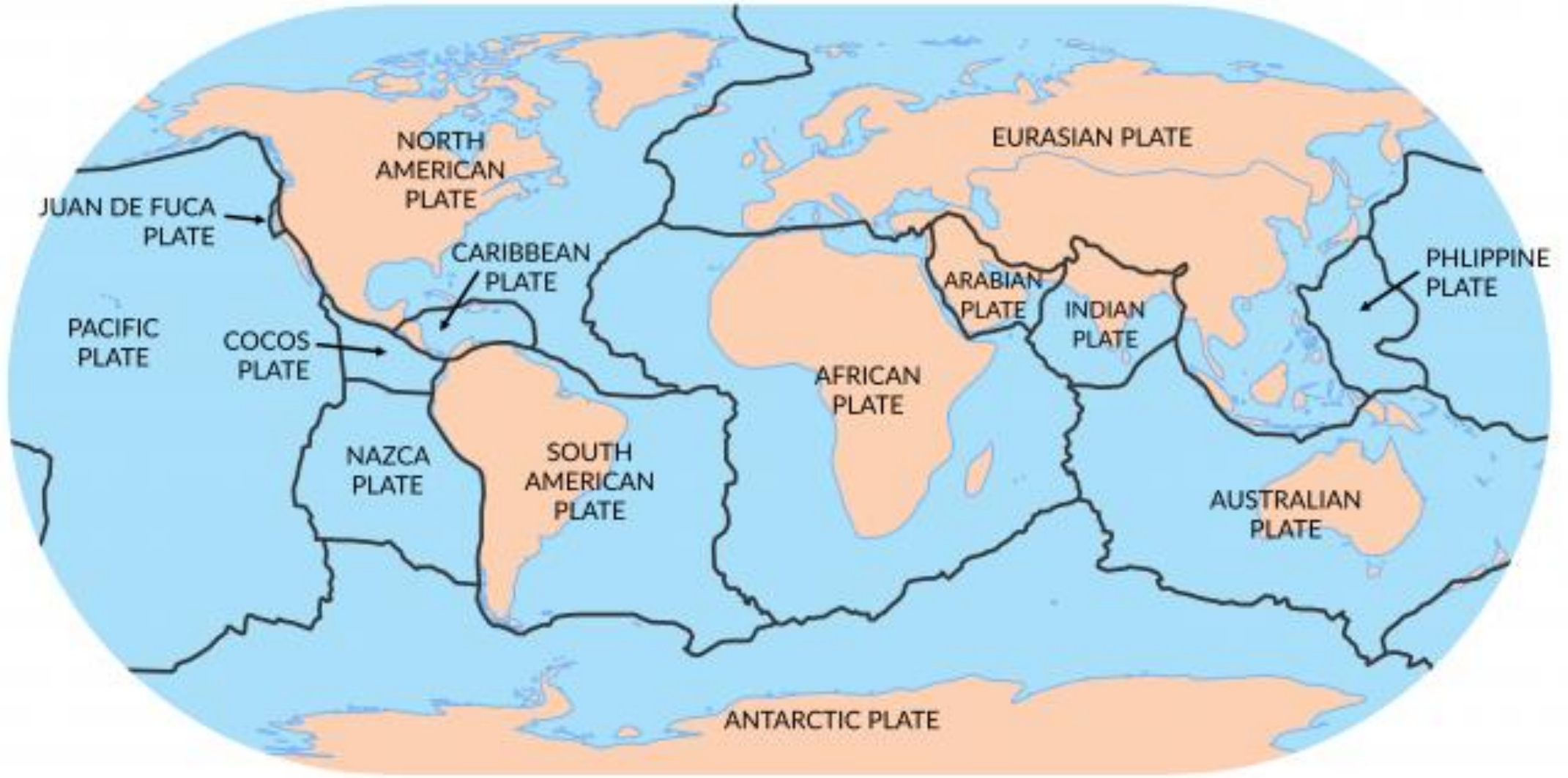


**CRETACEOUS**  
65 million years ago



**PRESENT DAY**

# Plate Tectonic Boundaries



# Bottom Relief or Submarine Features

## **Continental Shelves, Rise and slope**

The continental shelf extends to an average width of about 75 miles (120 km) in the Indian Ocean, with its widest points (190 miles [300 km]) off Mumbai (Bombay) on the western coast of India and off northwestern Australia.

There is wide range of variation in the continental shelves of the Indian Ocean. Quite extensive shelves are found along the margins of Arabian Sea and Bay of Bengal. Similarly, extensive shelves are observed along the eastern coast of Africa and around Madagascar which is itself located on the continental shelves. On an average, the continental shelves are very wide (640 km) in the west whereas these are narrow (160 km) along the coast of Java and Sumatra. These become further narrow along the northern coast of Antarctica.



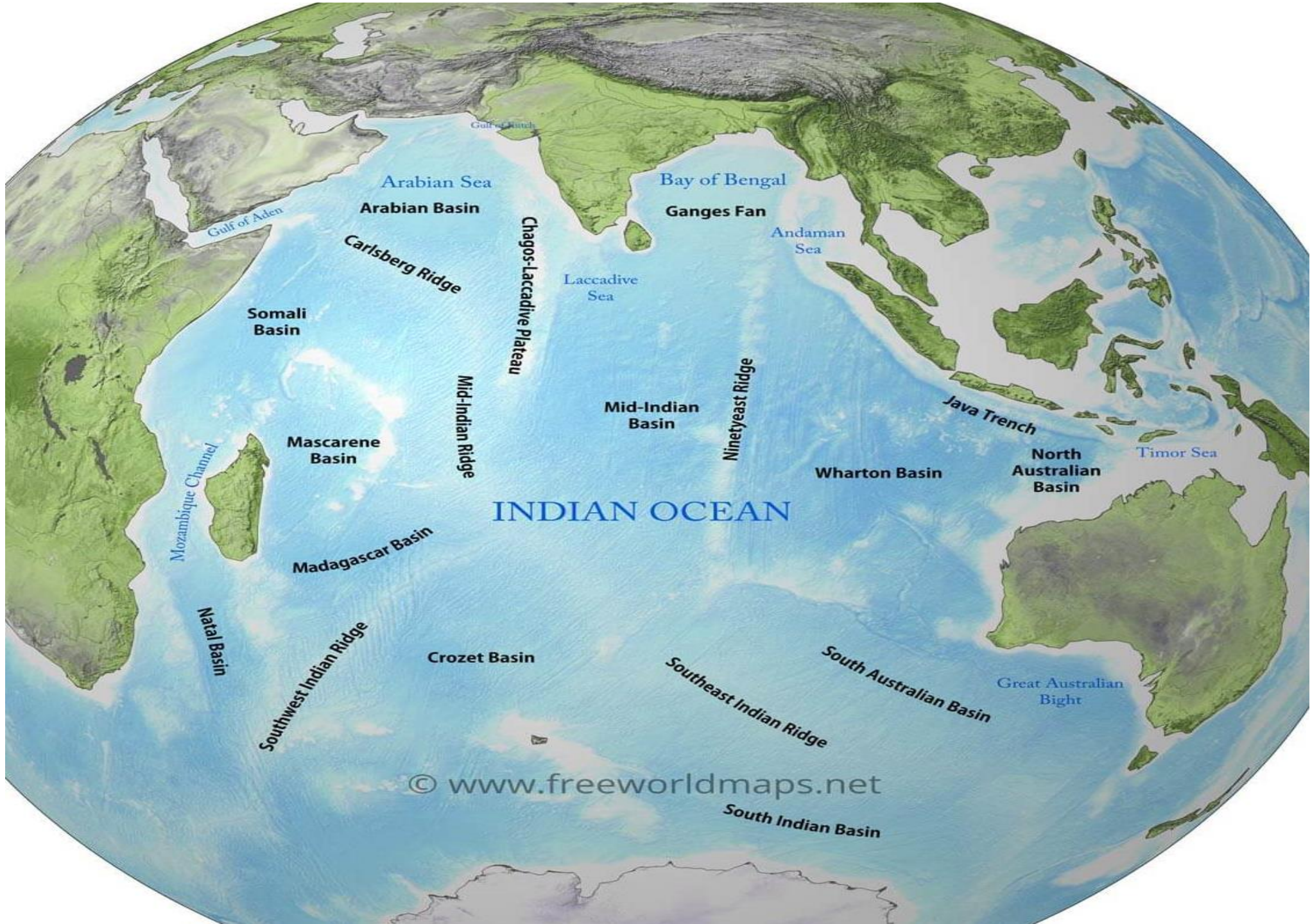
## Mid Oceanic Ridges

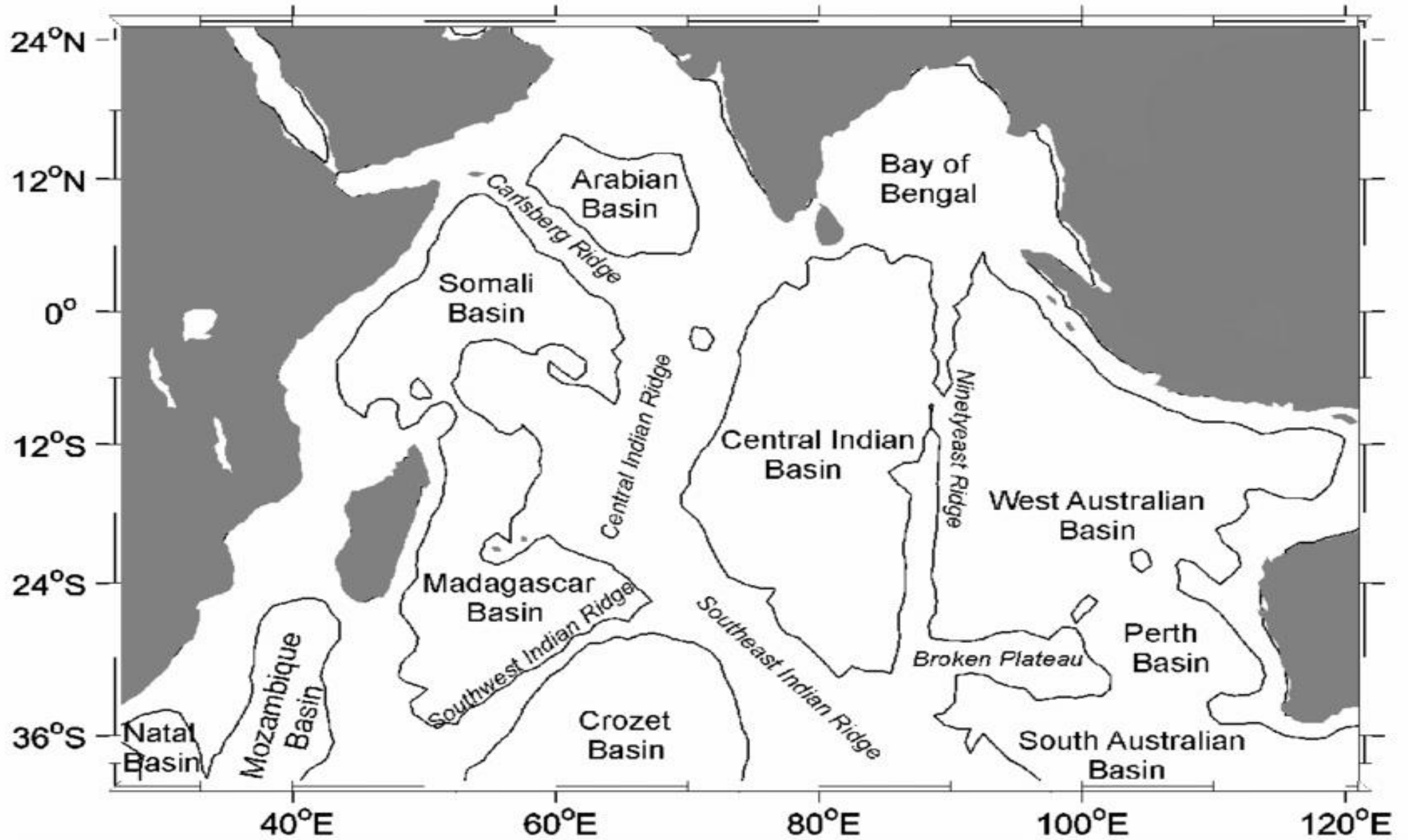
- The oceanic ridges consist of a rugged, seismically active mountain chain that is part of the worldwide oceanic ridge system and still contains centres of seafloor spreading in several places.
- The ridges form an inverted Y on the ocean floor, starting in the upper northwest with the **Carlsberg Ridge** in the Arabian Sea.
- Then they turn due south past the Chagos-Laccadive Plateau, and become the **Mid-Indian (or Central Indian) Ridge**.
- Southeast of Madagascar the ridge branches: (a) **the Southwest Indian Ridge** continues to the southwest until it merges into the Atlantic-Indian Ridge south of Africa, (b) and the **Southeast Indian Ridge** trends to the east until it joins the Pacific-Antarctic Ridge south of Tasmania.
- Most striking is the aseismic (virtually earthquake-free) **Ninety - east Ridge**, which is the longest and straightest in the world ocean.

## Ocean Basins

Ocean basins are characterized by smooth, flat plains of thick sediment with abyssal hills (i.e., features that are less than 3,300 feet high) at the bottom flanks of the oceanic ridges. The Indian Ocean's complex ridge [topography](#) led to the formation of many basins that range in width from 200 to 5,600 miles (320 to 9,000 km). From roughly north to south they include the Arabian, Somali, Mascarene, [Madagascar](#), [Mozambique](#), Agulhas, and Crozet basins in the west and the Central Indian (the largest), Wharton, and [South Australia](#) basins in the east.







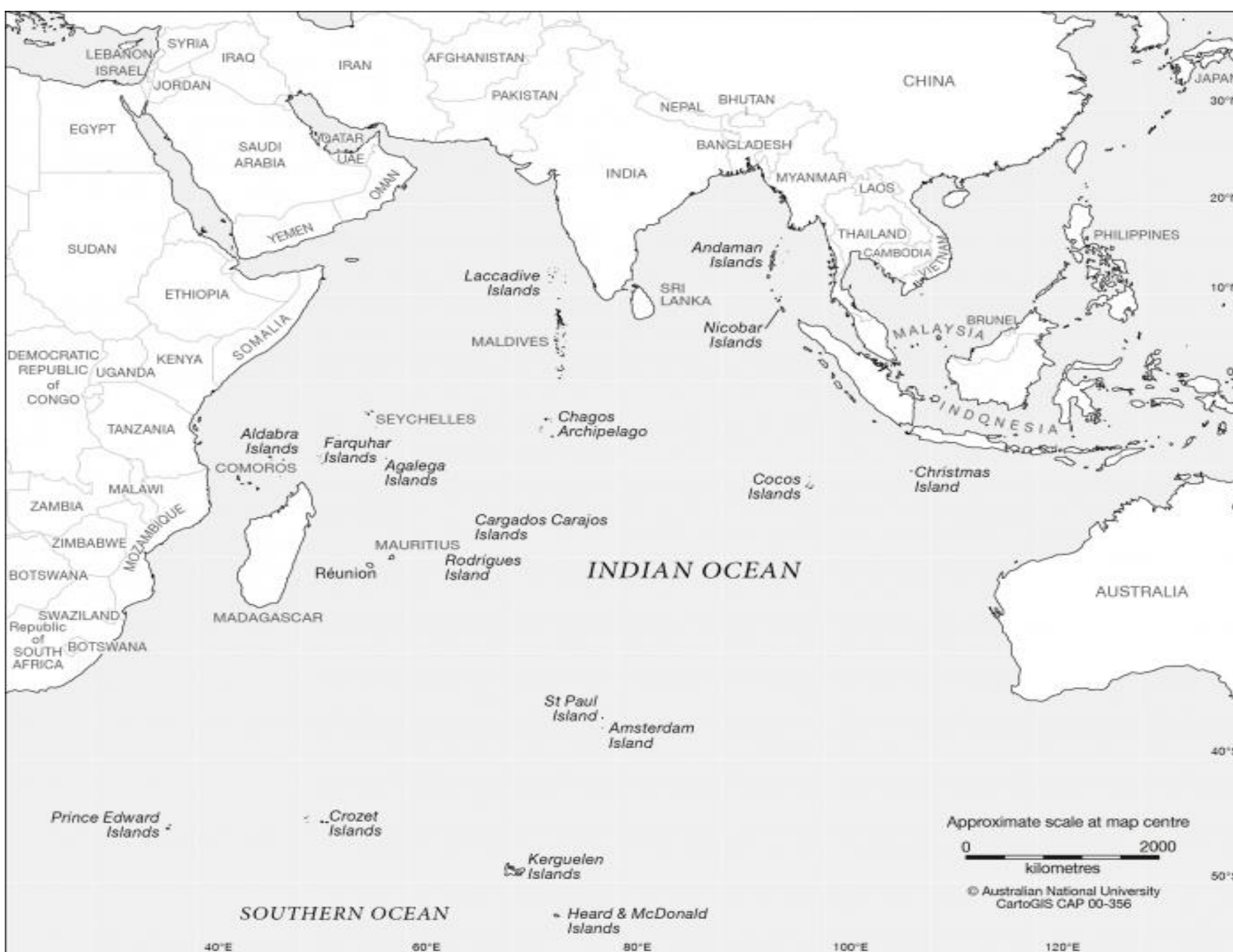
## **Ocean Deeps/Trenches**

The Indian Ocean has the fewest trenches of any of the world's oceans. The narrow (50 miles [80 km]), volcanic, and seismically active Java Trench is the world's second longest, stretching more than 2,800 miles (4,500 km) from southwest of Java and continuing northward as the Sunda Trench past Sumatra, with an extension along the Andaman and Nicobar Islands. The portion of that system adjacent to Sumatra was the centre of a massive undersea earthquake in 2004 (magnitude 9.1) that affected some 600 miles (1,000 km) of the associated fault zone. A series of devastating tsunamis generated by the quake swamped coastal towns, particularly in Indonesia, and reached to the northern end of the Bay of Bengal and as far as the Indian Ocean's western shores.

## **Islands**

The Indian Ocean has relatively few islands compared with the Atlantic and Pacific oceans. Madagascar—the fourth largest island in the world—the Maldives, Seychelles, Socotra, and Sri Lanka are continental fragments. The other islands—including Christmas, Cocos, Farquhar, Prince Edward, Saint-Paul, and Amsterdam; the Amirante, Andaman and Nicobar, Chagos, Crozet, Kerguelen, and Sunda groups; and Comoros, Lakshadweep (Laccadive, Minicoy, and Amindivi islands), Mauritius, and Réunion—are of volcanic origin.





**Madagascar and Sri Lanka** are the largest islands of the ocean and are structurally parts of the continents. **The Laccadive, Maldives and Chagos islands** rise from the central part of the Indian ridge and are low coral islands. The islands, which are extended from the Seychelles to Mauritius, are the westward extension of the Indian ridge. **The Andaman islands, the Nicobar islands, the Seychelles and Kerguelen islands** are exposed tops of submerged ridges. **Mauritius and St Paul's** are volcanic oceanic islands. The tropical part of the Indian Ocean contains coral reefs.



# Indian Ocean

