



Underwater Structures in the Indian Ocean

For Prelims: [Deep Sea Oceans](#), Relief, Structures and Types, [Mauryan Empire](#).

For Mains: Different Underwater Structures/Relief on the Ocean Floor

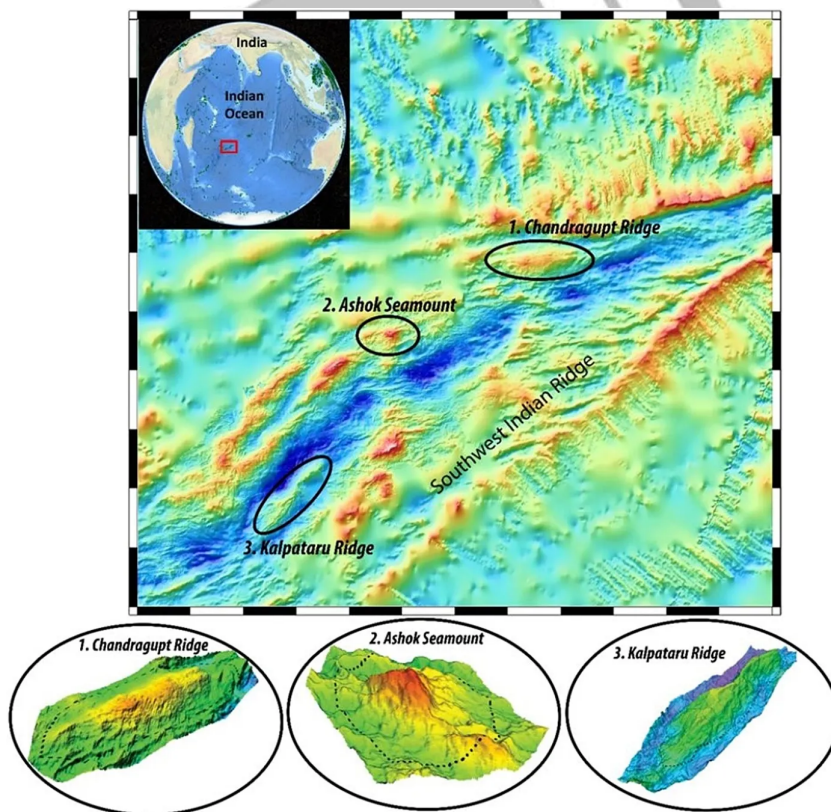
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Why in News?

Recently, three **underwater structures** in the [Indian Ocean](#) were named as [Ashoka](#), [Chandragupt](#), and [Kalpataru](#), which reflect India's growing influence in marine science and its commitment to exploring and understanding the Indian Ocean.

- This naming was proposed by India and approved by the [International Hydrographic Organisation \(IHO\)](#) and **UNESCO's Intergovernmental Oceanographic Commission (IOC)**.

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International Hydrographic Organisation (IHO)

- It is an intergovernmental **consultative and technical body** established in **1921** to enhance **navigation safety and protect the marine environment**.
- India is a member of the IHO.
- **Objectives:**
 - **Coordinating the activities** of national hydrographic offices.
 - Achieving the highest possible uniformity in nautical charts and documents.
 - Promoting the **adoption of reliable and efficient methods** for conducting and utilising hydrographic surveys.
 - **Advancing the sciences of hydrography** and the techniques used in descriptive oceanography.

UNESCO's Intergovernmental Oceanographic Commission (IOC)

- It promotes **international cooperation in marine sciences**, capacity development, ocean observations and services, ocean science, tsunami warning, and ocean literacy.
- It has 150 member states, and **India has been a member since 1946**.
- The IOC's work contributes to UNESCO's mission to promote the advancement of science and its applications for economic and social progress.
- The IOC is coordinating the **United Nations Decade of Ocean Science for Sustainable Development 2021-2030**, also known as the "**Ocean Decade**."

What are the Key Facts About the Underwater Structures?

- **Background and Significance:** The discoveries of these underwater structures are part of the **Indian Southern Ocean Research Programme**, initiated in 2004, with the [National Centre for Polar and Ocean Research \(NCPOR\)](#) as the nodal agency.
 - The program aims to study various aspects including **bio-geochemistry, biodiversity, and hydrodynamics**.
- **Total Structures:**
 - **Seven structures, including the recently added ones** in the Indian Ocean, are now named primarily after Indian scientists or based on names proposed by India.
 - **Previously Named Structures:**
 - **Raman Ridge** (accepted in 1992): It was discovered in 1951 by a US oil vessel. It was named after Physicist and Nobel Laureate [Sir CV Raman](#).
 - **Panikkar Seamount** (accepted in 1993): It was discovered in 1992 by India research vessel [Sagar Kanya](#). It is named after NK Panikkar, a renowned oceanographer.
 - **Sagar Kanya Seamount** (accepted in 1991): For its successful 22nd cruise in 1986 leading to its discovery, a seamount was named after the research vessel Sagar Kanya itself.
 - **DN Wadia Guyot:** It was named after geologist DN Wadia in 1993 when an underwater **volcanic mountain (guyot)**, was discovered in 1992 by Sagar Kanya.
 - **Recently Named Structures:**
 - **Ashoka Seamount:** It was discovered in 2012. It is in an oval-shaped structure spanning approximately **180 sq km** and was identified using the **Russian vessel Akademik Nikolay Strakhov**.
 - **Kalpataru Ridge:** It was discovered in 2012. This elongated ridge covers an area of 430 sq km and may play a critical role in supporting marine biodiversity.
 - Experts believe that this ridge **could have provided essential support for marine life** by offering habitat shelter and food sources for various species.
 - **Chandragupt Ridge:** This ridge is an elongated structure covering 675 sq km. It was identified in 2020 by the Indian research vessel **MGS Sagar**.

Who were Ashoka and Chandragupta?

- **Chandragupta Maurya (350-295 BCE):**
 - He was the Emperor of Magadha and the **founder of the Maurya dynasty**, which established a significant empire centred in Magadha.
 - He took advantage of the decline and weakness of the Nandas and overthrew the last ruler of the **Nanda dynasty, Dhanananda** with the help of [Chanakya \(Kautilya\)](#) and crowned himself as the emperor.
 - He gave up his throne and became a disciple of **Jain teacher Bhadrabahu**.
- **Ashoka:** He was the **third king** (after Chandragupta Maurya and Bindusara) of the Mauryan dynasty and ruled around 269 BC.
 - Ashoka's policy of Dhamma and efforts to spread [Buddhism](#) are significant aspects of his rule.
 - He **adopted the titles of Priyadasi and Devanampiya**, which can be seen in his Rock and Pillar edicts.

Note:

- **"Kalpataru"** is a Sanskrit term that translates to "**wish-fulfilling tree.**" In Hindu mythology, it is often associated with a divine tree that grants wishes and desires to those who seek its blessings. The concept symbolises abundance, prosperity, and the fulfillment of dreams.

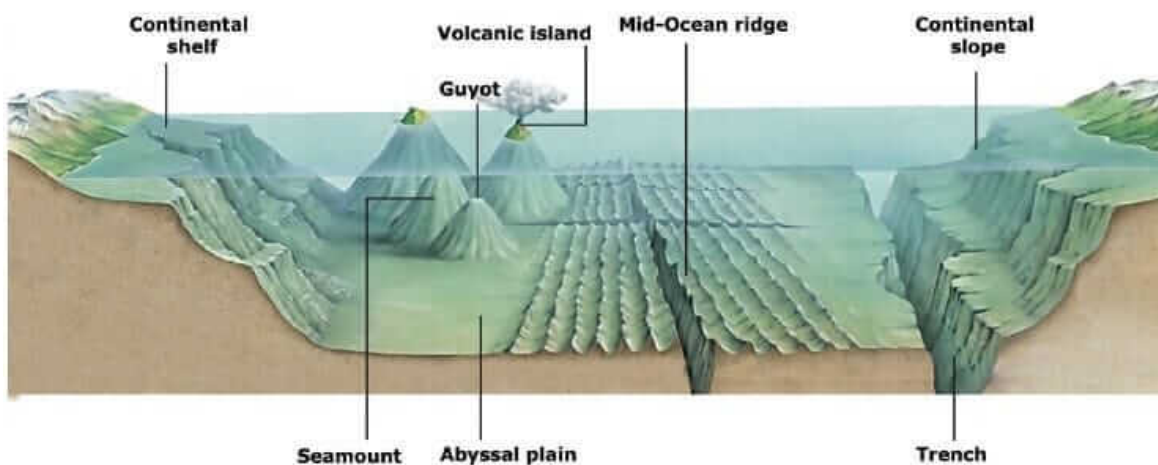
What are the Different Underwater Structures/Relief on the Ocean Floor?

- **About:**
 - **Ocean Floor or Seabed** is the **bottom of the water** that covers more than 70% of the Earth's surface and it includes elements like **Phosphorus, Gold, Silver, Copper, Zinc, and Nickel**.
 - The primary causes of Ocean Relief are interactions between tectonic plates, and erosional, depositional, and volcanic processes.
- **Zones of Ocean Floor:**
 - **Continental Shelf:**
 - The **shallowest and widest** part of the ocean floor.
 - Extends **from the coast to the edge** of the continent, where it drops sharply into the continental slope.
 - Rich in marine life and resources, such as **fish, oil, and gas**.
 - **Continental Slope:**
 - The steep slope that **connects the continental shelf to the abyssal plain**
 - Cut by **deep canyons and valleys** that are formed by underwater landslides and rivers of sediment.
 - Home to some **deep-sea creatures, such as octopuses, squids, and anglerfish**.
 - **Continental Rise:**
 - Made up of thick sequences of continental material that **accumulate between the continental slope and the abyssal plain**.
 - It can rise from processes such as the **downhill movement of sediment**, the settling of particles carried by **underwater currents**, and the slow settling of both non-living and living **particles from above**.
 - **Abyssal Plain:**
 - The **flattest** part of the ocean floor.
 - Covers **most of the ocean basin** and lies between 4,000 and 6,000 meters below sea level.
 - Covered by a **thick layer of fine sediments** that are carried by [ocean currents](#) and settle on the seafloor.
 - Inhabited by some of the most **bizarre and mysterious animals** on Earth, such as giant tube worms, bioluminescent fish, and vampire squids.
- **Oceanic Deeps or Trenches:**

- These areas are the **deepest parts** of the oceans.
- The trenches are relatively **steep sided, narrow basins**. They are some 3-5 km deeper than the surrounding ocean floor.
- They occur at the **bases of continental slopes** and along island arcs and are associated with active volcanoes and strong earthquakes, so are very significant in the study of plate movements.

▪ **Minor Relief Features of Ocean Floor:**

- **Submarine Canyons:** They are significant geological structures found on continental margins, serving as connections between the **upper continental shelf** and the **abyssal plain**.
 - They are deep, narrow valleys featuring vertical sidewalls and steep slopes, similar to land valleys.
- **Mid Oceanic Ridges:** They are found along **diverging plate boundaries** where tectonic plates move apart, and the gap is filled by upwelling magma that solidifies to form new oceanic crust.
 - These ridges consist of two parallel mountain ranges separated by a deep depression. The mountain peaks can reach heights of up to 2,500 meters.
- **Seamounts and Guyots:** **Seamounts** are **undersea mountains** formed by volcanic activity that rise hundreds or thousands of feet from the sea floor, often near plate boundaries. Example the **Emperor seamount**, an extension of the **Hawaiian Islands** in Pacific Ocean
 - **Guyots** are **flat-topped seamounts** that have been submerged as the seafloor gradually sinks away from oceanic ridges.
- **Atoll:** It is a **ring-shaped formation of coral reefs or islands** that encircles a **lagoon**, typically developing seamounts.
 - These structures **consist of low islands in tropical oceans**, with the reef surrounding a central depression that can contain various types of water, including seawater, fresh water, or brackish water.



Drishti Mains Question:

Q. What are the different types of oceanic relief features found on the ocean floor?