

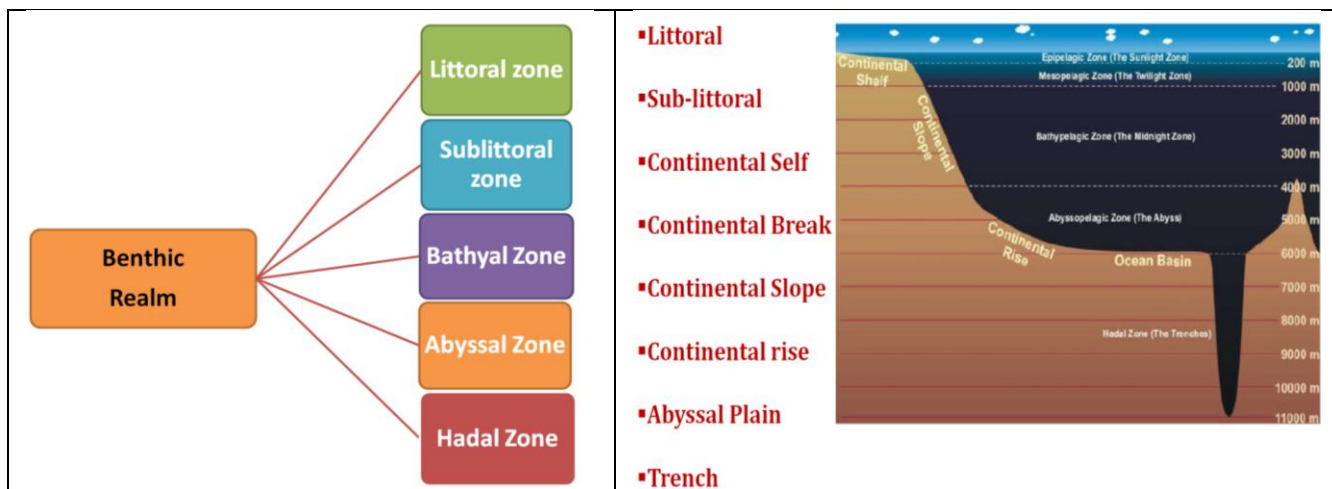
## Classification and definition of fishery zones and fishery resources of world

Almost all natural bodies of water bear fish life, the exceptions being very hot thermal ponds and extremely salt-alkaline lakes such as the Dead Sea and Great Salt Lake. The fishes belong to the most numerous and diversified group among vertebrates. They dominate the water bodies of the world through a variety of morphological, physiological and behavioral adaptations. They have been in existence for more than 450 million years. A total of 24618 species of fishes belonging to 482 families and 4258 genera have so far been described. About 58% of the fish species are marine while 41% are freshwater inhabitants and 1% migrants. In our Indian region alone, there are 2,500 species of which 930 are inhabitants of freshwater and the rest live in the seas. In other words, India harbours 11.5% of the fish fauna so far known in the world. There are over 800 living species of sharks and rays, 30 species of chimaeras and rattfishes, 6 species of lung fishes, 1 species of coelacanth, 36 species of long ray finned bichirs, sturgeons and paddlefishes. The Neopterygii are the rest of the known species of modern fishes. All these fishes inhabit various niches in the aquatic environment. The diversified habitats of fishes include open oceans, deep oceanic trenches, nearshore waters, saline coastal embayments, brackishwaters, estuaries, intermittent streams, tiny desert springs, vernal pools, cold mountain streams, lakes, ponds, etc.

### Structure of the Earth in the marine environment

While about 70% of the surface of the earth is covered by salt water, freshwater covers only about 1% of the earth's surface. By volume, 97% of all water is in the oceans.

**The bottom topography of the marine environment includes continental shelf, continental slope, continental rise and abyssal plains among other features.**



**Intertidal zone:** The intertidal zone (also known as the foreshore) is the area that is exposed to the air at low tide and submerged at high tide, for example, the area between tide marks. This area can include many different types of habitats, including steep rocky cliffs, sandy beaches and vast mudflats.

**Littoral zone:** It refers to the coast of an ocean or sea, or to the banks of a river, lake or estuary. It extends from the high water mark, which is rarely inundated, to shoreline areas that are permanently submerged. It includes the intertidal and sublittoral zones. The littoral zone is bordered by the

supralittoral zone, also known as the "spray zone", and the sublittoral zone, which runs to the edge of the continental shelf.

**Supra littoral zone (Spray zone):** It is the area above the spring tide line that is regularly splashed, but not submerged by ocean water.

**Sublittoral zone:** It is the part of the Earth's surface immediately below the intertidal zone and thus permanently covered with seawater. The sublittoral zone is the part of the ocean extending from the low tide mark to the edge of the continental shelf, with a relatively shallow depth extending to about 200 meters.

**Continental shelf:** The continental shelf is the extended perimeter of each continent and associated coastal plain. The shelf usually ends at a point of decreasing slope (called the shelf break). The continental shelf and the slope are part of the continental margin. The shelf area is commonly subdivided into the inner continental shelf, mid continental shelf, and outer continental shelf, each with their specific geomorphology and marine biology.

**Continental slope:** The sea floor below the break is the continental slope. The continental slope is much steeper than the shelf; the average angle is  $3^\circ$ , but it can be as low as  $1^\circ$  or as high as  $10^\circ$ . The slope is often cut with submarine canyons.

**Continental rise:** It is below the slope and finally merges into the deep ocean floor, the abyssal plain, but landward of the abyssal plains. Its gradient is intermediate between the slope and the shelf, on the order of  $0.5 - 1^\circ$ . Extending as far as 500 km from the slope, it consists of thick sediments deposited by turbidity currents from the shelf and slope. Sediment cascades down the slope and accumulates as a pile of sediment at the base of the slope, called the continental rise.

**Abyssal plain:** Abyssal plains are flat or very gently sloping areas of the deep ocean basin floor. They are among the Earth's flattest and smoothest regions and the least explored. Abyssal plains cover approximately 40% of the ocean floor and reach depths between 2,200 and 5,500 m (7,200 and 18,000 ft). They generally lie between the foot of a continental rise and a mid-oceanic ridge.

**The marine environment can be divided into three zones such as**

- **Pelagic zone**
- **Benthic zone**
- **Demersal zone**

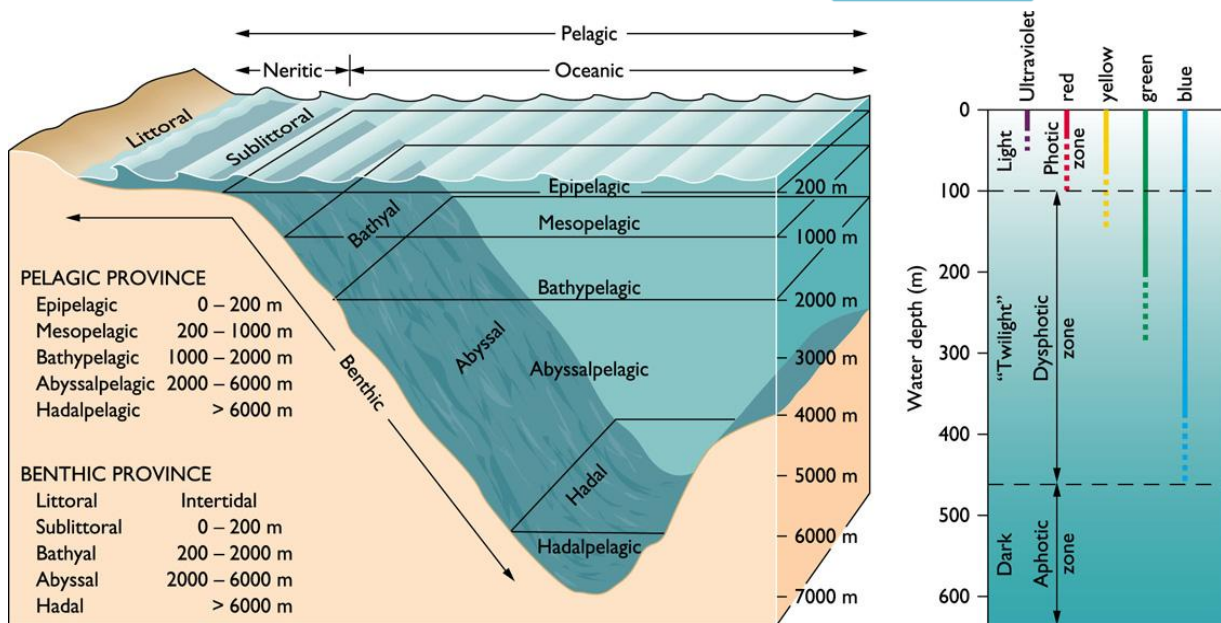
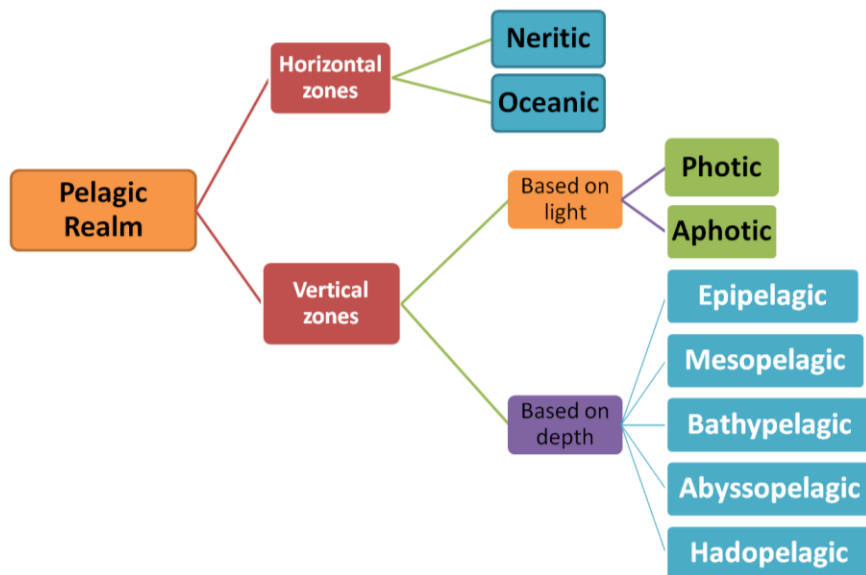
**Pelagic zone:** The Pelagic zone is the ecological region above the benthic, including the water-column up to the surface. Any water in the sea that is not close to the bottom is in the pelagic zone. The word pelagic comes from the Greek pelagos, which means open sea. Fish that live in the pelagic zone are called pelagic fish. Pelagic life decreases with increasing depth. In deep water, the pelagic zone is sometimes called the open-ocean zone and can be contrasted with water that is near the coast or on the continental shelf. However in other contexts, coastal water that is not near the bottom is still said to be in the pelagic zone. Profundal zone is a deep zone of a body of water, such as an ocean or a lake, located

below the range of effective light penetration. This is typically below the Thermocline. It is a part of the aphotic zone.

**Benthic zone:** The benthic zone is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub- surface layers. Marine organisms living in this zone, such as clams and crabs, are called benthos.

**Demersal zone:** The demersal zone is just above the benthic zone. It is the part of the sea or ocean (or deep lake) comprising the water column that is near to (and is significantly affected by) the seabed and the benthos. The demersal zone is just above the benthic zone and forms a layer of the larger profundal zone. Fish that live in the demersal zone are called demersal fish.

**Divisions of Pelagic Zones:** Depending on how deep the sea is, there can be up to five vertical layers in the ocean. From the top down (vertical), they are:



(a) BIOZONES

(b) LIGHT ZONES

**1. Epipelagic:** It is a pelagic zone from the surface (MSL) down to around 200 m (656 ft). It is the illuminated surface zone where there is enough light for photosynthesis. Due to this, plants and animals are largely concentrated in this zone. Nearly all primary food production in the ocean occurs here.

**2. Mesopelagic:** It is a pelagic zone from 200 m down to around 1,000 m (3,280 ft). Although some light penetrates this deep, it is insufficient for photosynthesis. The name stems from Greek, meso meaning middle.

**3. Bathypelagic:** It is a pelagic zone from 1,000 m down to around 4,000 m (13,123 ft). By this depth the ocean is almost entirely dark (with only the occasional thennoluminescent organism, such as lanternfish). The name stems from Greek, baths meaning deep.

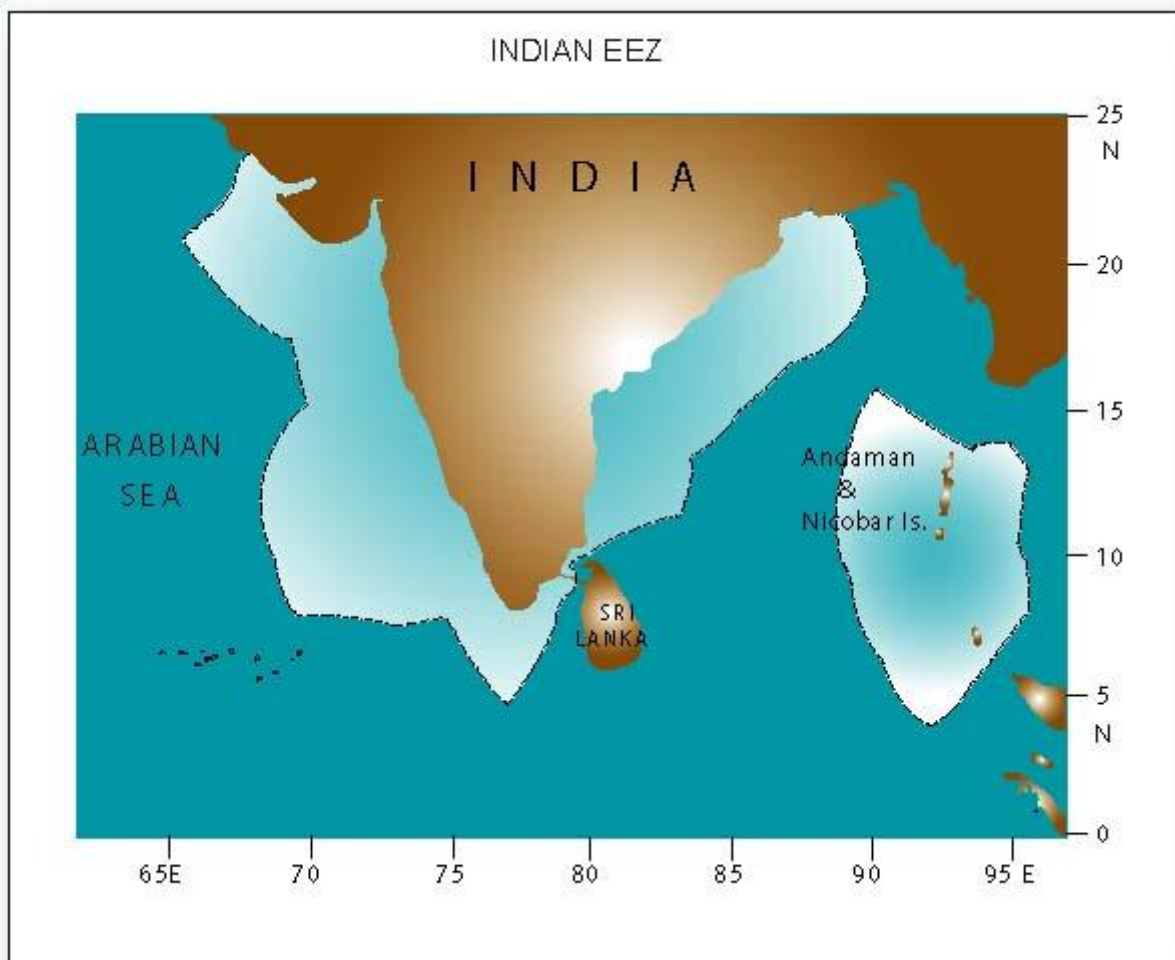
**4. Abyssopelagic:** It is a pelagic zone from 4,000 m down to above the ocean floor. No light whatsoever penetrates to this depth. The name is derived from the Greek, abyss, meaning bottomless.

**5. Hadopelagic:** It is the deep water in ocean trenches. The name is derived from the Greek, Hades, meaning underworld. Some define the hadopelagic as waters below 6,000 m (19,685 ft), whether in a trench or not.

**The marine environment is made into several zones as below for the administrative purposes with a view to utilize and manage the resources in a proper way.**

**Exclusive Economic Zone:** This concept of allotting nations EEZs to give better control of maritime affairs outside territorial limits gained acceptance in the late 20th century and was given binding international recognition by the Third United Nations Convention on the Law of the Sea in 1982. Under the law of the sea, an Exclusive Economic Zone (EEZ) is a seazone over which a state has special rights over the exploration and use of marine resources. EEZ is the area adjacent to a coastal state which encompasses all waters between:

- The seaward boundary of that state
- A line on which each point is 200 nautical miles (370.40 km) from the baseline from which the territorial sea of the coastal state is measured (except. when other international boundaries need to be accommodated) and
- The maritime boundaries agreed between that state and the neighboring states. Thus, the EEZ overlaps both the contiguous zone and territorial waters. States also have rights to the seabed of the continental shelf up to 350 nautical miles from the coast, where this extends beyond the EEZ, and does not form part of their EEZ. The total area of Indian EEZ is estimated to be 2,305,143 km<sup>2</sup> that include the mainland area of 1,641,514 km<sup>2</sup> and Andaman Islands, 663,629 km<sup>2</sup>. Fish stock that migrates between EEZ of two different countries (neighboring countries) or between an EEZ and High Sea, is called Straddling stock. Eg.Tuna. It is also referred to as shared stock. Shared stock is one which is available for capture in EEZ of two or more nations during its life history.



**Figure: Map showing Indian EEZ**

**Territorial waters:** Territorial waters, or a territorial sea, as defined by the 1982 United Nations Convention on the Law of the Sea, is a belt of coastal waters that extends up to 12 nautical miles (22 km) from its baseline (usually the mean low-water mark) of a coastal state. If this would overlap with another state's territorial sea, the border is taken as the median point between the states' baselines, unless the states in question agree otherwise. A state can also choose to claim a smaller territorial sea. The territorial sea is regarded as the sovereign territory of the state, although foreign ships (both military and civilian) are allowed innocent passage through it; this sovereignty also extends to the airspace over and seabed below. The term "territorial waters" is also sometimes used informally to describe any area of water over which a state has jurisdiction, including also internal waters, the contiguous zone, the exclusive economic zone and potentially the continental shelf.

**Contiguous zone:** It is a band of water extending from the outer edge of the territorial sea to up to 24 nautical miles (44 km) from the baseline, within which a state can exert limited control for the purpose of preventing or punishing "infringement of its customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea". This will typically be 12 nautical miles (22 km) wide, but could be more (if a state has chosen to claim a territorial sea of less than 12 nautical miles), or less, if it would otherwise overlap another state's contiguous zone. However, unlike the territorial sea there is no standard rule for resolving such conflicts, and the states in question must negotiate their own compromise.

**International waters:** The terms international waters or trans-boundary waters apply where any of the following types of bodies of water (or their drainage basins) transcend international boundaries: oceans, large marine ecosystems, enclosed or semi- enclosed regional seas and estuaries, rivers, lakes, groundwater systems (aquifers), and wetlands. Oceans, seas, and waters outside of national jurisdiction are also referred to as the high seas.

