

Hydrosphere

Hydrosphere

The totality of water surrounding the Earth, comprising all the bodies of water, ice and water vapor in the atmosphere i.e. water held in oceans, rivers, lakes, glaciers, ground water, soil, and air.

Components

- ❑ Oceans
- ❑ Glaciers (cryosphere)
- ❑ Atmospheric water vapour
- ❑ Freshwater
 - Surface water
 - Ground water

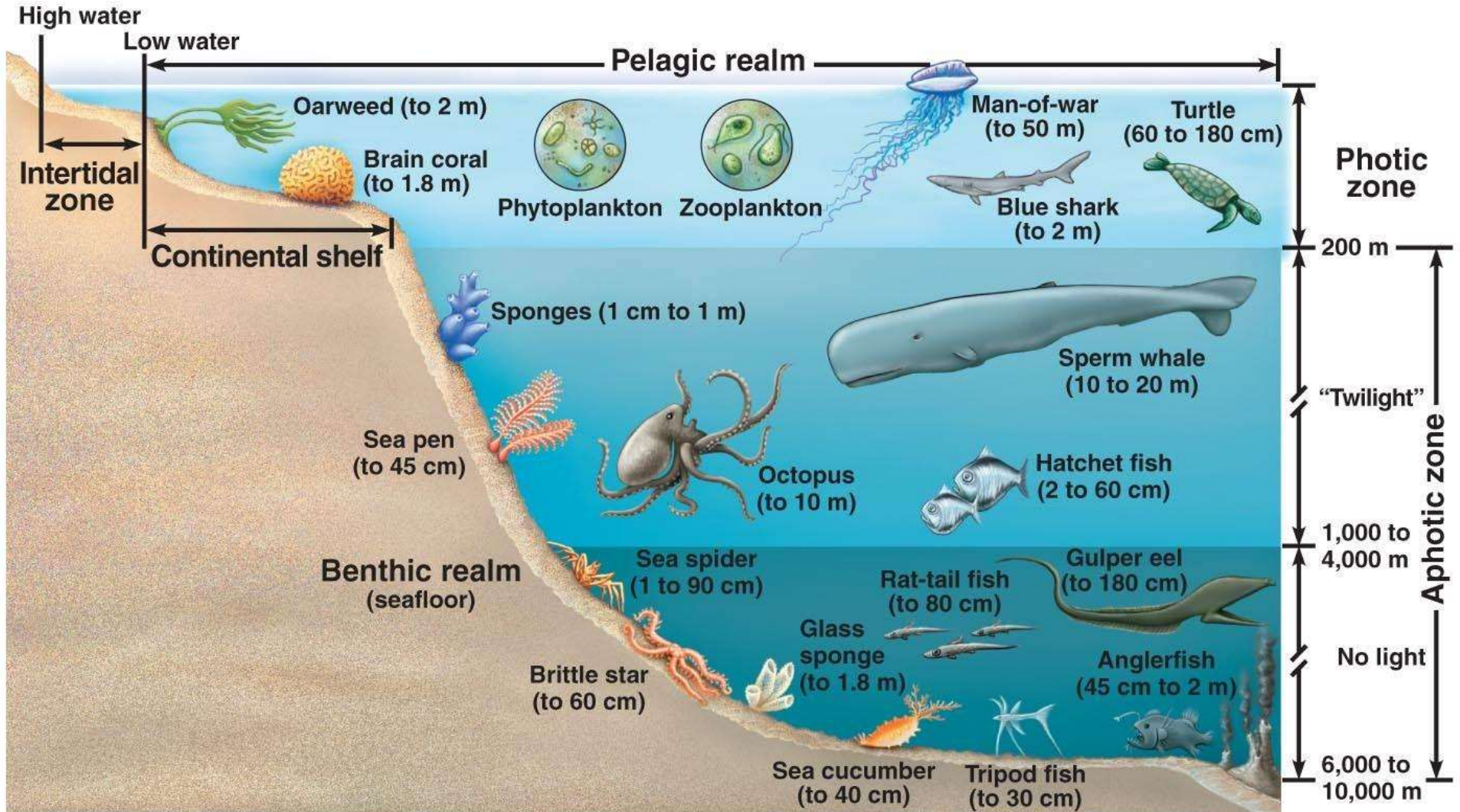
Parts of Hydrosphere	% of Hydrosphere
Ocean	97.6
Ice & Snow (Cryosphere)	2.07
Groundwater	0.28-0.3
Lakes & Reservoirs	0.009
Soil Moisture	0.005
Biological Moisture in plants and animals	0.005
Atmosphere	0.001
River & Streams	0.0001

Oceans

Important Role:

- Water has a high heat capacity, meaning that a gram of water can store more energy than a gram of many other compounds. Oceans reduce the extremes in temperature that would otherwise be experienced on the earth. Ocean currents can absorb heat from the atmosphere, thus delaying its cooling.
- Oceans affect the global cycling of chemical elements. They are a major storehouse of carbon and exchange carbon dioxide rapidly with the atmosphere, and they can play a major role in the rate of global warming.
- Oceans are the habitats of numerous organisms., many of which are directly inter related through different food chains. Marine food chains have their effects on the food chains of the coastal people.

Zones of Ocean



Shore Zone
(Littoral or Inter-
tidal zone)



- <http://www.seasky.org/deep-sea/ocean-layers.html>

Epipelagic Zone

- The surface layer of the ocean is known as the epipelagic zone and extends from the surface to 200 meters (656 feet).
- It is also known as the sunlight zone because this is where most of the visible light exists. With the light come heat.
- This heat is responsible for the wide range of temperatures that occur in this zone.

Epipelagic Zone

- The surface layer of the ocean is known as the epipelagic zone and extends from the surface to 200 meters (656 feet).
- It is also known as the sunlight zone because this is where most of the visible light exists. With the light come heat.
- This heat is responsible for the wide range of temperatures that occur in this zone.

- Animals that live in the twilight zone must be able to survive cold temperatures, an increase in water pressure and dark waters.
 - Octopus, squid, and the hatchet fish are some of the animals that can be found in this zone.
-

Mesopelagic Zone

- Below the epipelagic zone is the mesopelagic zone, extending from 200 meters (656 feet) to 1000 meters (3281 feet).
- The mesopelagic zone is sometimes referred to as the twilight zone or the midwater zone. The light that penetrates to this depth is extremely faint.
- It is in this zone that we begin to see the twinkling lights of bioluminescent creatures. A great diversity of strange and bizarre fishes can be found here.

Bathypelagic Zone

- It is sometimes referred to as the midnight zone or the dark zone.
- This zone extends from 1000 meters (3281 feet) down to 4000 meters (13,124 feet).
- Here the only visible light is that produced by the creatures themselves. The water pressure at this depth is immense, reaching 5,850 pounds per square inch. In spite of the pressure, a surprisingly large number of creatures can be found here.
- Sperm whales can dive down to this level in search of food. Most of the animals that live at these depths are black or red in color due to the lack of light.

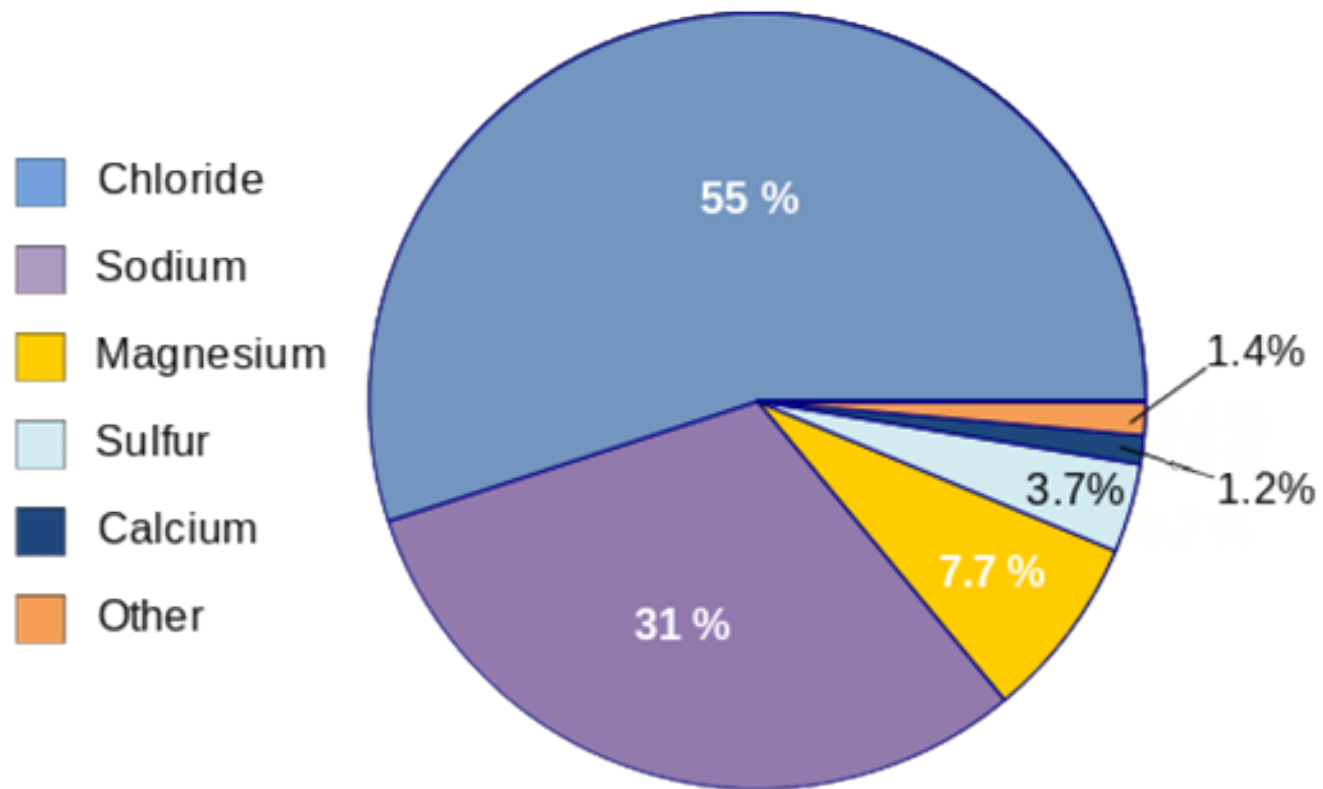
Abyssopelagic Zone

- It extends from 4000 meters (13,124 feet) to 6000 meters (19,686 feet).
- The name comes from a Greek word meaning "no bottom".
- The water temperature is near freezing, and there is no light at all. Very few creatures can be found at these crushing depths.
- Most of these are invertebrates such as basket stars and tiny squids. Three-quarters of the ocean floor lies within this zone. The deepest fish ever discovered was found in the Puerto Rico Trench at a depth of 27,460 feet (8,372 meters).

Hadalpelagic Zone

- This layer extends from 6000 meters (19,686 feet) to the bottom of the deepest parts of the ocean.
- The deepest point in the ocean is located in the Mariana Trench off the coast of Japan at 35,797 feet (10,911 meters).
- The temperature of the water is just above freezing, and the pressure is an incredible eight tons per square inch. In spite of the pressure and temperature, life can still be found here. Invertebrates such as starfish and tube worms can thrive at these depths.

Composition of Sea water



Solinity = 34.7 ppt
gm/l

Chlorinity

Major dissolved constituents of Sea water

<u>Element</u>	<u>gm./litre</u>
Cl	19.4
Na	10.8
Mg	1.29
S	0.9
Ca	0.41
K	0.38
Br	0.067
C	0.025
F	0.013
Sr	0.008
B	0.005
	<hr/> 33.298

Salinity based on chlorinity

Salinity can be determined through the amount of chloride ion (plus the chlorine equivalent of the bromine and iodine), called as chlorinity, which is measured using titration with silver nitrate (Knudsen et al., 1902)

The relationship between salinity and chlorinity is based on laboratory measurements of sea water samples collected from different regions of the world ocean and was given in 1969 by UNESCO as

$$S_A (\text{‰}) = 1.80655 \times \text{Chlorinity} (\text{‰})$$

S_A is called as "Absolute Salinity", unit: ppt

chlorinity Cl is defined as "the mass of silver required to precipitate completely the halogens in 0.328 523 4kg of the sea-water sample."

TDS \Rightarrow Total Dissolve. Solids
TSS \Rightarrow " Suspended "

0.8

0.65-0.7

$$\frac{1.5 \text{ gm}}{50 \text{ ml}} \times 1000 \text{ ml}$$

$$= 30 \text{ gm/l}$$

20 gm

50 ml

↓

105°C

21.5 gm

1.5 gm
50 ml

