

# Osmoregulation in fishes.

Osmoregulation - process of maintaining an internal balance of salt and water in body is osmoregulation.

## Bones and Cartilage.

## Cartilage

Endoskeleton

↓  
Vertebrate body

↓  
Consists of supporting or skeletal tissues

↓  
against mechanical injuries.

Bones

## Cartilage

### Cartilage

→ Avascular tissue (Without any blood vessel)  
(Exceptions - Laryngeal and Nasal Cartilages)

Cartilage (Components)

Matrix

Chondrocytes  
or  
Cartilage cells

Perichondrium

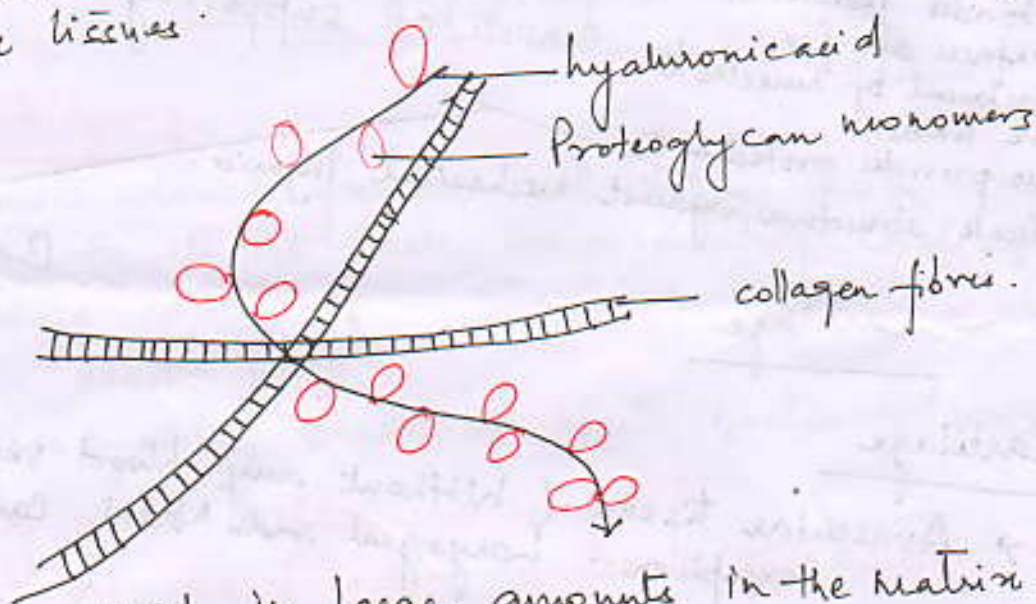
- Forms a dense fibrous sheath around the mature cartilage
- Consists of fibroblast cells.

## ① Matrix

- Cartilage consists of extensive matrix that is produced and maintained by chondrocytes.
- Solid, cheese-like, firm but elastic in nature.
- Resilient nature. (returns back to its own condition)

→ Matrix is rich in (Glycosaminoglycans)

- Hyaluronic acid
- Chondroitin Sulphate
- Keratan Sulphate
- The presence of above substances permits diffusion of substances between blood vessels in surrounding connective tissues.



→ Hyaluronic acid in large amounts in the matrix of cartilage makes it well adapted to serve its weight bearing capacity.

## ② Cartilage cells / Chondrocytes

- Numerous spherical cells with eccentrically located nuclei.
- lie within the matrix either singly or in groups.
- Arranged within lacunae.
- Multiply by simple mitosis and helps in growth of cartilage.
- Secrete Matrix and all the glycosaminoglycans and proteoglycans.

- Active chondrocytes**
- Contains high amount of ER, Large sized Golgi body, Numerous Mitochondria, Secretory granules,
  - Three types of protein filaments including - microfilament, intermediate filament & Microtubules.

- Old inactive Chondrocytes**
- Contains large amount of intermediate filaments, lipid droplets and glycogen stores.
  - Becomes distorted in shape due to shrinkage.

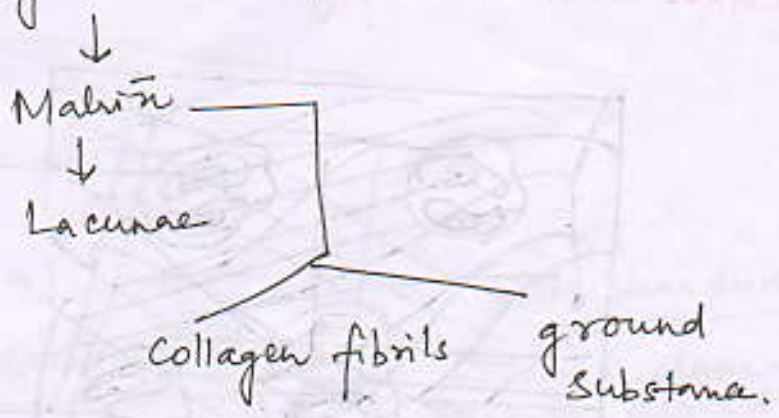
## Types of Cartilage

- ↳ Hyaline / glass cartilage
- ↳ Elastic
- ↳ Fibro cartilage

### ① Hyaline Cartilage

- Flexible, elastic, semitransparent, bluish cartilage.
- Appears glassy in nature.
- Contains all basic components of cartilage
- Throughout the matrix vacant spaces called lacunae are present.

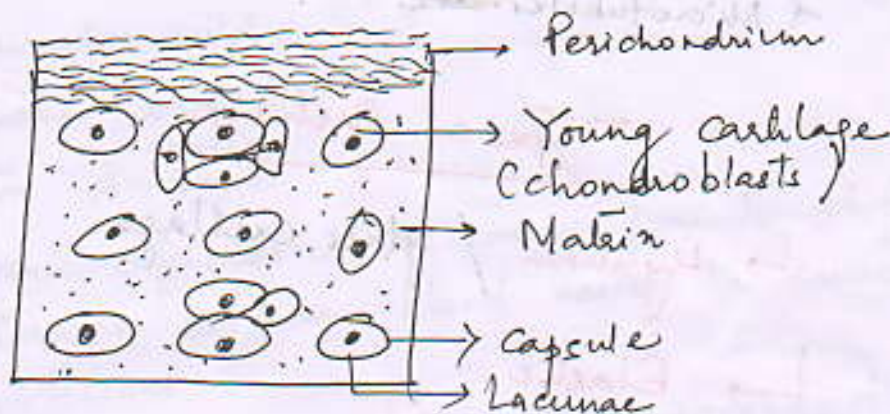
#### Hyaline Cartilage



- Highly hydrated
- 60-78% water
- Hyaline cartilage are precursors of bones

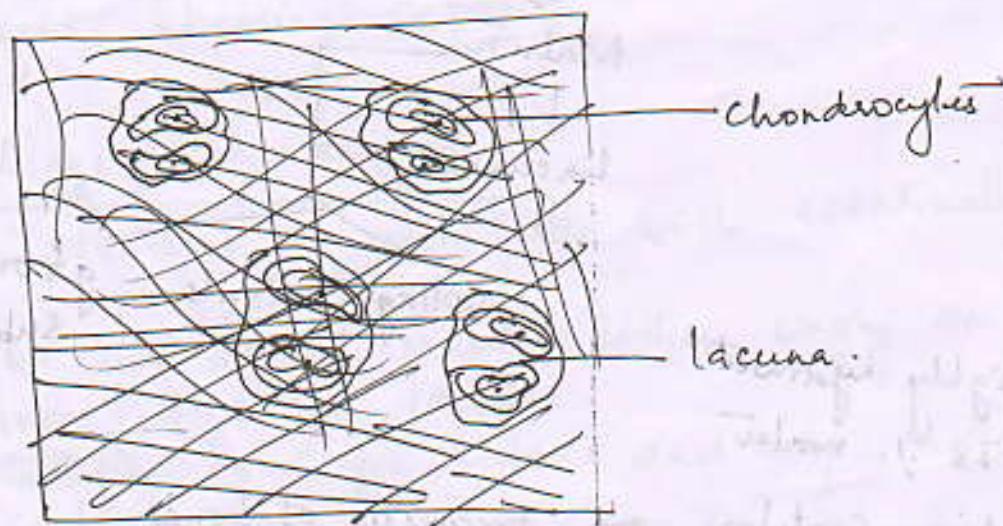
- Hyaline cartilages develop in the process of endochondral ossification.
- Present in adult as the skeletal unit in the rings of trachea, bronchi, nose and costal cartilages
- Withstands forces of compression & torsion.

(2)



### Elastic Cartilage :-

- Opaque, yellow coloured, flexible and highly elastic in nature.
- In addition to all the basic components of cartilage, elastic cartilage consists of
  - yellow elastic fibres.
  - interconnecting sheets of elastic materials (lamellae)
- Matrix of elastic cartilage never calcify.
- elastic cartilage are found in external ear, auditory canal and in epiglottis, in larynx.



# Adaptations and its role in evolution.

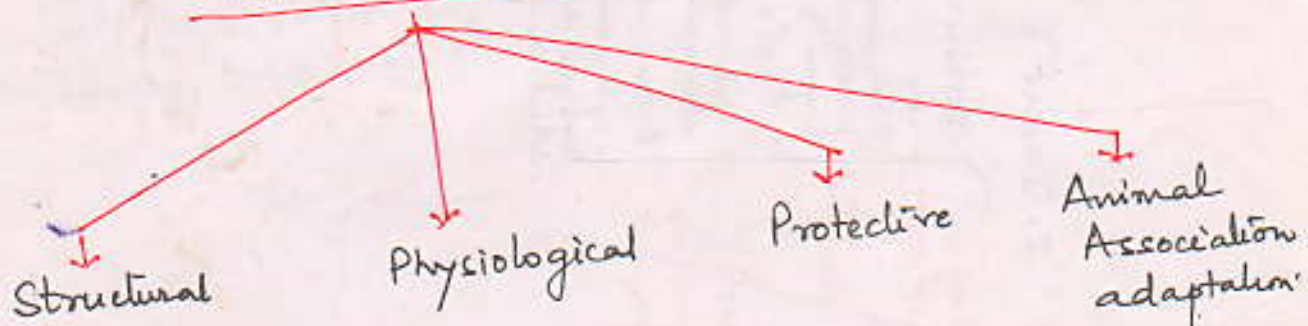
## Adaptation:

Morphological or physiological modification in an organism to adjust successfully in a particular environment. The modifications in the body organisation or physiology of organisms which helps them to thrive successfully in a particular environment. can also be known as adaptation.

40c

Particular modifications also helps the organisms to secure sufficient food; to protect and to survive.

## KINDS OF ADAPTATIONS.



## Structural Adaptations:

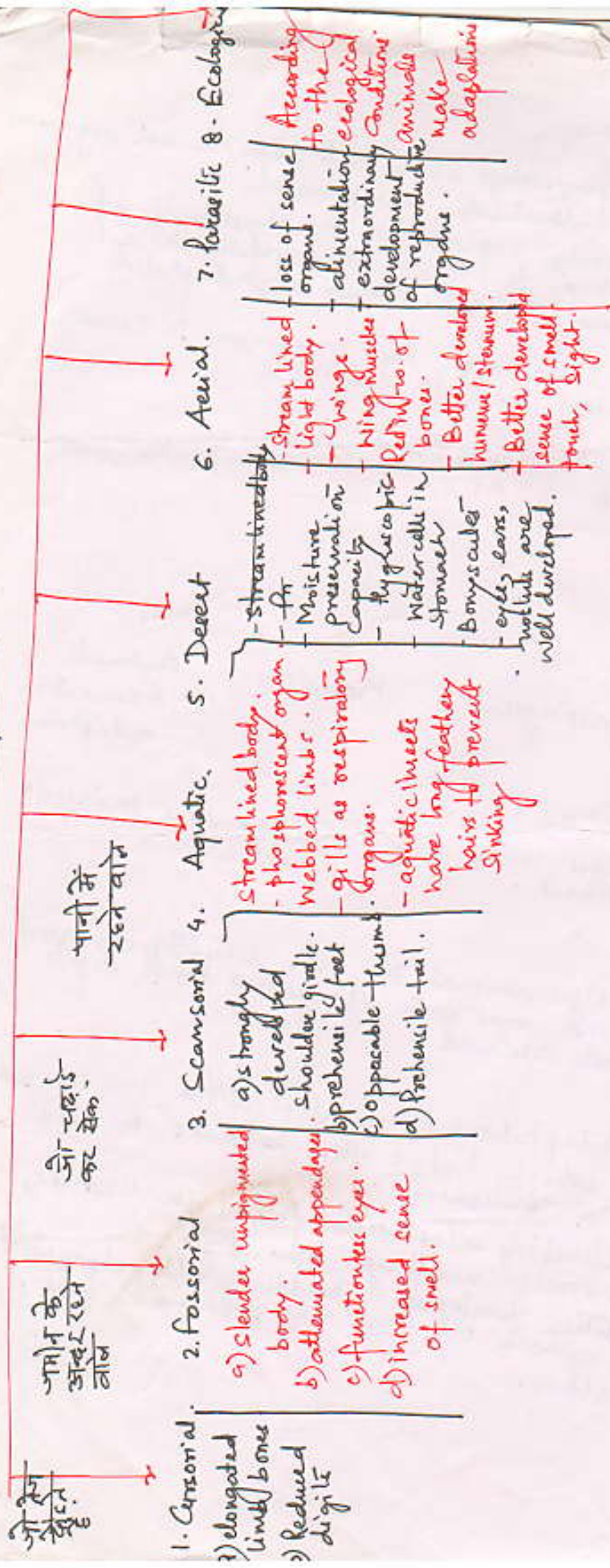
Includes changes in structure of organisms induced by physical environment.

Includes:-

1. Cursorial:- Helps animals to run swiftly on land. limb bones gets elongated and digits gets reduced.
2. Fossorial:- Adaptations or modifications in animals which helps the animals to live in burrow.
3. Scansorial:- Climbing adaptations found in lizards, squirrels; monkeys, apes. Hyls. Better developed shoulder girdle; elongated segments of limb etc. prehensile feet, claws.

lion

# Structural Adaptation



## PHYSIOLOGICAL ADAPTATIONS

- Changes in the functions of animals to adapt themselves to changed conditions of life.
- ex: Protozoa changes to survive within a temp. range of 20°-40°C.

## PROTECTIVE ADAPTATIONS.

- These adaptations protect the animals from their natural enemies are protective adaptation
- Effective only against a particular enemy and minimise the risk or injury from natural enemies.
- Hiding takes place by hiding/ or by attacking.

### Protective Adaptations:

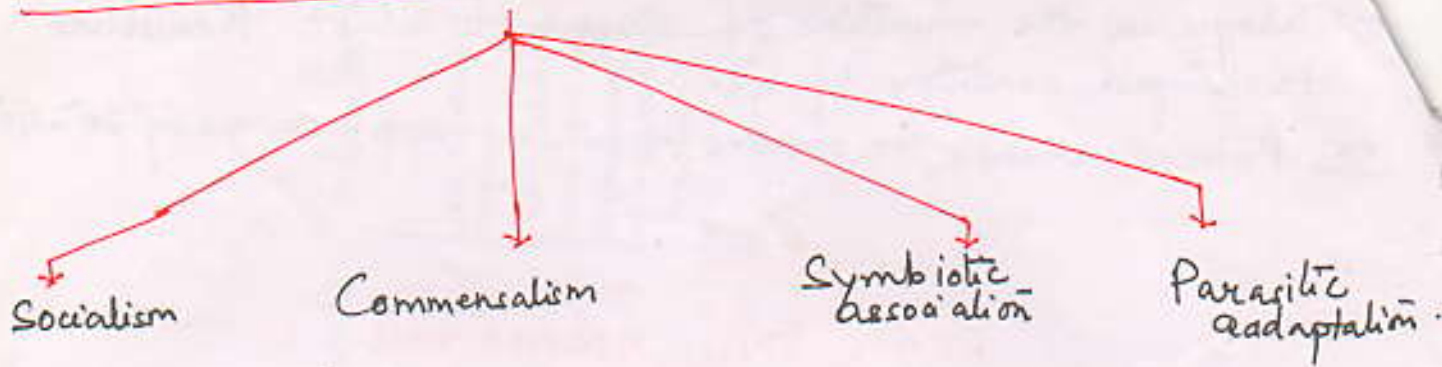
#### Visual Adaptations

- external appearance.
- attitude.
- Colour
- Shape / behaviour.
- Protective Colouration
- Mimicry
- Terrifying Appearance.
- Stimulation to death.
- Warning

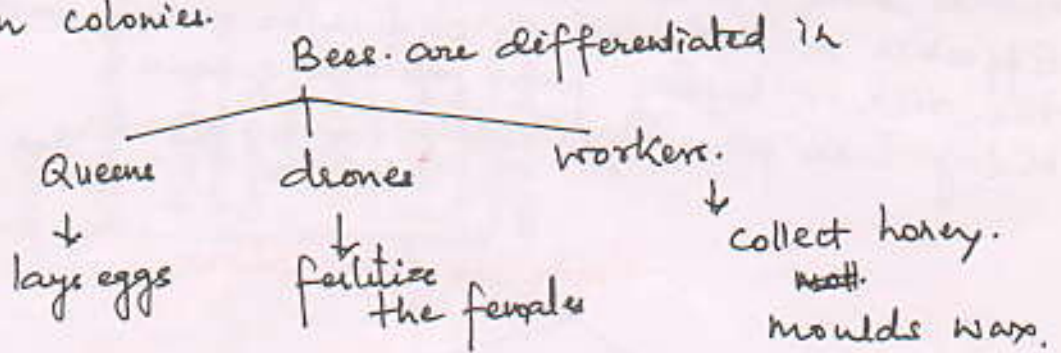
#### Non-Visual Adaptations

- Offensive Odours.
- Hard shells.
- Spines on the body of hedge hog.

# ANIMAL ASSOCIATION ADAPTATIONS.



Socialism: - The animals like bees, wasps and ants live together in colonies.



Commensalism: In this association the animals live together but one is benefitted while other has neither benefit nor harm.

Symbiotic Adaptations: In this association, animals are working/adapted in such a way that both are benefitted and each one is dependent physiologically on each other.

Parasitic Adaptations: In this case the animals live together in such a way that one gets only the benefit of other with which is totally dependent; while the other is harmed by the presence of former. Former is parasite and latter is host.



# Some other Adaptations:

## Biotic Adaptations

- Beneficial for a group but deleterious for an individual.
- Includes parental behaviour, kin selection. Supra individual.

## Parental behaviour:-

- Nest building.
- feeding the young ones.
- defending young ones.

## Social context:

Animals live in a group and also sacrifices itself for defense of the group.

- Warning signals produced by individuals of any social group helps to protect the society.

## Supraindividual function:

Adaptations helps the group. and it is regardless of impact on individual itself.

## Individual Adaptations.

Organismic adaptations includes adaptations at individual level.

## Significance and Role in evolution

More adaptations



More survival



changes are accepted



New variations are also adapted along with time



EVOLUTION / Adaptive Radiation



Leads to Specialisation