Organisms living in hypo-osmotic environment

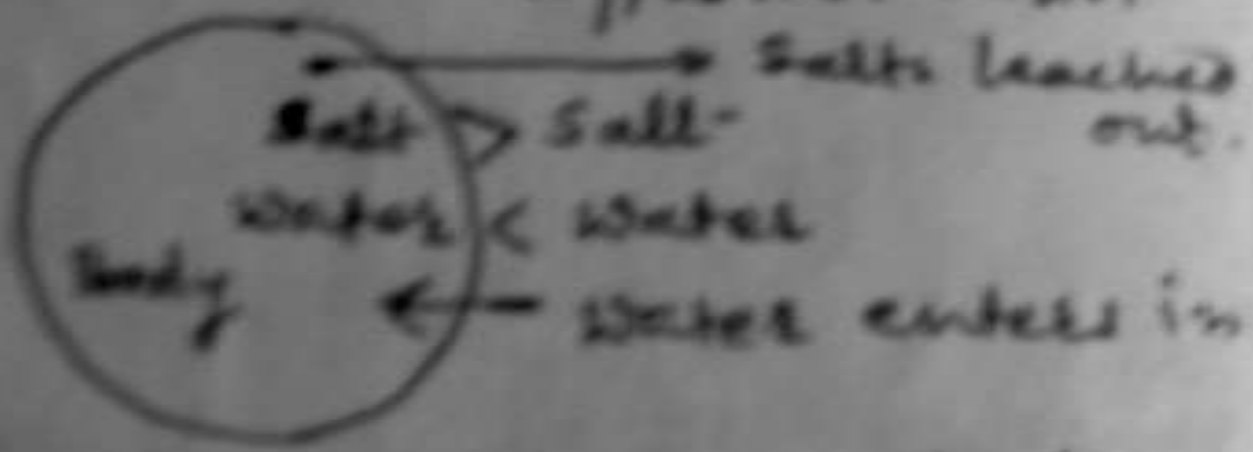
→ They include fresh water organisms,

→ All Estuarine organisms

→ They also include migratory organisms.

Hyposmotic living

Face mainly 2 problems



1. Inward flow of water. So the cells swell, animal gains weight
2. Leaching of salts from cells

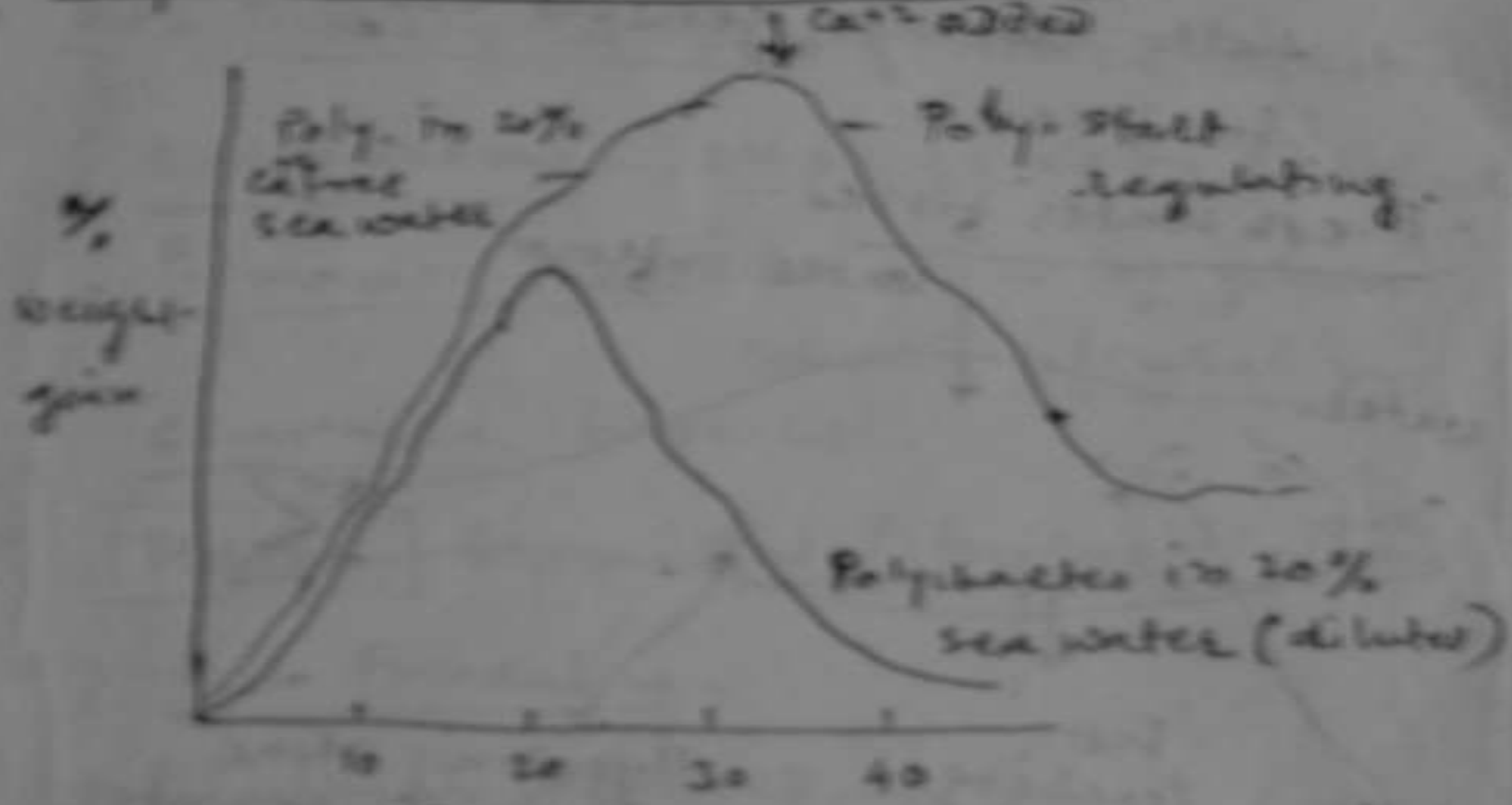
The problems faced by the organisms -

- **Water enters the body & the cells & the body will swell. (Water gain)**
- **Salts are leached out from the body (Salt loss)**

Proof--

- **Polychaete *Nereis diversicolour* was studied. The polychaete was kept in dilute marine water or fresh water.**
- **It gained weight for some hours due to water gain , but afterwards regained normal body weight by controlling water contents.**

Graphical Presentation of expt.



Concl. Ca^{+2} ions play important role in water content regulation

Water gain problem minimised by

- **When the polychaete was kept in calcium free dilute sea water ,it went on gaining water and swelled too much . But when calcium was added to the medium, the polychaete started regulation of water.**
- **Thus water regulation depends on availability of calcium.**

Again an experiment was done on Nereis. The polychaete was kept in sucrose solution isosmotic to seawater.

Even then they lost weight due to loss of salt.

This proves that in hypoosmotic condition the organism face two problems

i) salt loss from body

ii) water gain by the body

- **To overcome this the organism make there body surface impermeable to water / ions by calcification / chitinization etc. or secretion of mucus on body.**
- **Inspite of this the water gain is through flexible ‘thin walled’ joint, & respiration surface & when there is gain of water the the osmotic regulation should be done. When water is eliminated salts are also lost.**

- **To prevent salt loss the kidneys are modified. For example Eriocher (Crab) is Euryhaline. It can live in Marine as well as fresh water. When in fresh water it produces urine isosmotic to body fluids to keep the salt loss minimum. Even then there is loss of salt. To overcome this it shows absorption of salt through epithelial cells of the gills.**

- **Prawns (Euryhaline) when in fresh water absorb salts through general body surface.**

- **Fish : try to minimise salt by producing dilute urine. But still whatever salt is lost, is regulated by absorption through cells of gills.**

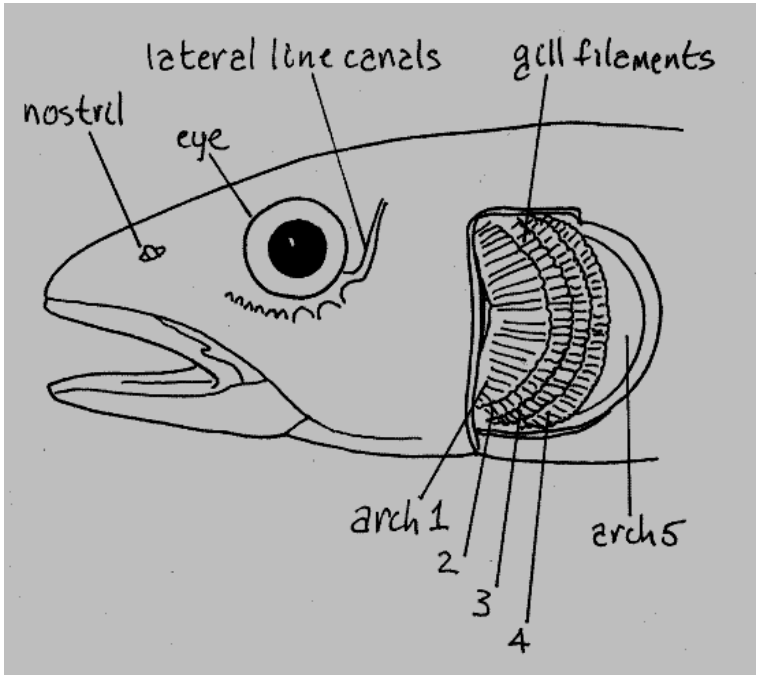
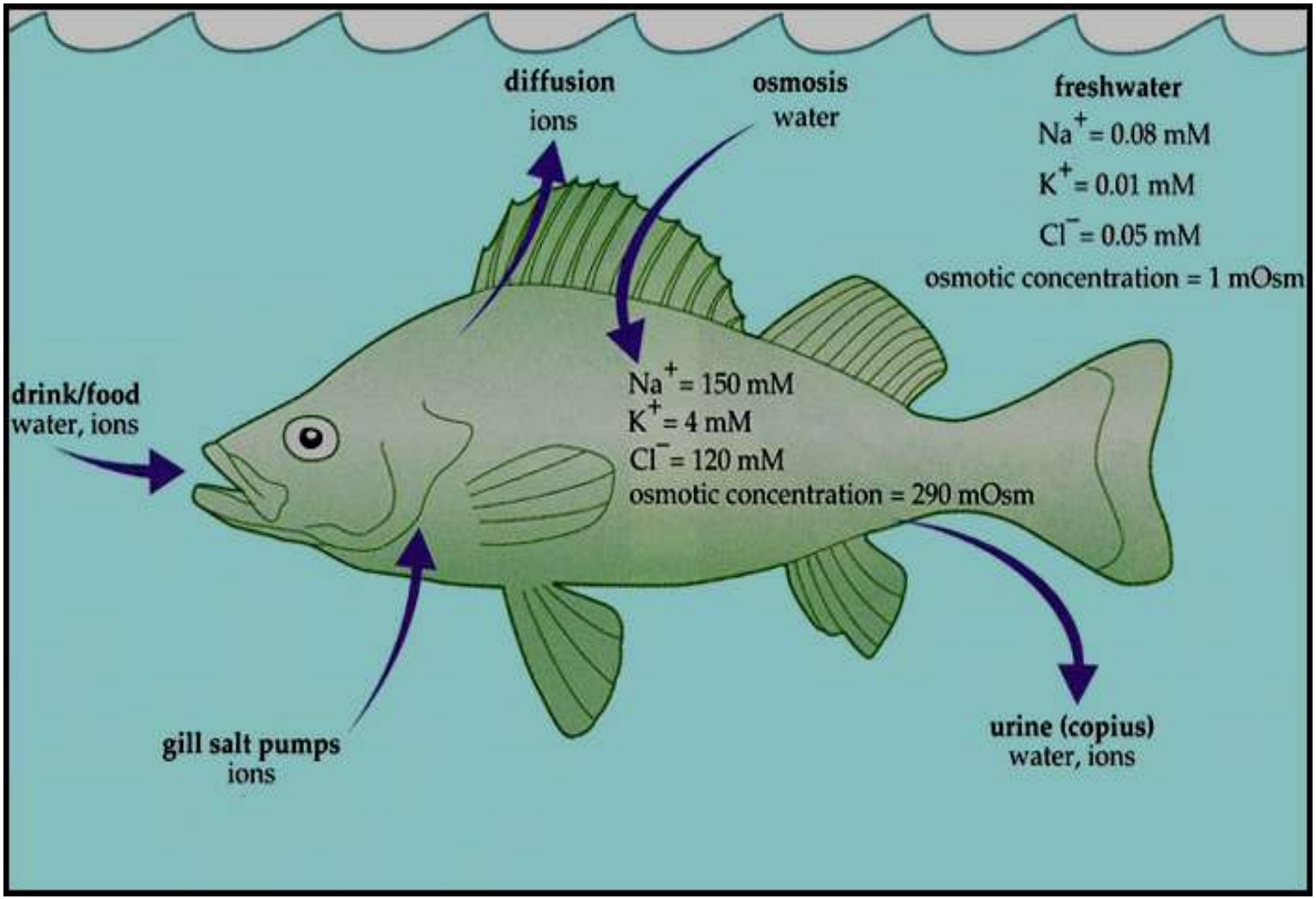
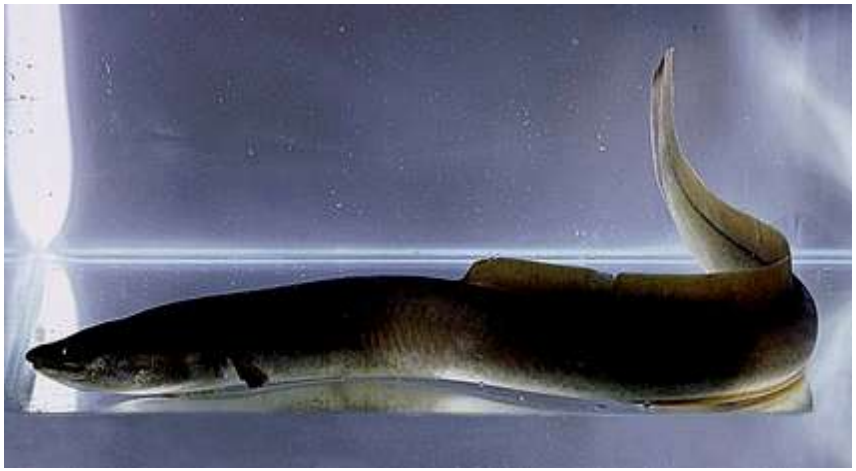


Figure of fish showing ionic and osmotic regulation.



- **In Eel Anguilla : When in fresh water Gills absorbs salts but in marine water gills excrete salts.**
- **In Amphibia : Hypotonic urine is produced but at the same time they absorb salts through general body surface.**



Hormonal control.

- **The adjustment of osmotic & ionic regulation is brought about by the hormones & most of the hormones are diuretic. These hormones produce dilute urine or hypotonic urine.**
- **In Earthworm the diuretic hormone is secreted by brain cells.**
- **In Pulmonate snails – green cells of pleural ganglion secrete diuretic hormone.**
- **In higher animals Pituitary secretes the diuretic hormone. This hormone have favourable effect on gills, salt gland & general body surface.**

There are two main types of snails, those that have just gills and those that have lungs. The snails with gills are called Gilled Snails. The ones with lungs are called Pulmonate snails.

- **Fish Fundulus when kept in dilute sea water or in fresh water can survive. But if the pituitory is removed it can not survive in fresh water. But in such fish, if the pituitory extract is injected it survives. Thus the prolactin secreted by pituitory plays an important role in ionic & osmotic regulation.**
- **Stickle back lives in fresh water during summer & in marine water during winter & when it is in fresh water the prolactin secretion rises.**

- **Adrenal cortex hormones are also important for fresh water living or marine water living. In marine water it causes excretion of salts through gills / excretory surfaces. In fresh water living there is absorption of salt as and when required.**