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Respiration in fishes — with accessory respi- — ratory organs.

Fishes are aquatic, live in both marine and fresh water. These respire with the help of gills. Gills are highly vascular and are able to bring about exchange of respiratory gases. But sometimes these have to face peculiar/abnormal environmental conditions such as the water become stagnant due to decrease in its volume, depletion of oxygen occurs during summer when water level falls to a considerable degree, increased rate of metabolism needs extra amount of oxygen, prolonged draught forces some fishes to live out of water for a short period of time etc.

During above mentioned adverse environmental conditions, gills become insufficient in taking required amount of oxygen and getting rid of carbon dioxide. Hence to assist in meeting extra demand of oxygen in aquatic or arid environment certain modified structures are formed. Such modified special organs developed for breathing/respiration in addition to gills are named Accessory respiratory organs.

These are more common in fishes ①

living in fresh water of tropical reservoirs and streams of hills. The important accessory respiratory organs are as follows:-

- (1) SKIN:-
- (i) In certain eels like *Anguilla anguilla*, *Amphipneus cuchia* and small mud skipper *periophthalmus*, the skin is very thin & highly vascular.
 - (ii) An accessory respiratory organs in both water and air when it is kept moist.
 - (iii) This enables the fish to leave water, pass through damp vegetation for a short distance and change the place by making a short land journey.
 - (iv) Some larval fishes breathe by skin until the gills are fully formed.

(2) External Gills:-


- (i) These are vascular and filamentous outgrowths of the ectoderm covering the outer surface of the visceral arches.
- (ii) They are in direct contact with water, the exchange of gases occurs easily.
- (iii) The larva of *polypterus* has a single pair of external gills lying in the region of hyoid arch.
- (iv) Larval *dipnoi* have four pairs of external gills. These disappear completely in adults of *Lepidosiren* but retained

as vestiges in protopterus.

(3) Buccopharyngeal epithelium:

In certain fishes like *Electrophorus*, *Boleopthalmus*, *perioptthalmus* and *monoptercus*, the buccopharyngeal epithelium is highly vascularised and may become folded to increase surface area. Buccopharyngeal cavities in these fishes are constantly filled with air through mouth. The specialized surface of the buccopharyngeal cavity absorbs oxygen directly from air and acts as an efficient accessory respiratory surface. This specialization occurred as a result of deficiency of oxygen in water and is considered as the most primitive and simplest type of accessory respiration.

(4) Opercular chamber:

The opercular chambers of some fishes like *perioptthalmus* and *Boleopthalmus* are enlarged for storing air. Their inner membranous lining is thin and vascular and allows exchange of gases. The air is drawn in through mouth, passes over the gill-slits and is retained in the opercular chamber for a short period of  After time. After exchange of respiratory gases the air is expelled through external branchial apertures.