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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 environ-mental 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 insuf-ficient in taking required amount of oxygen and getting rid of carbondioxide. Hence to assist in meeting extra demand of oxygen in aquatic or arial 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

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 Amphipnous 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 laying 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, periopthalmus and monopt-erus, the buccopharyngeal epithelium is highly vascularised and may become folded to increase surface area. Bucco-pharyngeal cavities in these fishes are constantly filled with air through mouth. The specialized surface of the buccoph-aryngeal cavity absorbs oxygen directly from air and acts as an efficient access-ory respiratory surface. This specialization occured 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 periopthalamus and Boleopthalmus are enlarged for storing air. Their inner mem-branous 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 chambers for a short period of time. After exchange of respiratory gases the air is expelled through external branchial aperture

(5) Pharyngeal diverticula: (2nd pair)

paired air chambers developed from the roof of pharynx (not from branchial chambers), lined by highly vascular epithelium capable of gaseous exchange and serving as air reservoirs like lungs are called pharyngeal diverticulum. These are also called supra branchial cavities as they lie above gills.

In channa striatus, the vascular epithelial lining is folded to form some alveoli. The gill filaments are greatly reduced.

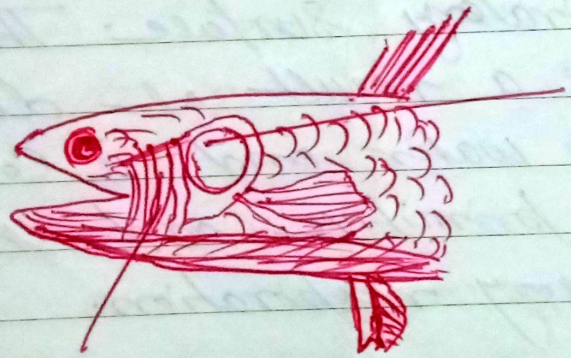

Fig-A Gills

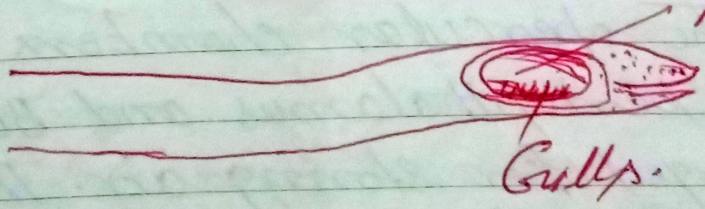

Fig-B

In periophthalamus, paired pharyngeal diverticula lie on the roof of the pharynx and are very small.

In Amphipnaus cuchia, sac like