



# Breath Beyond Gills

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**W**HEN we think about how fish breathe, the first that strikes our mind is “Gills”, something we have been hearing since our childhood. But is it the only organ for breathing, or it goes “Beyond Gills”? So the answer is, they possess other specially adapted organs for breathing.

Well! Gills on either side of the head are the primary respiratory organs. The lamella, a part of the gills, are highly vascularised and provide a large surface area for gas exchange. Where the oxygen is poor, the fish require other accessory respiratory organs to assist breathing. So, here is an attempt to shed some light on accessory respiratory organs.

## Buccal Cavity

The buccal cavity is located at the anterior end of the digestive and respiratory systems. It bridges the external environment and the internal processes of fish by acting as an accessory respiratory organ. The important feature to note is that they are specially designed for absorption of oxygen. Gulping is a natural process for the buccal cavity and its use for respiration is indeed strategic.

The buccal cavity happens to be more than just a mouth used for processing food, it also serves as an accessory

organ for respiration in certain species. The cavity helps in air-breathing as it contains vascularised cavities which can hold the gulped air. The oxygen directly diffuses into the bloodstream. It has a rich blood supply and the lining of the mouth and throat of the fish is highly vascularised. Breathing is not the key function of the buccal cavity but it can assist in respiration as an add-on to the gills. The oxygen levels are lower in the water, then the buccal cavity comes into play.

For different species, the adaption is different, depending on the habitat, water condition, oxygen levels and many more parameters. So, the use of the buccal cavity varies depending on the environmental conditions. It helps the fish species to absorb more oxygen from the water. For example, the Electric eels (*electrophorus electricus*) come to the surface regularly, to gulp air. It is absorbed through the mucous membranes of their buccal cavity. The buccal cavity is rich in blood vessels, so it can help as a respiratory organ. This adaptation is the key to their survival, especially in oxygen-poor environments where dissolved oxygen levels are low. By using their buccal cavity to take oxygen from the air, eels can remain active and generate strong electrical discharges, even in harder conditions.

## Gut

The gut consists of the oesophagus, stomach, intestines, and their associated organs like the liver and pancreas. Unlike the common ones like the primary organ gill, skin or labyrinth, the gut is rather unusual for respiration. When we think about the gut, our mind goes to food digestion. But certain species of fish use it to assist with respiration too. They provide a helping hand to the gills. The parts of the gut used for respiration are different for various species but essentially the highly vascularised areas of the thin membrane are used for gaseous exchange. Some fish might have special pockets used solely for respiratory function. When the air is gulped, it moves to the digestive tract and there it is absorbed directly into the bloodstream. They essentially have lung-like structures present in their gut which help this happen. The habitats where oxygen levels in water are low, these special features are found active.

When it comes to gut respiration, still a lot is a mystery. We haven't been able to fully understand the workings and complexities of this organ and its use in respiration. Scarcity pushes fish to adapt peculiarly and intriguingly.



Electric eel