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**Class: B.Sc Part-I (Hons)/(Sub.)**

**Paper: II Group: A**

**Topic: Respiration in Scoliodon**

### **Respiration in Scoliodon**

**Kingdom : Animalia**

**Phylum : Chordata**

**Class : Chondrichthyes**

**Oder : Carcharhiniformes**

**Family : Carcharhinidae**

**Genus : Scoliodon**

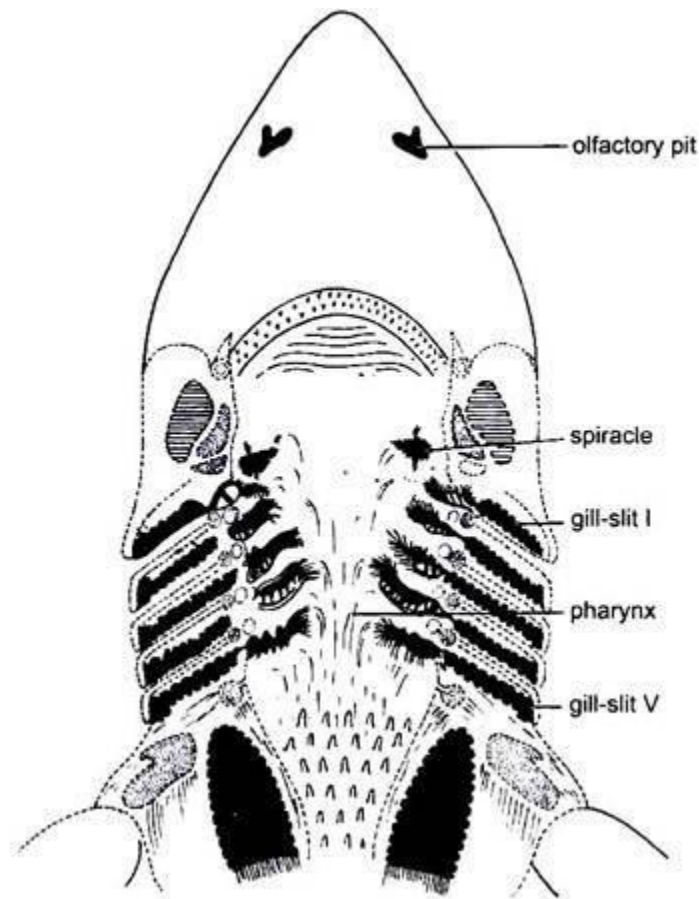
Scoliodon is a genus of requiem sharks in the family carcharhinidae .It is a marine shark. Due to its spindle shaped body, it is a very fast swimme. Its body has an exoskeleton made up of placoid scales.

In Scoliodon, the respiration is aquatic, i.e., respiration in water and it breathes by means of gills borne in a series of gill pouches on either side of the pharynx. Water enters the mouth and after passing through the buccal cavity, pharynx, gill-pouches and goes out through the gill slits after bathing the gills.

#### **Respiratory Organs:**

There are five pairs of gill- pouches bearing gills, arranged in a series behind the hyoid arch in the lateral walls of the pharynx. Each gill-pouch is compressed antero-posteriorly and communicates with the cavity of the pharynx through a

large internal branchial aperture and with the exterior through a narrow external branchial aperture (commonly called gill-slit). The endodermal mucous membrane of gill-pouches or interbranchial septa is raised into a series of horizontal folds to form lamelliforms branchial lamellae or gill-filaments.



**Fig. Scoliodon; Pharynx exposed to show gill-pouches.**

The branchial lamellae have a rich blood supply, and they have a very thin covering membrane through which blood is exposed to sea water for an exchange of gases. Each gill-pouch has two sets of gill-lamellae, one on its anterior wall and the other on the posterior.

Each set of lamellae is a half gill or hemibranch, so that gill-pouch has two hemibranches. The gill-pouches are separated from each other by fibro-muscular partition called the inter-branchial septa .

The interbranchial septa extend well beyond the branchial lamellae, then each bends posteriorly to form a flap which protect the lamellae as well as external gill-slit.

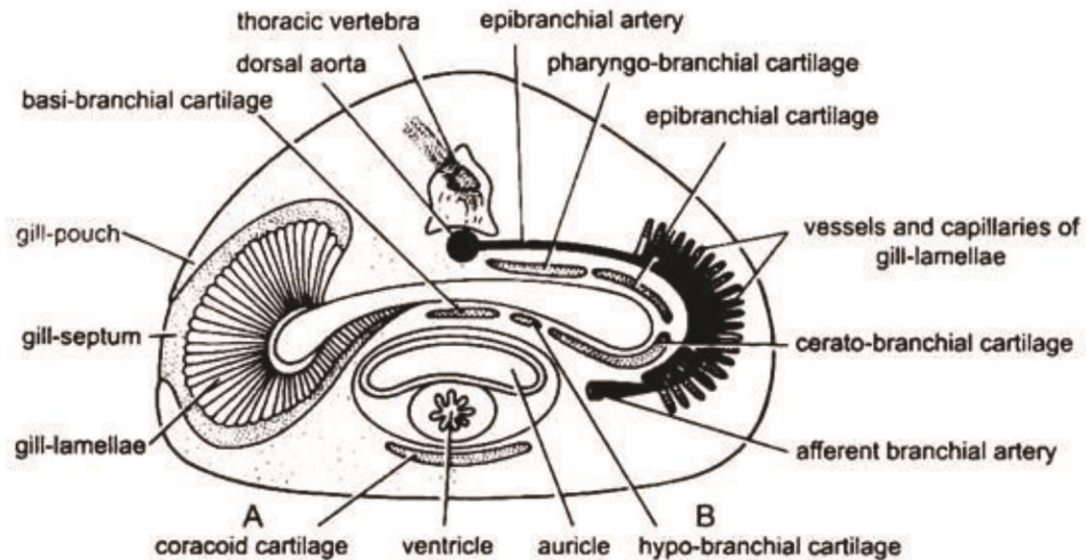
The inner part of each interbranchial septum has a supporting cartilaginous visceral arch with slender gill-rays. Visceral arches also give out rigid comb-like gill-rakers which project inwards to protect the internal branchial apertures from entering the food.

Each visceral arch supports the posterior branchial lamellae or hemibranch of posterior gill-pouch and the anterior branchial lamellae of the anterior gill-cleft.

These two hemibranchs or demibranchs with their interbranchial septum and the visceral arch constitute a complete gill or holobranch.

The posterior hemibranch of a septum has longer lamellae than the anterior one. Thus, a gill-pouch has two demibranchs belonging to two adjacent gills.

In Dogfish (*Scoliodon*), the hyoid arch bears only a hemibranch on its posterior surface, the first four branchial arches has holobranchs and the fifth branchial arch is without any gill (abbranch). Thus, it has nine hemibranchs.



**Fig.** *Scoliodon*. Diagrammatic representation of respiratory system in T.S. of body. A—A gill-pouch opened to show a gill in surface view; B—Parts of branchial arch and blood supply in gill-lamellae.

Between the first internal gill-slit on either lateral side of pharynx is a spiracle. In most elasmobranchs the spiracle bears minute branchial lamellae forming a false gill or pseudo branch and opens to the exterior by an external branchial aperture.

It is supplied with arterial blood and plays no part in respiration. But in Dogfish (*Scoliodon*) the spiracles are vestigial pits in the pharynx with no lamellae and external branchial apertures.

### **Mechanism of respiration**

Breathing movements occur in two steps:

#### **1. Inspiration:**

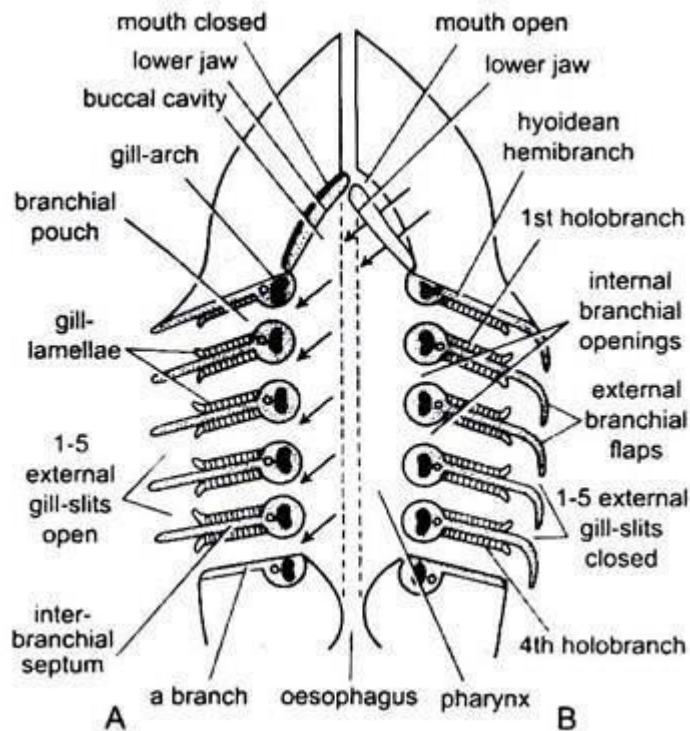
During inspiration the bucco-pharyngeal cavity expands by the action of hypo-branchial muscles.

As the external gill slits are tightly closed water enters the enlarged cavity through the open mouth.

## 2. Expiration:

Next when the mouth is closed by the action of adductor muscles the volume of bucco-pharyngeal cavity gets reduced due to the contraction of constrictor and interbranchial muscles.

As a result water is forced to enter the gill pouches, over the gill lamella. Water finally goes out through the open gill slits.



**Fig. Respiratory mechanism in Scoliodon (a) Inspiration (b) Expiration**

## Physiology of Respiration:

Each gill lamella has an extensive system of sinusoids which receive venous blood from an afferent branchial artery and pass it on to an efferent or epibranchial artery.

During the passage of blood through this network it becomes oxygenated by exchanging  $O_2$  and  $CO_2$  between the water and blood. This process is called external respiration.

As this oxygenated blood circulates through body its  $O_2$  is used by tissues to oxidise food stuffs and  $CO_2$  is released into blood which is formed during oxidization of food stuffs. This process is called internal respiration.