

## Respiratory Structures in Prawn(SEM II, CC-3)

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In *Palaemon*, three sets of organs help in respiration. They are:

(i) Lining of Branchiostegite,

(ii) Epipodites and

(iii) Gills.

These organs are enclosed within a special chamber, the **gill chamber**, lying on each side of the **cephalothorax**. The gill chamber is covered by the lateral extension of **carapace** called **gill-cover** or **branchiostegite**.

The gill chambers can open vertically, anteriorly and posteriorly:

(i) **Lining of Branchiostegite:**

Being highly vascularized, the inner lining of the branchiostegite serves as respiratory surface. In this lining, gaseous exchange takes place between the blood lacunae and surrounding water.

(ii) **Epipodites:**

Three pairs of small, vascularized, leaf-like membranous structures called **epipodites** are present on the **coxal segment** of each **maxilliped**. These organs lie in the anterior part of the gill-chamber and carry out respiratory functions like the **primitive gills**.

(iii) **Gills:**

Gills are **primary respiratory organs** in prawn. On each **lateral side** of the **cephalothorax** and **beneath** the **branchiostegites**, there are **eight gills**, each attached with the thoracic wall by a gill-root. **Seven** of these eight gills are serially arranged, while the **eighth gill remains concealed under the second one** on its dorsal side .

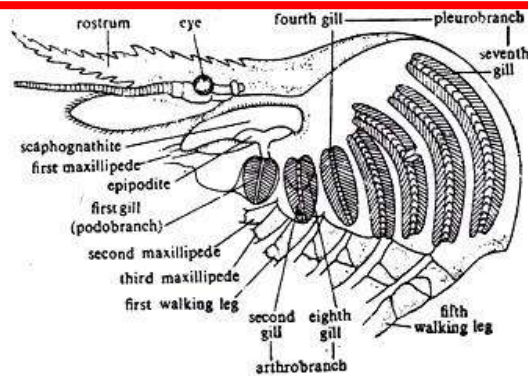


Fig. 2.57 : Respiratory organs (Gills) of *Palaemon*. Note that the branchiostegite of one side has been removed to expose the gill-chamber.

The gills are **crescent-shaped** and their

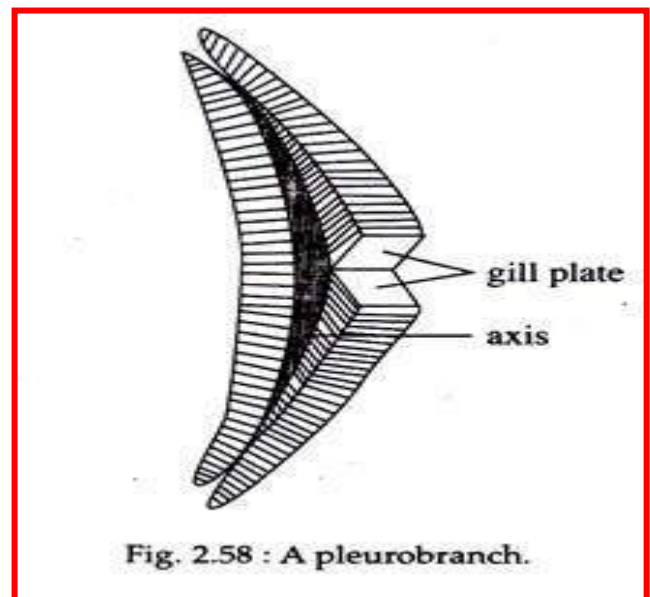


Fig. 2.58 : A pleurobranch.

sizes increase gradually from the anterior to the posterior direction. Each gill has a slender axis or base on which **double rows of rhomboidal leaf-like gill-plates** are arranged like the pages of a book. These types of gills are called **phyllobranch**.

According to the position of origin, the gills are of three types:

(i) **Podobranch** (Greek: podos, **foot**; branch, gill) — the **first gill** from anterior side is podobranch which remains attached with the **coxa of the second maxillipede**.

(ii) **Arthro-branch** (Greek: Arthros, **jointed**) — attached with the **arthroidal membrane** of **third maxillipede**. **Second and eighth gills** are arthrobranch.

(iii) **Pleuro-branch** (Greek: Pleuros, **side**) — attached with the **outer border of the thorax**

and over the articulating surface of the **walking legs**. **Third to seventh gills** are pleuro-branch.

**Histology:**

Histological structure of the gill shows that gill base has following layers— the **outermost cuticle**, **inner epidermis** and **innermost connective tissue mass**. Each gill-plate is formed by monolayer of cells, **sand-witched** between two layers of cuticle. The cellular layer includes two alternately arranged cell types—pigmented and transparent.

**Blood supply:**

**Two lateral** and **one median** longitudinal blood channels pass throughout the length of gill-base. The two lateral channels are interconnected by numerous **transverse channels**.

From each lateral channel a **slender marginal channel** is given to each plate. After covering the entire margin of the plate, the marginal channel opens within the **median channel**. The gill receives **deoxygenated blood** through **afferent branchial channels**.

Each branch of **afferent channels opens** within the **transverse channels**. From

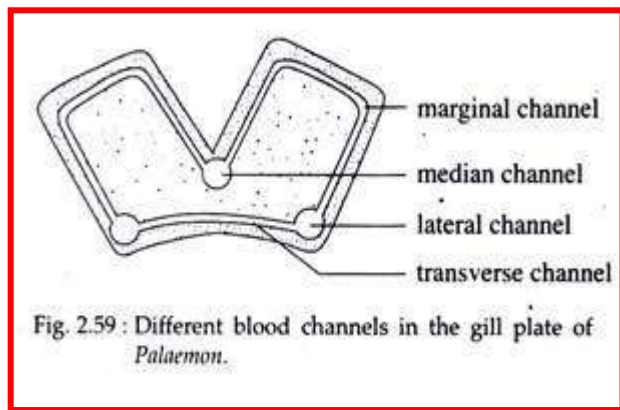


Fig. 2.59 : Different blood channels in the gill plate of *Palaemon*.

**transverse channels** the blood passes to the **lateral longitudinal channels** and is distributed subsequently within the **gill-plates** through the

**marginal channels**. After oxidation, the blood from **marginal channel** returns to the **median channel** and then to the **efferent branchial vessels**, which **convey it to the heart**.

**The course of circulation of blood through the gill is given below:**

**Mechanism of Respiration in Prawn:**

As a result of constant anteroposterior movement of the **exopodite or scaphognathite** of **second maxilla**, **water current enters** into the **gill-chamber** through the posterior side. Movements of **exopodites of maxillipeds** force the water to rush **inside the gill-chamber** through the posterior and lateral sides.

During the flow of water currents, the **vascularized surface** of **branchiostegites, gills and epipodites** are bathed in water and gaseous exchange occurs through these areas, that is dissolved oxygen is taken in and carbon-dioxide passes out.

The carbon- dioxide mixed water is **expelled** out through the **ventral region** of the gill-chamber due to the movement of **scaphognathite and epipodites**. In prawn, the respiratory pigment, **haemocyanin** is dissolved in plasma and carries oxygen to the tissue cells.

