

## CIRCULATORY SYSTEM OF CALOTES

It performs the important function of transportation of various substances within the body of the animal. The system consists of the blood, the heart and the blood vessels, arteries, veins and capillaries.

### **Blood:**

- The blood of Calotes is red in colour & it contains yellowish plasma and blood corpuscles.
- The red blood corpuscles are oval in form and nucleated.
- The white blood corpuscles are amoeboid in form in each bears a spherical nucleus.

### **Heart:**

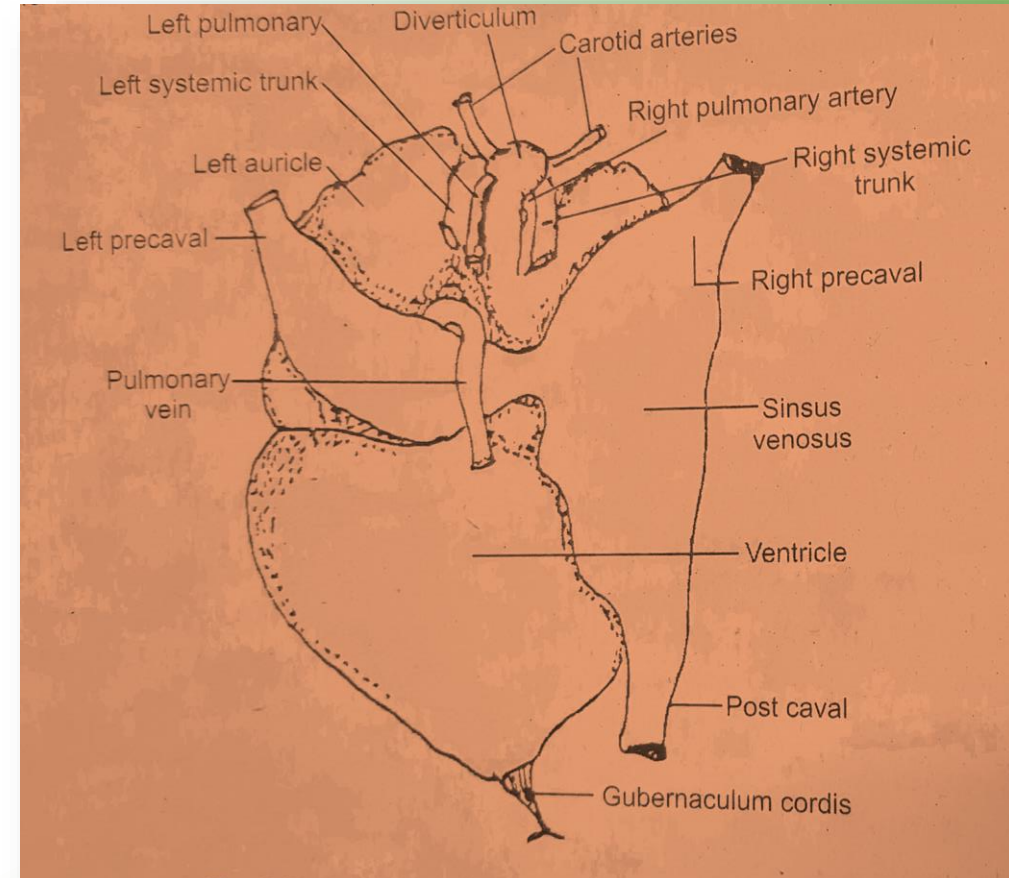
- The is a reddish, broadly conical muscular organ, situated in anterior part of the trunk midventrally.
- The broad base of the heart is directed towards the anterior whereas the pointed narrow end called apex is directed towards the posterior end.
- The heart is enclosed in a two layered thin, transparent pericardial membrane.
- The outer layer is called parietal pericardium whereas inner one is called visceral pericardium. The space between the layers of pericardial membranes is filled with pericardial fluid.
- The pericardial fluid protects heart from shocks and keep it moist and allows free movement during contractions. It also protects the heart from mechanical injury.
- At the apex a fibrous strand is attached to the pericardium called gubernaculum cordis.

## Structure of Heart:

The heart of Calotes is consist of sinus venosus, two auricles and one ventricle. There is no truncus arteriosus.

### 1. Sinus Venosus:

- It is thin walled chamber present on the dorsal side of the heart. It receives deoxygenated blood by three large veins, right and left pre cavals and a post-caval.
- The sinus venosus is formed by the right precaval and the post caval which meet each other to the posterior side of the right auricle.
- The sinus venosus is very much reduced and represented at the area of union between pre-caval and post caval.
- The sinus venosus opens into right auricle by a semi-circular sinu auricular aperture.
- This aperture is guarded by a pair of thin elongated ribbon like valves. It prevent back flow of blood.



## 2. Auricles:

- The heart consists of a pair of broad, sac like auricles. The two auricles are not equal size, the right auricle is larger than the left auricle.
- A shallow fissure or depression is present between two auricles. There is also transverse auriculo-ventricle. It is called coronary sulcus.
- A short finger like process called the diverticulum is present anteriorly in the fissure between two auricles.
- It is formed due to physical pressure exerted by the right pulmonary and right systemic trunk as they pass over anterior margin of the right auricle on the dorsal side.
- The diverticulum has no special significance.
- The auricles are thin walled, muscular chambers and they are separated from each other by a muscular vertical partition called interauricular septum. The right auricle is larger and darker than the left auricle. It has in its dorsal wall a large, transverse slit, the sinu auricular aperture to receive blood from the sinus venosus. The aperture is guarded by two lip like flaps called Sinuauricular valves.
- The auricles open into the ventricle in such a way that their blood passes into separate chambers of the ventricle.
- Their opening called auriculoventricular aperture is guarded by the auriculo ventricular valves.



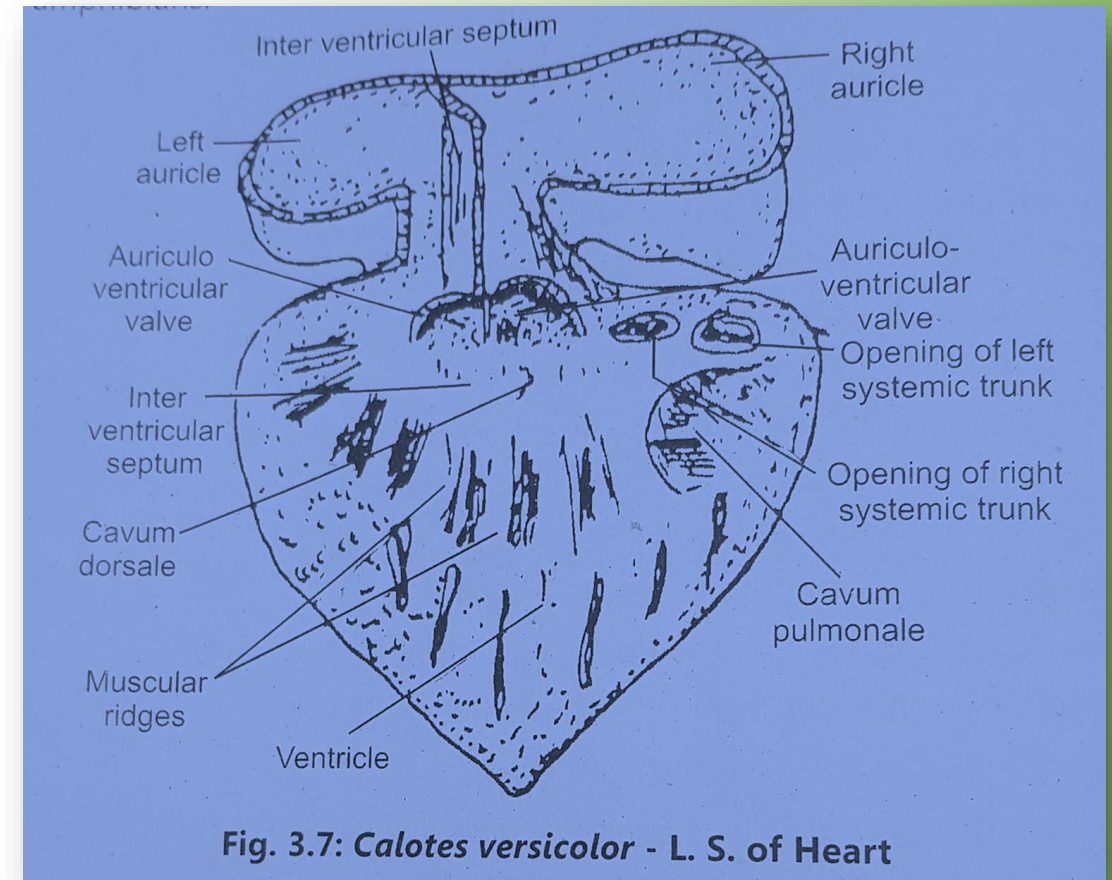
### 3. Ventricle:

- The ventricle forms the posterior half of the heart. There is single ventricle in the heart of Calotes. It is highly muscular, thick walled and spongy.
- The ventricle is triangular in shape with broad anterior base and a narrow posterior apex.
- Its inner surface has muscular ridges called the columnae carneae and the depressions are termed as the fissures.
- Its lumen is partially divided into right and left chambers by an incomplete muscular septum, the muscular ridge or interventricular septum. Ventricular cavity shows two chambers.
  
- Three aortic arches arise from the ventricle ---
  1. Pulmonary arch begins from the dorsal part of the right chamber
  2. Right systemic arch starts from the left chamber
  3. Left systemic arch starts from the right chamber.
- Each arch is provided with a pair of semilunar valves at its base to check the return of the blood.
- All aortic arches are bound together by connective tissue.

## **Mechanism of Blood Circulation:**

- In Calotes, the circulatory circuit is double. These are pulmonary or lesser circulation and systemic or greater circulation.
- Pulmonary circulation is conducted by the pulmonary arteries which carry deoxygenated blood to the lungs.
- In the lungs, the blood becomes oxygenated and returns to the left auricle by the pulmonary vein.
- The left auricle pours its content into the ventricle through the auriculoventricular aperture.
- In the greater circulation, deoxygenated blood returns to the sinus venosus by two precaval and one portocaval veins.
- The sinus venosus opens into the right auricle. The right auricle empties its content into the ventricle.
- The ventricle sends blood for circulation into the different parts of the body through the systemic and pulmonary arches.

- The entry and exit of blood in the ventricle are so beautifully arranged that a major quantity of oxygenated blood is always forwarded to the brain region.
- As the ventricle is incompletely divided, admixture of oxygenated and deoxygenated blood occurs.
- Thus, though the ventricle in *Calotes* is morphologically incompletely divided, there is a tendency for the physiological separation of the two types of blood, at least in two auricles completely and in the ventricle partially.
- From this point, the heart of *Calotes* is biologically more advanced than that of *Bufo*.





## Arterial System of Calotes:

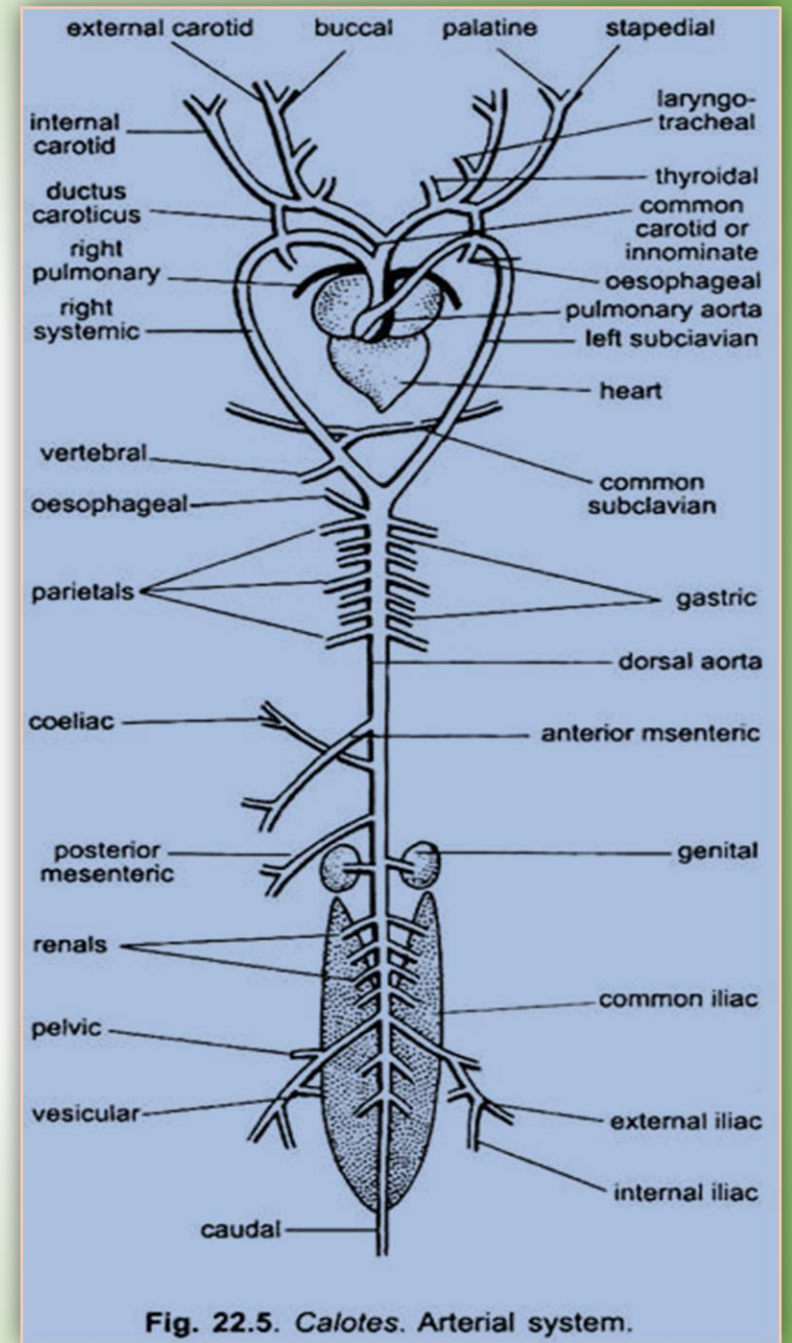
Arterial system distributes blood from heart to the various organs. Following aortic arches or trunks and their branches form the arterial system and take blood from heart to the body.

### 1. Pulmonary Trunks:

- Pulmonary arch or trunk arises from the right chamber of the ventricle.
- It bifurcates to form the left and right pulmonary arteries which turn posteriorly and enter the respective lung for oxygenation.
- Pulmonary trunk carries deoxygenated blood.

### 2. Systemic Trunks:

- The right and left systemic trunks arise from the left and right chambers of the ventricle respectively.
- They cross each other near the anterior border of the heart, extend outwards for a short distance and then proceed upward, backwards and inward.



- The right systemic contains almost oxygenated blood, while the left one carries mixed type of blood.
- It gives off number of branches to the cephalic and anterior regions of the body.
- It gives the branches such as coronary, the carotid, the oesophageal, the vertebral and the subclavians.

### **Coronary:**

It arises from right systemic close to its emergence from the ventricle and it supplies pure blood to the heart particularly to the ventricular area.

### **Common Carotid:**

The right systemic arch gives off just in front of the heart a very short common carotid or innominate artery that bifurcates to form the right and left carotid arteries. These arteries supply pure blood to the brain and other parts of cephalic region.

**a) Internal Carotid:** The internal carotid divides into two branches.

- i. Palatine artery:** It supply blood to the palate region. Palatine again gives hypophyseal which supplies blood to the brain.
- ii. The stapedia artery:** It gives mandibulars and temporal. The temporal again gives off superior orbital and the inferior orbital and maxillary. These branches supply blood to the orbital and maxillary areas.



**b) External Carotid:** It gives branches to the bucco pharynx, the tongue, the larynx and the trachea.

**Ductus Caroticus:** It connects each carotid artery with the systemic arch of that side. The point of junction of these arteries is covered by a glandular tissue called the epithelial body which is similar to parathyroid of mammals.

**Subclavian Artery:** The right systemic arch gives off just before joining the left systemic arch a short common subclavian artery that divides into the right and left subclavian arteries. It supply blood to the forelimbs.

**Oesophageal Arteries:** It arises from the dorsal side o the right systemic loop. Similarly 3-4 oesophageal arise from the left systemic loop. They supply blood in the oesophageal area.

**Vertebral Artery:** It is posterior to the oesophageals originate from right systemic and provide blood to the vertebrae.

**Dorsal Aorta:** The left and right systemics trunks join together and form dorsal aorta. It runs middorsal line just below the vertebral column. This trunk gives branches to visceral organs and posterior parts of the body.

**Anterior Oesophageal Artery:** It originates from the ventral surface of the dorsal aorta and provides blood to oesophagus.

**Parietal Arteries:** These are pointed and segmental. Small arteries supply blood to the trunk vertebrae, the thoracic ribs and the costal muscles. There are about 13 pairs of parietal arteries.

**Gastric Arteries:** The gastric arteries supply blood to cardiac stomach. Their number varies from 4 to 8 pairs.

**Anterior Mesenteric Artery:** It runs obliquely and supply blood to the intestine.

**Coelic Artery:** It supplies blood to the pyloric stomach. A splenic artery is given off by it to supply the spleen.

**Posterior Mesenteric Artery:** It is a large vessel runs obliquely and gives off branches to the duodenum, caecum, colon. It also gives branch to the gall bladder.

**Genital Artery:** The pair of left and right genital artery provide blood to the gonads.

**Renals:** In the region of kidneys few pairs of renal arteries supply blood to the kidneys.

**Iliac Arteries:** These supply blood to the various parts of hindlimbs.

**Caudal Artery:** The dorsal aorta runs posteriorly in the caudal region as a caudal artery and it supplies blood to the caudal vertebrae.

## Venous System:

The deoxygenated blood from the different parts of the body is brought back to heart by means of veins except pulmonary veins which carry oxygenated blood.

**Common Pulmonary Vein:** It is formed by the union of right and left pulmonary veins that bring blood from the right and left lungs. This vein opens into the left auricle. Though it is a vein but it brings oxygenated blood.

**a) Pre cavals:** There are two pre cavals, left and right which bring deoxygenated blood from the head and forelimb region into the sinus venosus, from which it passes into the heart. Each pre caval has been formed by the union of three veins.

- 1. The External Jugular:** It brings back blood from the floor of mouth and tongue, trachea and thyroid gland.
- 2. The Internal Jugular:** It drains from the brain. In the cephalic region maxillary vein, cerebral vein, lateral cephalic vein, palatine vein, occipital & mandibular vein bring blood from the respective areas.
- 3. The Subclavian Vein:** It draws blood from the forelimb. Each subclavian vein receives blood from brachial vein, subscapular vein, pectoral vein and vertebral vein.

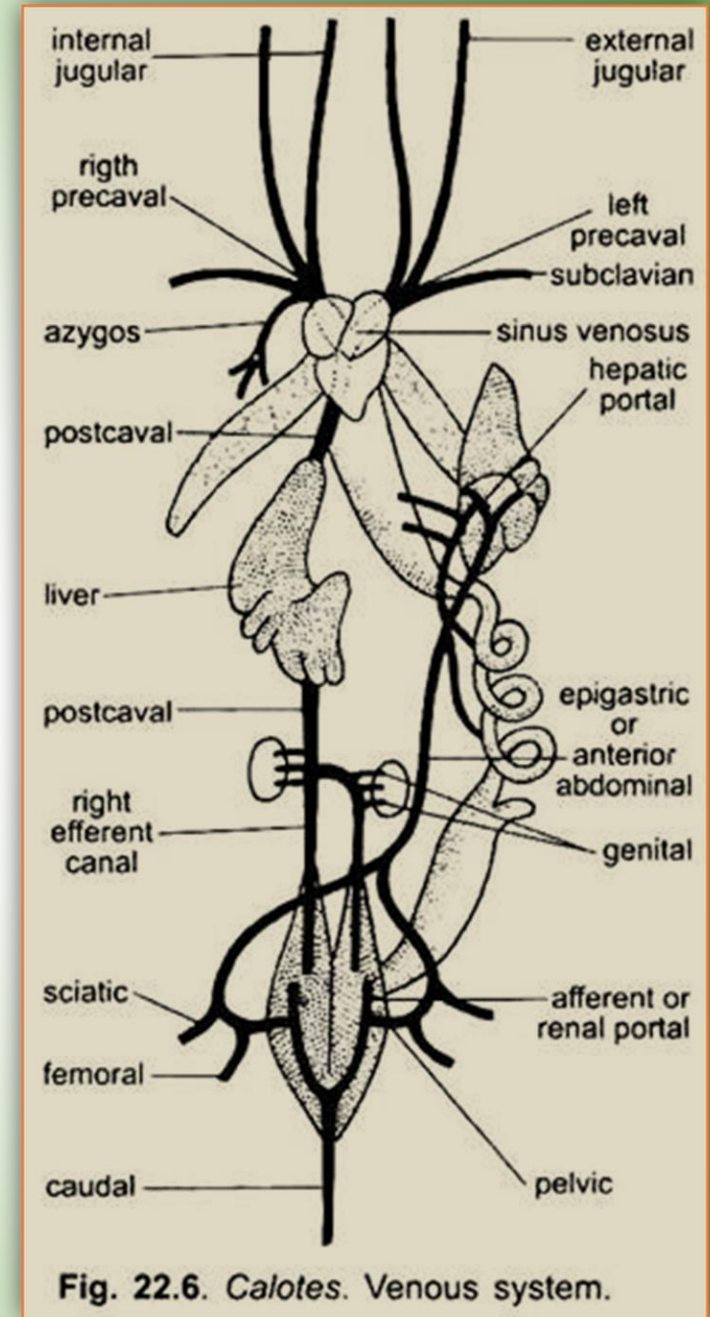


Fig. 22.6. Calotes. Venous system.



## **b) Post-caval:**

- It is single, median vein which collects blood from the visceral organs, the hindlimbs and the tail.
- This vessel pours its blood into the sinus venosus in the dorsal side of the heart.
- It takes its origin posteriorly from the paired left and right efferent renal veins, which runs forward along the inner sides of the kidneys and join each other in front of them to form the post-caval.
- The post-caval becomes large vein after emergence from the liver.
- It opens into the sinus venosus.
- A median caudal vein carries blood from the tail region.
- The hepatic portal enters the liver and breaks into capillaries where the blood from trunk and posterior region is filtered and again poured into the post-caval by hepatic veins.