

9.4 Nervous System of Prawn

The nervous system of prawn is of the annelidan type. However, it is somewhat larger and has more fusion of ganglia. It consists of

- (i) The central nervous system including brain connected with a ventral ganglionated nerve cord through a pair of circum-oesophageal commissures
- (ii) The peripheral nervous system including nerves, and
- (iii) The sympathetic nervous system.

1. Brain or supra-oesophageal ganglia: Brain lies at the base of rostrum, anterior to oesophagus and surrounded by a thick mass of fat. It is a bilobed structure derived from the fusion of several ganglia. On each side of the brain gives off

- (i) an antennular nerve to antennule, into which it sends a statocystic branch to the statocyst branch to the statocyst,
- (ii) A stout optic nerve to compound eye
- (iii) An ophthalmic nerve to muscles of eye-stalk
- (iv) an antennary nerve to antenna and
- (v) A slender tegumental nerve to labrum.

2. Circum-oesophageal Commissures: Posteriorly, the Brain gives off a pair of stout nerves or the circumoesophageal commissures. These run backwards and downwards, encircle oesophagus and unite ventrally with the sub-oesophageal ganglia. The latter form an indistinguishable anterior part of the ventral thoracic ganglionic mass. The two commissures are cross over, just behind oesophagus, by a double bridge of tough connective tissue, called endostemite. Each commissure bears a small commissural ganglion near its anterior end, sends a small mandibular nerve to mandible of its side. Both oesophageal commissures are connected together by a slender transverse commissure near their posterior ends.

3. Ventral Thoracic Ganglionic Mass: Like segments, the segmental nerve ganglia of cephalothorax also become fused to form an elongated ventral thoracic ganglionic mass, lying mid-ventrally on the floor of cephalothorax. It represents fusion of 11 pairs of ganglia and gives off laterally 11 pairs of nerves. First 3 pairs are the cephalic nerves, supplying the mandibles, maxillulae and maxillae, respectively. Last eight pairs are the thoracic nerves, of which first

three pairs supply the 3 pairs of maxillipedes, and the remaining five pairs supply the five pairs of walking legs. Each nerve to a leg becomes bifurcated before entering the legs.

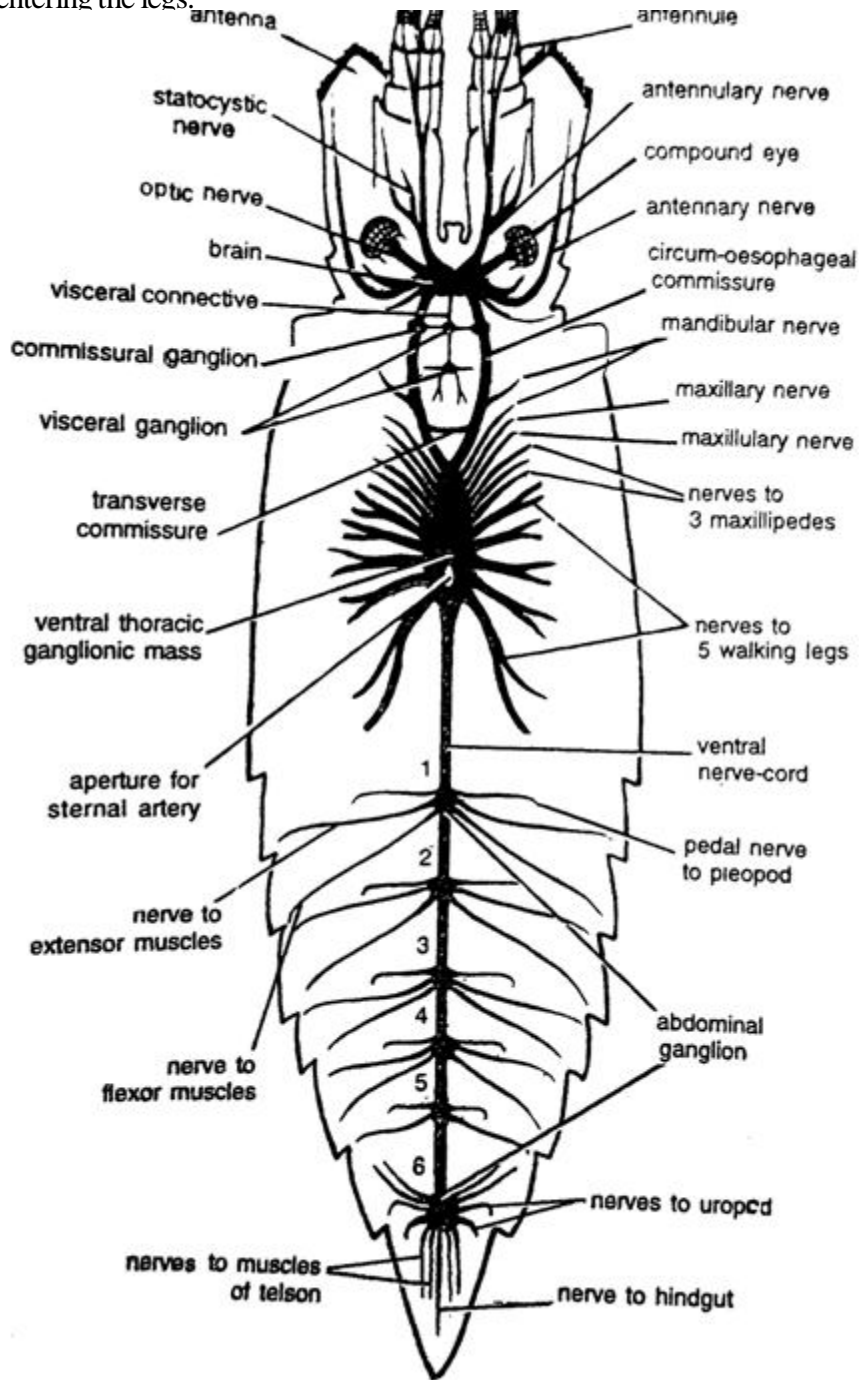


Fig 9.10 Nervous system in dorsal view

4. Ventral nerve cord: Ventral thoracic ganglionic mass gives off from its hind end a stout ventral or abdominal nerve cord. It runs along the mid-ventral line of abdomen. In each abdominal segment, it enlarges to form an abdominal ganglion. Each of the first five abdominal ganglia gives off three pairs of nerves

- (i) One pair of pedal nerves to pleopods
- (ii) One pair of nerves to extensor muscles and

(iii) One pair of nerves to flexor muscles of succeeding segment. The last, stellate or sixth abdominal ganglion is the largest composed of several fused ganglia. It supplies two pairs of nerves to flexor muscles, two pairs to uropods, two pairs to telson and a single median nerve to hindgut.

5. Sympathetic nervous system: Sympathetic, visceral or autonomic nervous system comprises a few ganglia and nerves. A small nerve, arising mid-posteriorly from brain, bears two visceral ganglia lying one behind the other. First ganglion is joined with the two commissural ganglia by connectives. Second ganglion gives off two pairs of nerves to the walls of oesophagus and cardiac stomach.

9.5 Excretory System of Prawn

The excretory system of adult *Palaemon* consists of

- (i) A pair of antennary or green glands
- (ii) A pair of lateral ducts
- (iii) An unpaired renal or nephroperitoneal sac and
- (iv) The integument.

True, nephridia do not occur.

1. Antennary Glands

Coxa of each antenna encloses an antennary gland which is opaque white in colour and as big as a pea-seed. It includes three parts

- (a) End-sac
- (b) Labyrinth or glandular plexus and
- (c) Bladder

(a) End sac: The bean-shaped end-sac is the smallest part lying between bladder and labyrinth. Internally, it contains a large central blood-lacuna.

(b) **Labyrinth:** Labyrinth or glandular plexus is relatively larger than the end-sac and lies on its outer side. It consists of numerous narrow, branching and greatly coiled excretory tubules. Tubules are lined by a single layer of large excretory epithelial cells. They open by a single aperture into end-sac and by many apertures into bladder.

(c) **Bladder:** Bladder is the largest of all, lying on the inner side of end-sac. It is a thin-walled sac made of a single layer of excretory epithelial cells. Its inner wall is prolonged as a short excretory duct or ureter, which opens to outside through a small rounded renal pore, situated on a papilla on the inner surface of coxa of antenna.

2. Lateral Ducts

A narrow lateral duct runs posteriorly from the bladder of each antennary gland. Ducts of both sides are connected by a transverse connective just in front of the brain. The two ducts run backwards along the oesophagus to open into the renal sac.

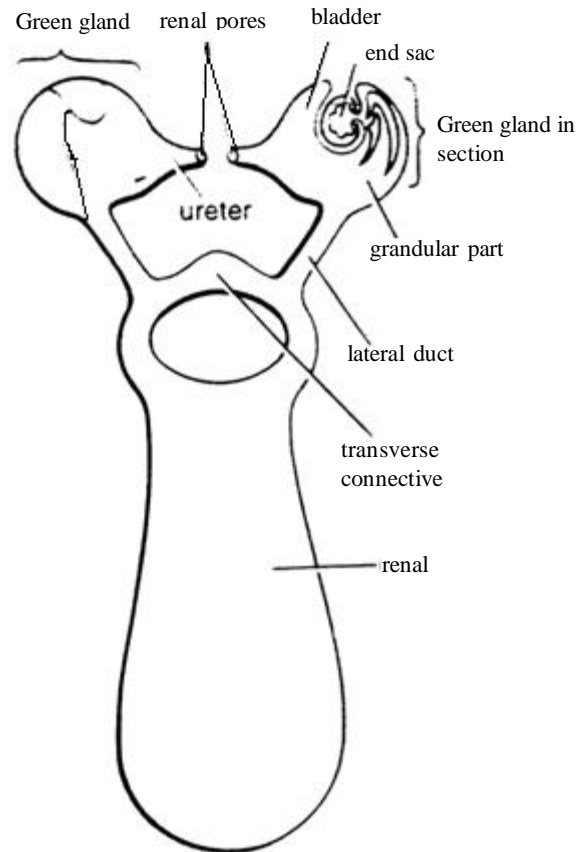


Fig 9.11 Excretory Organs in dorsal view

3. Renal-sac

It is large thin-walled sac lying above the cardiac stomach, just beneath the carapace and extending posteriorly up to the gonads. Its wall is made of a single layer of flattened excretory epithelial cells.

Physiology of Excretion

The complex, nephridia-like antennary glands extract nitrogenous wastes and excess water (osmoregulation) from blood in the same manner as the vertebrate kidneys. The end-sacs excrete mainly compounds of ammonia, but uric acid and other nitrogenous compounds are excreted by other parts. The excretory fluid from end sacs passes into labyrinths in which the useful materials are taken back by blood (Selective resorption). The remaining fluid (urine) passes into bladders and finally expelled out through the renal apertures.

Summary

Central nervous system of fishes consists of brain and spinal cord. The forebrain consists of olfactory lobes, cerebral hemispheres and diencephalon. Olfactory lobes are well developed in fishes. The diencephalon consists of pituitary gland which is attached to hypothalamus with the help of infundibulum. The midbrain consists of two optic lobes, hence called as corpora bigemina. The hindbrain consists of cerebellum and medulla oblongata. The spinal cord is uniform extends from medulla oblongata and extends up to the tail of the fish. Ten pairs of cranial nerves are found in fishes.

The excretory organs of fishes are mesonephric kidneys. Kidneys are located in the abdominal cavity close to the vertebral column. Kidney is made up of a large number of nephrons. Each nephron consists of a renal corpuscle with a glomerulus, neck proximal segment, distal segment and collecting duct. Fishes are ammonotelic animals which excrete ammonia. Osmoregulatory mechanism is well developed in fishes. In freshwater fishes, osmotic pressure of body fluid is higher than that of surrounding water and water diffuses into the body through gills, oral membranes. Freshwater fishes produce a large amount of hypotonic urine. In marine fishes, the salt concentration is high in surrounding water when compared to body fluids. They excrete concentrated urine. Elasmobranchs retain urea and TMO in blood.

Short Answer Type Questions

1. Define excretion.
2. What is osmoregulation.
3. What are the excretory organs of fish.