

Study of *Spermatophores* in Testes and Vas deferens of Marine Water Prawn *Penaeus indicus* in two different stages. (Decapoda: penaeidae)

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Abstract- Histological studies on the structure of Testes and Vasa deferens and Spermatophores has been clearly explained in a marine water prawn *Penaeus indicus* in two different stages like mature and fully mature stage. The reproductive system of male has the following reproductive organs such as Testis, Vas deferens and an Ejaculatory duct. A pair of testis looks like lobes and white in colour, vas deferens is divisible into Proximal, Middle and Distal parts. The Proximal vas deferens (PVD) is a thin tube coming out from the posterior part of the testis. The middle vas deferens (MVD) is slightly broad in the anterior part, flattened and folded at its posterior part. Distal vas deferens (DVD) is the small and cylindrical tube. The vas deferens which passes the spermatophores to the ejaculatory duct. The Distal vas deferens is the smallest portion and it was slightly bulged at the base of the ejaculatory duct. The functions of the ejaculatory duct is to release the spermatophores into the thelycum of female reproductive organ.

Index Terms- Testis, Vas deferens, Spermatophores, Septum.

I. INTRODUCTION

Decapod crustaceans represent a large, diverse biological group, which include shrimps, prawns, crabs, crayfish and lobsters and the marine water prawn *Penaeus indicus*. The sexual dimorphism and the reproductive physiology in arthropods (Adiyodi, K.G. and Adiyodi, R.G. 1974). The vasa deferentia of penaid shrimp is more complex when compared to other decapods. The vas deferens and ejaculatory duct has been involved in the formation of spermatophores in *Penaeus setiferus*, *P. duorarum* and *P. aztecus* (Bauer and Min, 1993) and *Trachypenaeus similis* (Bauer and Cash, 1991). The detailed studies on the origin and the formation of spermatophore materials in *Penaeus kerathurus* (Malek & Bawab 1974). Based on the morphology and taxonomic value the repantantian spermatophores are classified into two types namely, pedunculated and non-pedunculated spermatophores (Calman 1909). In *P. aztecus* and *P. duorarum* the appendage of the spermatophore show the maximum similarities when compared to the wing of the spermatophore of *P. kerathurus* (Bawab, 1974b) and *P. indicus* (Champion, 1987). During the formation of spermatophores, the vas deferens and ejaculatory duct both plays a major role in *Penaeus setiferus* and *P.vannamei* (Chow et al., 1991). Hence the main concept of the study is to explain the structure and the formation of spermatophores in the

vasdeferens and the ejaculatory duct in different stages of *Penaeus indicus*.

II. MATERIALS AND METHODS

Penaeus indicus (Indian white prawn) were collected in and around the Pattipuzham near Mahabalipuram. The specimens were collected from the Madha Prawn Hatchery Centre. The Prawns were collected by the local fishermen and they were reared in a big cement tank having the capacity of 0.5 tones water. The cement tank was filled with sea water which was aerated continuously and the water was removed periodically in every 12 hours for clearing the food and wastes. For the histological studies, healthy *Penaeus indicus* was selected, dissected and the following tissues were taken out from the male *Penaeus indicus*, Testis, Vasdeferens and Ejaculatory duct. The fixation process was carried out by using Aqueous bouin's fixative. Then, the tissues were processed routinely for paraffin embedding and sectioned to 4-6 µm thickness for staining by using haematoxylin – eosin (H&E) method (double staining method).

III. RESULTS

Morphology: The male *Penaeus indicus* can be identified by the presence of petasma (Figure 3). Petasma is a copulatory organ. It was formed by the union of the endopodites of the first abdominal appendages.

Testes: In *Penaeus indicus* the male consists of a pair of testes located in thoracic region. The testes are milky white in colour (Figure 2). It was located near the hepatopancreas and below the carapace.

Vas deferens: The vas deferens arises from the posterior part of the testes. It was thin, translucent and long tube like structure (Figure 2). It was divided into three types PVD(proximal vas deferens), MVD(middle vas deferens) and DVD(distal vas deferens).

Histology: In testis of fully mature stage the testicular lobes were more than in mature stage. The testicular lobes contains spermatophores. Each lobe was separated by the septum. Each testicular lobes consists of germ cells and glandular cells. The germ cells are smaller in size and the glandular cells are larger in size. In mature stage many number of spermatophores has been identified (Figure 4). But in fully mature stage only few number of spermatophores was seen (Figure 5). Because the spermatophores were migrated to

the PVD of fully mature stage . It was clearly noticed in Figure 6 & 7 of vas deferens.

The vas deferens contains many lobes. Each lobe consists of mass of spermatophores. The spermatophores were transferred from the Testes to PVD . The PVD and MVD of fully mature stage shows many lobes which consists of large number of mass of spermatophores (Figure 8) when compared to the PVD and MVD of mature stage (Figure 6 & 7) . The posterior part of the PVD has been continued as MVD. The MVD contains large number of spermatophores than the PVD. The MVD is slightly large than PVD. The vasdeferens lined with epithelial cells that secretes a fluid like substance. These substance helps the transfer of spermatophores from the vas deferens to the ejaculatory duct and also involved in the activation of spermatophores. The DVD is the small portion and it was continued as ejaculatory duct. Finally the spermatophores becomes more active in the DVD and in ejaculatory duct.



Figure 1. *Penaeus indicus*

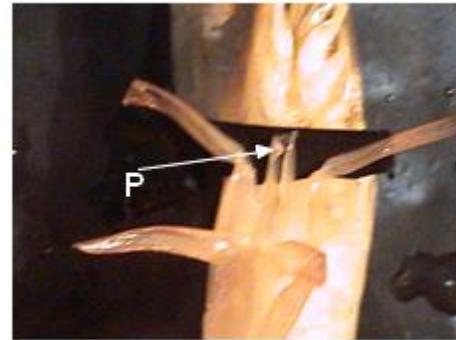


Figure 2. Identification of Male(*Penaeus indicus*). P- Petasma (copulatory organ).

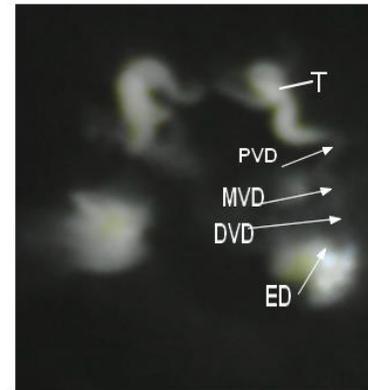


Figure 3. Male reproductive system of *Penaeus indicus*. T- Testis, PVD- Proximal vas deferens, MVD- Middle vas deferens, DVD- Distal vas deferens, ED- Ejaculatory duct.

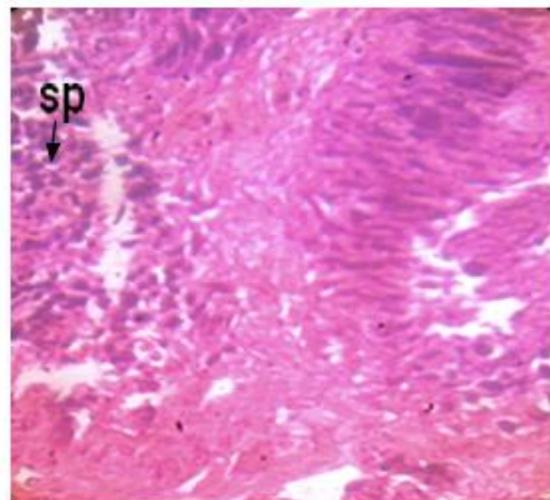


Figure 4. Testis of Mature Stage. SP- Spermatophores.

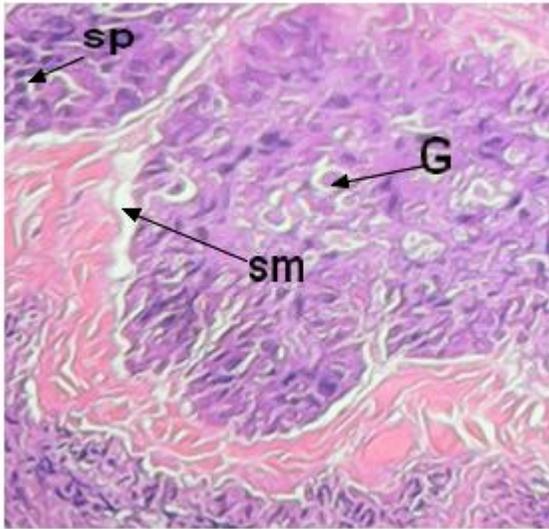


Figure 5. Testis of Fully Mature stage. SP- spermatophores, SM- septum, G- glandular cells.

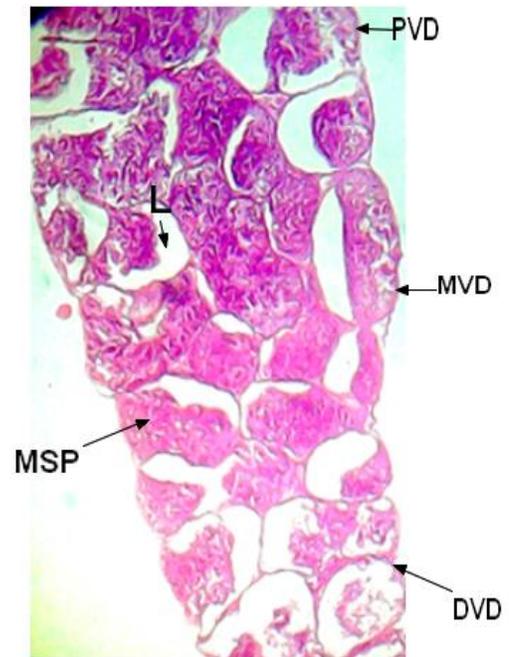


Figure 7. Vas deferens of Fully Mature stage
PVD- proximal vas deferens, MVD- middle vas deferens, DVD- distal vas deferens, L- lobes.

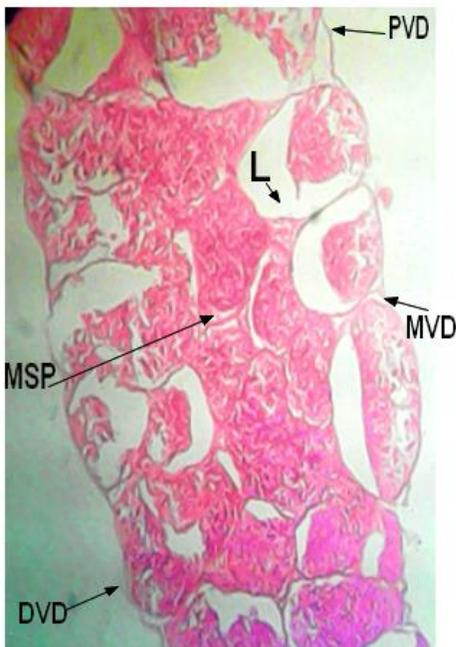


Figure 6. Vas deferens of Mature stage.
PVD- proximal vas deferens, MVD- middle vas deferens, DVD- distal vas deferens, L- lobes.

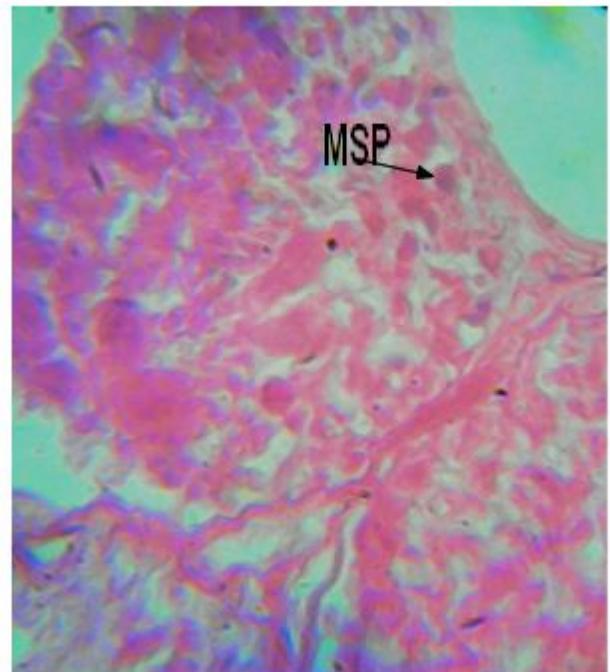


Figure 8. Vas deferens in Higher magnification. MSP- mass of spermatophores.

IV. DISCUSSION

The spermatophores structure and its function has been studied during the reproduction of deep water shrimps *Aristeus*

antennatus (Demestre M, Fortuno JM 1992). The spermatophore and the vasdeferens having the homology of structure in *Trachypenaeus (Rimapenaeus) similis* (Bauer and Min, 1993) than other species of penaeid genera. External deposition of spermatophores on the female of the white shrimp *Penaeus (Litopenaeus) setiferus* (Perez Farfante 1975). The studies on the formation of spermatophores and the structure of male reproductive organs have been undertaken in economically importance like *Fenneropenaeus (Penaeus)* (Subrahmanyam, 1965; Chow et al., 1991). In *P. aztecus* and *P. duorarum*, the spermatophore appendage material seems to be homologous to the glutinous substance of the spermatophore of *P. setiferus*. The formation of the appendage material and the projection of typhlosole in the vas deferens channels (Chow et al., 1991; Malek & Bawab, 1974b; Ro et al., 1990). The comparative study of the spermatophores in the ejaculatory duct explains the homologies of the spermatophores in the *P. setiferus*, *P. aztecus*, and *P. duorarum*. The partitions divides the vas deferens by internal septum (Malek and Bawab, 1974a, 1974b, Champion, 1987). As a result the spermatophores were arranged in compact lobes. The internal septum transport spermatic and non spermatic substances.

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