



ANATOMY OF THE MALE REPRODUCTIVE SYSTEM IN *AEOLESTHES HOLOSERICEA* FABRICIUS, 1787 (COLEOPTERA: CERAMBYCIDAE)

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**Abstract:**

Observations on the male reproductive system in *Aeolesthes holosericea* were carried out in the 4-5 day old males. They were dissected in insect Ringer solution and observations were made. The male reproductive system consists of a pair of prominent testes (each with 2 pairs of separate follicles), 4 pairs of vasa efferentia, a pair of vasa deferentia, a pair of seminal vesicles, a median ejaculatory duct, aedeagus and 3 pairs of accessory glands. The male gonopore is located in 9<sup>th</sup> abdominal segment mid ventrally.

**Keywords:** Testes; vasa deferentia; ejaculatory duct; aedeagus; *Aeolesthes holosericea*.

**Introduction:**

The anatomy of reproductive organs is of interest to workers in various fields. The taxonomists and morphologists described the reproductive organs and have used the structural features for classification and have attempted to interpret the structure in terms of ontogenetic and phylogenetic origin (Engelmann, 1970). The *Aeolesthes holosericea* which is one of the wood boring cerambycid (longhorned) beetles and serious pest of timber. Beeson (1941) reported 49 different host plant species to which *A. holosericea* infestation occurs in Indian forests. The information available on *A. holosericea* studies indicates that the studies pertaining anatomy of the reproductive system are scanty. Therefore, to overcome the lacuna it has been decided to work on the male reproductive system in *A. holosericea*. This study will provide basic information for further work on the reproductive physiology and indirectly help in the integrated pest management.

**Material and Methods:**

Field collected adults of *A. holosericea* were dissected in chilled insect ringer solution (Ephrussi and Beadle, 1936) under a stereoscopic binocular microscope. The system was cleaned by removing trachea, fat bodies and gross anatomy were studied followed by their measurements.

**Results:**

The male reproductive system includes paired testes, 4 pairs of vasa efferentia, paired vasa deferentia and seminal vesicles, a median ejaculatory duct, aedeagus and 3 pairs of accessory glands (Fig.1).

**a) Testis:** Testes are in pair and each testis consists of 2 pairs of testicular follicles. The testicular follicles are whitish, circular in outline dorsoventrally flattened structures measuring about 4 mm in diameter and is 1.5 mm thick.

They appeared like a disc having concavities centrally from both the sides and provided with a number of tracheal innervations.

**b) Vasa efference:** Vasa efferentia are 2 in number in each testis arose from dorsal central concavity of each testicular follicle. It is short 2 mm sized narrow cylindrical tube connects vasa deferens to the testicular follicle. The 2 vasa efferentia of each side converged as a single vasa deferens.

**c) Vas deferens:** The vasa deferentia are paired, long, narrow tubes run posteriorly and distally just prior to connection of accessory gland it slightly enlarged to form the seminal vesicle. Each vas deference was measured 10.5 mm long.

**d) Seminal vesicle:** Vas deferens of each side shows enlargement of the duct in the shape of dilation which is nothing but seminal vesicle. This enlargement or seminal vesicle occurs just before the connection of anterior accessory gland.

**e) Ejaculatory duct:** Posteriorly, the vasa deferentia leads into tubular duct called duplex ejaculatory duct. The ejaculatory duct is divisible into 2 regions proximal and distal. The anterior proximal region is very short, the cylindrical tube formed by the union of vasa deferentia and is comparatively thin. The distal region is broader initially (at the junction of the proximal and distal region of the ejaculatory duct) runs forward for short distance and turns posteriorly forming L shaped structure. Finally, it becomes narrower posteriorly and joins with the membranous sac of the aedeagus. It was measured about 5.5 mm in length (Anterior region 0.5 mm, middle region 5 mm).

**f) The aedeagus:** The aedeagus consists of median lobe called a penis, tegmen and internal sac called endophallus (fig. 2). The tegmen is divided into a ring like a phallobase, lateral lobes. Apically parameres are setosed separated from each other and fused to phallobase. The penis is

a flat pointed tube and has two dorsal projections called sturts which store membranous sac inside called preputial sac. The preputial sac is highly folded reversible tube within the aedeagus and is in continuation with the ejaculatory duct. It was measured 5.3 mm long. The tegmen is curved like beak and pointed apically like cock in which penis lies. The length of aedeagus was 2.6 mm.

#### **Accessory glands:**

There are three pairs of accessory glands viz. Accessory gland A, Accessory gland B and Accessory gland C. Accessory gland A is the longest accessory gland measured about 11 mm long. It is whitish, cylindrical convoluted tube curve backward in the abdomen. It is narrowing distally and slightly wider proximally nearly equal to the width of duplex ejaculatory width. Accessory gland B lies adjacent to the accessory gland A or it is very short whitish, cylindrical short tube joins and open into accessory gland A just about 1 mm away from the junction of the duplex ejaculatory and accessory gland A. Accessory gland C is similar in the color, size and shape of accessory gland B but its origin is just before the union of the two duplex ejaculatory duct. Accessory gland B originates from accessory gland A run backwardly towards duplex ejaculatory duct of the respective side then turns outward from the ventral side of accessory gland A forming exactly C shaped structure whereas accessory gland C is straight gland run parallel dorsally to the duplex ejaculatory. Accessory gland B and C were measured about 1 mm in length

#### **Discussion:**

Reproduction in the vast majority of insects is a function of the sexually mature adult. The reproductive organs comprise the internal organs (gonads, gonadal duct and the accessory glands) and external organs (genitalia). The internal organs of reproduction are partly mesodermal and partly ectodermal in origin (Mani, 1982).

The basic morphological features of the male reproductive system in *Aeolesthes holosericea* adult is of an insectan type in general and coleopteran type in particular with some minor differences. In Coleoptera, the male and female reproductive organs have been investigated by Bordas (1900), Williams (1945), Edwards (1961), Cerezke (1964), Simoes (2012).

Each testis of insect under study consists of two whitish discoidal separate testicular follicles. From each follicle thin tubular vas efference arises and joins with the vas efference of another follicle to form vas deference of the respective side. In *Prionoplus reticularis*,

the testis is composed of 12 to 15 lobes connected to vas deference by short vasa efferentia (Edwards, 1961). Considering the testis Bordas (1900) divides Coleoptera into two groups: 1) the organs are simple and tubular each being enclosed in a membrane and 2) testes are compound and divided into a number of separate follicles. The follicles may be rounded capsule each communicating with the vas-deference by means of a separate duct in Chrysomelids, Curculionids and Scarabaeids. However, separate rounded follicles are reported in *A. holosericea* but it is a polyphagan cerambycid beetle.

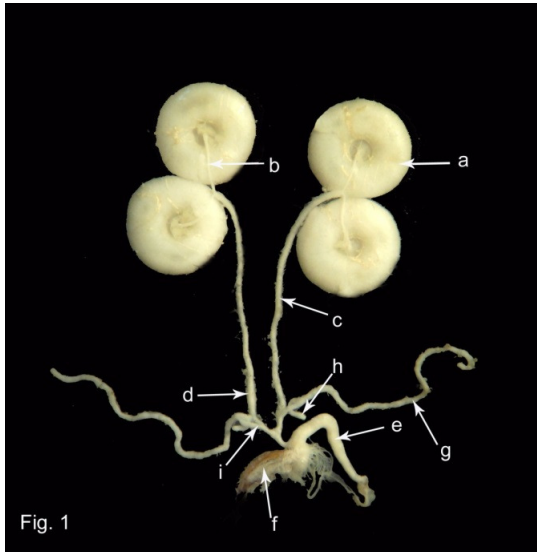
The division of the testes into a large number of follicles communicating with the vasa deferentia is a typical polyphagous coleopteran testis (Richards and Davies, 1963; Gerber et al. 1971). The division of testis into separate testicular follicles which by their vas efference join to vas deference of their respective side is also reported in *Phyllophaga anxia* (Berberet and Helms, 1972) *Corpophaneus lancifer* (Edmonds, 1974), *Geotrupes cavicollis* (Lopez and Benitez, 1982) and *Oryctes rhinoceros* (Jacob, 1989).

According to Snodgrass (1935), Richards and Davies (1963), Escherich (1894) and Wigglesworth (1977) in a majority of insects, the vas deference consists of a narrow tube and dilated at one point to form a seminal vesicle. Metcalf (1932) reported paired ejaculatory ducts in some Coleoptera. Edwards (1961) reported single tubular ejaculatory duct in *P. reticularis*. The aedeagus in *A. holosericea* has a more or less similar structure as described by Snodgrass (1935), Edwards (1961), Escalona and Slipinski (2012). The aedeagus and endophallus are placed inside a well-developed phallosome in the species under study. Almost similar structure has been reported by Berberet and Helms (1972) in *P. anxia*, Edmonds (1974) in *C. lancifer*, Jacob (1989) in *O. rhinoceros*. Edwards (1961) described endophallus into 3 regions in the everted condition in *P. reticularis*.

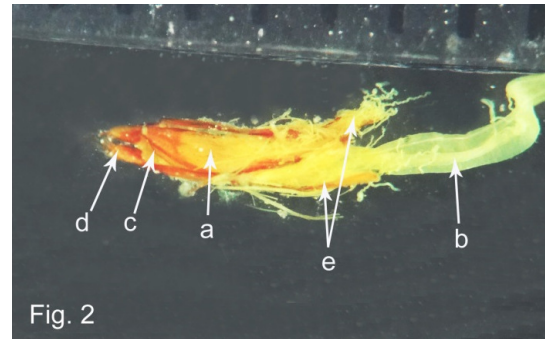
The male accessory glands generally arise from the anterior end of the ejaculatory duct or from short divergent anterior branches of the duct. Usually, a pair of accessory glands but in some insects series of glands arise from each side of ejaculatory duct while in other there may be the compact mass of the tubule about the terminus of each vas deference (Snodgrass 1935). From one to three pairs of accessory glands are usually present in relation with the genital ducts (Escherich, 1894; Blatter, 1897). A similar type of 3 parts of accessory glands is found in the species

under study. The two vasa-deferentia are joined with the duplex ejaculatory ducts from which three parts of accessory glands A, B, and C are

arosed. Finally, duplex ejaculatory ducts join from the median common ejaculatory duct.



**Figure 1** General organization of the male reproductive system in *Aeolesthes holosericea* adult after dissection. Note the Testis (a), vas-efference (b), vas-deferens (c), seminal vesicle (d), ejaculatory duct (e), aedeagus (f), accessory gland A (g), accessory gland B (h) and accessory gland C (i). **Fig.2.** Aedeagus of *A. holosericea*. Note the penis (a), endophallus(b), tegmen(c), parameres(d), dorsal sturts (e).



### Conclusion:

The basic knowledge on the reproductive system in insects will help to study the taxonomy of insects and also to formulate control strategies against the species under study and related species.

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