

# A Study on Morphology and Histology of Ovariole of Beetle *Cybister Tripunctatus* (Coleoptera: Dytiscidae)

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**Abstract-** *The present study is aimed at the female reproductive system in relation to vitellogenesis in the aquatic beetle *Cybister tripunctatus* (Coleoptera: Dytiscidae). The female reproductive system is well developed in the adult female and consists of a pair of ovaries, a pair of lateral oviducts, a common oviduct, a vagina, a spermatheca with a spermathecal gland and a colleterial gland. Each ovary is oval-shaped consisting about 20 to 25 ovarioles. All the ovarioles resemble with each other in shape and size and are anteriorly differentiated into a terminal filament, a germarium, a vitellarium and a pedicel. The pedicels are long tubular structures in *Cybister tripunctatus*. The terminal filament of the ovariole is composed of a mass of small spherical epithelial cells which are devoid of cytoplasmic content. Externally, the terminal filament is covered with tunica propria. A transverse septum is present in between the terminal filament and germarium.*

Kono, 1986; Ma and Ramaswamy, 1987; Grodowitz and Brewer 1987; Maruthi et al., 1987; Kurihara and Matsuzki, 1989). Extensive studies on *Dytiscus marginalis* pertaining to female reproductive system, particularly ovaries and oocyte development were initiated by Urbani and his co-workers since 1950. They first described origin, structure and functions of the ovarian body (Urbani 1950, a, b, c, 1951). The female reproductive system is evolved extensively in the insects showing wide range of variation in anatomical and histological structure and functional diversity. The female gonads, the ovaries in insects are well evident as the paired structures usually situated dorso-lateral to the gut and each consisting variable number of tubular ovarioles. Each ovariole is composed of somatic and germ cell tissues. The ovaries are basically of three types, panoistic, polytrophic, meroistic and telotrophic meroistic. In Coleoptera, particularly, the ovaries are of two types, polytrophic or acrotrophic or acrotrophic in Adephaga and Polyphaga respectively.

## I- INTRODUCTION

The female reproductive system in Coleoptera shows wide variation. In the anatomical organization, histological structure, process of egg development and mode of oviposition among different species. Most of the work on the female reproductive system in relation to vitellogenesis in Coleoptera has been carried out in polyphagous beetles while a very meager information is available on that of the Adephaga. (Rajendran and Ramlingam, 1979; Sareen and Sharma, 1981; Inamdar and Joshi, 1984; Sidhra et al., 1984; Khalifa, 1986;

## II- MATERIAL AND METHOD:

The aquatic carnivorous beetles were collected from the ponds located at Pauni, Dist. Bhandara (MS). The beetles were reared in laboratory throughout the year to carry out the present studies. The female reproductive organs were dissected in insect Ringer's solution under stereoscopic binocular microscope. The organs were fixed in Bouin's fluid for 18-24 hrs for histology and in 6 to 12 hours in Carnoy's fixative for DNA, RNA, protein and carbohydrate histochemistry. The fixed tissues were dehydrated and embedded in paraffin wax.

at 60-62. The sections were cut at 4 And 10 um thickness on the microtome for histological and histochemical Staining techniques respectively. Following histological techniques ( Humason, 1962) were used by Ehrlich's Haematoxylin-eosin (HE) method.

### III- OBSERVATION

The female reproductive organs are located in the abdominal cavity occupying the region comprising 1<sup>st</sup> to 8<sup>th</sup> abdominal segments. The reproductive organs are intermingled with the fat body and trachea. In the immature beetle, the ovaries are small laying ventral to the Alimentary canal in the posterior 4<sup>th</sup> and 5<sup>th</sup> segments of the abdomen. In the Maturated beetles, the ovaries develop extensively and they occupy most of the region of the abdominal cavity from 1<sup>st</sup> to 6<sup>th</sup> abdominal segments. Each ovary is a large and oval in shape consisting about 20 to 25 Ovarioles. Each ovariole is about 1.5 cm in length. An immature ovary measures About 8 to 12 mg and the fully maturated one about 46 to 54 mg in weight. The ovaries are externally covred with a thin peritoneal sheath. The ovaries are attached anteriorly to the inner surface of the wall of the 1<sup>st</sup> Abdominal segment by a suspensory ligament. They open posteriorly into the Lateral oviducts. The lateral oviducts are short and tubular structures. They run Latero-medially from the 6<sup>th</sup> to 7<sup>th</sup> abdominal segments. Both the lateral oviducts Unite together forming common oviduct. The common oviduct is a large Tubular and convoluted structure. The posterior part of the common oviduct is Modified into the bulbus vagina.

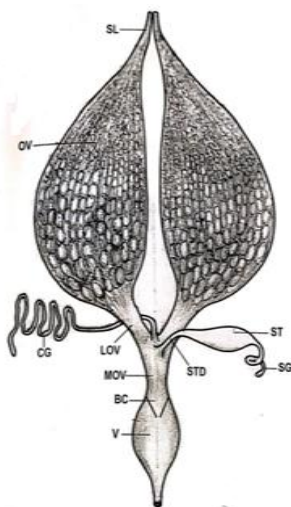


Fig- Female Reproductive System

Apical region of each ovariole contains stem line, the terminal filament. The terminal filament is anterior-most thread-like, slender, fine structure of the ovariole. The wall of the terminal filament is composed of a mass of small spherical cells with oval nuclei. The cells are almost devoid of cytoplasm. Internally a large lumen is present. Externally, the terminal filament is covered with a fine layer of tunica propria. A transverse septum lies in between the terminal filament and the germarium. The terminal filament of all ovarioles of an ovary unite together to form a thick cord, the suspensory ligament.

The germarium is a small region clearly marked from the terminal filament by a transverse septum. It lies between the terminal filament and the vitellarium. It contains some cystoblasts, cystocysts and profollicular cells. The anterior Part of the germarium is exclusively filled with cystoblasts. The cystoblasts are Spherical in shape and contain dense cytoplasm and large spherical nuclei at the Centre. The cystoblasts produce cystocysts after undergoing mitosis. The cystocysts are closely packed in the posterior region of germarium. The Posterior most region of germarium contains a germinal cyst forming an egg Chamber. The posterior region of the germarium in the maturated beetles Contains large number of trophocytes or nutritive cells, arranged in the several Tiers along with a small basal oocyte, migrating to the vitellarium. The vitellarium The posterior part of the germarium is enclosed with the follicular epithelial cells. They migrate from germarium into the vitellarium in which further development of oocyte is taking place. It is the largest part of an ovariole enclosing the oocytes encircled with the follicular epithelium. The oocytes are arranged in a linear fashion. Each oocyte is provided with a group of 15 trophocytes or nurse cells. Each oocyte and a group of nurse cells are separated from the preceding and succeeding follicles, by a single layer of cells, the interfollicular tissue. The ovaries, thus, represent polytrophic type. Initially, the trophocytes and their nuclei are spherical. The nuclei Are large and situated at the centre containing large amount of chromatin material. A Strongly eosinophilic cytoplasm is evident in peripheral region of the trophocytes. The cell bodies and the nuclei of the trophocytes measure about  $16.26 \pm 0.11 \mu\text{m}$  and  $11.88 \pm 0.08 \mu\text{m}$  in diameter respectively. The trophocytes transform into spherical to polygonal shape and their cell Bodies and nuclei measure about  $18.52 \pm 0.06 \mu\text{m}$ , In diameter respectively. The vitellarium thus contains a large number of oocytes arranged in A linear fashion.

Various stages of development of oocyte are clearly seen from Primary oocyte to the matured ova in anteroposterior direction.

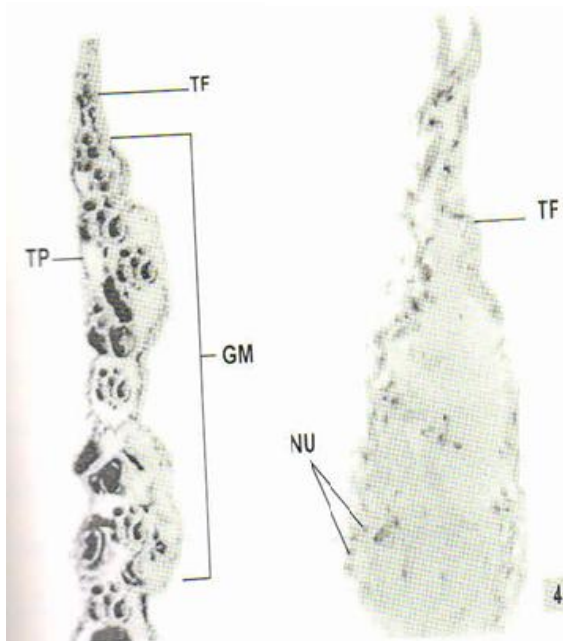


Fig. 1 HLS passing through early oocyte showing apical region of the ovariole differentiated into terminal filament and germarium IHE X 60

Fig. 2 HLS passing through terminal filament IHE X 128

#### IV- DISCUSSION

The number of ovarioles in each ovary vary greatly in Coleoptera. There is only one, ovariole per ovary in Scarabaeus and coprini (Heymons 1929, 1930), two per ovary in Pasalidae (Reyes Casillo and Richer, 1973), and uruulionidae (Stein, 1847, Munro 1990-12, Bisell, 1937, Lenkova, 1949, Cram,

1958, Burke 1959, Vernier 1970, Garthe 1970, Stone et al 1971, 56 in Ctenicera (Zacharuk, 1958 a ) and numerous in more than 329 species of beetles belonging to 45 families (Robgertson, 1961). In *Cybistertripunctatus* also 23-25 large number of ovarioles are observed in each ovary. According to Stein (1847) the ovaries in Coleoptera are of three major types -1. The ovary with pedicel of individual ovarioles, 2. The ovary with a common central pedicel and 3. The ovary with lateral pedicel, and in *Cybistertripunctatus* the ovaries represent the first type. Histology and development of the ovaries in *Dytiscus* is described by Korschelt (1886) and Demandt (1912) among *Dytiscidae*, while the present study is perhaps

first on *Cybistertripunctatus*. The lateral oviducts in *Cybistertripunctatus* are short and wide. In *Hydrophilidae*, however, the tubular glands at the base of the ovary in each lateral oviduct have been reported (Stein, 1847) while the lateral oviducts in *Cybistertripunctatus* do not possess such glands. In *Cybistertripunctatus* the vagina is a tubular structure while the bursa copulatrix is not clearly separated.

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