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Original Research Article

Effect of Monsoon Climate in Accurate Size of Histological Variations in Gonads of Freshwater Bivalve Mollusc *Corbicula regularis*

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ABSTRACT:
The bivalve molluscs are fresh water bivalve available in most of the regions in India. Most of the individuals are females or hermaphrodites and no complete male was observed. The most of maximum species of bivalve in various reproductive cycle times and water pollutions direct impact of development & productive imbalance. Particularly in Maharashtra state. Several environmental factors such as temperature, turbidity, depth, mechanical factor, light intensity, genetic & hormonal control. The maturation of gonads is also dependent on the richness of food supply which depends on climate. Generally the reproductive cycle of bivalve mollouscan population includes activation, growth and gametogenesis. The histological sections of the gonad throughout the study revealed that gonad consists of numerous follicles innervated by the connective tissue and muscles to determine the size of the oocyte. The present study was totally depends on the climatic imbalance in due to maturity of the gonads.

Keywords: *Corbicula regularis, Gonads, Histology, Monsoon*

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INTRODUCTION

Many species of bivalve mollusc abundantly found in Indian waters can sustain regular & very productive Fisheries in India, particularly in Maharashtra state. Effects may be of such minor significance that the organism can function normally. However, under stressful conditions (i.e., pH change, low dissolved oxygen, high temperatures, changes in hardness, etc.). The toxicity of some chemicals may also be enhanced or mitigated in the presence of other chemicals. In addition to killing the organisms, some heavy metals can have negative but lethal effects on individual organisms and populations, such as reduced reproduction, reduced mobility to escape predation, or alterations in behavior (Bayne, 1973).

Toxic impact may bring physiological, biochemical or pathological alterations in organisms. Increased pollution in the modern world leads to the contamination of aquatic ecosystem. Industrial waste is major cause of concern for aquatic environment because of their toxicity persistency and tendency to accumulate in the organisms. The aquatic organisms that pollution of aquatic environment from industrial, domestic and agricultural waste has exposed important aquatic organisms to contaminants which not

only endanger their lives but also eventually the food chain leading to, serious public health hazards (Gabbott, 1975).

Males and females of gonochoristic bivalves possess paired gonads, located near to the digestive gland. Two gonads are so close together that the paired condition difficult to detect. In diocious *Corbicula regularis*, the gonads commonly occur among the intestinal loops in the base of the foot. Several environmental factors such as temperature, lunar periodicity, depth, mechanical factors light intensity, genetic & hormonal control. The maturation of gonads is also dependent on the richness of food supply which depends on climate. Generally the reproductive cycle of bivalve molluscan population includes activation, growth and gametogenesis. Reproduction is divided into three major phases' gonad development, spawning & fertilization, development & growth. These phases functioning continually in co-ordination with seasonal environmental changes (Joseph & Raj, 2010).

MATERIALS & METHODS

The freshwater bivalves, *Corbicula regularis* were collected from the area of Girna, dam which is about at the distance of 50 Km. from Chalisgaon city of Maharashtra state, India. To make them acclimatize to laboratory conditions, they were maintained in a glass aquarium containing dechlorinated water for 3- 4 days. The adult animals with 60-62 mm shell length and 78-82 mm shell length were freshly collected between 4.30 – 5.30 p.m. on every full moon days of during monsoon season. Immediately after bringing to the laboratory the shells of the animals were brushed and washed with freshwater in order to remove the algal biomass, mud and other waste materials. The animals were soaked carefully and flesh of animals was fixed in Bouin's fixative for 24 hrs. The gonad tissue were then removed and processed for preparation of paraffin blocks. Dehydration of gonad was done through serial grades of ethyl alcohol while xylene was replaced by toluene during the process. The tissues were embedded in paraffin was at 58^{0}C. The sections of gonad were cut out 5–6µm thickness. The gonads were stained with methyl green pyronin stain. All the sections were observed under the research binocular microscope and wherever necessary, measurements were made before microphotography.

RESULTS

The histological sections of the gonad throughout the study revealed that gonad consists of numerous follicles innervated by the connective tissue and muscles upon the amount of connective tissue present was found to depend upon the state of maturity of the ground. The follicles were mostly packed with the germ cells, nutritive cells and lipid globules with the onset of gametogenesis. The oogonia and oocytes grew and vitellogenesis took place during maturation process. A follicles shows presence of a few nutritive cells and lipid globules even during maturation & presence of mature gametes. At the time of fully ripe gamete formation, size of the follicles enlarged and the connective tissue decreased. The wall of the follicle found to be made up of an inner with thin epithelial layer and outer muscular strands. In small sized animals (46-52 mm) oocyte diameter was found increased in post monsoon season i.e. the diameter of previtellogenic oocyte was found 73.4587 ± 3.124 to 81.224 ± 1.4712) and in vitellogenic oocyte it was found 79.1457 ± 3.457 to 82.145 ± 1.4578.**.** In medium sized animals (60.62 mm) the diameter of oocyte was found increased in post monsoon. The diameter of previtellogenic oocyte was found (77.456 ± 2.456 to 86.478 ± 3.124) & in vitellogenic oocyte, it was found (123.145 ± 2.785to 133.245 ± 6.415).

Table 1: Measurement of growing oocytes in small size (44 – 50 mm) *Corbicula regularis* during monsoon (Values in µm)

Season	Previtellogenic oocytes diameter	Vitellogenic oocytes diameter
Pre monsoon	82.586 ± 3.546 to 87.124 ± 4.215	112.4.254 ± 3.148 to 117.145 ± 7.154
Post monsoon	73.4587 ± 3.124 to 81.224 ± 1.4712	79.1457 ± 3.457 to 82.145 ± 1.4578.

Table 2: Measurement of growing oocytes in medium size (60 – 62 mm) *Corbicula Regularis* during monsoon (Values in µm)

Season	Previtellogenic oocytes diameter	Vitellogenic oocytes diameter
Pre monsoon	62.396 ± 4.392 to 73.892 ± 6.182	62.956 ± 3.185 to 877.023 ± 2.984
Post monsoon	77.456 ± 2.456 to 86.478± 3.124	123.145 ± 2.785to 133.245 ± 6.415.

Table 3: Measurement of growing oocytes in large size *Corbicula Regularis* during monsoon (Values in µm)

Season	Previtellogenic oocytes diameter	Vitellogenic oocytes diameter
Pre monsoon	88.456 ± 3.154to 93.345 ± 6.493	78.495 ± 0.680 to 95.508 ± 4.288
Post monsoon	80.383 ± 3.420 to 93.743 ± 5.985.	122.398 ± 5.374 to 131.284 ± 3.494

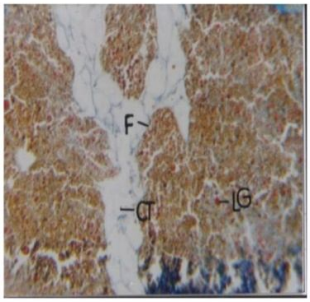

Fig. A

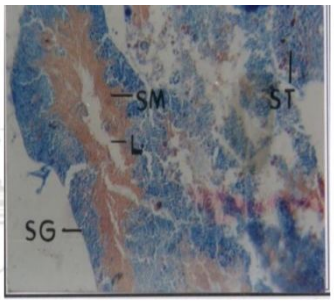

Fig. B

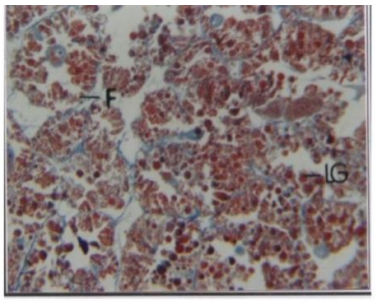

Fig. C

Figure 1: Accurate size histological details in male gonad of *Corbicula regularis* during pre monsoon season X 200

A = Small size F = Follicle SM = Sperm morule

B = Medium size LG = Lipid globule ST = Spermatids

C = Large Size SG = Spermatogonia SP = Sperms

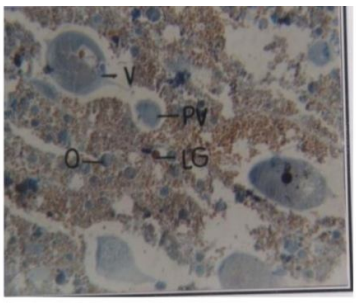

Fig. A

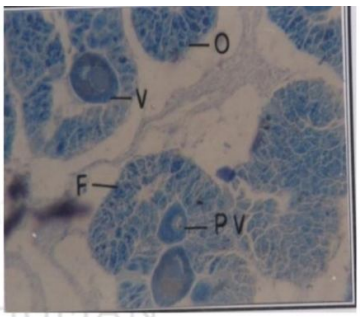

Fig. B

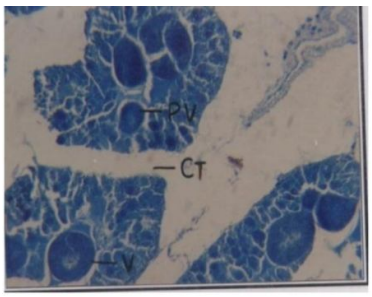

Fig. C

Figure 2: accurate size histological details in Female gonad of *Corbicula regularis* during pre-monsoon season X 200.

A = Small size F = Follicle V = Vitellogenic oocyte

B = Medium size O = Oogonia LG = Lipid globule

C = Large Size Pv = Previtellogenoic oocyte

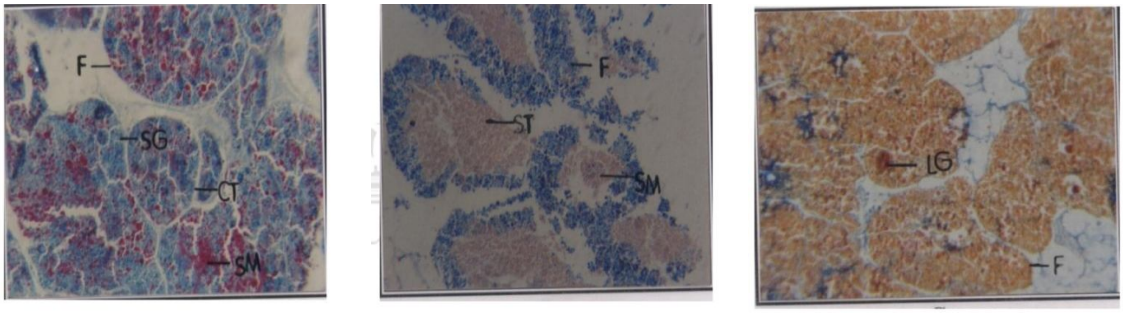

Fig. A **Fig. B** **Fig. C**

Figure 3: Accurate size histological details in male gonad of *Corbicula regularis* during pre-monsoon season X 200.

A = Small size	F = Follicle	SM = Sperm morule
B = Medium size	LG = Lipid globule	ST = Spermatids
C = Large Size	SG = Spermatogonia	SP = Sperms

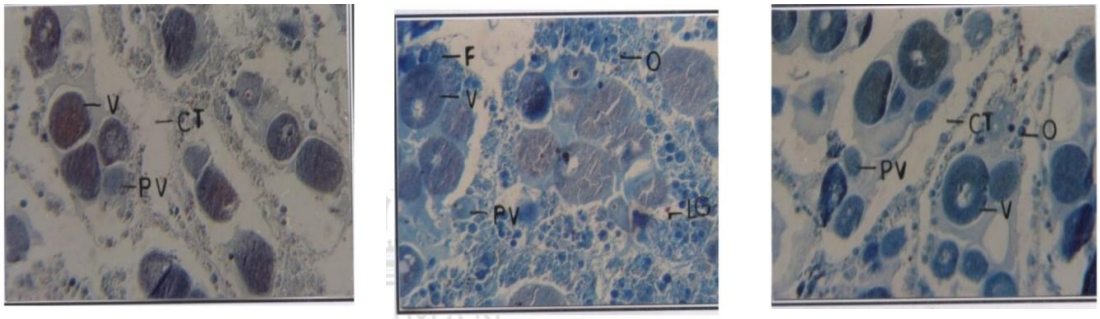

Fig. A **Fig. B** **Fig. C**

Figure 4: Accurate size histological details in Female gonad of *Corbicula regularis* during pre monsoon season X 200

A = Small size	F = Follicle	V = Vitellogenic oocyte
B = Medium size	O = Oogonia	LG = Lipid globule
C = Large Size	Pv = Previtellogenoic oocyte	

In Large sized animals (78 – 82 mm) the diameter of oocyte was increased in pre monsoon and post monsoon. The diameter of previtellogenic oocyte was found 88.456 ± 3.154to 93.345 ± 6.493 in pre monsoon. In post monsoon it was found 80.383 ± 3.420 to 93.743 ± 5.985. The diameter of vitellogenic oocyte was found. (78.495 ± 0.680 to 95.508 ± 4.288) in pre monsoon and it was found (122.398 ± 5.374 to 131.284 ± 3.494 in post monsoon.

DISCUSSION

*Corbicula regularis*is dioceous animal. The male-female ratio was 1:1 but the number of females was more in post-monson. There representative stages of gametogenesis, spewing and recovery proliferation of small oogonic takes place during the period from June to July; both the males and females were in maturation phase. Partially spawhing condition was seen in females in June As soon as monsoon reaches its peak the animal receives favourable environment with plenty

of food material available during June to July. The active gametogenesis slowdown in July. The germ appears to derive nourishment from failed transfer directly from the digestive glands. Therefore the rate of nutrient mobilization & transfer for the gonad one influenced by the stage of gametogenesis (Nagabhushanam & Mane, 1975).

Aquatic organisms are used as bioindicators for monitoring chemical pollution of freshwater and marine environments. Bivalves are a group of molluscs that are appropriate for study of biological impacts of environmental pollutants in aquatic ecosystems and they have many serious side effects on biological systems. However long term exposure to heavy metals can increase susceptibility to disease and development of histopathological malformations are widely used as bioindicators in biomonitoring (Sanders et al., 1993). Heavy metals are to histopathological alterations in mantle, digestive gland and foot tissues. Haemocytes and other lipopigmented cells (garanulocytomes) are related to sorption and storing of toxic chemicals (Johansson & Soderhäll, 1992). These cells were found in mantle and digestive gland of studied organism. Occurrence of this type of cells due to metal exposure has been reported in previous studies (Neff et al., 1987). Haemocyte infiltration and aggregation in damaged area of different tissues is a common defensive response of organism against toxic agents (Oliver & Fisher, 1999) which was study in connective and muscular tissues of mantle and digestive gland. Cilia of the external epithelial cells of mantle and foot are involved in dynamic activity of these organs. Exposure to cisplatin to destruction of cilia. The loss of cilia (hypoplasia) of gill, tissue where rupture and disintegration including connective and muscular tissues (Patil & Bal, 1967).

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