



## Histomorphological changes in the ovary of *Ophiocephalus punctatus* (Bloch, 1793).

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### Abstract :

Reproduction in majority of fish species is seasonal and gonadal maturation takes place at a time when conditions for the survival of the off spring are optimum. *Ophiocephalus punctatus*, Is also known as stripped or banded murrel. The ovarian cycle of *O. punctatus* from Nagpur region are worked out. The fish spawns only once a year in this region. Female reproductive organ is the paired ovaries. Each ovary contains numerous oocytes in different stages of development and degeneration. The ovary of *O. punctatus* is of cystovarian type because the lumen of ovary is continuous with the oviduct. Ovaries were processed by standard histological technique. Histological characteristics of ovarian tissues and oocytes stages were studied. The oocytes show well differentiated stages (i-vi) of maturation.

**Key words:** ovary, histology, *Ophiocephalus punctatus*

### Introduction

*Ophiocephalus punctatus*, is also known as stripped or banded murrel. It is abundant through the plain of Indian. It is capable of thriving in weed infested shallow, oxygen depleted and polluted water on account of possession of accessory respiratory organ and modified blood physiology which enables them to utilize atmospheric air directly for respiration. Reproductive development and reproductive histology in female are well understood by histological technique. Histology is the most accurate method to determine the reproductive state of female fish (West, 1990). The oogenesis is a very dynamic process in the ovaries, in which the oocytes passes through various phase of development similar in different fish species. The development of the piscine gonads has been described in terms of stages of maturity (Ha and Kinzie, 1996). The ovarian histological pattern of teleost was described according to the division of ovarian tissues into seven or eight stages of maturity based upon the dominant gametogenic cell type present (Crime and Glebe, 1990). Previous investigations relating to seasonal changes in the oocytes of fishes are many among which more recent and relevant to the present studies are those of James (1946), Ghosh and Kar (1952), Beach (1959), Belsare (1962). The purpose of the present study was to observe the changes in gonadal maturation and their histological differentiation of the snakehead *O. punctatus*.

### Materials and Methods

Adults of *Ophiocephalus punctatus* are selected for the present study.

#### Collection and Maintenance of Fish:-

The source of collection of fishes is from fish market, Nagpur city and water bodies in and around the city.

Sexual differentiation in the fish was done on the basis of the nature of urinogenital papilla. The papilla is disc like in females, while it is conical in males. The body weight of females ranged from 500 g. to 1.5 kg, whereas their length varied from 35 to 40 cms.

#### Histological Methods:-

The Fixatives used for Histological studies.

Bouin's fixative (aq.):- 12-18 hrs.

#### Embedding and sectioning:-

Tissues fixed in Bouin's fixative were transferred to 70 % alcohol and dehydrated in graded series of alcohol, cleared in xylene and embedded in paraffin wax at 60°C – 62°C.

The serial sections of ovaries were cut on Cambridge (rocking) microtome at 4µ-10µ thickness in transverse plane and processed haematoxylin- eosine technique.

#### Observation:

Histology reveals five distinct phases of reproductive cycle *O. punctatus* is an annual breeder (Fig.1). On the basis of cell and nuclear structure, staining intensity of the cytoplasm and yolk formation, the stages of development of oocytes are identified. Type I oocytes (Chromatin

nucleolar stage) these are smaller in size with darkly stained cytoplasm and large nucleus. They are mostly triangular in shape (Fig.2). Type II oocytes (Perinucleolar stage) these are characterized by slightly faint cytoplasm. Slightly more in diameter compared to type I oocytes. Nucleoli are arranged at the periphery of nuclear membrane. (Fig.3). Type III oocytes (Cortical alveoli), oocytes containing “intravesicular yolk” present in the cytoplasm, with little affinity for Haematoxylin. Zona radiata becomes visible, although not yet stained by Eosin. Accumulation of lipid inclusions in cytoplasm has begun. Some type III oocytes also show yolk nucleolar stage. (Fig.4). Type IV oocytes (Vitellogenesis), yolk granules or yolk globules present. Yolk vesicles increase in size and gravitate towards periphery as the yolk granules grow. Zona radiata is stained with Eosin. Yolk granules and oil drops present (Fig.5). Type V oocytes (Ripe stage), yolk granules are fused in homogenous mass, creating “Hyaline Oocyte” or hydrated oocyte. Nucleus is not visible due to disintegration of nuclear membrane and dispersion of its contents in the cytoplasm. When oocyte reaches hydrated stage, spawning is imminent (Fig.6). Type VI oocytes (Atretic oocytes), characterized by intense cellular disorganization. Such oocytes, although occur in maturation stage, are common in ripe stage also. Due to break down of zona radiata, they are irregular in diameter reflecting different stages of disintegration. (Fig.7).

**Discussion**

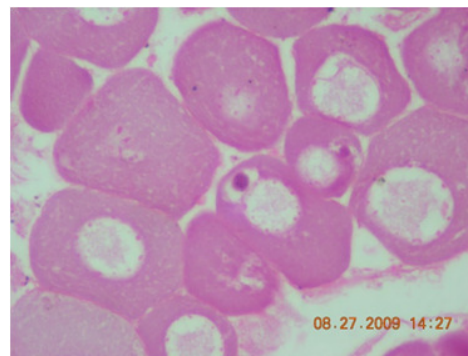
Reproduction is a natural phenomenon performed under the influence of exteroceptive factors which mediate their effects through the hypothalamo-hypophysial-gonadal sub-system operating as an organic axis bridging the ecological influences and gonadal maturation. (Saidapur, 1959). In the ovary stage i to vi, identified vitellogenesis commenced in stage iii. Differentiation of follicular membranes in theca, granulose and radiate was visible in stage iii oocytes which become more elaborates in stage iv and stage v oocytes. Follicular size also increased in this stage. Stage v, oocytes dominated the ovary during spawning phase. These were filled up with yolk globules and lipid droplets. These ripe eggs were discharged out of the body and the ovaries got reduced in size and GSI fall down drastically and stage vi, atretic follicles were visible in subsequent in the post-spawning phase.

The endocrine system provides a link between the external environment and the

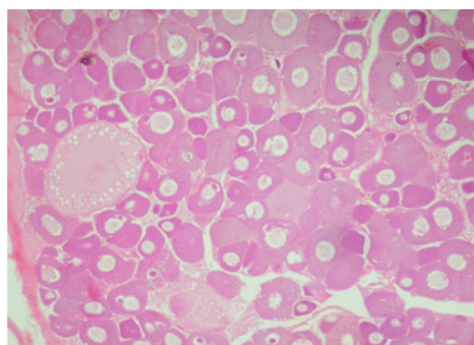
internal physiological state, as a result. Reproductive behavior is nicely synchronized with the gonads maturity and the environmental conditions. Reproductive behavior and the annual cycle are described by (Van Lesrel 1953).



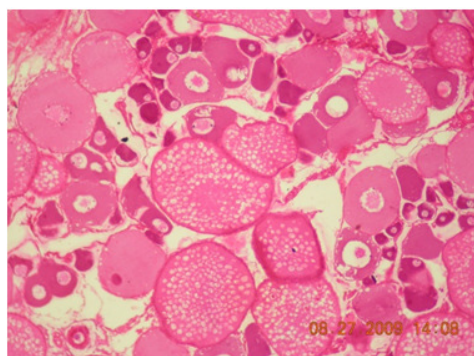
**Fig.1.** Photomicrograph of *Ophiocephalus punctatus*,



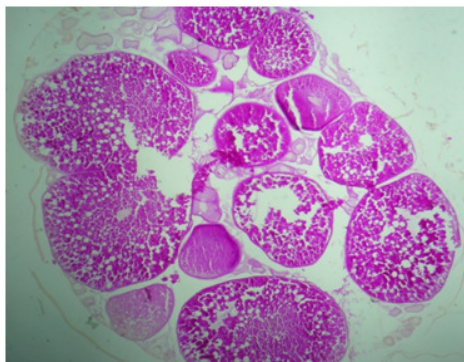
**Fig.2.** Photomicrograph of transverse section of ovaries showing chromatin nuclear type I oocytes. (100X).



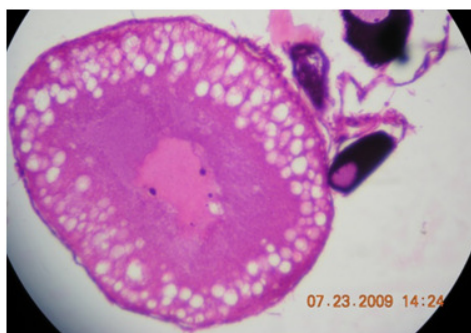
**Fig.3.** Photomicrograph of transverse section of ovaries showing Perinucleolar type II and type III oocytes. (100X).



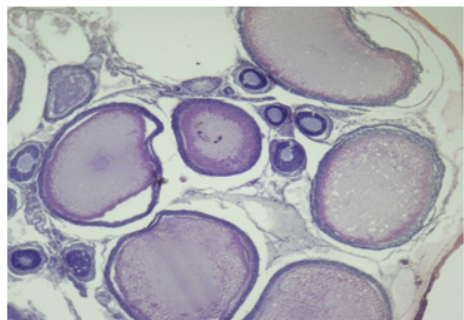
**Fig.4.** Photomicrograph of transverse section of ovaries showing cortical alveoli type III type IV and oocytes. (100X).



**Fig.5.** Photomicrograph of transverse section of ovaries showing vitellogenesis type IV and type V oocytes. (100X).



**Fig.6.** Photomicrograph of transverse section of ovaries showing ripe type V oocytes. (100X).



**Fig.7.** Photomicrograph of transverse section of ovaries showing atretic type VI oocytes. (100X).

**Conclusion:-**

*O. punctatus* in this region is found to be an annual breeder with the peak of reproduction during monsoon. The cyclical changes in the gonads take place not only due to intrinsic factors but there are many environmental factors which impinge on the sensory organs which together bring about maturation of gonads. On ovarian histology of *O. punctatus* revealed the basic histological architecture and identified the oocytes found within the ovary. It provides a basic knowledge for other studies such as reproductive biology,

reproductive toxicology and histopathology of this animal.

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