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EFFECT OF UNILATERAL EYESTALK ABLATION IN FEMALE *FENNEROPENAEUS INDICUS* (H. MILNE EDWARD, 1837)

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ABSTRACT

In the present investigation the effect of unilateral eyestalk ablation on the ovaries of female *Fenneropenaeus indicus* has been proved by the histological studies in the control and experimental animals. The morphological and histological studies on ovaries after 3 days of unilateral eyestalk ablations revealed the maturation of ovaries like stage III than the control (early mature). After 5 days of unilateral eyestalk ablation shows the fully matured ovaries like stage IV.

KEYWORDS: Unilateral ablation, previtellogenic oocyte, vitellogenic oocyte, follicular cells and cortical rods.

I. INTRODUCTION

Eyestalk regulates the molting and gonad maturation of the decapod crustaceans. Unilateral and bilateral eyestalk ablation induces the reproductive organs. Therefore it increases the population of shrimp. So that it was an important one in the shrimp mariculture. Several techniques have been used to assess ovarian changes in the reproductive cycles of crustaceans.[2] Macroscopic analysis of ovary size and color is mainly used to define the timing of spawning by external appearance.[2,16] Deposition of yolk in oocyte induces the increase in the diameter of oocyte. Hence during maturation, there was a change in the size and color of the ovary that are seen in the carapace of the animal, and color changes due to the carotenoid components, with specific color changes each being related to a new maturation stage.[5] The main constituents of yolk are protein and lipids, and vitellin is the major protein that accumulates within the ovary during vitellogenesis.[4,15] Yolk provides the primary nutrition during the early development and embryogenesis.[8, 14] Histological methods determine oocyte size and distribution, information that allows a basic classification of

ovarian structure and maturation.[6,11,17] Complementary tools for histological analyses are morphometry and stereology techniques, which have received increased attention in reproductive research in general and specifically in gonadal studies of fishes.[6,7] In the histological sections using a grid point, the stereological methods help in the determination of topological structural and three-dimensional geometric information of a sample.[9,17] The association of the morphometric techniques with biochemical analyses, mostly protein profiles, enables the delineation of the structural and functional dynamics of yolk synthesis and accumulation in previtellogenic and vitellogenic oocytes during ovarian maturation stages. Hence the present study explains the effect of unilateral ablation in female *Fenneropenaeus indicus* and the ovarian maturation.

II. MATERIALS AND METHODS

F. 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 the histological studies, healthy female *F. indicus* (early stage II) was selected, dissected and ovaries were taken out from the normal, unilateral ablated (after 3rd and 5th days) female *F. indicus.* In fixation process Aqueous bouin's solution was used as the fixative. Haematoxylin & eosin stains used for staining process.

III. RESULTS

In this experiment the immature (early stage-2) stage of female *F. indicus* was taken as the control. In *F. indicus* "H" shaped ovaries are seen. In immature (early stage-2) stage, the ovaries are white in colour (Fig 1). The previtellogenic oocyte with the trace of yolk granules has been found. The ovarian wall with single layer of follicular cells was identified (Fig 4). But after 3 days of unilateral eyestalk ablation the ovaries attains the late mature stage (stage -3) with orange and greenish in colour (Fig 2). The diverticula of the ovaries were developed well than the control. Vitellogenic oocytes with yolk granules and follicular cells with increase of layers were found. The cortical rods were dispersed (Fig 4). Whereas after 5 days of unilateral eyestalk ablation the ovaries become fully mature. This has been confirmed by the full greenish colour ovaries and well developed diverticula (Fig 3). The numerous follicular cells with closely intended with cortical rods in the margins of ovarian wall and

vitellogenic oocyte with large number of yolk granules were found. Oogonial cells were developed that shows the complete maturation of ovaries (Fig 6).

Fig 1: Early stage of ovary in *Fenneropenseus indicus* (before eyestalk ablation).

Fig 2: Late mature stage of *Fenneropenseus indicus* (After 3 days of unilateral eyestalk ablation).

Fig 3: Mature Ovary of *Fenneropenseus indicus* (After 5 days of unilateral eyestalk ablation).

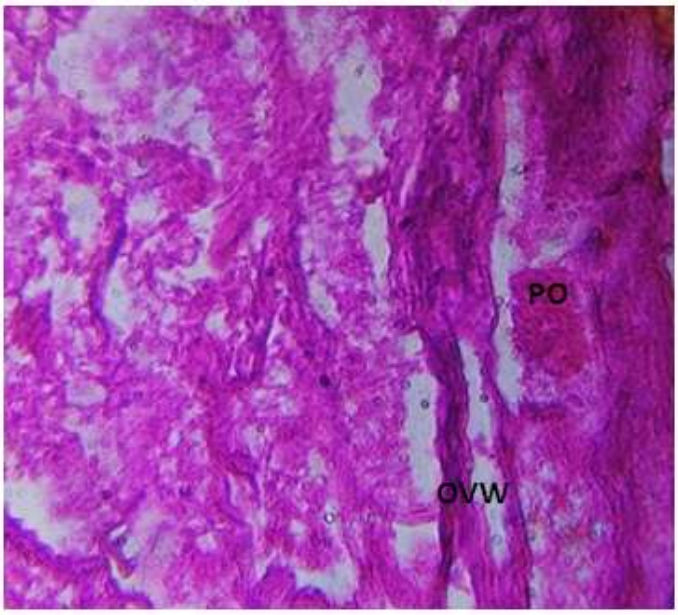

Fig 4: ovary- early stage of *Fenneropenseus indicus* (before eyestalk ablation) PO- Previtellogenic Oocyte, OVW- Ovarian Wall.

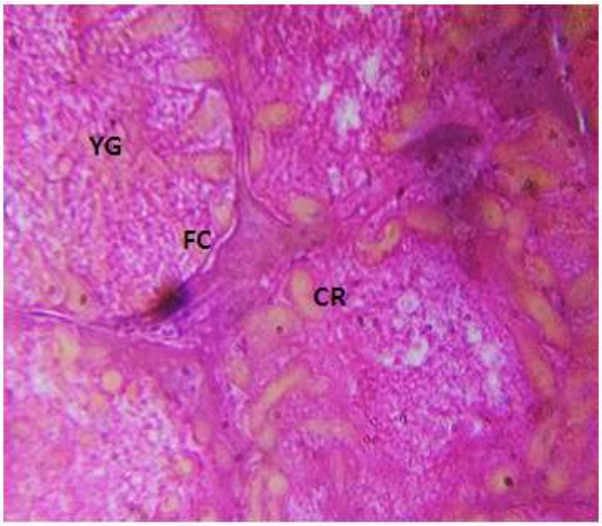

Fig 5: ovary- late mature of *Fenneropenseus indicus*(After 3 days of unilateral eyestalk ablation)YG- Yolk Granule, FC-Follicular cell, CR-Cortical Rods.

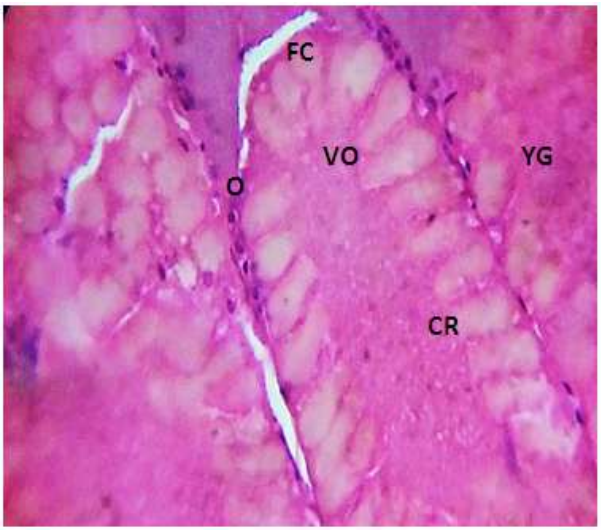

Fig 6: ovary- fully mature of *Fenneropenseus indicus* (After 5 days of unilateral eyestalk ablation) O- Oogonia, YG- Yolk Granule, FC-Follicular cell, CR-Cortical Rods, VO-Vitellogenic Oocyte.

DISCUSSION

Most of the studies with penaeid shrimps have proposed a range of three to six stages for ovarian maturation.[3] Histological techniques to establish five stages for the ovaries of *P. brasiliensis, Penaeus penicillatus, Penaeus merguiensis, Metapenaeus affinis* and *Parapenaeopsis stylifera*.[18] Histological and histochemical analyses to establish four ovarian stages for *P. monodon*.[4] Classification of the ovaries of *P. semisulcatus* into three stages based on histological evidence. In wild females of *F. paulensis*.[13] Four maturation stages based on histological and morphometric analysis of the ovaries.[12] Structural and ultrastructural analyses to classify the ovaries of *P. indicus* in five maturation stages. Histological, morphometric, stereological and biochemical assays significant features were recognized that make it possible to identify five maturation stages of ovaries in eyestalk-ablated females.[15] Early maturing and spent stages are compared a similarity of these stages is observed.[1] After spawning the ovaries of shrimps are not completely empty, with some oogonia and previtellogenic oocytes remaining, suggesting that in this species there are consecutive ovarian maturations in the same reproductive season. The present study was taken to focus the impact of unilateral eyestalk ablation on the female *Fenneropenaeus indicus*. The histological studies after 3rd and 5th days of unilateral eyestalk ablation shows the maturation of ovaries with follicular cells, cortical rods and vitellogenic oocytes with yolk

granules. Finally, this study helps to increase the eggs formation in shrimps. Thereby it may reduce the demand of the marine prawns, an economically important one. Hence, the present investigation paves the way to increase the baseline knowledge about the oocyte development and maturation stages thereby, hampering the tempo of this economically important marine prawn towards its increased production

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