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HISTOMORPHOLOGICAL CHANGES IN THE BRAIN IN RELATION TO OVARIAN CYCLE OF FRESHWATER CRAB, *BARYTELPHUSA CUNICULARIS*

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ABSTRACT

Ovarian maturation by neurosecretory cells in the brain of freshwater crab, *Barytelphusa cunicularis* have been examined. The histological scrutiny of the brain of *Barytelphusa cunicularis* related with three types (A, B and C) of neurosecretory cells, which are classified on the basis of size, shape and tinctorial characters. All these types of cells marked annual cyclic changes of cytoplasmic material in association with ovarian cycle. The activity of these cells has been correlated with the ovarian cycle. They are distinguishable by their size, nature locations, shape, nucleus position, cell measure and the secretory product in the cytoplasm. The result indicates that the neurosecretory A, B and C cells of the brain seen involved in the process of mating ovulation. The neurosecretory materials staining intensity index of these cells is described.

Figure : 01 References : 36 Table : 01
KEY WORDS : *Barytelphusa cunicularis*, Benitura, Murum, Neurosecretory cells, Ovary.

Introduction

Behavioural and physiological processes in crustaceans are regulated by neurohormones elaborated by neurosecretory cells. The neurosecretory cells are modified by selective histological stain. The secretory material which is formed in the cell body may be transported by axoplasmic flow either to be released into the circulatory system or to be carried to storage sites in modified axonal terminals. The axons of these cells run in more or less well defined tracts and often terminates in a special organ generally termed as neurohaemal organs[3]. The morphological observations on the neurosecretory system of decapod crustacean have been worked out by several workers[2, 5, 19].

Brain is circumeosophageal commissure or connectives each of which contain a commissural ganglia. The neurosecretory cells are comparatively larger than other nerve cells in size typically having large nucleus, abundant cytoplasm and secretory droplets or granules in the perikaryon which stain pink [6,12]. In supraesophageal (brain) and commissural ganglia of the crab, *Paratelphusa hydrodromous* contain only two types of cells A and B but while working on the neurosecretory system of *Paratelphusa jacquemonti* described four types of cells[28, 30]. Reported three types of cells in the central nervous system of the portunid crab, *Scylla serrate*[25]. Five types of neurosecretory cells in the crab, *Potamon, Eriocheirchionectes, Neptunus and Seasarma* was described[13]. Observed organs of the crabs, different types of cells were probably the different stages of the secretory activity of three basic types of cells[13, 23, 24]. While working on five

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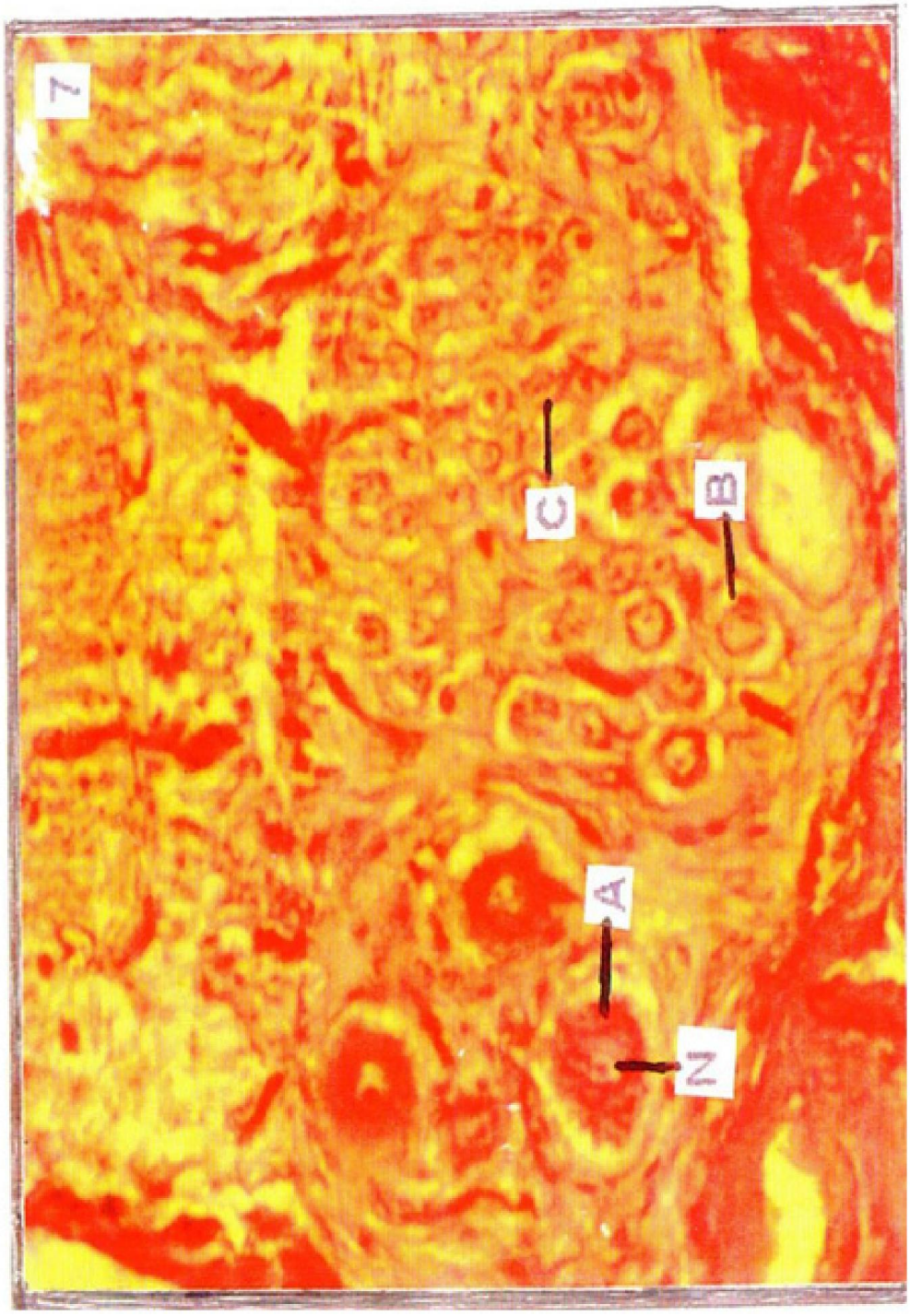

Fig. 1: T.S. of the brain of the crab, *Barytelphusa cunicularis*, Showing 'A', 'B' and 'C' neurosecretory cells (Mallory's triple X 600 x).

TABLE - 1 : Histomorphological Profile of brain neurosecretory cells of the crab, *Barytelphusa cunicularis*

Sr.No.	Features	'A' cells	'B' cells	'C' cells
1.	Location	Distributed on the anterior and posterior region of the brain.	Occur in the anterior median and lateral sides of the neuropile	These are the smallest cells and are located on the anterior and lateral side of the brain.
2.	Shape	Elongated	Oblong or elongated	Oblong
3.	Size (cell area) ìm^2	1288.19 ± 45.6	398.4 ± 22.6	158.3 ± 5.8
4.	Vacuoles	Present	Small vacuoles are present.	Absent
5.	Axons	Always present which are longer than B and C cells.	Normally present smaller than A cells.	Absent.
6.	Nucleus position	Central located	Normally near axon hillock	Ab-axonal
7.	Shape	Slightly rounded	round	round
8.	Size (ìm^2)	252.7 ± 21.3	85.5 ± 3.3	31.3 ± 3.7
9.	Staining characteristics with Mallory's triple cytoplasm	Dark red	Pink	Red
10.	Nucleoplasm	Dark blue	Blue	Faint blue
11.	NSM intensity criteria	3	2	2

species of crabs found that the secretion of A, A[1] and E cells show a close relation to the sexual cycle and observed that these cells were active during the breeding season[21]. A valuable data are available on the study of neurosecretory apparatus in various crustaceans e.g. Brachyurans, Macrurans and Anomurans[1,3,4,8,10,11,14,16,17,18,20,25,26]. The neurosecretory cells are localized in more or less discrete groups. They have been classified into different types on the basis of their size and histological peculiarities. Study indicates that the freshwater crab, *Barytelphusa cunicularis* has still remained unexploited regarding these aspects. Therefore, in the present investigation histomorphological changes in the brain in relation to ovarian cycles have been studied.

Material and Methods

The freshwater female crab, *Barytelphusa cunicularis* used in the present investigation. The crabs were collected from freshwater reservoirs of Benitura, Murum, Dist-Osmanabad (M.S.), India, from local fisherman. The animals were acclimatized in laboratory conditions for one week under photoperiods and they were fed earthworm on alternate days. The ten crabs were kept in 100 ltrs platic tanks. The water were changed after every day. To study moulting stages in the crab, *Barytelphusa cunicularis* the common procedure was adopted. For staging moulting cycle in *Barytelphusa cunicularis* use of the pair of fine dissecting scissors the tissue samples were immediately weight mounted on slides in physiological saline and observed the microscopically detailed and used a light microscope at a magnification at 250X.

For histomorphological study, the tissues like brain and ovary were dissected out. The brain and ovary were fixed in aqueous Bouin's Fluid for 24 hrs. Dehydrated in ethanol grades and embedded in paraffin wax (m.p.58^0-60^0). Sections were cut at 6-8µ thick. Section of the brain was stain with Mallory's triple stain (Mallory) and sections were stained with delafieldshaemotoxylin and eosin. Section were cleared in xylene and mounted in DPX. Neurosecretory cell area, nucleus area and neurosecretory material staining intensity were measured[17].

Results and Discussion

The data on the histomorpholocial changes in the brain in relation to ovarian cycle, freshwater crab, *Barytelphusa cunicularis* are presented. (Table -1 and Fig.1).

The presence of three types of neurosecretory cells in the central nervous system of *Barytelphusa cunicularis* is an agreement with the observations *Sesarmadehaani* á, â and ãcells. Three types of cells like A, B and C were also reported in *Paratelphusa hydrodromous*[30]. Several important ganglia are located in the brain including the optic antennary and olfactory centers. There are three types of neurosecretory cells found in the brain and designated also as A, B and C types, whose characters are shown in Table- 1. 'A' cell is located at the base of the circumoesophageal commissure. These are larger in brain measuring 1288.9 ± 45.6 ìm^2 in cell area. Type B neurosecretory cells are located at the outer margin of the circumoesophageal commisssure. These cells are oblong in shape and measure 398.4 ± 22.6 ìm^2 in cell area. Nuclear area of 85.5 ± 3.3 ìm^2. The type C cells are few in number measuring 158.3 ± 5.8ìm^2 in cell area and are oblong in shape. Nucleus size is of 31.3 ± 3.7ìm^2. Type A cell is stain dark red with Mallory's triple stain, B cells stain faint pink and C cells take red colors.

Neurobiologists described different types of neurosecretory cells in crustaceans and cyclical variations in the secretory process of these cells those correlate with the physiological state of the animal or the season have also been reported[22,27,33]. Neurosecretory cells were described in a brachyuran crustacean. They are distinguished three types of cells in the brain of the crab, *Sesarmadehaani*. The fact that the decapod crustacean central nervous system is the site of synthesis of a variety of neurohormones is now well established[4,10,29,34]. The details study on the distribution of neurosecretory cells in the central nervous system of brachyuran has been done only by a few investigators such in *Sesarmadehaani*[7]. In the *Potamondehaani*, *Ericheir japonicas, Chionecetesopilia, Neptunustrituberculatus, Sesarmaintermedia*, in *Virunalitterata*, *Callinectessapidus* and in the fiddler crab, *Ucapugilator*[15,17,20,22]. Actual distinguished eleven types of neurosecretory cells among the five species that he studied[22].

The histomorphological survey of serially section brain of *Barytelphusa cunicularis* and stained with Mallory's triple stain revealed the presence of three distinct types of neurosecretory

cells like A, B and C. The presence of three types of neurosecretory cells in the central nervous system of *Barytelphusa cunicularis* in agreement with the observations in *Sesarmadehaani* described α, β and $\sqrt{}$ cells and some observation in *Macrobrachiummal colmsoni*[35]. Three types of cells like A, B and C were also reported in *Paratelphusa hydrodromous* and *Scylla serrate*[30, 31]. Three main types of neurosecretory cells like A, B and C were also observed in the brain and thoracic ganglion of the stomatopod Squillaholoschista but the brain was reported to contain four types of neurosecretory cells i.e. A, B and C in the fiddler crab, *Ucapugilator* observed type I, II and III neurosecretory cells[17].

Histomorphological features i.e. location, cell shape, staining affinities and nature of secretion the neurosecretory cells in the central nervous system of *Barytelphusa cunicularis* closely resembles to other decapod crustaceans. Cell type 'A' appears to correspond to the cells of *Sesarmadehaani* the 'A' and 'E' cells of *Potamondehaani*cells type I of the *Ucapugilator*[7,17,22]. Cell 'A' type of the crab, *Collinectessapidus* and 'A' cells in the crab, *Scylla serrata*[9, 15]. Cell type 'B' appears to be the same time at the cells of *Sesarmadehaani* and the 'A' cells of Chionecetesopilio , 'C' cells of Scylla serrate and 'C' cells of *Callinectessapidus*[7,9,15,21,31,32,36]. It is concluded that crustacean reproduction were a sufficiently understood. And for recent new technological advances in such type of hormonal changes, progress in the understanding of crustacean endocrinology is essential. This kind of research may provide useful information for commercially important species and extension of crustacean culture.

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