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Study of Neurosecretory Cells in Sand Lobster *Thenus orientalis* of Royapuram Coast-Chennai

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Abstract: The present investigation on *Thenus orientalis,* a sand lobster of Royapuram coast, Chennai. Was conducted for two consecutive years. Careful observation made on the morphological and histological investigations showed that there is synchronous growth and its impact on the development of the animal with regard to the control of neurosecretory cells found in the cerebral ganglion, thoracic ganglion and eye stalk reveals different types of cells in both male and female sand lobsters. Intensive staining reactions of the cells suggest a specific role of neurosecretory cells in the production of hormones for the gonadal maturation.

Key words: Gaint cell % *Thenus orientalis* % Neurosecretory cells

INTRODUCTION

In recent years considerable evidences has been put forward to demonstrate hormonal control on different aspects of reproduction in crustacean [1, 2]. The survey of neurosecretory cells in the brain of the crab *Sesarma* was reported by [3] and also he classified them into three types. Subsequently Adiyodi [4] made a clear review on these aspects in different crustacean groups. Deecaraman [5] have reported on types of neurosecretory cells found in the eye stalk thoracic ganglion and brain of *Squilla holoschista* and noted the cyclic activity in relation to reproductive phases. The authors have further studied the chemical characterization of neurosecretory products elaborated by neurosecretory cells of brain, thoracic ganglion and eyestalk. The x-organ is known to contain different neurosecretory cell types involved in the synthesis of inhibitory hormones of multivarious physiological activities namely growth, moulting, heart rate, metabolism, water balance, dispersion of pigment and reproductive activity [5]. It is clear that there is less information available in *Thenus orientalis* on various aspects. Hence the present study is undertaken which includes the involvement of neurosecretory cells in the maturation process of male and female reproductive organs.

MATERIALS AND METHODS

Royapuram fishing harbour is one of the major fishing grounds for catching fishes and crustaceans. The sand lobster *Thenus oreintalis* on which the present investigation has been carried out was collected from this fishing center. The live specimens of *Thenus oreintalis* sand lobsters were collected from the commercial catches of Royapuram Fishing Harbour. The incidental catches appears to be available from May to April in all seasons throughout the year . They are brought immediately to the laboratory and the collection is grouped under different classes with regard to there study.

Histology: For the histological studies the brain, thoracic ganglion and eyestalk from both mature males and females were taken out and fixed in Boiuns fluid. For obtaining good sections, the tissues were fixed in Ciaccious fluid [6]. After fixation for 24 hrs the tissues were dehydrated in different alcoholic series and embedded in paraffin wax melting point at 52°C-54°C. The paraffin blocks were sectioned at 4-6ìm, affixed to albuminised slides, deparaffinised in xylol and stained in chrome - alum - haemotoxylin phloxine (CHP) and paraldehyde fuschin [7]. For differentiating types of neurosecretory cells in the brain, eye stalk and thoracic ganglion was followed by the

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method suggested by Deecaraman and Subramoniam [5] and Fingerman [8]. The stained sections were latter mounted in DPX [9,10].

RESULTS

The study on different types of neurosecretory cells found in the brain, thoracic ganglion and eyestalk in the matured male and female sand lobsters *Thenus orientalis* belonging to decapodan groups of crustacea reveal that the different types of neurosecretory cells show various functions with regard to their involvement in the production of gonad inhibiting hormones and gonad stimulating hormones during the period of quiescent and reproductive stages which exhibits interesting results showing different staining reactions.

Morphology of Brain , Thoracic Ganglion And Eye Stalk of Male and Female "*Thenus Orientalis*".

Brain: In *Thenus orientalis* the brain (cerebral ganglion) is situated beneath the carapace at the anterior region. it is a bulged mass like structure with creamy colour. Antennary and antennulary and optic nerves originate from the cerebral ganglion. This is quite similar in both male and female sand lobsters.

Thoracic Ganglion: It is an elongated structure lying on the sternal plates in the mid ventral line. It is an bulged white mass structure giving rise to many nerves.

Eye Stalk: The eye stalk are situated in the anterior region at the sides of the cephalic region of the carapace. The eye stalks are covered with hard chitinous structure and very strongly situated beneath the socket like sac, which protrudes out whenever it is activated by touch.

Histology: In the present study an attempt was made to study the involvement of neurosecretory cells of brain, thoracic ganglion and eye stalk. of male and female *Thenus oreintalis*. The cross sections of brain , thoracic ganglion and eye stalk showed different types of neurosecretory cells. On the whole it is noted by the intense staining reactions in haemotoxylin and eosin, the neurosecretory cells of brain, thoracic ganglion and eyestalk of mature males as shown in the (Figs 1, 2 and 3) suggest the involvement in the production of testicular stimulating hormones (TSH) for the maturation process of testis.

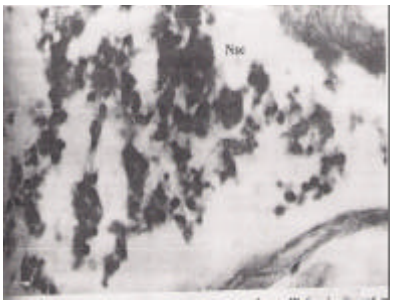

Fig. 1: Photomicrograph showing the C.S of brain of male *T. orientalis* stained in haematoxylin and eosin Note: The darkly stained NSC cell (A, B & C)

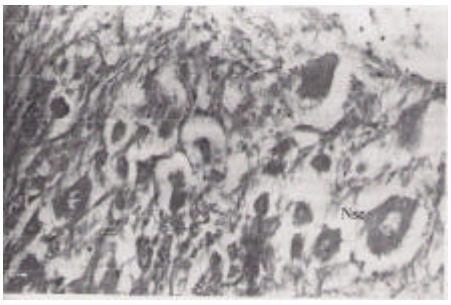

Fig. 2: Photomicrograph showing the C.S of thoracic ganglion of male *T. orientalis* stained in haematoxylin and eosin Note: The darkly stained NSC cell (A, B, C & D)

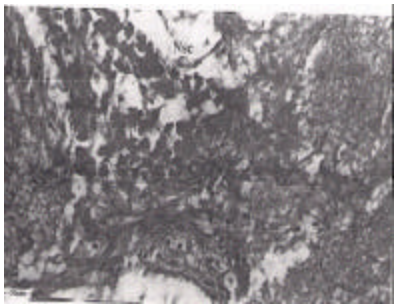

Fig. 3: Photomicrograph showing the C.S of eye stalk of male *T. orientalis* stained in haematoxylin and eosin Note: The darkly stained NSC cell (A & B)

Similarly in females, the cross sections of brain, thoracic ganglion and eyestalk showed different types of neurosecretory cells which exhibit more intense staining reactions as shown in the (Figs 4, 5, 5a and 6) suggests a specific role in the involvement in the production of ovarion stimulating hormone (OSH) for the maturation process of gonads involved in the growth, development and reproduction.

It is evident that there are three different but distinct types of neurosecretory cells as (A, B and C) in the brain and four types of neurosecretory cells (NCS)

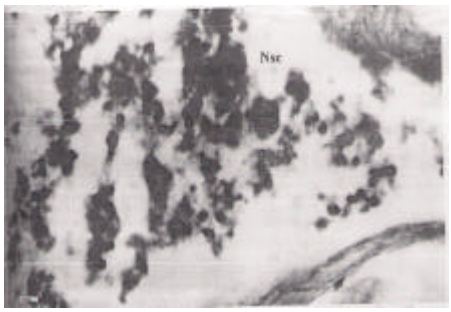

Fig. 4: Photomicrograph showing the C.S of brain of female *T. orientalis* stained in haematoxylin and eosin Note: The darkly stained NSC cell (A,B& C)

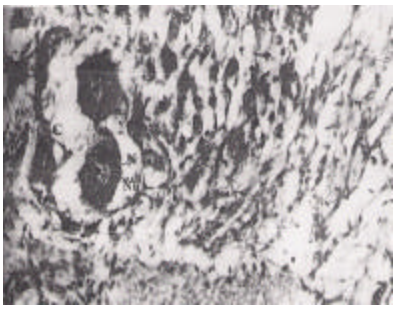

Fig. 5: Photomicrograph showing the C.S of thoracic ganglion of female *T. orientalis* stained in haematoxylin and eosin Note: The darkly stained NSC cell (A, B, C & D). The bivalent cell of C type is darkly stained.

Fig. 5a: Photomicrograph showing the C.S of thoracic ganglion of female *T. orientalis* stained in haematoxylin and eosin Note: The single giant NSC cell stained darkly which may be D type.

cells (A, B, C and D) in the thoracic ganglion and two types of neurosecretory cells as (A and B) in the eyestalk. These neurosecretory cells varies in size and shape. Few are very small in size. The neurosecretory cells of A and B are very small in size and they are spherical and elliptical in shape. The C and D are comparatively bigger and hexagonal in shape. These cells exhibit secretory granules and also the nucleus and nucleolus are

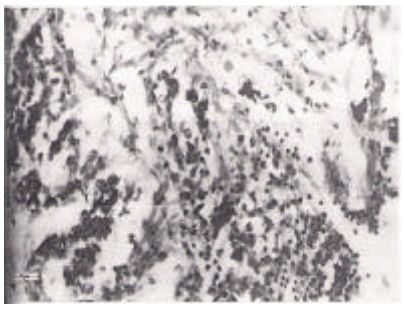

Fig. 6: Photomicrograph showing the C.S of eye stalk of female *T. orientalis* stained in haematoxylin and eosin Note: cluster of darkly stained NSC cell (A & B)

quite distinctly seen. The staining reaction is also intense due to the presence of neurosecretory mass in the cytoplasm.

The neurosecretory cells of thoracic ganglion are comparatively larger in size with a distinct nucleus and dense neurosecretory mass and is denoted as D type neurosecretory cell (NSC) cell and hence called as "GIANT" neurosecretory cell, which exhibits distinct nucleus and nucleolus surrounded with rich neurosecretory mass as shown in (Fig 5a).

From the observations it shows clearly that the neurosecretory cells of eye stalk, brain and thoracic ganglion of *Thenus orientalis* has a specific role in the involvement of certain types of functions which shows several changes reflecting on ovary and spermathecal glands, which involves in the release of subsequent neurosecretory materials reflecting simultaneously on target organs.

DISCUSSION

According to Kulasekharan, *et al.* [11], Sharmila jadhav [12] and - Sujatha [13] in a fresh water crab *Spirotelphusa hydrodroma* classified the neurosecretory cells of brain and thoracic ganglion into four types and reported that it contains precursor materials which becomes elaborated and mature and further suggested that the neurosecretory cells have two phases comprising a formatory phase and secretory phase and the less staining reaction is exhibited by the neurosecretory cells of early stages. He further suggested that these types of neurosecretory cells undergo elaboration and when released to the system reaches the target organs and influences them to function specifically.

Sujatha [13] in *Uca triangularis* reported different types of neurosecretory cells of brain, thoracic ganglion and eyestalk with respect to summer season and winter season males and confirmed that the secretion of the different types of neurosecretory cells of brain, thoracic ganglion and eyestalk of summer season males showed higher activity in secretion of hormones suggesting the hormonal impact on the gonadal maturation, whereas, the winter season males show less activity in secretion of the hormones suggesting the hormonal effects on gonadal maturation. But the present study on the neurosecretory cells found in the brain, thoracic ganglion and eyestalk of *Thenus orientalis* of fully matured males and females which exhibits intense staining reaction, suggests the specific role played by some of the neurosecretory cells in secreting the ovarion stimulating hormones which is responsible to growth, development and the maturation of ovaries. Similarly, some of the neurosecretory cells found in the mature males show intense staining reaction in the brain, thoracic ganglion and eyestalk suggesting the specific role in elaborating the testicular stimulating hormones which is necessary for the gonadal maturation in secretion of testicular and ovarion hormones.

In conclusion, the study on the Neurosecretory cells found in the brain, thoracic ganglion and eyestalks of both matured males and female sand lobster Thenus orientalis reveals different types of cells suggesting a specific role in the production of hormones for the gonadal maturation leading to growth and development.

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REFERENCES

1. Jesperson, A., 1979. Spermiogenesis in two species of Nebalia leach (Crustacea) Malcostraca Phyllocarida: Zoomorphol., 93: 87-97.
2. Nagabushanam, R. and R. Sarojini, 1980. Reproductive endocrinology of decapod Crustacea. National Academy of Sciences India. Golden Jubilee Commemoration, 1: 37.
3. Enami, M., 1951. The sources and activities of two chromatophorotropic hormones in crabs of the genus *Sesarma* . Histology of secretory elements. College of Fisheries and Animal Husbandry, Hiroshima University, Fukuyama Japan, *Biological, Bulletin*., 101: 3.
4. Adiyodi, K.G. and R.G. Adiyodi, 1970. Endocrine control of reproduction in decapod crustaceans, Biological. Review, 45: 121-165.
5. Deecaraman, M. and T. Subramoniam, 1983b. Histochemistry of the neurosecretory systems in a stomatopod crustacean Squilla holoschista. Proceedings. Indian. Academy Science Animal Sci., 92: 387-398.
6. Subramoniam, T., 1982. Manual of research methods for marine invertebrate reproduction, CMFRI (Central Marine Fisheries Research institute) Special Publication, 9: 7-15.
7. Gomori, 1941. Aldehyde Fuchsin, A new stain for elastic tissue. American, J. Clinical, Pathol., 17: 395-404.
8. Fingerman, M., 1985. The physiology and pharmacology of crustacean chromatophores, American, Zoology, 25: 233-252.
9. Bancroft, J.D. and A. Stevens, 1977. Theory and practice of histochemical techniques (Publications) Churchill Livingstone, Edinborough, London and Newyork.
10. Humanson, A., 1979. Animal tissue techniques Fourth Edition W.H. Freeman and Company, San Francisco.
11. Kulasekaran, 1994. Some aspects of reproduction in a fresh water crab, *Spiralotelphusa hydrodroma* (Herbst) of Salem District. Tamilnadu, Ph.D., Thesis, University of Madras, Madras.
12. Sharmila Jadhav, 1997. Some aspects of reproduction in a brackish water crab, *Uca* (*Celuca*) *lacteal annulipes* (Crane, 1975) of Pulicat lake, Tamilnadu, Ph.D. Thesis University of Madras. Madras.
13. Sujatha, 1998. Studies on the reproductive aspects in a brakish water crab, *Uca* (*Celuca*) *triangularis bengali* (Crane, 1975) of Pulicat lake, Tamilnadu, Ph.D. Thesis University of Madras. Madras.