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Neurosecretory Staining in the Cerebral and Pleural-Pedal Ganglia of *Haliotis discus hannai* and *Trochus niloticus*, and its Relationship to Reproduction.

By

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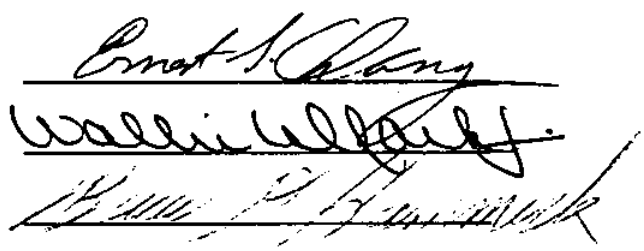

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ABSTRACT

Neurosecretory staining in the brain ganglia of two economically important prosobranch gastropods, Haliotis discus hannai and Trochus niloticus, was studied during their respective reproductive cycles, and the variation in stain affinity of the neuroscretory cells and amount of neurosecretory material contained in the neurosecretory cells were measured.

Neurosecretory activity was found in Cell Types A and B in the cerebral ganglia of Haliotis discus hannai, and the amount of neurosecretory material in the cells and stain intensity varied with the reproductive cycle. Cell Types C and D were not neurosecretory. The stain intensity of Cell Type A showed a correlation with vitellogenesis in the ovary. The stain intensity of Cell Type A in males showed no correlation with a physiological function in the testis. Cell Type B in both sexes did not show a correlation with either gametogenesis, vitellogenesis or spawning. The pleural-pedal ganglion contained 8 different cell types. The quantity of different cell types in the pleural-pedal ganglion was unusual for a prosobranch gastropod. Cell Types, #1- and #7-cells, showed neurosecretory staining and variation in the stain intensity during the reproductive cycle. Cell Type #1 was the most abundant cell in the pleural-pedal ganglion and the variation of neurosecretory material clearly correlated with gametogenesis.

Neurosecretion in Cell Type #7 showed a strong correlation with the induction of spawning. A possible neurohemal organ (pleural organ) was found in close proximity to the #7-cells in the statocyst tissue. The pleural organ is the first ectodermal neurohemal organ reported in a prosobranch gastropod. A nervous connection (stato-pleural nerve) with a possible sensory function was found between the statocyst and the pleural-pedal ganglion. The stato-cerebral nerve probably does not transmit the nervous impulses from the statocyst as has been previously reported.

The reproduction of Trochus niloticus was very unusual and was not similar to any previously described prosobranch. The population as a whole was asynchronous, nevertheless, the population contained several sub-groups which had synchronized reproductive cycles. Spawning occurred primarily at the new moon lunar phase (the day of the new moon and the 3 following days). The reproductive cycle was approximately 8 lunar months. T. niloticus was a seasonal spawner with complete spawning and each individual had only one co-hort of gametes developing at a time. Gametogenesis occurred during the first 1 to 2 lunar months after spawning, and then there was a relatively linear increase in the size of the oocytes during vitellogenesis. A second layer formed around the oocyte at the end of gonad development.

Two major cell types were found in the cerebral ganglion. The AF stain intensity of Cell Type 1 remained relatively constant at a high level for most of the reproductive cycle;

however, there were decreases in the intensity during two periods; first to third lunar month (period of rapid oocyte growth) and eighth to ninth lunar month (period of rapid expansion of secondary layer). The stain intensity of Cell Type 1 in the cerebral ganglion of males showed no variation. The stain intensity of Cell Type 2 was very low in most individuals and the stain intensity in the left cerebral ganglion was consistently reduced compared to the right cerebral ganglion. Eleven cell types were found in the pleural-pedal ganglion. The larger cells were along the edge of the ganglion with the medulla relatively empty. Most cells of all cell types were located along the cerebro-pedal and cerebro-pleural connectives, and along the curve of the pleural-pedal ganglion surrounding the statocysts. The cells near the statocyst showed neurosecretory staining with AF and Herlant's. P-cells contained intensely staining neurosecretory material, and the amount of neurosecretory granules and the intensity of staining varied during the experiment. The oscillation of the stain intensity in P-cells did not show any correlation with the reproductive cycle. The structure of the statocysts was typical of gastropods. The morphology of the statocyst was almost identical to the statocyst in abalone. A stato-pleural nerve was found connecting the sensory cells of the statocyst to the pleural-pedal ganglion.

A preliminary study on the production of yolk in the red abalone, Haliotis rufescens, is reported. The molecular

weight of the major yolk protein is approximately 2 X 10^6 daltons. The yolk protein in the red abalone is insoluble in dilute buffer solutions and must be isolated in distilled water. Experiments were conducted to measure the concentration of the major yolk protein in the blood during the reproductive cycle, however, the results were inconclusive.

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