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A SCANNING ELECTRON MICROSCOPY OF THE MANTLE OF THE JUVENILE *OCTOPUS VULGARIS* TO REVEAL SOME ENVIRONMENTAL IMPACTS

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ABSTRACT

Microstructure of the mantle of juvenile *Octopus valgaris* was studied using scanning electron microscopy. Two layers; epidermis and dermis followed by a muscle layer were recognized. The chromatophore cells and reflecting elements including iridophores and leucophores were observed in the dermis. Three types of ciliated cells were exhibited on the dor, sal surface of the examined mantle.

However, the investigation indicated a relationship between the aquatic pollution and the microstructure of juvenile's mantle of this cephalopod.

INTRODUCTION

Molluscan skin represents one of the main interfaces between the external and internal environments of an animal. In most mollusks the skin is involved in respiratory exchanges, water fluxes and probably salt regulations. Moreover, skin protects the animal by forming mucus and shell; both represent characteristic secretions of the molluscan skin.

The skin in cephalopods represent one of the most impressive features, and so was studied by several investigators especially capacities to affect rapid and adaptive physiological color changes (Bott 1938, Parkard & Sanders, 1971, Packard & Hocberg 1977, Halon & Hixon 1980 & Hanlon1982). However, types of ciliated cells in cephalopod species were studied in embryos and early hatching juveniles (Sundermann-Meister 1978; Arnold & Williams-Arnold 1980; Denuce & Fornisano, 1982 & Paulij and Denuce,1990).

The present study aimed to study the effect of environmental pollutants on the mantle microstructure of juvenile *Octopus vulgaris*. Special concern has been paid to declare the correlation between cephalopods mantle structure and pollution.

MATERIAL AND METHODS

Investigated samples were collected from Abu-Qir, Alexandria (which is considered a polluted region due to local industrial discharges) .Immediately after catching the specimens, small parts of dorsal mantle wall were cut and fixed in 10% formalin in seawater. They were then washed in phosphate buffer (pH7.4) and post fixed in 2% osmium tetroxide for 2 hours, washed again and dehydrated in acetone. They were air dried, attached to aluminum stubs and coated with gold palladium. The samples were investigated by J.S.M. 5300 Jeol SEM.

RESULTS AND DISCUSSION

A scanning electron microscope investigation on dorsal mantle of juvenile *Octopus vulgaris* shows that it consists of two layers attached to one another over their whole extent .The outer layer is the epidermis and the deeper connective tissue layer is the dermis followed by a layer of muscles (Fig. 1). There are large number of papillae like structures called microvilli on the outer surface of epidermal cells (Fig. 2). The size of these papillae varies according to the region of the skin and they are numerous in outer area of skin (Fig. 2). They might have a possible function in respiration. The second layer the dermis consists of a fibrous connective tissue, which contains blood vessels and nerves (Figs. 2, 3, 4 & 5), then the muscle layer (Fig. 6).

Chromatophore cells:

The chromatophore cells are found in great abundance .They are small-flattened sacs each containing a bag of pigment (Fig .7) and attached with chromatophore nerves (Fig. 8). They are comparable to cells that have been described by previous authors (Packard & Sanders, 1971; Packard & Hochberg 1977; Froesch & Messenger, 1978 & Geasa , 1996).

Reflecting elements:

There are two types of reflecting elements on dorsal mantle of juvenile *Octopus vulgaris* named, iridophores and leucophores (Figs. 8 & 9) The two types are arranged in a layer situated beneath the chromatophoral layer and they are nearly similar to those referred to by Mirow (1972).

Iridophores are arranged in several layers and formed of horizontal layer (platelets) which are surrounded by collagenous tissue (Fig. 8).

The leucophores appear as a band of very dense circular profiles (Fig. 9) that are closely associated with iridophores, and may serve to maximize reflection. It is important to mention that, Arnold (1967) and Mc conathy *et al.* (1980) reported that these elements occur on the ventral side more than dorsal side in hatched *Loligo* mantle.

Ciliated cells:

Ciliated cells appear on the dorsal surface of the mantle of juvenile *Octopus vulgaris*. Some ciliated cells are large, flattened and separated from each other by non-ciliated cell type (Figs. 2 & 9). Other ciliated cells appear elongated and form lines or bands (Boletzky,1980) on the mantle epithelium because of their contact with each other (Figs.2, 10). In young cells, cilia of unequal length were found like flowers. A third type of ciliated cells was clearly visible (Fig. 11). These cells resemble those of Arnold and William-Arnold, (1980) in *L. pealei* embryos, which first appear at Naef, stage VIII on the external yolk sac. However, in the mantle epithelium, these cells are first found at stage XIII.

So, it is important to mention that the appearance of ciliated cells in the integument of embryos and juveniles is not exclusive to cephalopods. In decapod cephalopod embryos, these cells degenerate after hatching (Billet and Courtenay, 1973; Kessel *et al.*, 1974; Smith *et al.*, 1976).

According to Kessel *et al.* (1974), embryonic ciliated cells are important for respiration and the movement of mucus over the embryo. However, degeneration of the mantle epithelium of cephalopod embryos after hatching was first observed by Faussek (1901) and Ranzi (1931), while in the incirrate octopods, the integument of the embryo is entirely devoid of cilia. Such result was also investigated in the adult (Geasa ,1996).

However, the present investigation reports that ciliated cells occur in a large number as observed by Fioroni (1963). He found that during hatching, the mucus cells are practically emptied but no degeneration of the epidermis takes place.

From such observation, it could be suggested that pollution of the environment surrounding the animal implies the increase of the respiratory surface and probably produces certain secretions, which locally react with such environmental pollutants.

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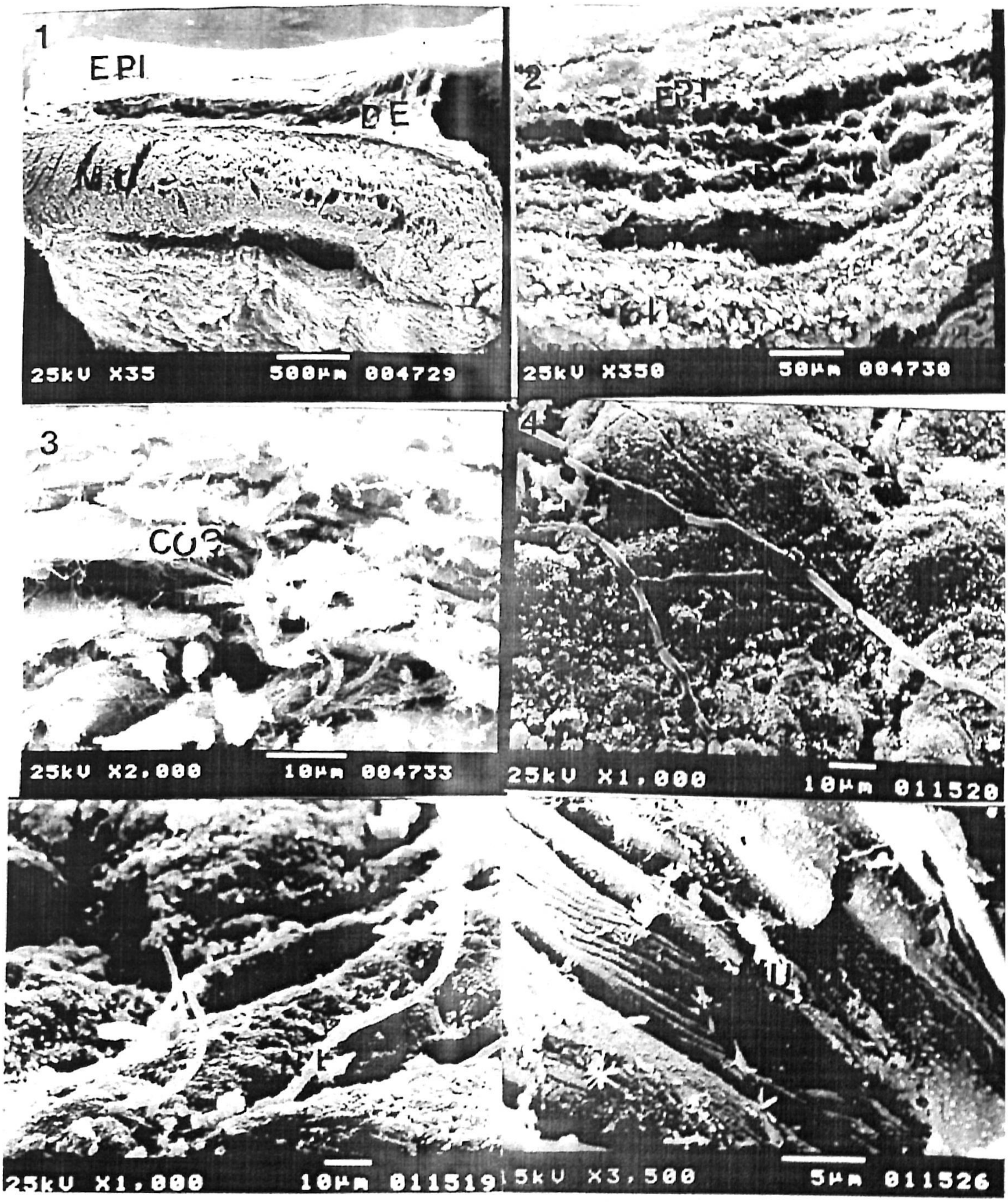
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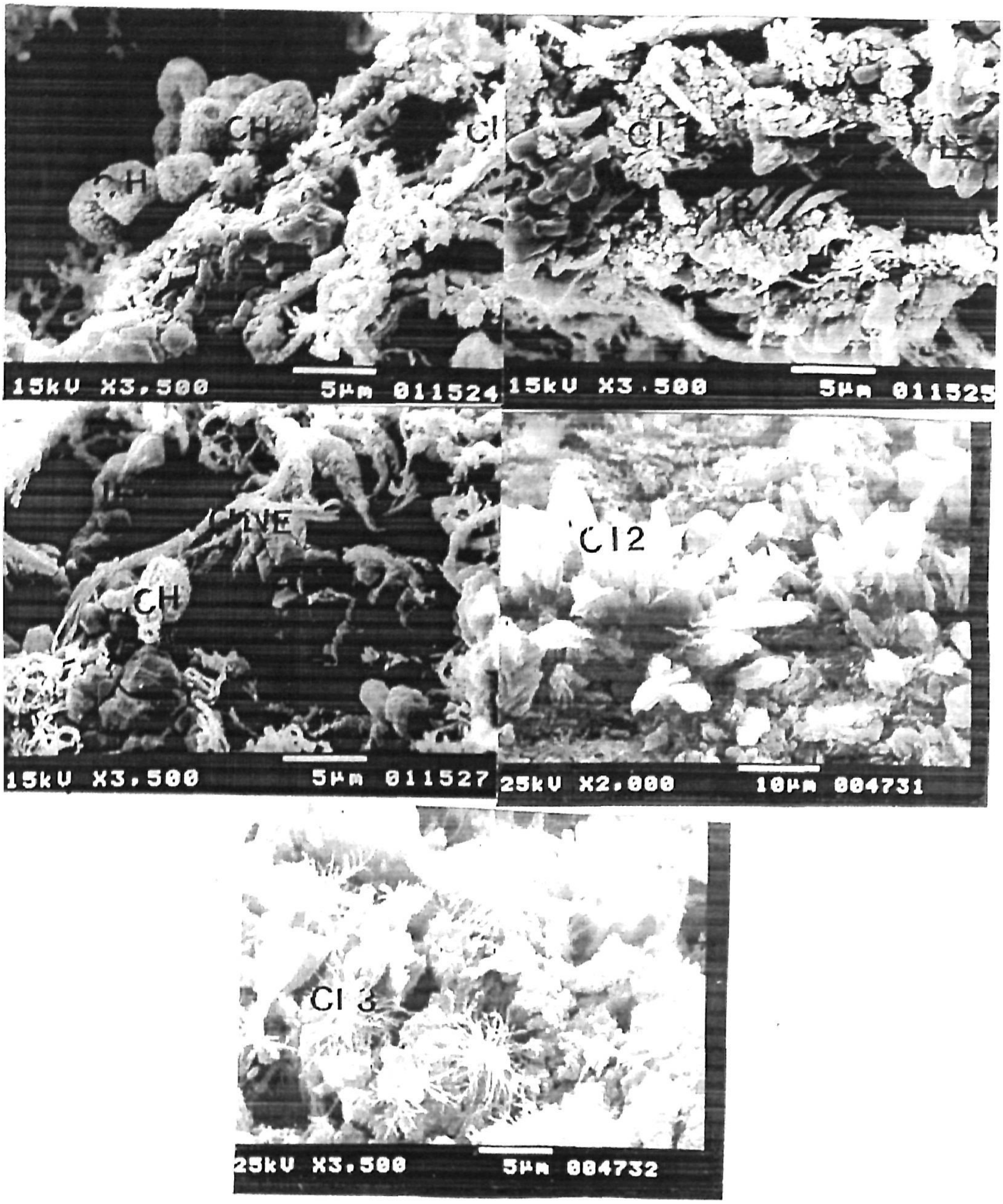
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