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THE HISTOMORPHOLOGICAL AND THE FUNCTIONAL PECULIARITIES OF THE PHOTORECEPTIONAL BLOCK OF THE SIGHT ANALYZER OF THE CYPRINUS CARPIO, ATHERINA MOCHON PONTICA AND THE CTENOPHARYNGODON IDELLA

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The results of the photoreception process and the primary remake of sight information researches of the Cyprinus carpio, the Atherina mochon pontica and the Ctenopharyngodon idella, shows the histological structure of the sight analyzer of these species.

The specific fish environment defines the presence of the corresponding sense organs and the receptors for the perception of the outside information. The informational stream goes from the organs of sight to the central nervous system where it analyses and according to it arrives at the corresponding decision of the metabolic or the ethologic character. Such regular environmental monitoring allows the organism to adapt to their metabolism or to put into work the locomotorical reaction for the satisfaction of the individual physiological needs and also to distinguish the most important outside signals and react upon it. It is worthy to pay attention on the evolutionist positions that thinks that the complication of the eye structure and the middle brain with the help of putting together the conditioned reflex with the central organs of sight. Today the peripheral sight apparatus of fish is rather good studied from the morphological point. Different aspects of the comparative histology of the fish eye have been examined in many monographs and a lot of works have been devoted to the histological organization of the eyes retina of the marine bottom and the pelagic fish. But at the same time, today there wasn't information about the retina structure of many fish species, so this question demands detailed investigations.

As from the anatomic-functional point, so from the histological structure the fish eye has many similar lines with the eye of the ground vertebrate: in many species the main details of the organ are rather good expressed and executed the same functions of the receiving of the inverted optical representation of the environmental objects on the retina (picture 1).

The process of the photoreception and the primary remake of sight information carry out by complicated structure of the retina. A number of earlier histological investigations of the photoreception block of the fish eye has been summed up by Ariens Kappers, Huber, Crosby [1], which is described it as multi layer structure. Later [5] it was find out that the structure of the fish eye retina had many specific peculiarities similar with the analogical structures of the other vertebrate. So, the retina consists of the light sensitive (photoreceptor), the nervous and the little cells. The neurons of the retina form three radial layers: the photoreceptional, the associational and the ganglionar; two types of neurons, in addition, include into the radial chain — on the level of the contact of the first and the second neurons (horizontal neurons), and also on the level of the connection of the second and the third neurons (amakrinus neurons). The associational bonds of the neurons are good observed at the thin cut of the retina of the Atherina mochon pontica (picture 2).

All retina cells in connection form 8 main layers:

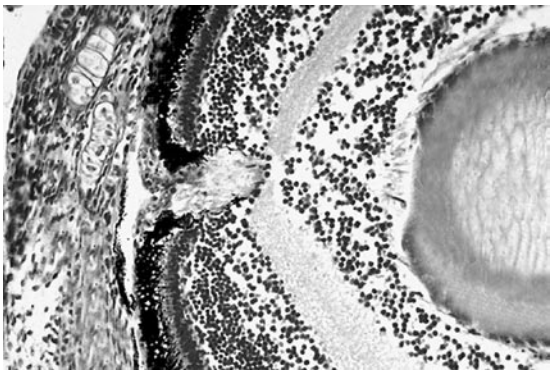
1. the pigmentary epithelial;
2. the photosensory;
3. the external nuclear;
4. the external reticulate;
5. the internal nuclear;
6. the internal reticulate;
7. the ganglionar;
8. the layer of the nervous fibre.

The nuclear and the ganglionar layers correspond to the neurons bodies, the reticulate layers correspond to their contacts (picture 3).

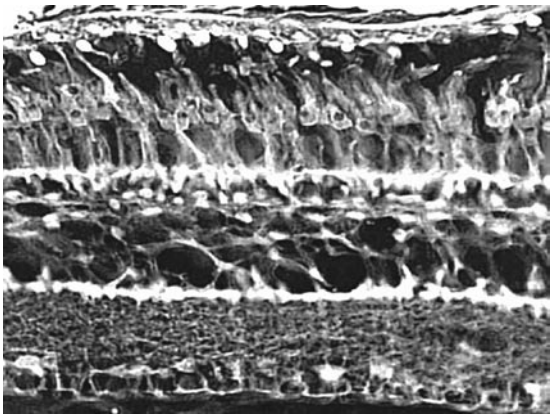
The retina of the bonefishes can have three types of the photoreceptional cells: the neurosensorius sticks, the single neurosensorius conifers and the double neurosensorius conifers. All the types are not necessarily present in the retina or in all species of fish, some species of the deep water marine bonefishes have neurosensorius sticks retina. The neurosensorius sticks and neurosensorius conifers of the fish retina can be different from one another by the presence of the various pigments in their external segments and at the same time different fish species have big variability of the spectral characteristics of the visual pigments [3], that's explained by the presence of two types of retinal (the types of vitamin A — retinal and the 3-hydroretinal and also two kinds of opsin).

The peculiarities of the retina structure correspond to the conditions of the species inhabitation and correlate with the spectral composition of the sunlight in the ambient environment [2, 4]. The position and the interaction of the cells of the pigment membrane, neurosensorius sticks and neurosensorius conifers are changed according to the lighting: with the changes of lighting some parts of the photoreceptors cellular bodies (miods) could change their length: at the daylight — the miods of the neurosensorius sticks become wider but the neurosensorius conifers smaller, at night — the opposite.

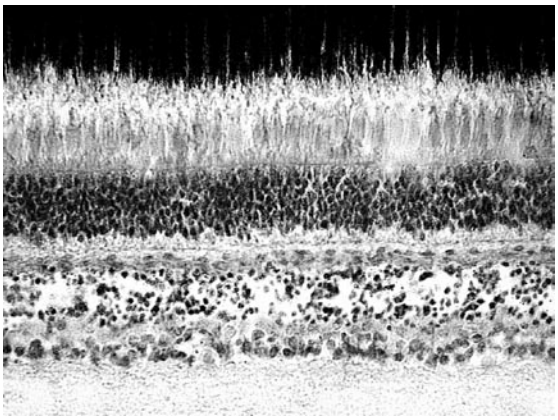
Analyzing the facts of the micrographs we can say that during the lighting happens the extradition of the pigment-including sectors of the neurosensorius conifers and the introduction of the neurosensorius sticks into the corresponding hollows in the pigmentary epithelium. The results give the opportunity to say that this migration flows quickly and the speed is different for the neurosensorius



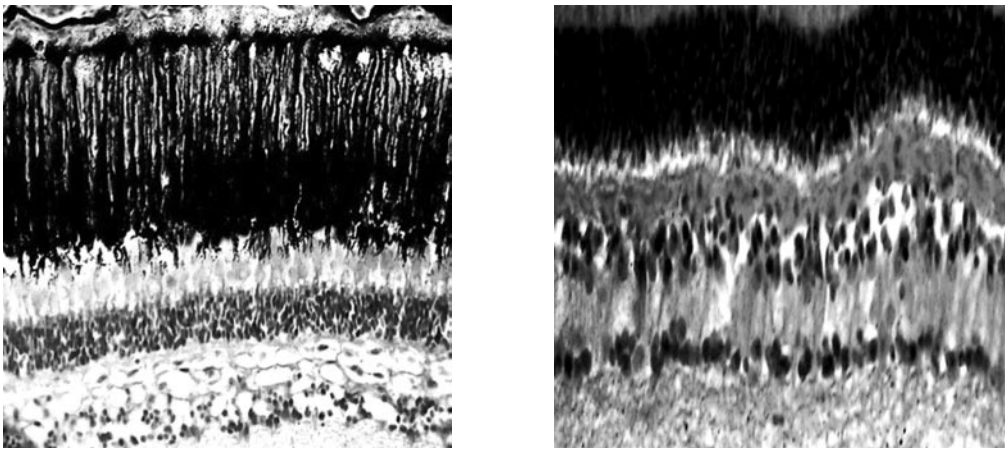
Picture 1. **The fragment of the eye of the Cyprinus carpio baby-fish. Bemer, Chart. 300***



Picture 2. **The nervous cells of the retina of the Atherina mochon pontica. Bemer, Chart. The negative presentation. 700***



Picture 3. **The retina of the Ctenopharyngodon idella one-year-old fish. Bemer, Chart. 500***



A *B*

Picture 4. **The retina of the one-year fish of the Ctenopharyngodon idella at the daylight (*A*) and during the darkness (*B*). Bemer, Chart. 400***

sticks and for the single and the double neurosensorius conifers, so it gives the appearance of the photomechanical effect which plays the big role in the light and the dark adaptation.

Accordingly, the investigation of the peculiarities of the micro level organization of the retina of different fish species lets to open the specific light reaction of the different power and the different wave length, that's why the choice attitude of the species to the different colours and light sources.

The received factual information leads to the usage of it not only in the morph functional and physiological investigation but also in the boundary of the organization of the factorial fish catch on the electro light.

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ГІСТОЛОГІЧНІ І ФУНКЦІОНАЛЬНІ ОСОБЛИВОСТІ ФОТОРЕЦЕПТОРНОЇ СИСТЕМИ ЗОРОВОГО АНАЛІЗАТОРА ЗВИЧАЙНОГО КОРОПА, ЧОРНОМОРСЬКОГО АТЕРИНИ І БІЛОГО АМУРА

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Приведені результати дослідження процесу фоторецепції і первинної обробки зорової інформації у звичайного коропа Cyprinus carpio, чорноморської атерини Atherina mochon pontica і білого амура Ctenopharyngodon idella, показана гістологічна структура зорового аналізатора цих видів риб.

ГИСТОЛОГИЧЕСКИЕ И ФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ФОТОРЕЦЕПТОРНОЙ ДОЛИ ЗРИТЕЛЬНОГО АНАЛИЗАТОРА ОБЫКНОВЕННОГО КАРПА, ЧЕРНОМОРСКОЙ АТЕРИНЫ И БЕЛОГО АМУРА

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Приведены результаты исследования процесса фоторецепции и первичной обработки зрительной информации у обыкновенного карпа Cyprinus carpio, черноморской атерины Atherina mochon pontica и белого амура Ctenopharyngodon idella, показана гистологическая структура зрительного анализатора этих видов рыб.