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Fundamentals of the

HISTOLOGY OF FISH

PART I

HISTOLOGY OF TELEOSTS

An Introductory Text for Veterinary Students

CHAPTER 1

THE SKIN

The skin is composed of:

A) Epidermis:

The epidermis covers the body surface and invests the tail and fins.

In adults the epidermis consists of stratified squamous epithelium, namely the fibrous Malpighian cells.

Unlike its mammalian counterpart, it is living and capable of mitotic division at all levels, even at the outermost squamous layer.

The fibrous Malpighian cells are rounded in shape, however they are horizontal and flattened at the superficial layers. Their cytoplasm is composed largely of an accumulation of elongated vesicles, degenerating mitochondria and some dense bundles of fibers, instead of the normally widely distributed bundles of fibers and mitochondria around the ovoid nucleus.

A fingerprint - like structure has been observed by electron microscope on the free surface of the cells in the outermost layer, but its significance is not known.

The epidermis is covered by a mucopolysaccharide layer (about 1 micron thick), namely, the cuticle. It is normally secreted by the epithelial surface cells rather than by goblet mucous cells.

The cuticular layer contains specific immunoglobulins, lysozymes and free fatty acids, all of which are believed to have antipathogen activity.

Specific accessory organs are present:

1) Mucous gland cells or goblet cells:

They are usually found in the middle layers of the epidermis. Although in a very thin epidermis a mucous cell may be seen to have its base on the basement membrane. They increase in size and elaborate secretions (mainly glycoprotein) as they approach the surface.

2) Club cells (Leydig cells) :

They are large rounded cells, found in the lower and middle layers of the epidermis. These cells secrete a potent alarm substance into the water when the skin of the fish is injured, and this substance may serve as a warning of possible danger to the other fish.

3) Granule cells:

They contain a substance in the form of oil droplets. This substance is thought to be poisonous in nature and secreted from the skin into the water.

4) Other cells:

They include lymphocytes, macrophages and large, clear cyst-like structures of putatively cellular origin.

B) Dermis:

The dermis consists of:

1) Stratum spongiosum:

It is a loose network of collagenous and reticular fibers contiguous with the epidermal basement membrane and contains the pigment cells (Chromatophores), mast cells, cells of the scale beds and the scales.

2) Stratum compactum:

It consists of collagenous dense matrix, which provides the structural strength of the skin.

The capacity for colour change to match the environment or due to sexual activity is very highly developed in many teleosts and is induced by chromophores, e.g.

(1) Melanophores (melanin-pigment containing cells).

(2) Lipophores (organic - solvent - soluble pigment containing cells):

a) Erythrophores (containing red pigments).

b) Xanthophores (containing yellow pigments).

The Scales:

The scale consists of:

1) Outer osseous layer:

It is formed by the cells which resemble osteoblasts.

Inner fibrous layer:

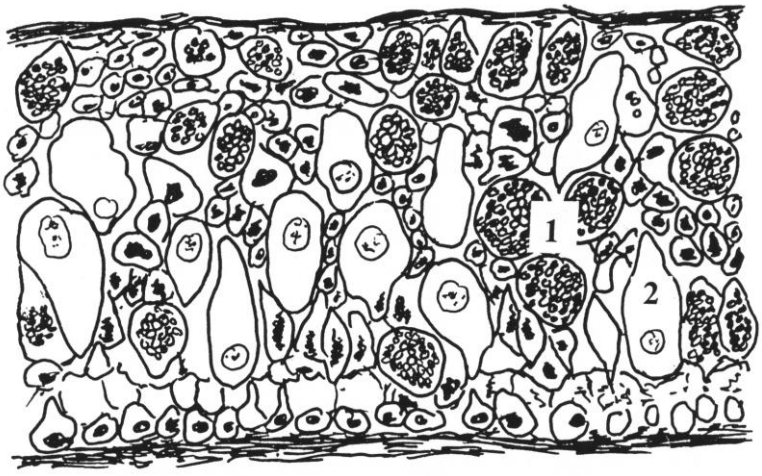
It is composed of collagenous fibers which are produced by fibroblasts.

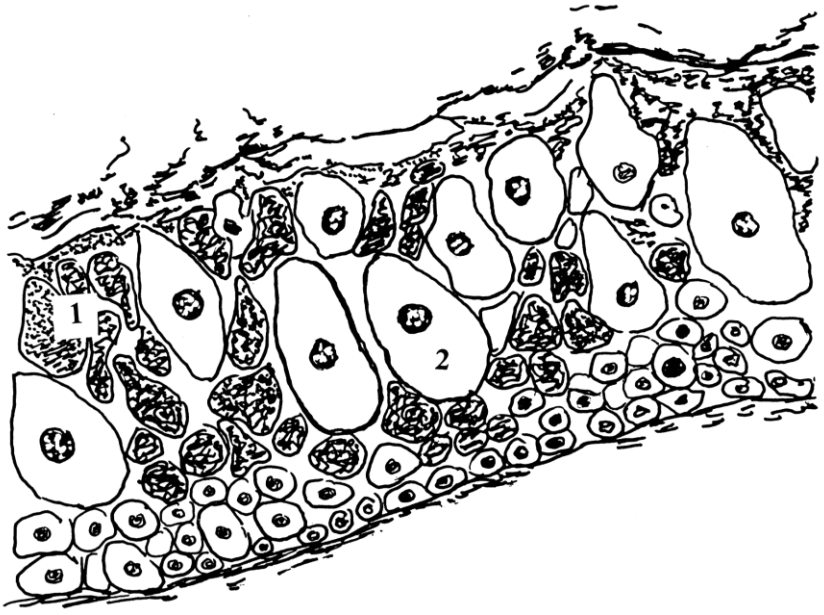
The marginal portion of the scale is called growth - ridge. It is consisted of osteoid tissue.

Osteoblasts accumulated periodically at the growth ridge to form osseous substance. Thus the circuli (growth rings) are formed. The growth rings allow determination of the individual's age.

Hypodermis:

It consists of loose c. t. containing fat cells and abundant blood vessels.



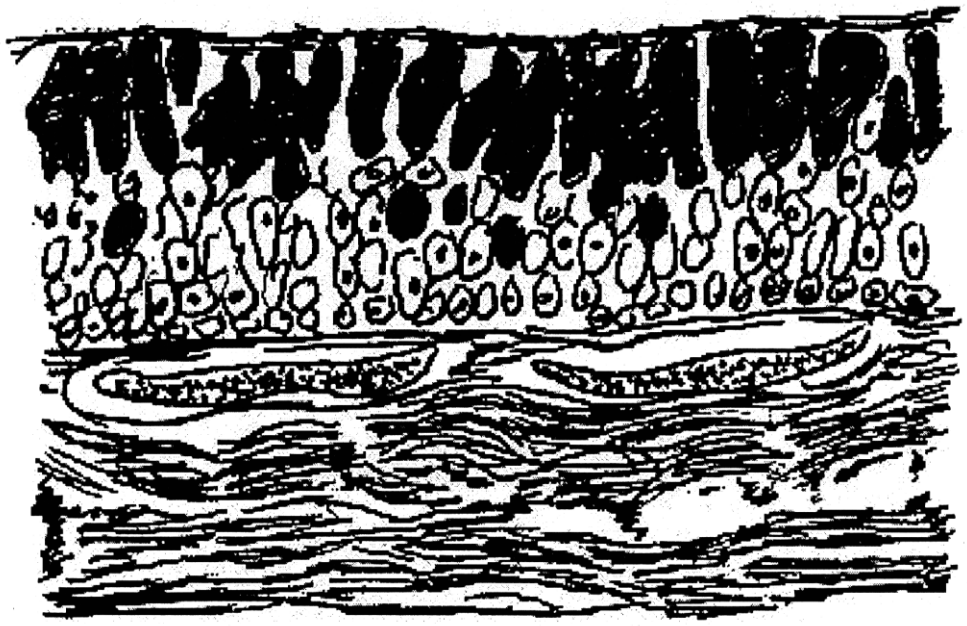


THE EPIDERMIS OF TELEOSTS

(Alcian blue / PAS technique)

1- Mucous cells.

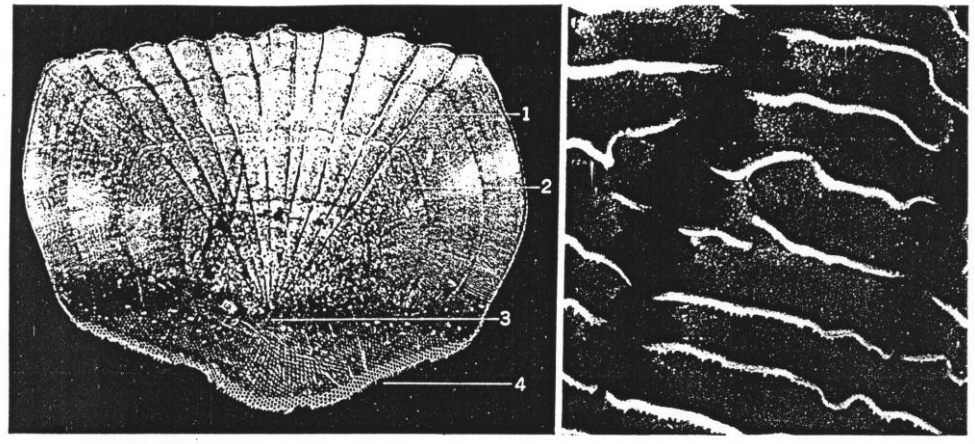
2- Club cells.



THE SKIN OF EEL

(PAS technique)
Mucous cells (black) manifest strong PAS –positive reaction.

FINGERPRINT-LIKE PATTERN ON THE SURFACE OF THE SUPERFICIAL EPIDERMAL CELLS OF TELEOSTS.



Left: SCALE OF TELEOSTS

1- Groove
2- Annuli.
3- Focus.
4- Teeth.

Right: Circuli (Growth rings).