B. Sc. (Hons) Part-II Practical
Course: Zool. H. 211
Experiment 3
Identification of fish scales

Introduction

Fish scales are dermal in origin; epidermal scales are lacking in fishes.
Five major types of scales are found:

A. Primitive types

1. Cosmoid scales
2. Ganoid scales

B. Evolved types

3. Placoid scales
4. Cycloid scales
5. Ctenoid scales

1. Cosmoid scales

Present in Choanichthyes *e.g*. crossopterygians (*Latimeria*), dipnoans (*Neoceratodus*) and their extinct relatives.

Salient features

(a) Cosmoid scales are composed of an inner layer of dentine-like **cosmine** and an outer layer of vitrodentine;
(b) Probably these scales have evolved by the fusion of placoid scales.

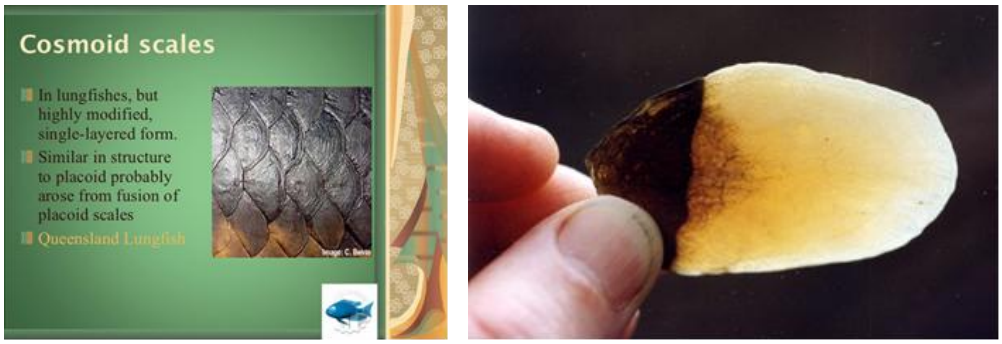

Fig. 1 Cosmoid scale (right) in Australian lungfish, *Neoceratodus*

2. Ganoid scales

Found in primitive ray-finned fishes *e.g*. Bichir (*Polypterus)*, Bowfin (*Amia*), Garpike (*Lepisosteus),* sturgeon (*Acipense*r) etc.

Salient features

(a) Ganoid scales are usually rhomboid in shape and consist of a bony basal layer, a layer of dentine and an outer layer of ganoin (an inorganic salt found in bones);
(b) These are modified cosmoid scales.

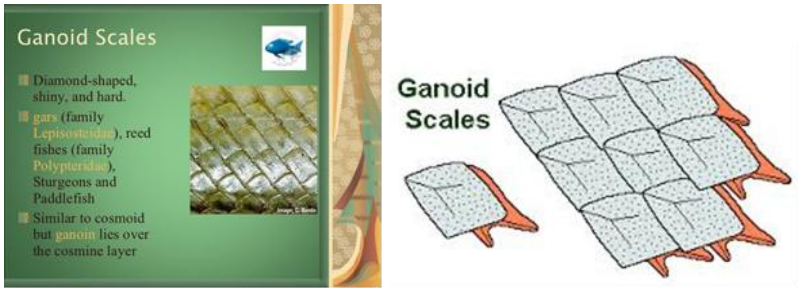

Fig. 2 Ganoid scales

3. Placoid scales

These scales are found in Chondrichthyes *e.g*. dogfishes, sharks, sawfishes, rays, skates etc.

Salient features

(a) Placoid scales are composed of an inner core of pulp, a middle layer of dentine and an outer layer of enamel-like vitrodentine;

(b) They do not grow in size, but new scales are added in between the old ones;

(c) Each scale has a basal plate, a pulp cavity and spines that project posteriorly.

Identifying characters of a placoid scale

1. The scale is microscopic in structure.
2. Presence of a diamond-shaped basal plate, an opening of the pulp cavity, two lateral spines and a median spine.
3. Absence of concentric lines of growth.

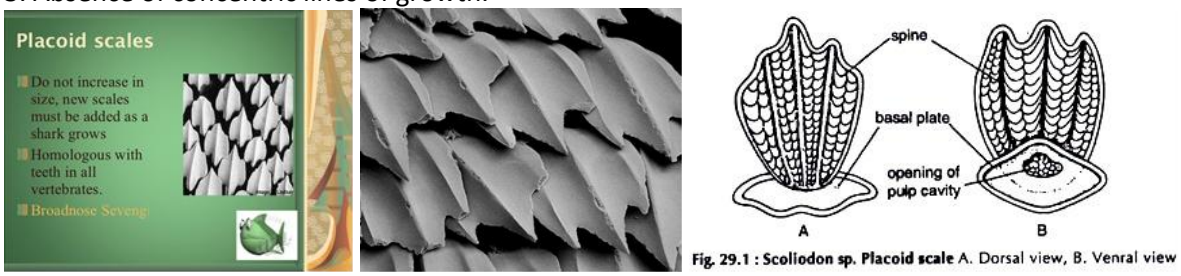

Fig. 3 Placoid scales

4. Cycloid scales

Cycloid scales are most common in soft ray-finned fishes *e.g*. carps and salmon, and also in two living lungfishes (*Protopterus* and *Lepidosiren*).

Salient features

(a) Cycloid scales (Gr. *cyclo*, circle) are rounded in form; centre is thicker which gradually thins out towards the margin;

(b) They have concentric lines of growth, that may be used to determine the age of the fish;

(c) The arrangement of the scales is imbricate or overlapping.

Fig. 4 Cycloid scales

Identifying characters of a cycloid scale

1. It is roughly circular in outline, flattened with smooth anterior end.
2. It is composed of a central nucleus and numerous lines of growth.
3. The posterior part of the scale has many longitudinal grooves.
4. Absence of spines and pulp cavity.

5. Ctenoid scales

Present in most spiny or hard ray-finned fishes, *e.g*. perches, snakeheads, tilapias etc

Salient features

(a) Ctenoid scales (Gr. *ctenos*, comb) are rounded in shape with many comb-like projections;

(b) Similar to cycloid scales, they also have concentric lines of growth, and the arrangements of the scales are overlapping or imbricate.

Identifying characters of a ctenoid scale

1. It is roughly oval in outline and flattened.
2. It is composed of a central nucleus and numerous lines of growth.
3. The anterior part of the scale has many tooth- or comb-like projections.
4. Absence of spines and pulp cavity.

Comparison between a cycloid and a ctenoid scale

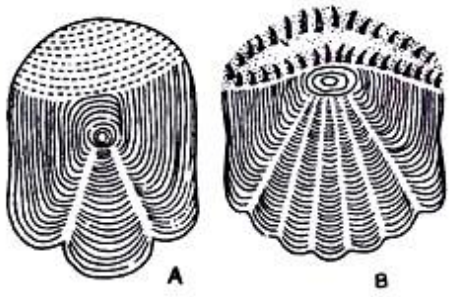

Fig. 29.2 : Scales. A. Cycloid scale, B. Ctenoid scale

Fish scales: Exceptions to the Rules

1. Fishes without scales: *e.g*. Catfishes (F. Siluridae), torpedoes, electric rays etc.
2. Fishes having localized scales: *e.g*. Ratfishes (head), sturgeons (tail) etc.
3. Some fishes like snakehead and flounders have both ctenoid & cycloid scales in their bodies.
4. In some species of flatfishes, males have ctenoid scales but the females have cycloid scales!!
5. In many fishes, scales are modified into scutes (Hilsha), saw (sawfish), teeth (dogfish), spines (porcupine fishes), stinging tails (stingrays), bony plates (pipefishes, seahorses), blade-like peduncles (surgeon fishes) etc.

Preparation of a slide for placoid scale

Brief protocol

1. Take a small piece of skin (dorsal surface) from a dogfish→
2. Remove all muscles from its ventral surface →
3. Put the piece of skin in a test tube →
4. Add 5 ml of 5% KOH solution to it →
5. Boil the test tube over a spirit lamp for 2-3 minutes →
6. Note the brown residue at the bottom of the tube →
7. Remove the KOH solution from the tube →
8. Wash the residue 4-5 times in tap water →
9. Add 1-2 drops of eosin to stain the residue →
10. Using a paint brush, collect some residue and put on a slide →
11. Add a drop of glycerin →
12. Finally, observe the placoid scales under a compound microscope.

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