Laboratory work № 4

External covers of fish, the lateral line, determining the age of fish by scales

Objective: To explore the variety of external covers of fish, learn how to determine the .formula of lateral line and learn the technique for determining the age of fish scales

Materials and equipment: A set of fixed fish – 10–20 species. Preparations: scales of different species of fish. Table: "The structure of different types of fish scales", "The structure of the lateral line of fish". Photos of scales of different species of fish. Tools: .binocular microscope, glass, cuvettes, tweezers, dissectingneedles

Basic theoretical information

The scales of fish. Body of majority of fish is covered with scales. Small scales appear on the body of the young fish when it is on the transition from the stage of the late larvae to the stage early fry. Number of scales does not change, but their size increases with age. By building of scales it can be determined not only duration of the life of fish, but the rate of .growth for each year or the transition to the spawning herd

There are the following types of scales: placoid, ganoid, cosmoid and bone (cycloid and .(ctenoid) (Fig. 7

Figure 7. Different types of fish scales: 1 – placoid scales; 2 – ganoid scales; 3 – cycloid .scales; 4 – ctenoid scales



Placoid scales are characteristic for the sharks and stingrays. It consists of rhombic plates, which occur in the corium, and odontoid outgrowth, which reaches the surface of the body and directed to the rear end of the body of fish. It contains three layers: vitrodentin, dentin .and pulp

Ganoid scales have rhombic shape and a side ledge in a shape of tooth with which scales are interconnected, forming a kind of armor. It has three layers: ganoine, cosmine, isopedin. It occurs at the base of the upper lobe of caudal fin of sturgeon fish, gar pike and polypterus.

Cosmoid scaleshave rounded shape, it is has no ganoine layer. It is typical for crossopterygian fish.

Bone scales were formed as a result of the simplification of ganoid, layers of ganoine and cosmine have disappeared only bone basis has remained. There are two types of scales, with a smooth rear edge – cycloid (carps, Clupeiformes et al.), and with serrated surface on the edge of scleritis – ctenoid (Perciformes, flatfish).

Scales on the body of fish are contained in a special leather pocket, from which only part of it peeps out. These pockets are clearly visible on the body of carp fish, when the scales are removed.

If the scales are observed with optical devices, the lines, each of which forms a ring can be seen. These rings are called scleritis. Their size increases with distance from the center of the scale, and outlines of each ring almost correspond to edge outlines of the scales. Rings are located less and thicker, creating wider and narrower areas. During the year, one broad zone of scleritis is usually formed (summer) and one narrow zone (autumn and winter), and the amount of dual zone corresponds to the age of the fish.

The fish grow unevenly during the year, which affects the growth scales. It increases due to the emergence of young scales with bigger size, which grow under the old. Thus, scales becomes thicker every year. It consists of the accrete flakes, the top of which is the smallest and oldest, and bottom one is the largest and youngest.

Lateral line (linea lateralis – l.l.). The majority of fish has lateral line on each side of body, which is the kind of fish seism sensory sense organ that is able to accept lowfrequency vibrations of water. It is a subcutaneous canal, which is covered with reniform sensitive epithelial cells which are connected with nerve endings. The canal is connected with the external environment by holes that penetrate the scales or skin of the fish body.

The lateral line has essential systemic importance. Its appearance is quite diverse. In some fish it runs along the sides of the body in the form of a straight line from the head to the base of the caudal fin (carp, perch, bream, etc.), in others it is intermittent (smelt) or have



bends over pectoral fins (sabrefish). Herring, gobies and some other fish have no lateral line, and the system of developed sensory canals on the head performs its functions.

Characteristics of lateral line are recorded using formula. To write the formula the number of lateral line scales along the lateral line, above and below it are counted. So the

formula of lateral line ofide looks like 61 54 98 56.. □ □ □ll , that means: 56 is the lowest number of scales along the lateral linefor the species, 61 - the largest number of scales along the lateral line, 8–9 – the number of scales on the lateral line to the base of the dorsal fin, 4–5 – the number of scales in the lateral line to the base of pelvic fins. counting above and below the lateral line can not be always carried out accurately, so sometimes it is limited to only counting scales along the lateral line. Then the formula of lateral line ofideis following: .l.l. = 56–61

Progress of work

1. All fish should be divided into species and numbered with labels that are put in the gill .slits

2. .Prepare sample books for scales of different species of fish

3. .Thoroughly clean the fish from dirt, slime and scales of other fish species

4. Measure the fish – industrial and the absolute length should be determined. Small fish (up .to 50 cm) should be measured to within 1 mm, and large (over 50 cm) – up to 0.5 cm

5. To weigh each species of fish. Fish weighing more than 250 grams weighed to within 2–3 g, 40 to 250 g – 1 g, less weight – 0.5 g

6. To determine the right place for selection of scales for each species. Examine the scales of .fish, to specify what type is it to determine the position of the lateral line

7. .Record formula of lateral line of fish, chosen by teacher

8. To conduct a sampling of scales from the middle of body length of fish or above its lateral .line using the scalpel or forceps

9. After sampling wipe it of mucus (rinse with water and clean with a soft brush or wash in .weak solution of ammonia), or put it to the scales book for further processing

10. To dry scales, then put between two slides for its determination under the microscope. If scales are large dandruff can be used or the age rings can be determined with the naked .eye