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EVALUATION OF THE MORPHOMETRIC AND MERISTIC CHARACTERS OF FISHES

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(A) Aim: To determine the body proportions, to prepare adult skeleton, to familiarise with staining technique for small specimens and to count vertebrae, spines and rays.

(B) Materials: Monocular microscope, camera lucida, measuring boards, scales, dividers, scalpels, forceps, mounted needles, brushes, pipettes, heater, aluminium kettle, sodium hypochlorate, hand lens. For Alizarin staining, the following materials are required: Glacial acetic acid, Glycerine, Chloral hydrate, Alizarin, Petri dishes, embryo cups, cavity slides, cover slips etc.

(C) Methods:

(I) Morphometric measurements:

1. If the fish samples collected for the study are preserved, wash them in running water to remove formalin and its smell, for about 1 to 2 hours.
2. It is better to examine the fish in fresh condition, but this may not be possible at all times. It is

desirable that measurements of freshly caught fish form the basis of comparison until such time as the effects of freezing or chemical preservation on the body proportions have been determined to have constant effects and these effects are finally established. The natural variability of most dimensions is relatively small so that the effect of preservation on differential shrinkage or expansion of different body parts might lead to spurious results if samples of preserved fish from one region are compared with samples of fresh fish from another or if samples of fish from two different regions had undergone different preservative treatment. But, this does not apply when countable (meristic) characters rather than measurements are concerned.

3. Overall length measurements are to be made between perpendiculars along the median longitudinal axis, keeping the mouth of the fish in closed condition.

4. The tail fin has to be extended to give normal (total) length or the tips of one or both the caudal lobes may be drawn to the longitudinal axis of extreme (total) length. Some times total length measurements are made with the caudal lobes partially drawn together so that their outer edges are parellel to each other and to the axis. Follow a uniform pattern throughout the study. If a normal length is the chosen dimension, it is necessary to standardise the procedure of laying the fish on the board. A common method is to place the head of the fish against the nose piece of the measuring board with the right hand, hold the fish in position with the left hand, and use the right hand to straighten the body of the fish and extend its tail with a single stroking movement.

5. Where a choice of sides is involved, all measurements and counts are made on the left side of the fish. When side-to-side comparisons are being made, or if necessary for other reasons, denote by prefixing "r" or "g" (right or

greater) to the notation (or term). This rule may be applicable to Ph and Vh, vide lecture notes III (2), Fig. 3.2.1.

6. Measurements by using calipers and dividers: The tip of the fixed arm of the calipers (or one point of the dividers) is applied to the point mentioned and the tip of the sliding arm of the calipers (or the other point of the divider) is applied to the second point mentioned.

7. Take morphometric measurements of the fishes (Refer lecture notes III (2),Fig. 3.2.1, definitions of position).

II. Meristic counts:

1. Examine and count the number of spines and soft rays in the median fins such as the spiny dorsal, soft dorsal, caudal and anal fins.

2. Count the number of spines (if any) and rays in the paired fins.

3. Count the number of scales in the lateral line and lateral transverse.

4. Count the number of gillrakers in the upper and lower limb of the first gill arch.

5. Count the number of chin pores and barbels.

6. Note the pattern of teeth in the jaws, vomer and palatine.

7. Note the number of pyloric caecae and colouration of the body cavity.

8. Note the shape and structure of the air bladder.

9. Note the number of myotomes and the pigment pattern.

III. Vertebral counts, number and disposition:

1. The vertebral column has to be prepared by boiling the fish in fresh water, just long enough to loosen the tissues from the bones. If the bones appear to be oily

it may be necessary to bleach them in a dilute solution of commercial "Clorax" (Sodium hypochlorite).

2. Note the total number of vertebrae (n) beginning with the 1st vertebra and counting one for each bony segment behind it, including the complex terminal or urostylar segment. (i.e. how many segments there are in the linear series of a vertebral column). This is given in systematic works on fishes, and is extensively employed in biometric investigations on fishable populations.

3. Note for any abnormality i.e., long and irregularly formed segments, which suggests local fusion of adjacent vertebrae. If these non-typical segments are counted as if they are single vertebrae, the total (n) for the back bone proves lower than normal. Complex segments at the posterior end of the back bone are widespread in some fishes.

4. Seeing that (n) is by definition an integer, it can be expressed as the sum of other integers. Group the vertebrae into Precaudal (A) and caudal (B). The precaudals may be again grouped into post cranial (a) and abdominal (b). Caudal vertebrae may be grouped into anterior caudal (c) and posterior caudal (d). This may be expressed as n = (A + B) = (a + b + c + d). The summation of (n) as (a + b + c + -----) is of practical utility in the study of variation from species to species.

5. Examine each segment of the vertebral column and the differences in the vertebral form which are structural rather than numerical or geometrical differences which may be figured and described rather than counted. These are no less important, although these cannot be expressed in concise mathematical terms.

6. Concerning the number of individuals, the greater the number of individuals examined, the greater the value of the results obtained.

7. Take out the vertebral columns of the fishes given and describe them.

8. Examine the vertebral variations in groups of fishes such as Leiognathids.

VI. Alizarin staining of fish larvae:

The alizarin preparation used to stain the hard parts of large fishes have to be slightly modified for staining the fish larvae and postlarvae, as these are delicate and require special care. Prepare the staining solution by the following formula:

Glacial Acetic Acid	0.5 ml.
Glycerine	3.0 ml.
Chloral hydrate	10.0 ml.
Alizarin stain	100.0 gms.

The fish larvae are to be hardened and kept in 5% formalin. After hardening, wash them, place them in 1 to 2% KOH. After these become transparent, these can be stained. The staining solution is added drop by drop to fresh KOH containing the specimen till it becomes violet - pink in colour. Once these are stained, the used up solution may be pipetted out, fresh KOH solution and increasing quantities of glycerine may be added at regular intervals and the stained material is preserved in pure glycerine.

References

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