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A Lucioperca volgensis with a deformed head from the river Danube

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There are two ways in which the skeleton of fishes may be deformed; either the head or the vertebral column is misshapen and the neural and haemal spines are bent in various directions (scoliosis). The skeleton deformations were mostly observed by *Cyprinus carpio* and *Salmo trutta m. fario* originated from pond-farms. The frequentest head-deformations are pugheadedness, when the upper jaw is cut shorter than the lower one, roundheadedness, when both jaws are equally shortened, total, or partial adherence of mouth, and total or partial lack of gill covers.

WUNDER (13, 14) JÁSZFALUSI (4) and MÜLLER (7) wrote about the deformations of pond-farm *Cyprinus carpio*, GROTE-VOGT-HOFER (2), ANTIPA (1) and SCHÄPERCLAUS (9) about head deformations of *Esox lucius*, *Abramis brama* and *Gadus morrhua*.

In the Hungarian literature BÖCKH noticed head deformations on *Cyprinus carpio* from the Danube, and VUTSKITS (12) on a *Cyprinus carpio* from the Balaton. HANKÓ (3) writes about *Salmo trutta m. fario*, *Cyprinus carpio* and *Acipenser güldenstädti*; finally ROTARIDES (8) about the pug-headedness

of *Cyprinus carpio* and *Lucioperca sandra* both from the Balaton.

In the sept. of 1957 the fish collection of the National Museum received a pug-headed *Lucioperca volgensis*. Its length was 24,6 cm and its age 4 years, as I verified it by scale examinations. The forehead of this specimen was shortened, and steep and the upper jaw reached only the half of the lower one. The deformation of this sample is greater than that of the specimen about which ROTARIDES wrote. In the literature only ANTIPA (1) mentions such deformation of *Lucioperca volgensis*.

In order to make thorough examinations I prepared the skeleton of this fish. On the deformed specimen the frontal, which is normally a strait and flat bone, swells out in an arch on the top of the skull, then it brakes and bends down in a rectangle. Laterally it is bent vertically towards the orbits. The lath-like projections on the frontal are failing.

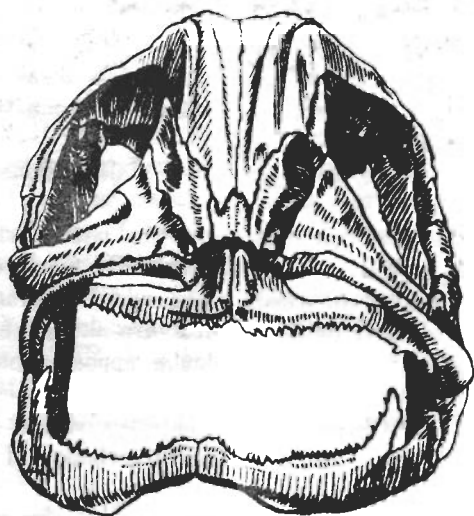
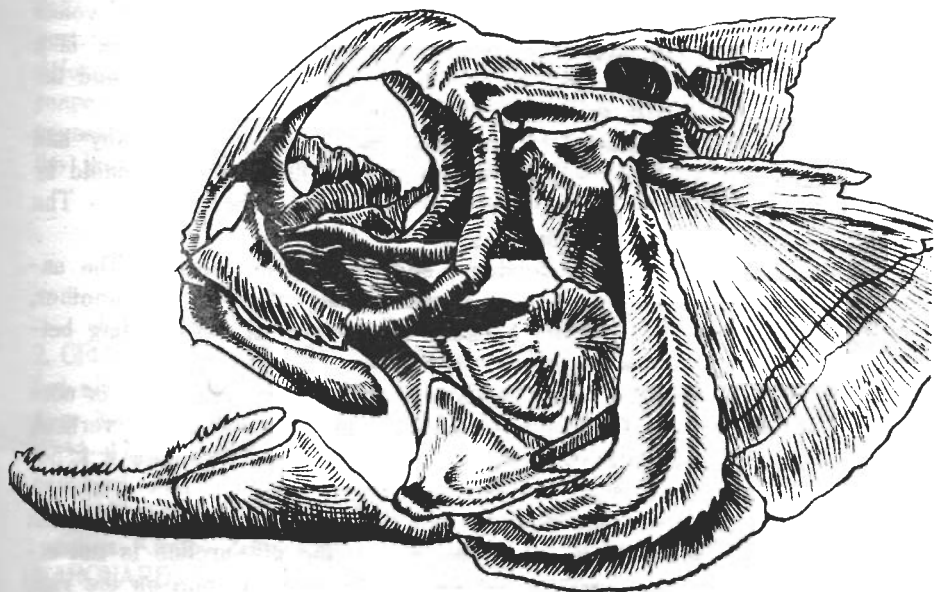
The mesethmoideum - which is normally horizontal - in this case stands vertically, the two knob-like projections on it are failing and the surface of the bone is completely even. The size of the mesethmoideum is smaller than the normal size.

The prefrontals are situated vertically, laterally they are bent forward and outward and therefore if we examine the skull from the side, we see really the lower, in this case the hinder parts. The cartilage which connects the two prefrontals reaches the basisphenoidium.

The orbit is not round, but ventrally lengthened and has a shape of ellips.

Neither the maxillary has a regular shape, because its posterior end bends inward on the bottom and on the top.

The situation of the premaxillary is also changed. On normal specimens the dorsal process of the premaxillary forms an angle of 30-35 grades, with the base of the skull, and the teeth are directed downwards. On the deformed specimen, the process of the premaxillary forms an angle of 90 grades, with the base of the skull, therefore the teeth are directed backwards and if we examine the skull from the side, they are invisible. The two premaxillaries are developed assymmetrically, for the bone of the right side is rudimentary and it reaches not even the half length of that of the maxillary. The right premaxillary is connected with the maxillary by cartilage.



The shape of the vomer is also changed. The edge of the anterior part is not convex, but is concave. The teeth of the vomer are not in a semicircle, and not in two rows, but are situated in a triangle. The wedge-like process of the vomer is lacking, and the bone is completely grown together with the parasphenoid.

The parasphenoid is not strait, but is undulated, stubby and thickened. The parasphenoid is connected with the basisphenoid by a highly developed - greater than the usual - bone knob. - The mesopterygoid is also undulated.

The palatine is a gooddeal shorter than the normal. The anterior ends of the two palatines are standing close to one another, nearly touching each other, because the vomer is not standing between the palatines but behind them.

The lower jaw - the dental as well as the articular - is normally developed. The upper stem of the preopercular is not vertical, because its lower part is shifted backwards and therefore it is not at right angles to the base of the skull.

The basihyal is also abnormal, because it is not triangular but equally wide till its end. The first of the gill-arches is not symmetrical, because similiary to the premaxillary, the one on the right side is only partially developed, its lower half exists, but its upper half is lacking.

We can see from these facts that not only the anterior part of the skull is deformed but also the inferior (basihyale) and posterior (preopercular, gill) one, except the otical and occipital region, which I have found normal.

Considering the possible causes of deformations; these can be the following:

1. Infections diseases obtained in the postembrional state.
2. Rachitis as the result of nourishment insufficiency.
3. Deformation in embrional state, which has an explanation in the mechanism of development. Such are the pugheadedness and the roundheadedness. These show similar appearances by all species of fishes.

According to TORNIER (11) pug-headedness is the result of the weakening of plasm, and the water absorption of the yolk, which causes its swelling.

It is not decided yet what the cause of plasmweakness may

be. According to the opinion of some specialists it is connected with genetics, others explain it with external causes (the presence of certain ions, lack of oxygen). SCHÄPERCLAUS (9) thinks head-deformation to be the result of direct or indirect heritence. In this respect MÜLLERs (7) notices are interesting. He states that the causes of deformations are abnormal metabolical occurrences, mainly the lack of cholesterol, which diminishes the vitality of the plasm.

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