

**CRANIAL OSTEOLOGY OF *SCHIZOTHORACHTHYS NIGER*
(HECKEL) MISRA (CYPRINIDAE: SCHIZOTHORACINAE).
1. NEUROCRANIUM**

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ABSTRACT

The paper describes the neurocranium of a fresh water fish of Kashmir namely *Schizothorachthys niger* (Heckel) Misra (Cyprinidae: Schizothoracinae). Some of the prominent cranial features of the fish are: Frontals are narrow and elongated and form the dorsal border of the orbit. Serrated projections are absent in the frontals of this fish. Supraorbitals form only antero-dorsal border of the orbit, while ventrally the orbit is encircled by a series of five bones. The nasals are fused with the mesethmoid. Parethmoids have lateral wing like outgrowths. Parasphenoids give out lateral projections which support the basal plate of sphenotic bone.

INTRODUCTION

A good number of publications are available on the osteology of fish skull. However, the Schizothoracids have received very little attention in this regard. The only report on the osteology of this group is that of Das and Daftari (1967) for *Schizothorax (Schizothorachthys) esocinus* Heckel.

The ichthyofauna of Kashmir is peculiar as it is dominated by Schizothoracids of which some fifteen species have been reported from different aquatic systems of the valley (Das, 1965). In order to have an insight into the phylogeny of this group of Kashmir fishes detailed study of their anatomy, biology and ecology need to be undertaken. The present contribution is an attempt in this direction and reports the osteological peculiarities of neurocranium in *Schizothorachthys niger* (Heckel) Misra, which is one of the commercially important fish, of Kashmires.

MATERIAL AND METHODS

Fish were obtained from Dal Lake for the study. For preparing articulated skeletons fresh skulls were washed in water and then immersed in hot water (60°C) to which bleaching powder was added in the ratio of 1:10 (Wt/Vol.). The skull was removed from the solution after about 30 minutes and washed under a mild jet of water. Loose skin and muscles came off easily under the pressure of water. The skull, free of any muscle, was allowed to dry slowly in an open place, taking care not to expose it to direct heat which tends to break the bones. For disarticulated skull duration in the bleaching powder solution was extended to about an hour. Alizarin preparations of the skull were made for constant comparison of bones.

OBSERVATIONS AND DISCUSSION

The structural pattern of different bones of neurocranium of *S. niger* and the manner

OSTEOLOGY OF *SCHIZOTHORAICHTHYS NIGER*

in which bones articulate with each other are shown in Fig. 1-8. In the following pages only a brief resume of the structural peculiarities is given and stress is laid on the characters which make the skull of this fish distinct from that of its allies i.e. other schizothoracids and cyprinids.

The skull of *S. niger* is almost completely ossified and is vault shaped, laterally compressed tapering towards snout region.

In a 3-year old fish, skull was about 55 mm long, 34 mm high at the posterior region, 18 mm broad at articulation of jaws and 32 mm broad at opercular region.

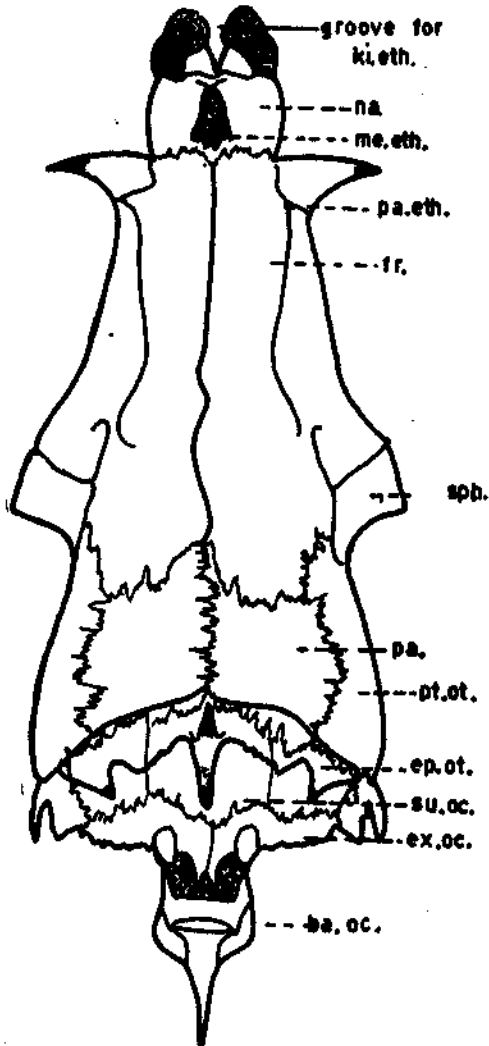


FIG. 1. Dorsal view of neurocranium of *S. niger*.

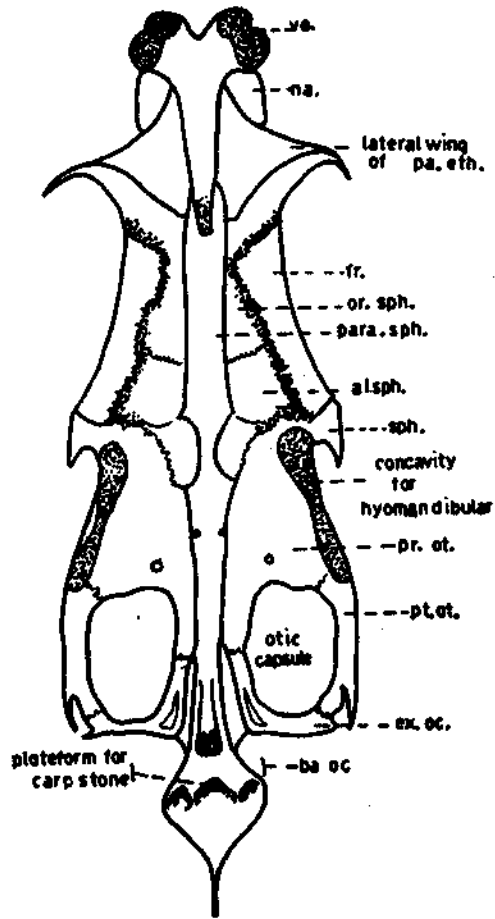


FIG. 2. Ventral view of neurocranium of *S. niger*.

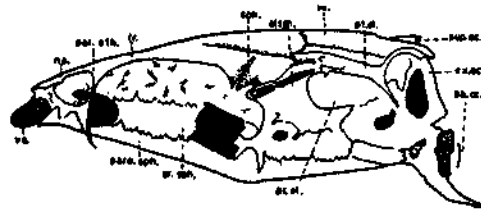


FIG. 3. Side view of neurocranium of *S. niger*.

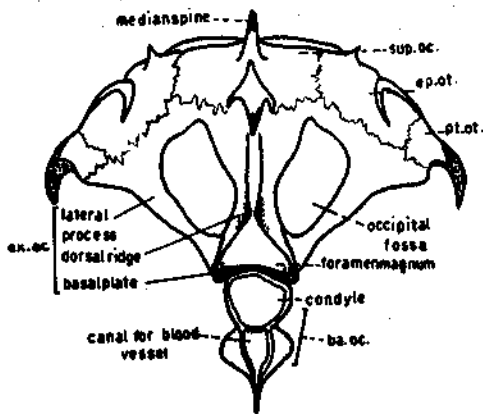


FIG. 4. Posterior view of neurocranium of *S. niger*.

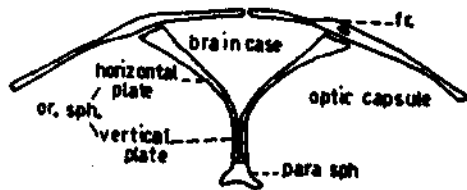


FIG. 5. T.S. through orbital region.

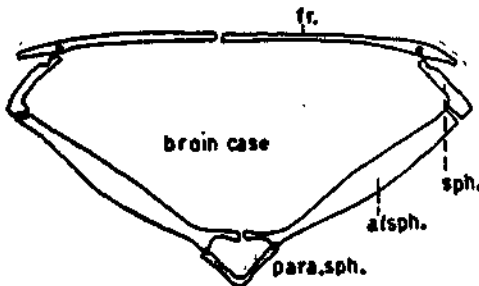


FIG. 6. T.S. through a sphenotic region.

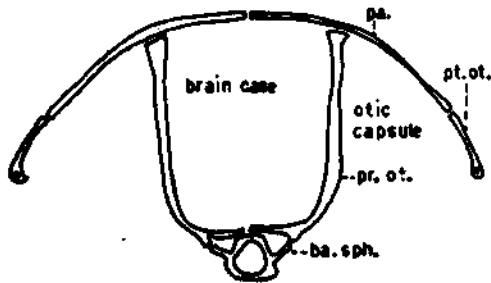


FIG. 7. T.S. through otic region.

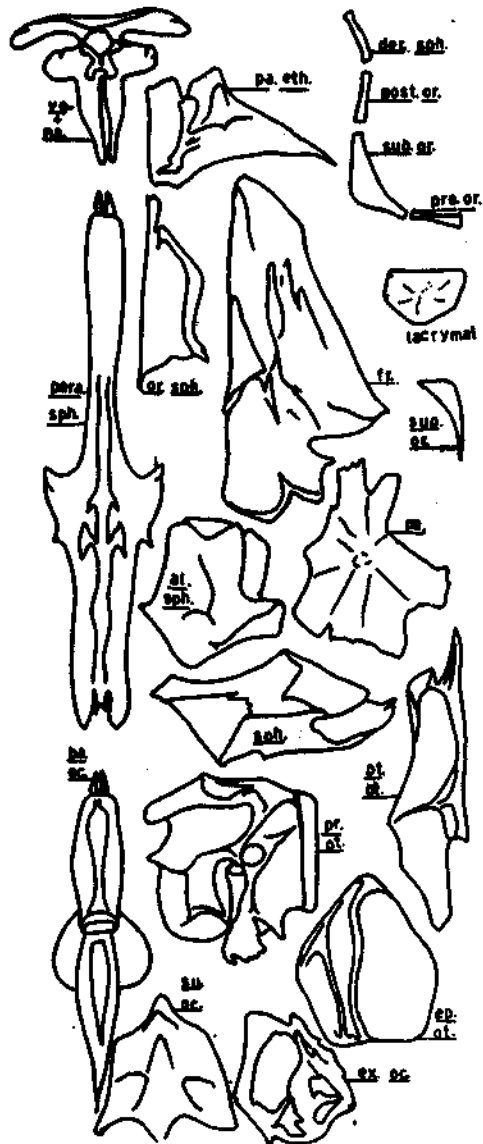


FIG. 8. Disarticulated neurocranium of *S. niger*.

Key to the abbreviations used in the figures

alsph. - alisphenoid; ba.oc. - basioccipital; der.sph - dermosphenotic; ep.ot. - epiotic; ex.oc. - exoccipital; fr. - frontal; ki.eth. - kinethmoid; me.eth. - mesethmoid; na. - nasal; or.sph. - orbitosphenoid; pa. - parietal; Pa. eth. - parethmoid; para.sph. - parasphenoid; post.or. - postorbital; pr.ot. - protic; pt.ot. - pterotic; pre.or. - preorbital; sph. - sphenotic; sub. or - suborbital; sup. or - supraorbital; vo - vomer.

As is typical of all teleosts, the skull in *S. niger* is divisible into two regions namely Neurocranium and Viscerocranium. The osteology of neurocranium only is described here.

Neurocranium

It constitutes the major part of the skull, providing a protective covering to the brain and major sense organs. It is divisible into four parts.

a. **Ethmoid region:** It is the anterior most part of the cranium and is composed of following bones.

i. **Mesethmoid:** It is the anterior median dorsal bone, triangular in shape. It lies anterior to the frontals and is laterally flanked by two nasals, which are completely fused with it. Anteriorly it is drawn out into two knob like structures by a deep median groove. Similar condition is reported for *S. esoinus* (Das and Daftari, 1967). The knob provides attachment to the palatine bone and the cartilaginous disc of maxilla. The groove itself is used for articulation of kinethmoid, which is an ossified ligament. Mid-ventrally the mesethmoid is produced into a septum which partially separates the two nasal chambers.

ii. **Nasals:** The two nasals lie on either side of the mesethmoid bone. In *Labeo rohita* they have been reported to lie at the margin of the skull (Sarbahí, 1932) but in *S. esocinus* they are broad and very near to each other being obliquely articulated with the triangular median bone. (Das and Daftari, 1967). In *S. niger* the two nasals are completely fused with the mesethmoid and are differentiable from the latter only by faint demarcation lines. Nasals form the roof of the olfactory capsule.

iii. **Parethmoids:** Paired bones are attached to the frontals ventrally. Each has three parts (i) dorsal vertical plate attached with frontals and mesethmoid, (ii) basal region forming the floor of the ethmoid region and (iii) wing like out growth forming

the partition between the olfactory region and the orbit.

iv. **Vomer:** It is a median bone located at the anterior end of the floor of the neurocranium. It lies in close contact with the basal plate and the wing like out-growth of parethmoid and the knob like process of the mesethmoid. Posteriorly it fits into the forked end of the parasphenoid bone.

v. **Lacrymal:** Paired flat, some what triangular bones, attached to the lateral wing of parethmoid ventrally and to the maxilla anteriorly. It forms the ventral rim of nasal capsule and antero-ventral rim of orbit.

b. **Orbital region:** It lodges the eye on either side of the cranium and consists of the following bones.

i. **Frontals:** The frontals are much elongated and rectangular. They form the roof of the cranium and the posterior part of the dorsal border of the orbit. The two bones are sutured with each other on the mid-dorsal line and with the mesethmoid and nasal anteriorly and with parietals posteriorly. In *S. esocinus*, the outer margins of frontals are serrated and bear six projections (Das and Daftari, 1967) but no such serrations or projections are present in *S. niger*.

ii. **Orbito-sphenoids:** These are irregularly shaped bones lying ventral to the frontals and meeting alisphenoids posteriorly and lateral wings of parethmoid anteriorly. Each bone is divisible into (i) horizontal basal plate which meets its counterpart from the other side to form the floor of cranium and part of the inner roof of orbit and (ii) the longitudinal vertical process which is in close contact with its counterpart and forms the inter-orbital septum.

iii. **Parasphenoid:** This median bone forms the floor of the cranium and extends from the vomer in front to basi-occipital behind. The vertical process of orbito-sphenoid rests on dorsal apex of middle conical region. Posteriorly the bone becomes flattened and forms sutures with respective

alisphenoids to enclose a large cranial space within.

iv. *Alisphenoid*: These are paired irregular bone bordered dorsally by the frontals and sphenotic. Anteriorly these meet the horizontal basal plates of respective orbitosphenoids to enclose a large cranial space. Ventrally these bones join above the parasphenoids and enclose a cavity which connect the two orbits.

v. *Orbitals*: The orbital bones consist of paired preorbitals, sub-orbitals, post-orbitals, dermosphenotics and supra-orbitals. Except for lacrymals all other orbital bony elements are rod shaped. Das and Daftari (1967) have reported that supra-orbitals in *S. esocinus* are extended posteriorly upto post frontals and form the whole dorsal border of orbit but in *S. niger* the supra orbital is restricted to anterior median part of the orbit only. Post-frontals reported by Das and Daftari (1967) in *S. esocinus*, are absent in this species. The rod shaped dermosphenotics are present, while, they have been reported to be absent in *S. esocinus* (Das & Daftari, 1967.)

c. *Otic region*: It lodges the stato-acoustic organ and is composed of the following bones.

i. *Parietals*: These are large squarish flat bones meeting each other midventrally by sutures. Laterally they are bordered by pterotics, anteriorly by frontals and by supra-occipitals. They form the postero-lateral roof of cranium.

ii. *Sphenotics*: These are paired irregular bones which join the lateral wings of frontals anteriorly. Ventrally they are bordered by pterotic. An elongated concavity is enclosed between the sphenotic, protic and pterotic for the condyle of hyomandibular bone.

iii. *Pterotics*: Paired narrow and elongated bones between sphenotic and epiotic. They form the outer free margin of the otic capsule.

iv. *Protics*: Paired bones sutured anteriorly with sphenotic and alisphenoid, ventrally with the parasphenoid and dorsally with pterotic. They form the lateral wall of cranium and inner wall of otic chamber.

v. *Epiotics*: Paired bones lying posterior to parietals and lateral to supra-occipitals. Each bone bears a median spine. The spines of the two epiotics are equidistant from the median spine of supra-occipital. These form the posterior wall of otic chamber.

d. *Occipital region*: It is the hindmost part of the neurocranium and is composed of following bones.

i. *Supra-occipital*: A median bone located at the dorsocaudal extremity of the cranium, being posterior to parietals and flanked by epiotics on each side. This bone has a median spine which provides attachment to trunk muscles.

ii. *Ex-occipitals*: Paired bones lying ventral to supra-occipital and epiotics. Each ex-occipital is divisible into three regions:

(a) ventral flat basal plate which meets its counterpart in mid-ventral line to form the floor of cranium, (b) dorsal ridge, which together with that of the other bone encloses the foramenmagnum whose ventral rim is formed by the ventral basal plate and (c) lateral process. The two lateral processes form the base for the attachment of supra-temporal bone of pectoral girdle.

iii. *Basi-occipital*: It is a large median bone forming the ventrocaudal portion of cranial box. Posteriorly it is produced into an occipital condyle having the shape of opisthocelous vertebral centrum. It also bears a tube for the blood vessel. The basi-occipital is anteriorly attached to parasphenoid and posteriorly is drawn out into a keel like structure for attachment of muscles.

In conclusion, it can be said that the neurocranium of *S. niger* follows a typical cyprinid plan with specific variation i. e. the elongated

OSTEOLOGY OF *SCHIZOTHORAICHTHYS NIGER*

frontals are devoid of spiny serrations, short tubular dermosphenotics and short supraorbitals are present and pre and post frontals are lacking.

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