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EDWIN CHAPIN STARKS

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Osteology

of certain

Scombroid Fishes

BY

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WITH TWO PLATES AND ONE TEXT FIGURE

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THE COMPARATIVE OSTEOLOGY OF GERRES AND LEIOGNATHUS.

My material is *Gerres embryx* Jordan and Starks, from Maryland, and *Leiognathus fasciatus* (Lacepede), from Samoa.

The crania in profile and general shape are very similar, but in detail they are not. In *Leiognathus* the supraoccipital extends backwards in a high triangular crest just as it does in the Chætodonts, without extending at all forward over the top of the head. Its upper edge is thick and divided into three longitudinal ridges. On each frontal a high, thick, crest converges backwards to the supraoccipital. In *Gerres* the supraoccipital is simple and extends forward over the frontals. Beneath its anterior end a large conical cavity is formed between the frontals, by a high wing on each frontal curving upward and inward and meeting its opposite fellow at the median line. The long ascending processes of the maxillaries projects into this cavity, while in *Leiognathus* they lie wholly on the upper surface of the cranium.

Both genera have a lateral process projecting back from the middle of the premaxillary, which, however, is common to many forms. This process in *Leiognathus* closes inside of the maxillary, while in *Gerres* it closes outside. The maxillary elements are very similar.

In *Gerres* the suborbital chain of bones is complete, and there is a suborbital shelf present. In *Leiognathus* the suborbital chain is incomplete,* and no suborbital shelf is present. The absence of the suborbital shelf was one of the characters by which Doctor Boulenger defined the family Gerridæ (+Leiognathidæ). That the character is valueless in this connection is proved by the fact that it is not found in *Gerres cinereus*. In *Gerres brasilianus* it is present, but not so well developed as in *Gerres embryx*.

In *Gerres* the articulation of the hyoid arch to the suspensory is as usual—the interhyal attached between the lower end of the hyomandibular, and the upper end of the symplectic, which is long and runs along the inner surface of the quadrate in a channel. In *Leiognathus* the articulation is unique so far as known, the interhyal being articu-

*I have long had in mind the question as to whether the suborbital canal was ever present in the adult and the bones undeveloped for its protection. Until now I have always found the bones accompanying the canal; when the canal was absent the bones were. *Leiognathus*, however, proves to have a suborbital canal and the bones not developed around it.

lated to the lower edge of the very short symplectic and the epihyal to the interopercle, as described in greater detail elsewhere in this paper.

Leiognathus has three distinct tooth-bearing superior pharyngeals on each side about equal in size. *Gerres* has two: a very small anterior one, and a very large ovoid one behind it, to which the third and fourth arches are very distinctly attached. There are traces of a suture separating off a small, lunate, posterior portion of this plate, but if this portion represents a third pharyngeal element it is entirely behind the fourth arch and unattached to it. The lower pharyngeals of both genera meet broadly on the median line, but are not at all coalesced.

There is no very important difference between the shoulder girdles of these two genera. In *Gerres* the pelvic girdle is wide as in most of the percoid fishes, but in *Leiognathus* it is deep and compressed, with a wing of bone on each side extending forward so that a deep channel is left between them. This resembles the pelvic girdle of most of the Chætonontoid fishes, and of other deep forms related to the Scombroids.

As might be expected these genera are too closely related to show important differences in the vertebral column. They both have 10 + 14 vertebræ. The parapophyses in *Leiognathus* are larger than in *Gerres*, stand out more prominently, and are unconnected at the base. The last pair are anchylosed, and spread out in a broad trowel-shaped bone about the end of the abdominal cavity. In *Gerres* they are as in most of the Percoid fishes—the last three or four with a bony ridge connecting them in pairs at the bases.

Internally, as externally, the long anal of *Leiognathus* is a noticeable difference. The abdominal cavity is very much shorter, with the first interhæmal and hæmal bones vertical, instead of sloping far backwards as in *Gerres*.

In *Leiognathus* there is a very large basecst at the base of each dorsal and anal ray firmly joined, suturally, to the interspinous bones. In *Gerres* basecsts are present in connection with these rays, but they are small, detached nodules of bone.

On the whole these two forms, aside from the similarity between the mouth parts, have no more in common than most any Percoid fish might have with any Scombroid fish. Hence I propose to recognize the Scombroid family Leiognathidæ and the Percoid family Gerridæ.

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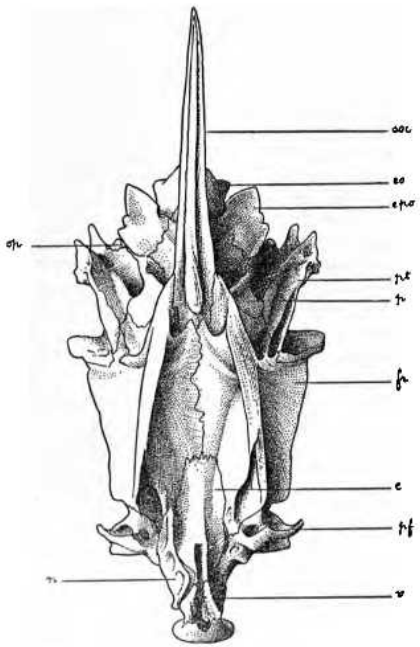
THE OSTEOLOGY OF LEIOGNATHUS FASCIATUS IN DETAIL.



SUPERIOR VIEW OF CRANIUM OF LEIOGNATHUS FASCIATUS.

Drawn by C. L. STARKS.

e, ethmoid. *fr*, frontal. *p*, parietal. *soc*, supraoccipital.
eo, exoccipital. *n*, nasal. *pf*, prefrontal. *v*, vomer.
epo, epiotic. *op*, opisthotic. *pt*, pterygoid.

On each frontal, beginning at the anterior outer edge just behind the prefrontal, is a high, thick ridge which converges backwards with its fellow of the opposite side, and is continuous with the lateral ridge

of the supraoccipital crest. These and the median supraoccipital ridge are finely sculptured on their upper edges, and in the undissected specimen are externally visible, being covered only with very thin skin. Between the frontal ridges there is a broad median area depressed below the level of the supraorbital region on the outer side of the frontal ridges. From the sphenotic a sharp ridge curves upward to the posterior end of the great frontal ridge, joining it near its union with the lateral ridge of the supraoccipital crest. In the base of the lower end of this ridge is the opening of a sensory tunnel, which curving upward and backward pierces the great frontal ridge, and opens at the posterior end of the frontal near the supraoccipital. This sensory tunnel is in continuation with the suborbital and pterotic tunnels, and also with the frontal tunnel, which runs forward traversing longitudinally the great frontal ridge and thence the nasal.

The supraoccipital extends back in a high triangular crest without either extending forward over the frontals, or being in continuation with a median frontal ridge. Following its entire upper contour on each side is a lateral ridge, which is in continuation with the high ridge on each frontal as described above. Posteriorly the supraoccipital extends down over the exoccipital suture, but it does not reach to the foramen magnum.

The exoccipitals meet both above and below the foramen magnum, and their vertebral articular fascets are nearly in contact above the basioccipital. Each bears three foramina more or less in a horizontal line. The middle one, the vagus foramen, has two smaller foramina close beside it, and the anterior one, the glossopharyngus foramen, is only partially contained by the exoccipital, being between that bone and the prootic. The posterior one, the foramen of the occipital nerve, is situated on the ridge that runs forward from the exoccipital condyle to the pterotic crest.

The whole lower posterior part of the basioccipital is occupied by a very large opening to the myodome, filling the width of the bone and leaving its side walls thin. From the upper posterior edge of the basioccipital is a sharp ridge running downward and forward to its lower edge just in front of the posterior opening to the myodome. Between this and the basioccipital condyle are some pits ending blindly, but resembling neural foramina.

The parasphenoid bears a thin median keel below, behind which is a saddle-shaped notch where on each side the first toothless pharyngeal lies. Just back of this is a swollen knob for the support of the other superior pharyngeals, and still farther back, extending under the knob,

is a deep conical cavity with its apex pointed forward, just as in the genus *Gnathanodon* and in several members of the family Scombridæ, only the myodome does not open into its side, as it does in the Scombridæ. The parasphenoid extends a little behind the front of the posterior opening to the myodome in a little sliver of bone on each side, but it does not reach nearly to the basioccipital condyle. A broad wing is developed upwards along the prootic on each side of the myodome and is strengthened by a lateral ridge continuous with a sharp thin ridge on the prootic and the outstanding wing of the sphenotic. As the prootics and the lower edges of the basioccipital end abruptly against the parasphenoid, without curving inward at all toward each other, the parasphenoid forms the entire lower floor of the myodome.

Through the lateral wing of the prootic is a rather long tunnel—the trigemino-facialis recess, running from the middle of the preorbital surface of the bone forward, and opening on the orbital surface. A foramen opens into this recess at about its middle on the postorbital surface just below the articular cup of the hyomandibular.

The alisphenoids meet and divide the anterior opening of the brain case into two parts—a lower round part, and an upper, much larger, triangular part.

Bordering the posterior half of the lower opening is the basisphenoid. It is connected with the prootic roof of the myodome for its full width without an opening between. It sends down a long process to the parasphenoid.

The sphenotic stands outward in a very prominent lateral wing behind the eye, and is continuous with the frontal supraorbital border. To its outer edge is attached one of the suborbital sensory tube bones, which reaches upward to the frontal.

The opisthotic is almost wholly on the inferior surface of the cranium, though a portion of its thickened posterior end is visible from above. It covers the pterotic-exoccipital suture, and no part of it is interposed between the pterotic and exoccipital. The broad lower limb of the posttemporal is firmly attached to it without the intervention of a ligament.

The parietals are widely separated by both the supraoccipital and the posterior points of the frontal which project backwards. They are situated just above and anterior to the epiotics. Each is in outline an irregularly round bone, and is traversed by a sharp wing running from just behind its middle upward to where the frontal joins the supraoccipital ridge.