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CRANIAL DIFFERENCES IN THE AFRICAN CHARACIN FISHES OF THE GENERA *ALESTES* AND *BRYCINUS*, WITH NOTES ON THE ARRANGEMENT OF RELATED GENERA¹

BY GEORGE S. MYERS²

While engaged in a comparison of the skeletons of certain American and African tetragonopterid characins I had occasion to examine the crania of two species referred by Boulenger to *Alestes*, namely, *A. liebrechtsii* Boulenger and *A. grandisquamis* Boulenger. These skulls, both from specimens collected by Messrs. Herbert Lang and J. P. Chapin of the American Museum Congo Expedition, at Faradje, Belgian Congo, appeared so different as to suggest that the species should be generically separated. Starks (1926, p. 167, footnote), after a study of these same two specimens, has suggested that generic differences exist between them. The skeletons are now in the collection of Stanford University, and I wish to thank Prof. E. C. Starks for the privilege of examining them. Dr. E. W. Gudger of the American Museum has been kind enough to send me some other African characins for skeletonization and comparison.

The cranium of *Alestes liebrechtsii* (Fig. 1) is of a tapering type, much wider posteriorly than anteriorly, and the roof is greatly arched in transverse section. The thin, somewhat translucent frontals are slightly fluted, this fluting radiating from a common center near the outer posterior part of each bone. Extending from the supraoccipital far between the frontals is an oval fontanel, entirely separating the parietals. The tube of orbitosphenoid bone which protects the olfactory nerve as it leaves the brain-case to meet the prefrontal is met by a similar tube extending out from the latter bone.

In *Alestes grandisquamis*, on the contrary, the cranium (Fig. 2) is short and heavy, and narrows anteriorly practically none at all. The roof is flattened and little convex, the bones thick, massive, and opaque.

¹Scientific Results of the American Museum Congo Expedition. Ichthyology, No. 7.

²Of Stanford University, California.

There is no fluting but instead radial striations of the bone. There is no suggestion whatever of a fontanel, the parietals meeting each other suturally. The orbitosphenoid olfactory nerve-tube extends to the prefrontal, where it meets only a slight rim about the nerve foramen. Furthermore, the facial bones forming the circumorbital chain are thick and deeply striated, very different indeed from the thin bones of the other species. The teeth are decidedly more massive than in *liebrechtsii*.

These differences appear to me to be of generic value, but it remains to be seen whether or not they extend with the same distinctness through-

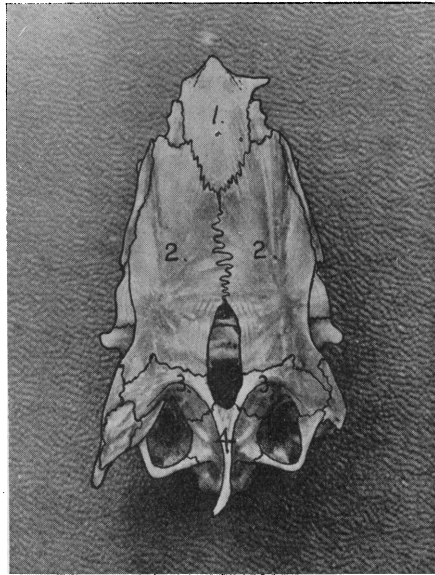


Fig. 1. *Alestes liebrechtsii* Boulenger. Cranium from above.
1. Mesethmoid. 2. Frontals. 3. Parietals. 4. Supraoccipital.

out any two groups of the species that are currently referred to *Alestes*. I have prepared and examined the skeleton of a small specimen of *A imberi* Peters and find that it agrees substantially with the characters given above for *A. grandisquamis*. In this specimen the olfactory nerve-tube is not distinctly separated distally from the orbitosphenoid wall, and it does not reach the prefrontal, but as in *grandisquamis* there is no prefrontal tube, not even a rim being seen about the prefrontal foramen.

These three skeletons are, unfortunately, the only ones of *Alestes* available to me. Sagemehl (1885, Taf. 2, figs. 17 and 18) has, however,

figured the cranium of *Alestes dentex* and it is easily seen that, in so far as the tapering form and fontanel go, it conforms admirably to my description of *liebrechtsii*. Further, Regan (1911, p. 18) remarks, "... most species of *Alestes* have fontanels, but in *Alestes macrolepidotus* they are absent and the parietals are united by suture." This apparently agrees with the structure of *imberi* and *grandisquamis*.

Both of the species which we have seen to possess a tapering skull and a parietal fontanel have certain external features in common. *A. dentex* and *A. liebrechtsii* are elongate, herring-like fishes with compara-

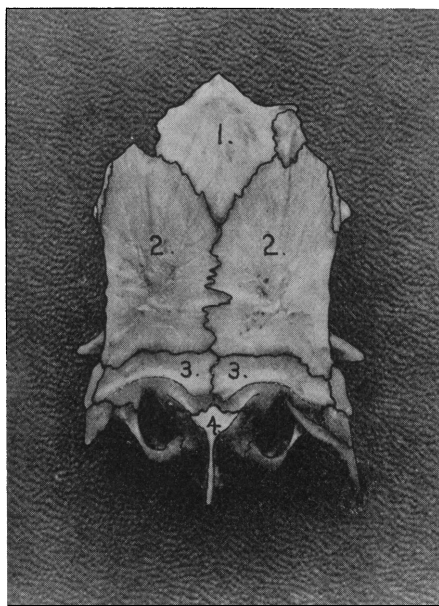


Fig. 2. *Brycinus grandisquamis* (Boulenger). Cranium from above.

Numbers as in Fig. 1.

tively small scales and a well-developed adipose eyelid. The three lacking the fontanel, *A. grandisquamis*, *A. macrolepidotus*, and *A. imberi*, are differently shaped fishes with large, heavy, oblique scales and the adipose eyelid very slightly developed or absent.

It appears to me that we are dealing with two distinct genera. To one of them, typified by *A. liebrechtsii* and *A. dentex*, we may leave the name *Alestes* Müller and Troschel, of which the genotype is *niloticus* Geoffroy = *dentex* Linné.¹ To the other we may apply *Brycinus*

¹I use *dentex* in the Boulengerian sense. It is possible that *dentex* will not stand for this species.

Cuvier and Valenciennes, of which the genotype is *macrolepidotus* Cuvier and Valenciennes. What will be the distribution of many of the species not examined, which are currently referred to *Alestes*, cannot be settled without osteological investigation of them. It is hoped that some one with more material at his command will carry the work through.

NOTES ON RELATED GENERA

The *Tetragonopterus*-like characin fishes of Africa appear to differ externally from their American relatives in the closely bound-down maxillary and in having the lateral line extending out through the lower part of the caudal peduncle rather than through the middle. Boulenger's arrangement, in four genera (*Bryconæthiops*, *Alestes*, *Micralestes*, and *Petersius*), can probably be emended to advantage, as has been indicated above. Merely to express my idea of the relationships of *Alestes*, *Brycinus*, and the other genera, I have prepared a synopsis of the genera. This is not intended to be taken as an analysis of the generic groups, but only as a basis for discussion of the characters involved.

SYNOPSIS

- a. Premaxillary teeth in three series; the inner tuberculate or molariform, with excavated crowns; dorsal fin originating in advance of pelvic fins; cranium flat and rather broad; a parietal fontanel present.
 - Bryconæthiops* Günther.
- aa. Premaxillary teeth in two series; dorsal originating above or behind pelvic fins.
 - b. Inner series of premaxillary teeth with obliquely truncated or molariform excavated crowns.
 - c. Cranium flattened, not tapering; no fontanel; dentition massive; scales large and thick; adipose eyelid feeble or absent. *Brycinus* Cuvier and Valenciennes.
 - cc. Cranium arched and tapering forward; fontanel present; dentition moderate; scales fine; a well-developed adipose eyelid. *Alestes* Müller and Troschel.
- bb. Both series of premaxillary teeth simply compressed.
 - d. Scales of the lateral line and rows below abruptly smaller than those of the rows above.
 - Arnoldichthys* Myers.
 - dd. Scales of the lateral line and rows below of approximately the same size as those above.
 - e. Parietal fontanel absent.
 - Petersius* Hilgendorf.
 - ee. Parietal fontanel present.
 - Micralestes* Boulenger.

BRYCONÆTHIOPS Günther

This genus is well distinguished by the triple series of premaxillary

teeth and the dorsal position. There is a fontanel and a wide adipose eyelid. I have examined one *B. macrops* Boulenger, 150 mm. total length.

There appear to be two or three species in the Congo. Nichols and Griscom (1917, p. 678) doubt the distinctness of *B. yseuxii* Boulenger from *B. microstoma* Günther, but they appear to have had some examples of the subsequently described *B. macrops*.

BRYCINUS Cuvier and Valenciennes

This genus has a great superficial resemblance to the American *Chalceus*, as Cockerell (1914, p. 107) has noted. Besides *B. macrolepidotus*, *B. imberi*, and *B. grandisquamis*, the following seem referable to this genus on external characters: *Brycinus nurse* (Rüppell), *B. schoutedeni* (Boulenger), *B. brevis* (Boulenger), *B. batesii* (Boulenger), *B. rhodopleura* (Boulenger), *B. bimaculatus* (Boulenger), *B. kingsleyæ* (Günther), *B. rutilus* (Boulenger), *B. affinis* (Günther), *B. jacksonii* (Boulenger), *B. carmesinus* (Nichols and Griscom), *B. lateralis* (Boulenger), *B. curtus* (Boulenger), and *B. vittatus* (Boulenger).

There may be an unsuspected generic type in the other species of the Boulengerian "*Alestes*" which do not resemble either *Brycinus* or *Alestes*. Five very similar species, *Alestes tholloni* Pellegrin, *A. intermedius* Boulenger, *A. tessmanni* Pappenheim, *A. longipinnis* (Günther), and *A. chaperi* Sauvage, form one group. Again, apparently of another group are: *Alestes poptæ* Pellegrin, *A. opisthotænia* Boulenger, *A. tæniurus* Boulenger, *A. humilis* Boulenger, *A. stolatus* Boulenger, *A. sadleri* Boulenger, and *A. stuhlmanni* Pfeffer.

ALESTES Müller and Troschel

Referable to this group seem to be but five species: *Alestes dentex* (Linné), *A. baremose* (Joannis), *A. macrophthalmus* Günther, *A. liebrechtsii* Boulenger, and *A. ansorgii* Boulenger.

ARNOLDICHTHYS Myers

The writer erected this genus in 1926 for a single peculiar species from the Niger, *Arnoldichthys spilopterus* (Boulenger). The scales are unlike those of any other characin.

PETERSIUS Hilgendorf

Boulenger included a number of small species with fontanels in this genus, but it must be restricted to a single species only, *P. conserialis* Hilgendorf, a peculiar large form from East Africa, lacking a fontanel.

MICRALESTES Boulenger

Boulenger separated *Micralestes* from *Petersius* on the presence in the former of a pair of conical teeth behind the mandibular series. I have indicated above that *Petersius* must be restricted to its single original species. Nichols and Griscom (1917, p. 682) were unable to find these conical teeth in *M. altus* and it seems likely that the distinction is not a valid one. At least a classification which separates *Petersius pulcher* Boulenger and *P. major* Boulenger from such a similar fish as *Micralestes urotænia* Boulenger should be very carefully scrutinized before it is accepted. For the present I prefer to place all the species assigned to *Petersius*, save *conserialis*, in *Micralestes*. That this is a tentative arrangement should not be lost sight of, for I have been able to examine only *M. acutidens*.

Micralestes as thus constituted is arbitrarily separable into two groups. The species with the lateral line incomplete¹ fall into the subgenus *Phenacogrammus* Eigenmann² (1907, p. 30). *Hemigrammalestes* Pellegrin³ (1925, p. 158) is an exact synonym of Eigenmann's name, and if the character of the teeth is not valid, then *Hemigrammopetersius* Pellegrin⁴ (1925, p. 158) is also a synonym. The other group, with lateral line complete, is of course, *Micralestes*, *sensu stricto*. Within this group we may indicate that *M. hilgendorfi* Boulenger and *M. leopoldianus* Boulenger are very closely related.

If the character of the conical teeth is found to be valid the species included here under *Micralestes* which were placed by Boulenger in *Petersius* must be known under the generic term *Hemigrammopetersius* Pellegrin.

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¹An inconsistency may be seen in the failure to consider an incomplete lateral line of generic value in these fishes, while it is retained as a diagnostic character of a number of genera of American characins. In the present instance it seems clear that the loss of part of the lateral line in a few species is a mark of individual specialization and not significant of genetic relationship between the line-less species. This is doubtless the case with several of the American genera, but until the needed careful realignment of the entire mass of neotropical characins has been carried through, it would cause needless confusion to peremptorily synonymize certain genera on the inadequate premises now available.

²Genotype *M. interruptus* Boulenger.

³Of which the genotype is hereby fixed as *M. interruptus* Boulenger.

⁴Of which the genotype is hereby fixed as *Petersius major* Boulenger.

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