

## NOTES ON SKELETONS OF ETHEOSTOMATINÆ.

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The junior author of the present paper has prepared the skeletons of 20 species of *Etheostomatinae*. These have been studied with a view to ascertaining what skeletal characters, if any, distinguish this group as a whole from the *Percinae*, and also in what respects the different subordinate groups or genera are distinguished from each other.

The studies here made have been, in a measure, superficial, and refer especially to the upper parts of the cranium and the numbers of the vertebræ. A detailed comparison of the smaller bones, especially those of the lower parts of the head, offers numerous difficulties, as several of the species examined do not reach a greater length than two inches. The jaws and the membrane bones of the skull, being sufficiently described elsewhere, are not noticed in this paper.

1. *Percina caprodes*, Raf.

This species is the largest of the Darters, and in the structure of the cranium it is the one which approaches nearest to the typical *Perches*. In this respect, it is evident that *Percina* is more nearly allied to the other Darters than it is to *Perca*. Its cranium is decidedly more like that of *Perca* than like that of *Stizostedion*. So far as the cranium is concerned, *Perca* is probably nearer *Percina* than either is to *Stizostedion*.

Comparing the skull of *Percina* with that of *Perca*, we find that in the former the bones of the skull above are much smoother; the ridges and grooves on the frontal, parietal, and mastoid regions, conspicuous in *Perca*, are nearly obsolete in *Percina*. The tube-like pores on the frontal bones conspicuous in *Perca* are barely visible in *Percina*. Parietals and supraoccipital with radiating striæ, more regular than in *Perca*, the ridges lower and less sharp. Frontal region narrower than in *Perca*, and less depressed. Supraoccipital bone longer than in *Perca*, its crest very much smaller, not rising to level of the occiput. Sutures of skull more distinct than in *Perca*. Skull in profile less convex at occiput, more elevated between eyes.

Suprascapula in *Percina* trifurcate, the forks slender, the posterior part without serration; its form similar to that of *Perca*. Scapula, L-shaped, thinner and weaker than in *Perca*; its edge not serrate. Foramen of ulna much larger than in *Perca*. Pelvic bones proportionately shorter and broader than in *Perca*. Coracoid without serrations. Rest of skeleton essentially as in *Perca*; number of vertebræ,  $23 + 21 = 44$ . Lower pharyngeals triangular-elliptical, with large teeth.

As compared with the other Darters, the skull of *Percina* is much broader between the eyes; the parietal bones are more strongly ridged, the sutures more distinct, the top of the cranium beyond the eyes more

depressed, and the supraoccipital crest more developed than in most of the others. In all these respects *Percina* is intermediate between *Perca* on the one hand, and the extreme forms, *Ammocrypta* and *Microperca*, on the other.

The other Darters form two irregular lines, the one with depressed cranium, and slenderer bones, culminating in *Ammocrypta*; the other having the cranium more convex transversely, the bones firmer and smooth, and the vertebræ fewer in number. This group seems to culminate in *Microperca*.

2. *Hadropterus aspro*, Cope & Jordan.

This species has the skull smoother than in *Percina*, its surface more convex transversely; frontal region very narrow, grooved; parietals slightly striate, somewhat depressed behind the eyes, but less than in *Boleosoma*. Supraoccipital large, its crest reduced to a minute process. Profile essentially as in *Percina*. Bones of shoulder-girdle and pharyngeals essentially as in *Percina*. Pyloric cæca, 4. Vertebræ,  $19 + 23 = 42$ .

3. *Hadropterus scierus*, Swain.

Skull essentially as in *H. aspro*. Vertebræ  $18 + 22 = 40$ .

4. *Hadropterus evides*, Jordan & Copeland.

Skull essentially as in *H. aspro*, the parietal region a trifle smoother and a little more convex transversely. Vertebræ  $18 + 22 = 40$ .

5. *Hadropterus phoxocephalus*, Nelson.

Skull more elongate than in *H. aspro*, the frontal region very narrow. Parietals smooth, somewhat depressed above, but rather strongly convex transversely; no supraoccipital crest. Suprascapula slender; scapula broad. Profile most prominent behind eye. Vertebræ  $19 + 20 = 39$ . Pyloric cæca 2. This species is chiefly peculiar in the narrowness of the head.

6. *Cottogaster copelandi*, Jordan.

Skull short, the frontal region rather short and not very narrow. Parietals faintly striate, depressed above, little convex transversely. Sutures distinct. Supraoccipital crest obsolete; scapula broad. Profile most prominent above eye. Pyloric cæca 3. Vertebræ  $18 + 20 = 38$ .

7. *Ulocentra simotera*, Cope.

Skull not very narrow anteriorly. Parietal region rather depressed, not strongly transversely convex, its bones faintly grooved. Frontal region much broader than in *Diplesion blennioides*, the top of the head much flatter. Profile highest above posterior margin of eye, scapula rather broad. Supraoccipital crest small. Vertebræ  $15 + 23 = 38$ .

So far as the skull is concerned, this species more resembles *Cottogaster* than *Diplesion*.

**8. *Diplesion blennioides*, Rafinesque.**

Frontal region very narrow. Ethmoid region abruptly decurved. Parietal region rather convex transversely, rather broad, the bones finely striate, with obscure sutures. No supraoccipital crest. Suprascapula very short. Scapula rather broad, L-shaped. Profile low posteriorly, full above eyes. Skull more flattened above than in *Etheostoma*, but less so than in *Cottogaster*, *Hadropterus*, &c. Pyloric cæca 4. Vertebrae  $19 + 23 = 42$ .

This species approaches more closely to *Etheostoma* than do any of the preceding, so far as the form of the cranium is concerned. The group of which *Etheostoma zonale* is the type apparently marks the transition from the one series to the other.

**9. *Boleosoma maculatum*, Agassiz.**

Frontal region short, very narrow. Parietal region flattish above, its bones faintly striate. No supraoccipital crest. Profile most convex above front of eye. Suprascapular processes slender. Pyloric cæca 6. Vertebrae  $15 + 22 = 37$ .

**10. *Boleosoma camurum*, Forbes.**

Skull essentially as in *B. maculatum*. Pyloric cæca 3. Vertebrae  $17 + 21 = 38$ .

**11. *Ammocrypta pellucida*, Baird.**

Frontal region narrow. Parietal region depressed, flattish; the bones thin, nearly smooth. Sutures very distinct. Supraoccipital crest obsolete. Profile highest above posterior part of eye. Ulnar foramen very large. Scapula and suprascapula slender; all the bones of the body comparatively slender and thin. Top of head rather more flattened than in any other genus. Pyloric cæca 4. Vertebrae  $23 + 21 = 44$ .

**12. *Ammocrypta vivax*, Hay.**

Skeleton essentially as in *A. pellucida*, the sutures of the skull perhaps less distinct. Vertebrae  $21 + 20 = 41$ . Pyloric cæca 4.

The remaining species, now referred to *Etheostoma* and *Microperca*, agree very closely with one another in the form of the cranium, which is narrow behind the eyes, across the parietal region, and very strongly convex transversely. In these species the vertebrae are more or less reduced in number and there are usually fewer rays in the spinous dorsal and anal.

**13. *Etheostoma zonale*, Cope.**

Frontal region very short, moderately narrow. Parietal region very strongly convex transversely, the bones with radiating striæ. No supraoccipital crest. Profile most prominent above posterior part of eye. Pyloric cæca 4. Vertebrae  $16 + 23 = 39$ .

This species differs from the others referred to *Etheostoma* chiefly in the shortness and decurvature of the frontal region.

**14. *Etheostoma variatum*, Kirtland.**

Skull narrow, the parietal region strongly convex transversely, supraoccipital and parietals with fine radiating striæ. Supraoccipital large, its crest obsolete. Sutures obscure. Scapula shorter and broader than in *Percina*; shoulder girdle otherwise similar. Profile much as in *Percina*, highest at occiput. Lower pharyngeals narrowly triangular. Pyloric cæca 3. Vertebrae  $15 + 21 = 36$ .

**15. *Etheostoma lepidum*, Baird & Girard.**

Skull essentially as in *E. variatum*, the sutures more distinct. Pyloric cæca 2. Vertebrae  $16 + 19 = 37$ .

**16. *Etheostoma maculatum*, Kirtland.**

Frontal region narrow. Parietal region narrow, very convex transversely. Profile highest at occiput, essentially as in *E. variatum*, the skull a little narrower. Pyloric cæca 4. Vertebrae  $15 + 24 = 39$ .

**17. *Etheostoma whipplei*, Girard.**

Skull essentially as in *E. variatum*, the profile lower above the eyes. Pyloric cæca 3. Vertebrae  $15 + 21 = 36$ .

**18. *Etheostoma flabellare*, Rafinesque.**

Frontal region longer and narrower than in any other species. Parietal region very strongly convex transversely, surface of skull smooth; a trace of supraoccipital crest. Profile low, highest at occiput. Differs from *Etheostoma variatum* chiefly in the greater length and compression of the head. Pyloric cæca 3. Vertebrae  $13 + 20 = 33$ . Lower pharyngeals very narrow.

**19. *Etheostoma fusiforme*, Girard.**

Skull essentially as in *E. variatum*. Pyloric cæca 3. Vertebrae  $16 + 20 = 36$ .

**20. *Microperca punctulata*, Putnam.**

Frontal region not very narrow. Parietal region transversely convex, its bones smooth. No supraoccipital crest; sutures very distinct; skull highest above posterior part of eye. Vertebrae  $14 + 16 = 30$ .

So far as the skeletons are concerned, we seem to be justified in the following inferences:



1. The *Etheostomatinae* are near allies of the *Percinae*, and should not form a separate family.

2. They are among themselves closely related, and the extreme forms are so connected by intermediate forms that they might with no great violence to nature be regarded as forming a single genus.

3. The species nearest allied to the typical *Percinae* is *Percina caprodes*. This is the largest in size, and of the others in general those smallest in size are most aberrant in structure.

4. Those species which have usually been grouped together on external characters agree in general in regard to the skeleton.

5. As most of the skeletal characters change by degrees, none of them are of much use in defining genera.

6. Those skeletal characters apparently of most importance are in the structure of the mouth, the breadth of the frontal region (*Percina*), the number of vertebrae, and the outline of a transverse section of the skull across the parietals, whether , as in *Boleosoma*, &c., or , as in *Etheostoma*. The prolongation of the frontals in *Etheostoma flabellare* and in *Hadropterus phoxocephalus* and its shortness in *Etheostoma zonale* seem to be purely specific characters. The development of the nearly obsolete supraoccipital crest, the distinctness of the sutures, and the sculpture of the parietals are features which offer no basis for trenchant division, except, perhaps, as distinguishing *Percina* from all the others.

6. As defined by skeletal characters alone, we may distinguish *Percina*, *Etheostoma*, *Microperca*, and perhaps *Diplesion* and *Ammocrypta* from the rest as distinct genera. The other groups, if retained, must be separated from these and from each other by other characters.

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#### NOTE ON THE SCIENTIFIC NAME OF THE YELLOW PERCH, THE STRIPED BASS, AND OTHER NORTH AMERICAN FISHES.

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By the rules of nomenclature now adopted by the American Ornithologists' Union (rules which the present writer proposes to follow in future ichthyological papers), certain names now in current use in North American Ichthyology become untenable. The following cases come under the rule, which has been thus formulated, "Once a synonym, always a synonym."

1. The name *Perca americana* (Schranck 1794) is antedated by *Perca americana* Gmelin (= *Roccus (Morone) americanus*). The yellow Perch must therefore stand apparently as *Perca lutea*. The name *Centropomus luteus*, Rafinesque, "Précis des Découvertes Somnologiques, 1814," is apparently prior to that of *Bodianus flavescens*, Mitchill, 1815.

2. The name *Perca saxatilis*, Bloch & Schneider is similarly antedated by *Perca saxatilis* of Bloch, which is a species of *Crenicichla*. The name next in date is that of *Perca septentrionalis*, Bloch & Schneider, Syst. Ichth., 90. The Striped Bass may therefore stand as *Roccus septentrionalis*.

3. Similarly the species described by Girard as *Gobius gracilis* is different from the earlier *Gobius gracilis* of Jenyns. The former should stand as *Lepiogobius lepidus*, from the later name of *Gobius lepidus*, Grd.

4. *Lepadogaster reticulatus*, Girard is preoccupied by *Lepadogaster re-*