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ON PLEISTOCENE REMAINS OF OPHICEPHALUS FROM JAVA, IN THE "COLLECTION DUBOIS".

by

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(with Plates III-V)

When, in the fall of 1947, my predecessor, Dr. F. P. Koumans, suddenly withdrew from ichthyological research, some of the fossil fish-remains from Trinil, collected and partly examined by Prof. Dr. E. Dubois (1907; 1908), still remained to be investigated or re-examined. I gladly accepted the opportunity to complete the research on this interesting material.

A considerable part of these fossil remains, labelled by Dr. Koumans (but not mentioned in his paper, 1948, p. 80) as "16 fragments of skull-bones", which "probably belong to *Ophicephalus* spec." (no. 11640), still proved to be in a sufficient state of preservation to permit an accurate identification of the bones these fragments must represent, as well as of the kind of fish to which the greater part must have belonged, and its affinities.

Almost all identified bones or fragments obviously belong to an in my opinion extinct, Ophicephalid [1]) species or form, and consequently have been compared most accurately with our material of that genus in the collection of fish-skeletons. However, I regret to have to state that this material was very small, consisting of but three specimens: one identified as *Ophiocephalus striatus* Bl., from Java. Kuhl & Van Hasselt, total length 21.5 cm (cat.

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1) *Ophicephalus*, cf. Smith, H.M., 1945. The fresh-water fishes of Siam, or Thailand. Bull. U.S. Nat. Mus., Washington, no. 188, p. 466.

a), in a rather bad condition; a second identified as *O. micropeltis* K. & v. H., from Java, Kuhl & Van Hasselt, 52.5 cm (cat. a); and a third identified as *Ophiocephalus* spec., also from Java, Van Raalte, 45 cm (cat. a). The latter two are in a fine condition.

A close re-examination, moreover, quite convinced me that, especially on account of the locality, the dentification, and the numbers of finrays, the latter two specimens too probably must be regarded as representing the common recent *O. striatus* Bl., this making the material available for comparison still considerably poorer.

Very useful was also, on account of the occurrence in the fossil collection of a very well preserved lower pharyngeal bone, a large number of such bones collected by Bleeker, now in the collection of the Leiden Museum. Among these are represented the following Ophicephalid species: *marulioides* Blkr., *melanopterus* Blkr., *striatus* Bl., *gachua* H. B., *bankanensis* Blkr., *lucius* (K. & v. H.) C.V., *micropeltes* (K. & v. H.) C.V., and *punctatus* Bl., all without locality or further information.

Further I may mention Day's paper on the skeleton of *Ophicephalus striatus* Bl. (1914, pp. 19-55, 16 pls.), which was very useful, especially on account of the numerous photographs of the separate bones of the skull, seen from opposite directions.

Ophicephalus palaeostriatus nov. spec.

Ophiocephalus, Dubois, 1907, p. 455; —, Hennig, 1911, pp. 59, 60, pl. 11 fig. 13; —, Martin, 1919, p. 106; —, De Beaufort, 1931, p. 464.
"Ophiocephaliden Arten", Dubois, 1908, p. 1239.

Holotype: right lower pharyngeal bone (no. 11640) (see h, p. 88).

The specimens are in the Dubois Collection of the Rijksmuseum van Natuurlijke Historie at Leiden.

First I shall now give an enumeration of the various fragments I recognized as belonging to *Ophicephalus*. These must have belonged to at least four specimens (see f: left opercles!), and, as there can be found no distinct differences between the duplicate or triplicate fragments suggesting otherwise, probably to a single species.

Whenever possible and useful, some short remarks on the more important characters of the fragments will be added. As, obviously, the shape of the various parts of the skull seems to have changed but little or not at all since the formation of the Trinil layers (accepting *striatus* Bl. as a direct descendant; see the final conclusion in this paper), I expect the proportional sizes of the various bones, in comparison with the total length of the specimen, to have changed but little, being about as in recent *striatus*; therefore, by

comparing the sizes of the fossil fragments with the same parts in our material of the latter species, I shall give, whenever possible, the approximate sizes of the fossilized specimens.

All fossil bones enumerated below are figured on the plates at the end of the present paper.

a. Anterior part of left dentary (no. 11640) (Pl. III figs. 1, 2).

This fragment is well preserved, it represents a considerable part of the original dentary, and still distinctly shows all the more important and discriminating characters.

The anterior end shows the slightly irregular articulating surface by which it has been connected with its right partner. Backwards it reaches to slightly beyond the anterior end of the inside opening of the deep fossa.

The general shape as well as the minor details, e.g., the shape and situation of the numerous nerval pores, the remains of the implantation of the teeth on the upper surface (viz., a band of 5 or 6 rows of small circular ridges near the anterior symphysis, growing narrower backwards, to 2 or a single irregular row at the posterior end of our fragment, situated along the outer edge and covering a considerable part of the upper surface; within these, a single row of 3 considerably larger circular ridges, originating at some distance behind the anterior symphysis, with irregular and cavate interspaces, at present opening to the central fossa), the various ridges and the somewhat concave lateral outer surface, all show a convincing agreement with our material of recent *striatus*.

The only, and rather indistinct, difference I could find, is the somewhat coarser sculpture of the lower outer surface, with its slightly more distinct longitudinal ridges. This differing character I found, often much more developed, in several of the further remains of superficial bones of this species.

The maximum length of this fragment is 37.5 mm. It must have belonged to a specimen measuring about 60 cm.

b. Left articular (2 ×) and angular (1 ×) (no. 11640) (Pl. III figs. 3-6).

These two fragments are well preserved, the largest with a complete angular, but with the dorsal process, situated close before the articulation with the quadrate, mutilated; the smaller without angular, but with the dorsal process still complete. Both further show a considerable part of the lower horizontal anterior process, with the top mutilated only, while the smaller also shows a considerable part of the more slender upper (or outer)

horizontal anterior process; these two anterior processes must have articulated with the dentary.

The whole shape and structure accurately agree with those in our material of recent *striatus*, only the outer surface showing a distinctly coarser sculpture.

The fragments measure 34.5 and 40.5 mm, the latter even 42 mm with the angular included. They must have belonged to specimens measuring approximately 50 and 60-65 cm.

c. Left quadrate (no. 3798) (Pl. III figs. 9, 10).

This fragment has the dorsal and anterior lamellar part mutilated, which parts must have articulated with the pterygoid, meso- und metapterygoid; the posterior horizontal, broad and flat spine also has the top mutilated. The inside still distinctly shows the groove between these two parts and the fossa for the spinous projection of the symplectic (see Day, 1914, p. 26). The broad articulating part at the lower anterior angle is undamaged, and shows the broad joint by which it has been connected with the left mandible.

All characters of this small but characteristic fragment, measuring but 17 (length) × 15 (height) mm, are in complete accordance with the corresponding bones of *O. striatus* Bl. It must have belonged to a specimen measuring about 50-60 cm.

d. Left hyomandibular (no. 11640) (Pl. III figs. 7, 8).

This very fragile bone is nevertheless remarkably well preserved, the whole dorsal half being almost complete, only the ventral lamellar portion almost wholly lacking.

The shape of this part is very characteristic: the articulating, elongate, somewhat columnar dorsal part, with which it must have articulated with sphenotic, pterotic and opercle; the upper part of the almost perpendicular thickened area or ridge on the inside, which must have articulated with the symplectic; the articulation with the upper part of the preopercle; the whole complex surface with ridges, furrows, pores, etc. Nevertheless I found no characters differing from those of *striatus* Bl.

The length of this fragment, measured from the anterior end of the articulate head to the articulation with the opercle, is exactly 50 mm. It must have belonged to a specimen measuring approximately 65-70 cm.

e. Fragments of left preopercle (2 ×) (no. 11640) (Pl. III figs. 15, 16, Pl. IV figs. 5, 6).

Both fragments represent the median portion, articulating with the poste-

rior part of the upper margin of the interopercle, the anterior dorsal process of the subopercle, and the opercles. Especially the larger fragment is important, representing a considerable part of the original preopercle with only small portions of the horizontal anterior process, the lamellar median part, and the upper apex lacking. The smaller is much more damaged, and represents a tiny part of the median portion only.

The larger fragment shows an accurate conformity with our material of *striatus,* while the second part, although provided with hardly any substantially discriminative characters, seems to be from identical origin.

The maximal length of both pieces is 36 and 19.5 mm, so that they must originate from specimens measuring about 60-70 cm.

f. Right and left(?) subopercle (no. 3798) (Pl. III figs. 11-14).

The smallest fragment, in my opinion probably representing the median portion of the left subopercle, as such has been identified by eliminating all other possibilities, but the larger right subopercle, which is almost undamaged except the posterior lamellar portion, is very characteristic. The latter distinctly shows the rather smooth and narrow parts which were situated below the under and lower anterior margins of the opercle, the posterior margin of the interopercle, and, along the anterior margin of the dorsal process, the part which must have articulated with the inside of the median portion of the preopercle.

A distinct difference in comparison with the same parts in recent *striatus,* is the very rough and rather irregular sculpture of the further outside surface. The slightly concave inner surface is completely smooth.

The length of the larger part is 32.5 mm, the height 22 mm without, and 31 including the anterior dorsal process. This fragment must have belonged to a specimen measuring about 60 cm, the smaller fragment to a specimen slightly larger.

g. Upper parts of right (2 ×) and left (4 ×) opercles; posterior tips of left opercle (2 ×) (no. 3798) (Pl. III figs. 17-20, Pl. IV figs. 1-4, 7-14).

All these fragments on the inside surface still have parts of the ridge "running anteriorly posteriorly about one-third of the distance from the dorsal margin" (Day, 1914, p. 28), but only in five of the upper parts, two right and three left fragments, "this ridge continues anteriorly in a large expanse, concave anteriorly, which serves for the socket of the posterior end of the head of the hyomandibular" (see d); these upper parts further are thickly lamellar and show the re-enforcements along the anterior and

dorso-anterior margins. The two posterior tips on the inside still have the posterior ends of the longitudinal ridge.

In all characters, these fragments completely agree with the same parts in our material of recent *striatus,* with the exception of but one: the much more developed sculpture on the outer surface, behind the re-enforced margins mentioned before. They doubtless belong to one Ophicephalid species.

The horizontal length of the upper parts varies between 25 and 33 mm, measured along the horizontal internal ridge, the longest with but a small tip lacking. These fragments seem to have belonged to specimens measuring about 50-65 cm.

h. Right lower pharyngeal (no. 11640) (Pl. IV figs. 15, 16).

This is, in my opinion, the most interesting fragment, being remarkably well preserved, and providing the necessary characters to establish the relationship of this Pleistocene species.

The bone itself is almost undamaged, while furthermore the upper surface still bears a median patch of teeth, situated near the inner posterior angle, the further upper surface being covered with well preserved sockets which increase in size towards the internal and posterior margins and towards the inner posterior angle.

This fossilized bone has been compared with the pharyngeal bones in Bleeker's collection, mentioned before, and shows a very close relationship with the species *striatus, melanopterus,* and *marulioides,* three very closely related species of the Ophicephalid group with the teeth "on vomer and palatines" in "a pluriserial band, without large canines" (cf. Weber & De Beaufort, 1922, p. 314). The closest, however, proved to be the relation with *striatus,* on account of the very strong and, between the inner posterior angle and the oblique lateral margin, very wide shape of the fossil bone, this character hardly differing in the rather robust pharyngeal bones of *striatus,* while in *melanopterus* and *marulioides* this bone seems to be distinctly more slender. Moreover, the number, shape, and situation of the teeth gives a distinct indication: *marulioides* has much less rows on its more slender pharyngeal bone, *melanopterus* generally also seems to have less rows, while the shape and situation indicates a closer relationship with *striatus.* This seems decisive, even although our material appears to show a considerable range of variation in the latter character in *striatus,* probably in connection with age(?).

As the fossil *Ophicephalus* must have lived in the middle Pleistocene, thus not very long ago, it seems not without importance to mention that of

the three species mentioned before, only *striatus* nowadays occurs on Java, even although, as an argument, it is very weak, *melanopterus* and *marulioides* both occurring on Sumatra and Borneo (cf. Weber & De Beaufort, 1922, pp. 315, 316).

The length of the fossil bone, measured along the median longitudinal margin originally articulating with the left partner, is 22.5 mm, the width, measured perpendicularly upon the previous direction, 27 mm, the longest, oblique measure 35.5 mm. It must have belonged to a specimen measuring approximately 60 cm.

i. Right supratemporal (no. 3798) (Pl. IV figs. 17, 18).

This part is almost undamaged, and shows all characters in complete accordance with our material of *striatus*, only the upper surface showing a distinctly more striate sculpture.

The maximum (transverse) length, measured slightly obliquely towards the apex of the posterior process, is 25 mm. It must be the remain of a specimen measuring about 60 cm.

j. Supraoccipital (no. 3798) (Pl. IV figs. 19, 20).

This part too is well preserved, its shape in accordance with that in our material of *striatus*, but the upper surface with more distinct longitudinal striae, diverging toward the front margins.

Length 25.5 mm (anterior apex slightly mutilated), width 14.5 mm. It must have belonged to a specimen measuring approximately 70-75 cm.

k. Fragments of frontals (5×) (no. 3798) (Pl. IV figs. 21-26, Pl. V figs. 1-4).

These parts represent the anterior portion of a right frontal, with a considerable though mutilated portion of the central part, and with a part of the supraorbital rim still distinct (1 ×); the posterior parts of right (2 ×) and left frontals (1 ×); and a very large portion of the central part of a left frontal, with a part of the supraorbital rim along the anterior end of the lateral margin (1 ×).

All these fragments doubtless belong to an Ophicephalid species, but they differ from the same parts in recent material by having the dorsal surface provided with much more distinct ridges and striae (see Hennig, 1911, pl. 11 fig. 13).

The length of the longest fragment is 40 mm, the width of the widest 24 mm; they must have belonged to specimens measuring about 60-75 cm.

l. Right (1 ×) and left (2 ×) interopercles (nos. 11640, 3798) (Pl. IV figs. 27-30, Pl. V figs. 7, 8).

Of the right interopercle, this collection contains the posterior half only (no. 11640); of the left interopercles one (no. 11640) is almost complete and undamaged, the second consists of the posterior half only (no. 3798).

These fossil bones too doubtless are of Ophicephalid origin, differing in the more developed striae and ridges on the outside surface only.

The utmost length of the almost complete left interopercle is 45 mm, its height slightly before the posterior end 22.5 mm; in the two fragments these measurements are 26 mm, 17 mm (right), 27 mm, 24 mm (left interopercle). They must have belonged to specimens probably measuring about 50-70 cm.

m. Left clavicle (no. 11640) (Pl. III figs. 21, 22).

This fossilized fragment represents a considerable part of the original clavicle, with the upper (dorsal) end lacking, and with the ventral end, originally articulating with the right partner, slightly damaged. The articulation with the lower process of the hypocoracoid (see Day, 1914, p. 31, pl. 10) is still visible.

Compared with our recent material, this fragment shows no differences.

The maximum length is 43 mm, so that it seems to have belonged to quite a large specimen, probably measuring about 75 cm.

n. Right otolith (no. 3798) (Pl. V figs. 9, 10).

This otolith is but slightly damaged anteriorly and dorsally. It exactly fits against the outer surface of a proötic also in this collection (see o).

It is about oval, while the outer surface is covered with some rather fine vermiculate striae. The slightly concave inside surface is smooth, its coloration like milky quartz, with about 12 indistinct lines passing through and diverging towards the ventral and posterior margins.

In contradistinction with Day's remarks on recent *striatus*, this otolith shows no concentric lines and has on the convex surface no "somewhat S-shaped groove over the whole length" (Day, 1914, p. 23).

In comparison with the sizes Day (l.c.) gives for a specimen of *striatus* measuring 50 cm, this otolith is rather small, its utmost length being hardly more than 14 mm, its width 8.5 mm, while it is about 3.2 or 3.3 mm thick. As the damage is but slight, the original size can have been hardly more.

o. Right proötic (no. 11640) (Pl. V figs. 5, 6).

This fossil bone forms a considerable part of the original proötic, with the characteristically shaped portion articulating with the parasphenoid, and the lateral oblique portion in the axil of which there is a distinct smooth and concave part; in the latter the otolith, mentioned before (see n), accurately fits.

The whole shape of this intricate fragment completely agrees with that of the same part in our recent material of *striatus*.

The maximum length is 31.5 mm; the total length of the specimen must have been approximately 60-65 cm.

p. Fragment of parasphenoid (no. 11640) (Pl. IV figs. 31, 32).

This fossil fragment consists of a small portion of the anterior and median part, which has articulated with the sharp posterior process of the vomer; the lateral laminae are lacking.

A comparison with the same part in recent material of *striatus* shows no differences.

The maximum length is 32.3 cm.

Except the fossilized skull-fragments just mentioned, there are in this collection, the unidentified parts excluded, some fragments (Pl. V figs. 11-18) definitely not belonging to *Ophicephalus* spec., viz., a fragment of a left preopercle (no. 11640), a left? ceratohyal (no. 3798), and two fragments of shouldergirdles, one of which probably has belonged to a Silurid (no. 3798). I am unable to decide to which species these must have belonged.

Summarizing the facts mentioned above, I come to the following statement: the various fragments mentioned under the headings a to p must belong to an Ophicephalid species, obviously a species very closely related to the recent and very common *Ophicephalus striatus* Bl.

There are, however, some discriminative characters, viz., the much more developed sculpture, consisting of striae and ridges, on the superficial and dermal bones; the slightly stronger lower pharyngeal bone; and the obviously smaller otolith.

On account of these facts, I suppose these to be remains of an Ophicephalid species most closely related with *striatus*, now extinct, which may possibly be a direct predecessor of the latter species. I consequently name this species *Ophicephalus palaeostriatus* nov. spec.

The fragments of *Ophicephalus* mentioned in Dr. Koumans' paper (1948, p. 80), evidently also belong to this species.

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EXPLANATION OF THE PLATES

Plate III

Ophicephalus palaeostriatus nov. spec.; fig. 1, anterior part of left dentary, seen from the outside; fig. 2, idem, from inside; fig. 3, left articular and angular, from outside; fig. 4, idem, from inside; fig. 5, left articular, from outside; fig. 6, idem, from inside; fig. 7, left hyomandibular, from outside; fig. 8, idem, from inside; fig. 9, left quadrate, from outside; fig. 10, idem, from inside; fig. 11, fragment of left subopercle, from outside; fig. 12, idem, from inside; fig. 13, right subopercle, from outside; fig. 14, idem, from inside; fig. 15, part of left preopercle, from outside; fig. 16, idem, from inside; fig. 17, articulate upper part of right opercle, from outside; fig. 18, idem, from inside; fig. 19, fragment of right opercle, from outside; fig. 20, idem, from inside; fig. 21, left clavicle, from outside; fig. 22, idem, from inside. Natural size.

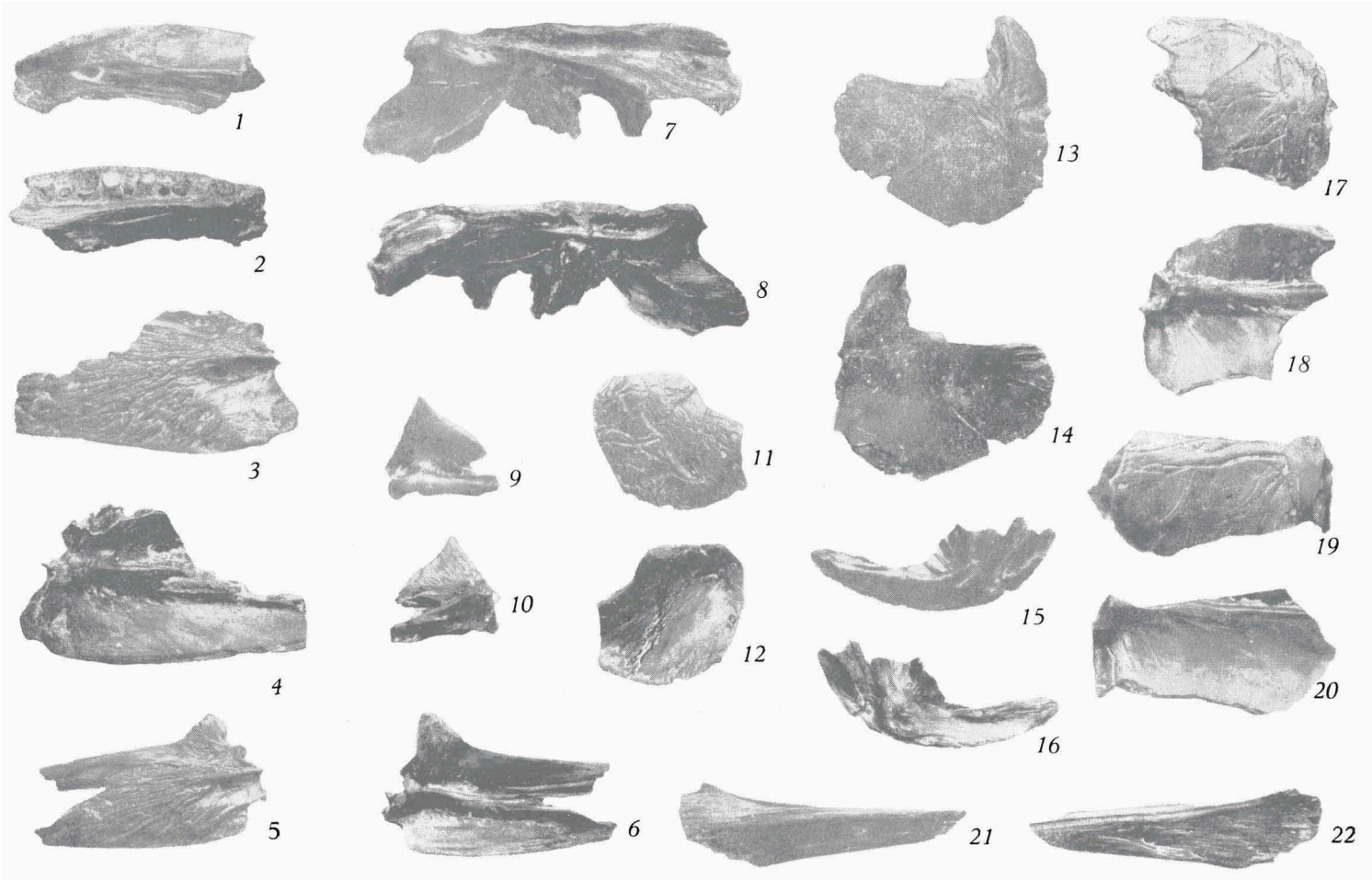
Plate IV

Ophicephalus palaeostriatus nov. spec.; fig. 1, articulate part of left opercle, seen from the outside; fig. 2, idem, from inside; fig. 3, posterior tip of left opercle, from outside; fig. 4, idem, from inside; fig. 5, fragment of left preopercle, from outsde; fig. 6, idem, from inside; fig. 7, articulate part of left opercle, from outside; fig. 8, idem, from inside; fig. 9, articulate part of left opercle, from outside; fig. 10, idem, from inside; fig. 11, articulate part of left opercle, from outside; fig. 12, idem, from inside, with articulate head damaged; fig. 13, posterior tip of left opercle, from outside; fig. 14, idem, from inside; fig. 15, right lower pharyngeal (type!), dorsal view; fig. 16, idem, ventral view; fig. 17, right supratemporal, dorsal side; fig. 18, idem, ventral side; fig. 19, supraoccipital, dorsal side; fig. 20, idem, ventral side; fig. 21, fragment of right frontal, with distinct part of supraorbital rim, dorsal side; fig. 22, idem, ventral side; fig. 23, fragment of right frontal, dorsal side; fig. 24, idem, ventral side; fig. 25, fragment of left frontal, dorsal side; fig. 26, idem, ventral side; fig. 27, posterior half of right interopercle, seen from the outside; fig. 28, idem, from inside; fig. 29, posterior half of left interopercle, from outside; fig. 30, idem, from inside; fig. 31, fragment of parasphenoid, ventral side; fig. 32, idem, dorsal view. Natural size.

Plate V

Ophicephalus palaeostriatus nov. spec. and species incertae.

Ophicephalus palaeostriatus nov. spec.; fig. 1, fragment of left frontal with part of supraorbital rim, dorsal side; fig. 2, idem, ventral side; fig. 3, posterior part of right frontal, dorsal side; fig. 4, idem, ventral side; fig. 5, right proötic, lateral view; fig. 6, idem, opposite view; fig. 7, left interopercle, seen from the outside; fig. 8, idem, from inside; fig. 9, right otolith, from outside; fig. 10, idem, from inside. Species incertae; fig. 11, fragment of shouldergirdle, from outside; fig. 12, idem, from inside; fig. 13, fragment of shouldergirdle (possibly Silurid?), from outside; fig. 14, idem, from inside; fig. 15, part of left ceratohyal, from outside; fig. 16, idem, from inside; fig. 17, fragment of left preopercle, from outside; fig. 18, idem, from inside. Figs. 1-8, 15-18, natural size, figs. 9-14, × 3.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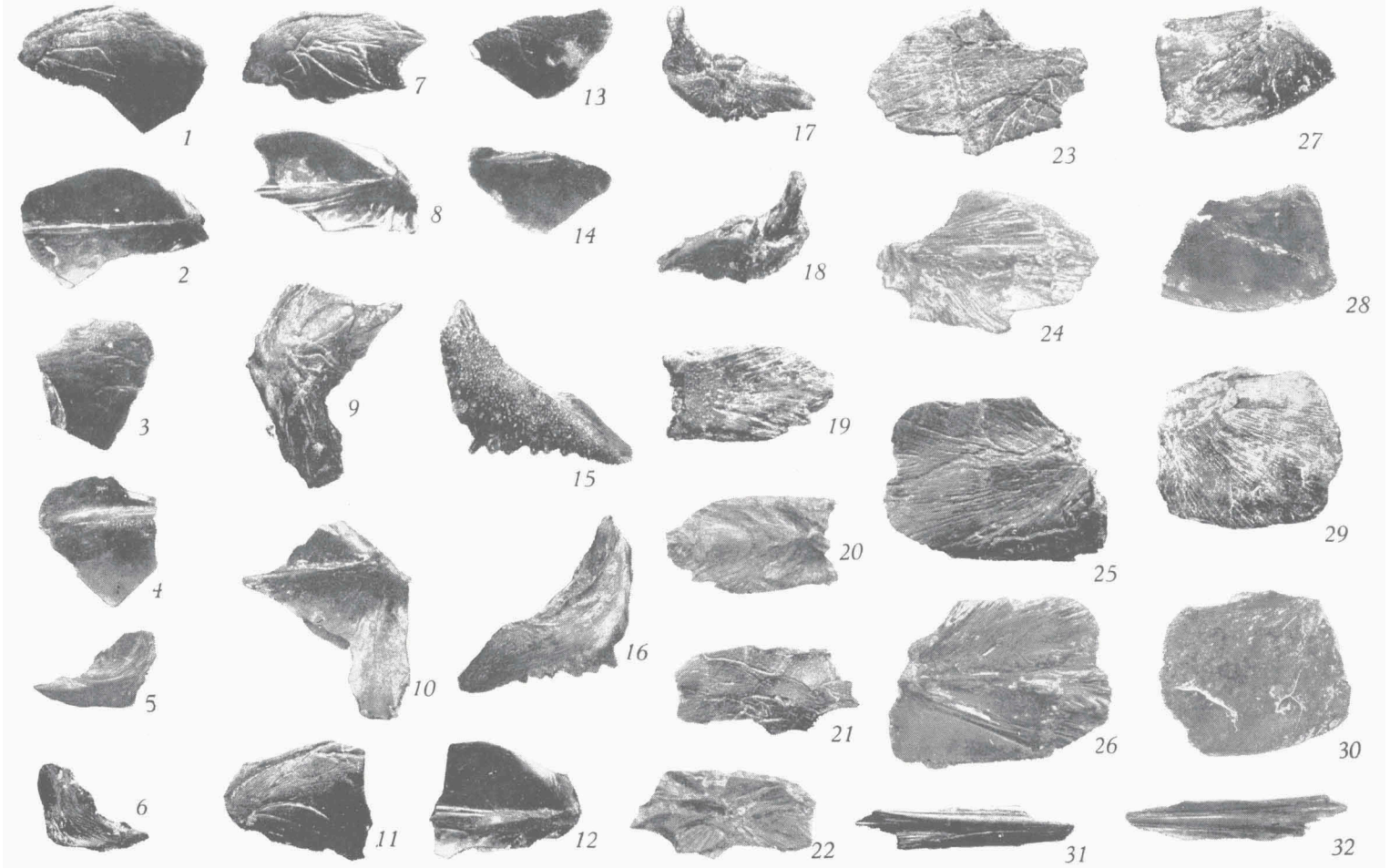
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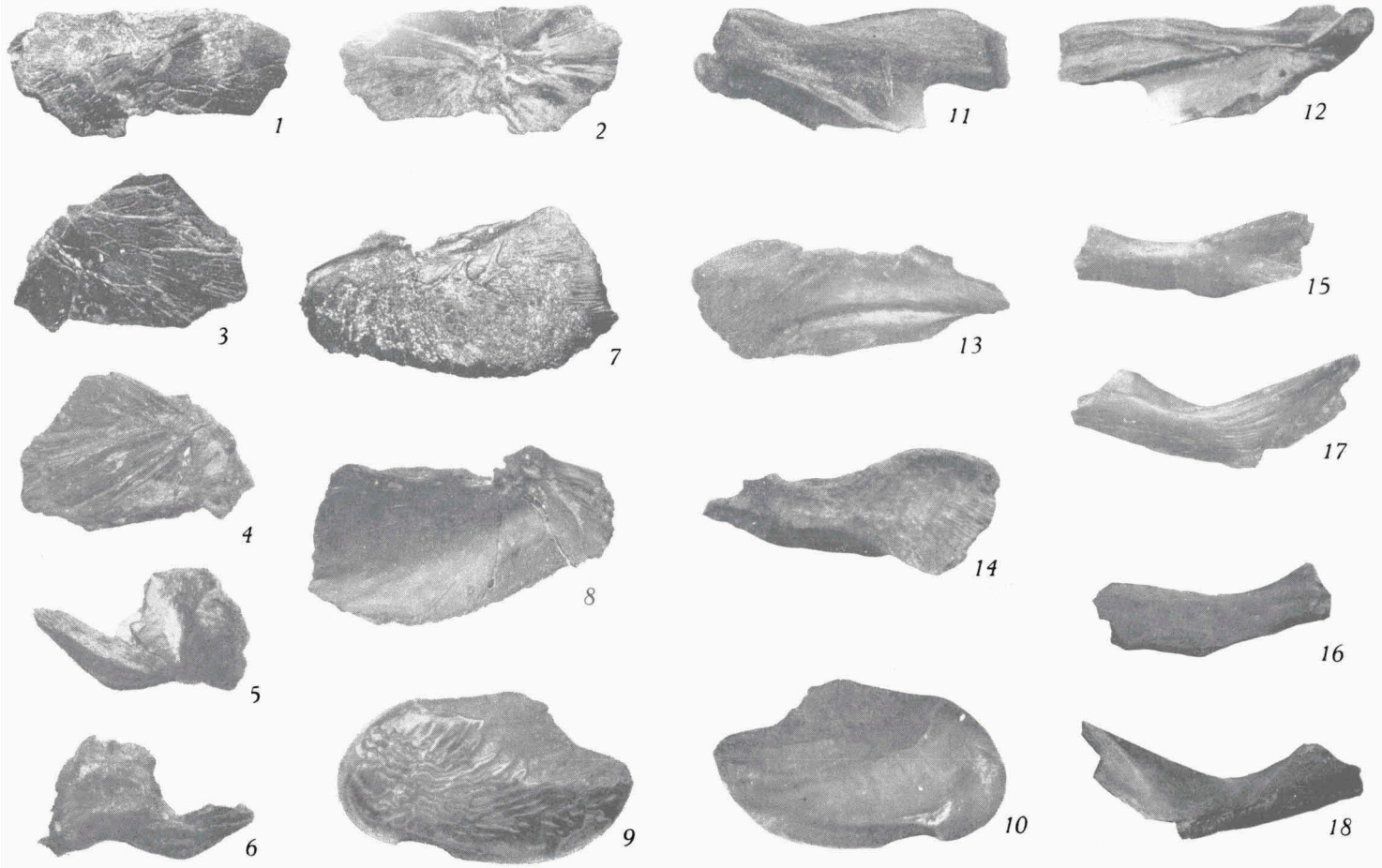
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