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AN EARLY MIOCENE FLATHEAD (PISCES: PLATYCEPHALIDAE)
FROM WYNYARD, TASMANIA

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(with three text figures and one plate)

ABSTRACT

CORBETT, K.D., 1980 (31 v): An Early Miocene flathead (Pisces, Platycephalidae) from Wynyard, Tasmania. *Pap. Proc. R. Soc. Tasm.*, 114: 165-175 (incl. one plate). ISSN 0080-4703. Geological Survey of Tasmania, Department of Mines, Hobart, Tasmania, Australia.

A well-preserved flathead skull from the Early Miocene marine beds near Wynyard is described. A comparison with the modern sand flathead *Platycephalus bassensis* Cuvier reveals a very close similarity.

INTRODUCTION

A fossil fish skull was collected by the author from the Early Miocene Fossil Bluff Sandstone (Banks 1962, p. 235; Quilty 1972, p. 30) about 400 m west of Fossil Bluff, Wynyard, in 1962. The skull was in a large boulder of friable glauconitic sandstone at the base of the low shoreline cliff, and was well preserved, with most of the bones still present. The broad, flat nature of the skull and the low bony ridges on the dorsal surface suggested it might be a flathead, and an examination of the skull of the modern sand flathead, *Platycephalus bassensis* Cuvier 1829, revealed a striking similarity. Undoubtedly the fossil skull belongs to the same genus, but the lack or poor preservation of several of the critical bones in the fossil, and the lack of detailed osteological descriptions of most of the modern species, precludes placing the fossil with certainty in one of the present-day species.

This appears to be the first record of a fossil flathead. The specimen is in the collection of the Geology Department, University of Tasmania (No. 57519).

DESCRIPTION OF THE FOSSIL SKULL
(see Figs. 1 and 3 and Plate I)

Nomenclature used in the following sections is that of Gregory (1951). Although the characteristic vomerine teeth and preopercular spines are missing, the skull is undoubtedly that of a flathead, and all the identifiable bones are closely similar to those of the modern species *P. bassensis*. Bones of the mouth region have been removed forward of a transverse line just behind the vomerine teeth, so that only the posterior part of the mandible remains, and the posterior portions of one premaxilla and one maxilla. Some of the bones from the left side of the skull are also missing. Breaking and spreading of bones have occurred due to compression.

The atlas and part of the second vertebra, including portions of the neural arches, are attached to the skull. Of the shoulder girdle, portions of the left and right cleithra and the right supracleithrum are present.

The dorsal surface of the cranium is almost flat, with a number of low bony ridges. Most of the suborbital bones are missing, and only an estimate of the diameter of the orbit can be given. The interorbital area is concave, and its width appears to be about three-quarters of the transverse diameter of the orbit.

An Early Miocene Flathead (Pisces; Platycephalidae) from Wynyard, Tasmania

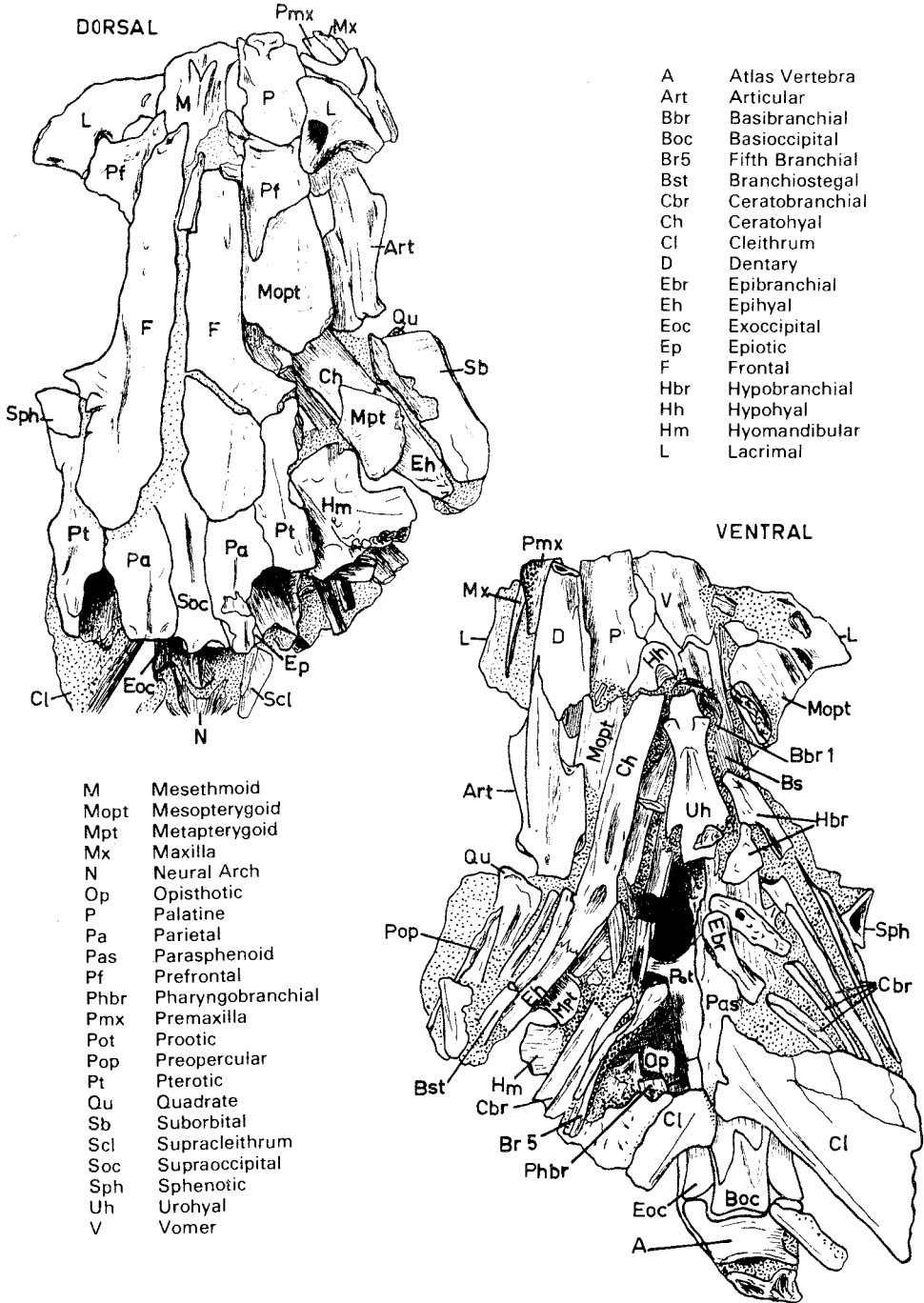
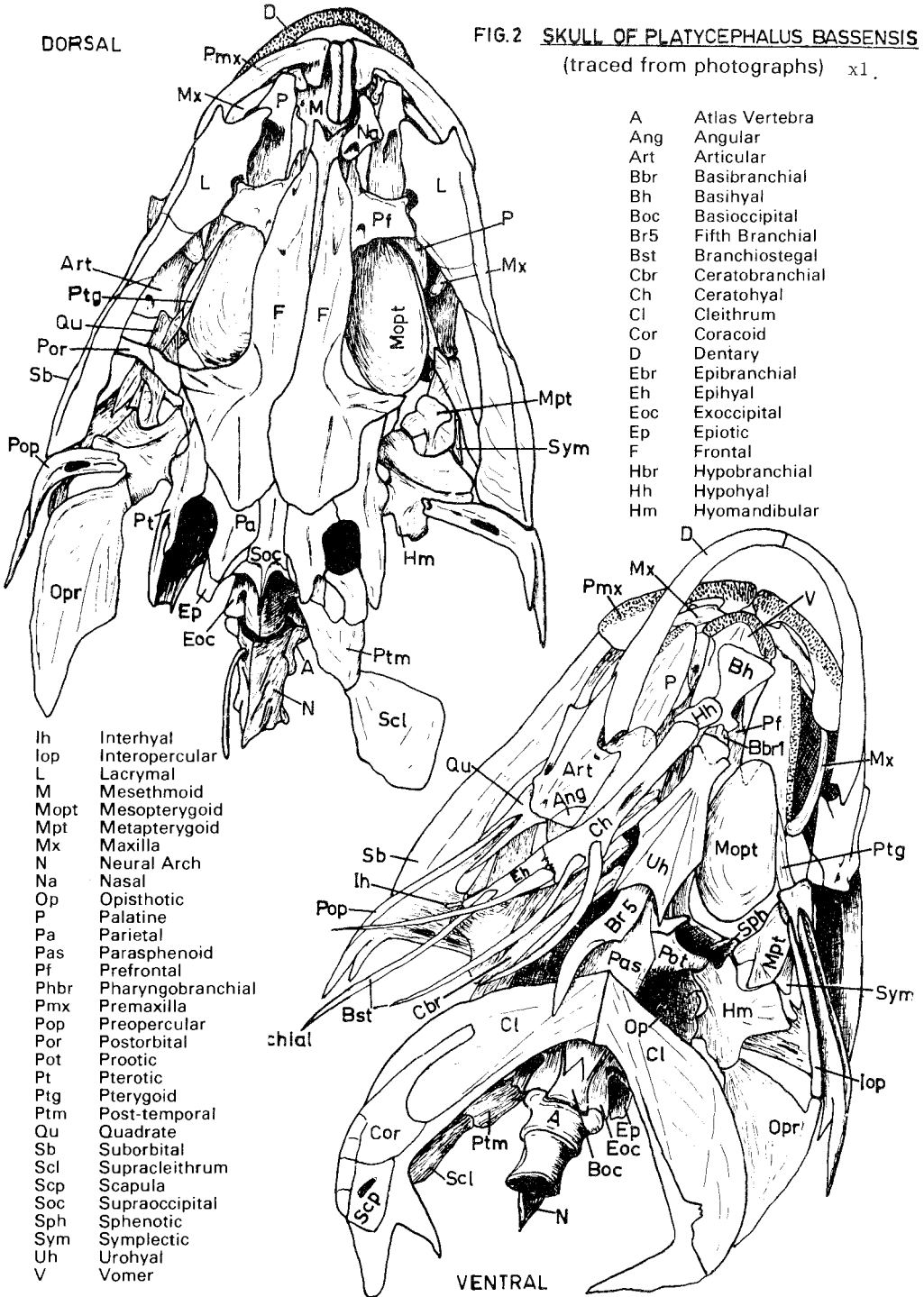


FIG. 1. - Skull of fossil *Platycephalus*, xl.

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FIG. 2 SKULL OF PLATYCEPHALUS BASSENSIS
(traced from photographs) x1.



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The *supraoccipital* is overlapped on either side by the parietals and anteriorly by the frontals. Its exposed surface is elongated and slightly expanded at either end. It bears a low median ridge for most of the anterior half of its length. A median vertical lamina, the occipital crest, projects down from beneath the body of the bone to meet the exoccipitals above the foramen magnum. The posterior portion of this crest is missing.

The *parietals* are rather flat bones overlying the epiotics and overlapping the supraoccipital to the inside and portion of the pterotics to the outside. They are overlapped anteriorly by the frontals. Each bears a low median ridge. Their posterior ends have been removed.

The *epiotic* bones are almost obscured by the parietals, and have their posterior projections removed.

The *pterotics* are elongated and irregular in shape. The left side bone is almost complete, and the elongated posterior process extends back almost to the level of the end of the exoccipital. A narrow lamina slopes downwards and inwards from this process and connects with the opisthotic. The posterior articular facet for the hyomandibular is present near the anterior of the lateral edge.

The *frontals* are long and narrow, and expand laterally behind the orbits. They have broken apart along the midline suture. The lateral borders project upward and outward in the interorbital region. The line of this border is continued back over the posterior of the bone as a low, gently curved ridge. A number of smaller ridges form almost a radial pattern lateral to this main ridge in the area just behind the orbit. The maximum depth of the bone is beneath the lateral border in the interorbital region.

The *prefrontals* are thick, hollow bones originally sutured to the frontals on the inside and articulating with the lacrymals on the outside. The body of the bone is somewhat rectangular, but the median border is produced forward, to suture with the mesethmoid, and backward, to suture with the outer border of the frontal. The dorsal outline is thus triangular, with the lateral apex truncated to form the articular facet for the lacrymal. The dorsal surface slopes forwards with an arcuate ridge just behind the anterior border. The posterior margin bears a tiny antorbital spine. The dorsal and ventral surfaces are inclined to each other, and the body of the bone is open posteriorly.

The *mesethmoid* (dermethmoid, supraethmoid) is overlapped by the frontals and prefrontals. Two narrow spurs project forward and outward from the dorsal surface, which slopes forward in front of these and is slightly expanded laterally. The anterior portion of the bone has been removed. The anterior borders are in contact with those of the underlying vomer, and a hollow cavity is present between these two bones.

The right *lacrymal* is the more complete, but has been broken into three parts. Portion of the articular facet for the prefrontal has been removed, revealing the hollow region within this facet, which is the thickest portion of the bone. The anterior border is deeply arcuate, and the shaft of the maxilla projects forward from beneath this arc. There are three short spines (preorbital spines) on the anterolateral margins, the third being very small. The posterior portion of the bone is missing.

One *posterior suborbital* is present, though parts of its anterior and lateral borders are missing. It is a thin, flat rectangular bone with a low longitudinal ridge near its lateral margin.

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The *palatine* bone present is elongated and rather flat except for an upward-projecting dorsal process near its anterior end, most of which is missing. The bone widens posteriorly and bifurcates near the posterior end, the lateral projection being the longest. A narrow band of small tooth bases is present along the lateral ventral margin, although mostly obscured by the dentary.

The posterior portion of the *premaxilla* which remains is laminar and tapers slightly posteriorly. A band of small, round, uniform tooth bases is present along the lateral ventral margin, portion of which is missing.

The portion of the *maxilla* present is rod-like anteriorly and behind this expands dorsoventrally and a thin, slightly curved lamina projects dorsally from the thickened ventral border.

The *vomer* is a flat, elongated bone covering the anterior margin of the parasphenoid. The anterior end has been removed, and the bone is broken about half way along its length. It bears a shallow, median ventral groove, and appears to taper posteriorly.

The *basioccipital* narrows just in front of the occipital condyle and extends about half way along the floor of the braincase, most of its ventral surface being covered by the parasphenoid.

The *exoccipitals* are present on either side of the basioccipital, their hindmost portions forming the articulating facets for the transverse processes of the atlas. A thin lamina projects upward and inward from each bone to form the lateral boundaries of the foramen magnum.

The *opisthotic* is exposed on the floor of the auditory capsule and slopes upward and outward to connect with the outermost processes of the pterotic. The suture with the prootic is irregular.

The *prootic* bones are visible on the left ventral side of the anterior part of the braincase. An outward-projecting process forms a buttress for the lower half of the anterior hyomandibular facet. Behind the median end of this buttress the bone swells to form a slight saccular bulge, which has been flattened by compression.

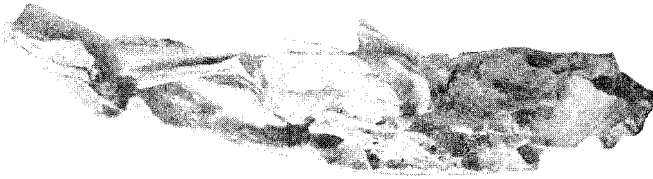
The *parasphenoid* is a long, flat bone extending along the base of the skull near the posterior end of the basioccipital forward to the vomer. It is broken in the middle and much of it is concealed. The posterior end bifurcates. It is broadest between the prootics, narrows in front of this, then expands laterally to form a narrow outward-projecting process, as can be seen on the right side. This process is missing on the left side. The bone is narrow in front of this and appears to expand very gradually forward to where it is covered by the vomer.

The posterior portion of the *dentary* which remains is thick and hollow, roughly D-shaped in section, and increasing in diameter posteriorly. The hinder end is deeply bifurcated, forming a recess into which the pointed anterior part of the articular projects. The bifurcation is in the horizontal plane and is unequal, the ventral portion being wider and flatter. The narrow dorsal margin, which probably bears teeth, is not exposed.

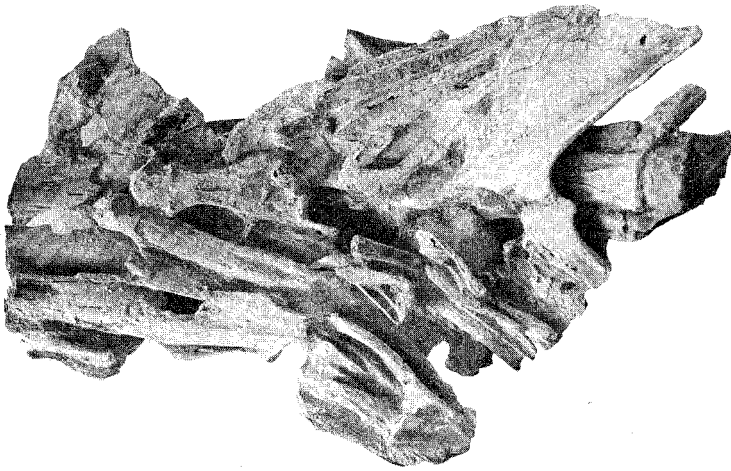
The *articular* has a very characteristic shape best seen in figure 3. The long pointed anterior part projects into the bifurcated end of the dentary. The posterior end bears a well developed articular facet for articulation with the quadrate.

Both *quadrates* are present, although one was removed during preparation and is

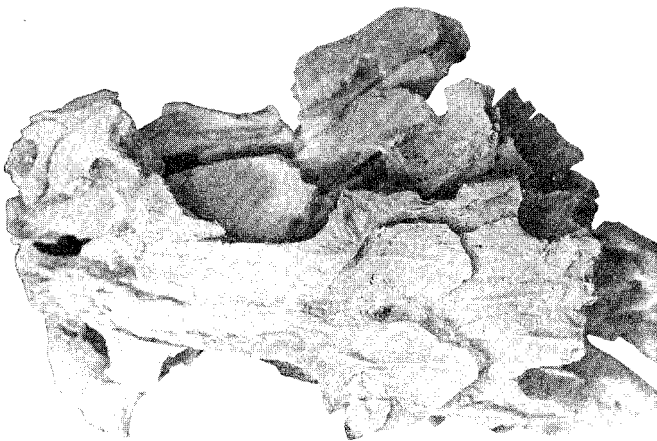
An early Miocene Flathead (Pisces; Platycephalidae) from Wynyard, Tasmania



III



II



I

PLATE 1

Figure I - Dorsal view of fossil skull; Figure II - ventral view;
Figure III - right lateral view. All xl.

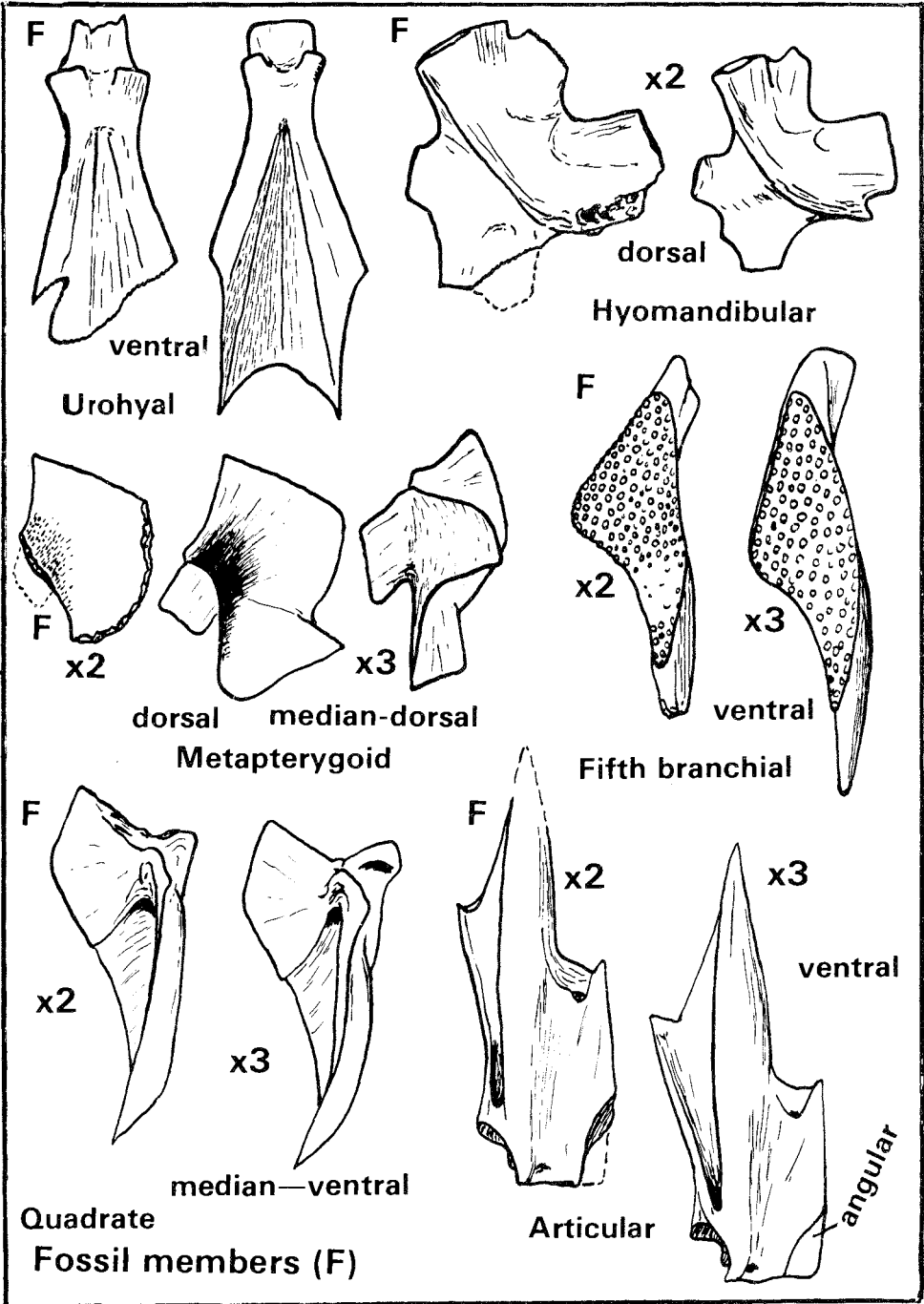


FIG. 3 - Comparison of some fossil and modern bones.

An Early Miocene Flathead (Pisces; Platycephalidae) from Wynyard, Tasmania

shown in figure 3. The bone has a stout, flat shaft which widens anteriorly to form the articular facet. The ventral surface of this shaft is divided unequally by a low longitudinal ridge which does not reach the anterior end. The inner side of the anterior arm of the preopercular originally sutured along this ridge, and has been moved only slightly from this position. Extending down from the underside of the shaft is a thin lamina of bone which tapers posteriorly.

The *preopercular* is represented only by the anterior arm. This tapers anteriorly to a point, and is incised longitudinally.

Both the *mesopterygoids* (endopterygoids) are present in part, the right one being nearly complete. It is a large, flat, scale-like bone lying beneath the right orbit. The lateral border is straight and slightly thickened, and the bone is widest posteriorly.

Part of a *metapterygoid* is present on the right side of the skull. The upward-projecting dorsal processes, and part of the posterior lamina are missing. The remaining portion is flat and fan-shaped (fig. 3).

The *hyomandibular* is present in almost its original position on the right side of the skull. The articular facet for the pterotic is located at about the middle of the median border (fig. 3). Forward of this, forming most of the anterior border, is the strong anterior articular facet for the prootic and sphenotic. Lateral to this is a thin, broken lamina which originally sutured to an inward-projecting process of the metapterygoid. The thick lateral projection originally was sutured to the inner arm of the preopercular. The posterior border is broken, and the articular facet for the opercular has been removed. The dorsal surface is strongly ridged, while the central surface appears to be smooth.

The *hypohyal* is a short, thick bone of irregular shape. The anterior border is rounded and the median surface is indented.

The *ceratohyal* is roughly oar-shaped, the anterior two-thirds being rod-like while the posterior portion is expanded and flattened laterally, though still fairly thick. The shaft is grooved longitudinally. The *epihyal* is fused tightly to the ceratohyal and tapers posteriorly. A small, rounded facet at the posterior end originally articulated with the interhyal. The ventral surface of the epihyal and the flattened portion of the ceratohyal show a common longitudinal ridge with a shallow groove on either side. The dorsal surface is smooth. The interhyal has not been identified.

Several *branchiostegals* are present on the left ventral side of the skull. These are long, thin, slightly curved bones with small articular facets at their anterior ends. They are flattened rather than circular in section.

The *urohyal* is a large, flat, unpaired bone of characteristic shape (fig. 1, fig. 3). The small anterior lamina partly covers the first basibranchial. Two thickened buttresses are present behind this, and behind these again the bone is almost flat and widens posteriorly, covering the other basibranchials.

Five branchial arches are identifiable. The *first basibranchial* is a small, rounded, equidimensional bone bearing rounded indentations on either side for the articulation of the first hypobranchials. The *hypobranchials* have expanded inner ends merging into the slender, deeply incised form of the long *ceratobranchials*. The posterior *epibranchial* and the two small, rectangular *pharyngobranchials* bear the typical small, closely arranged tooth bases. The fifth branchial arch is represented by a single, rather flat, posteriorly pointed bone (ceratobranchial) which bears teeth over

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most of its inner (dorsal) surface (fig. 3).

The *supracleithrum* is a thin, flat bone lying almost vertically at the posterior of the skull (plate 1). Its dorsal border is straight and slightly thickened.

The *cleithra* are large, flat bones which appear to have been sutured together medially. The posterior border is considerably thicker than the rest of the bone.

The *atlas* has a narrow centrum and well developed wing-like transverse processes. Above and just behind these are deep pits in the side of the centrum.

THE SKULL OF *PLATYCEPHALIS BASSENSIS* CUVIER

Since there is little published osteological information on the modern flatheads for comparison, a skull of *P. bassensis* was prepared and a brief description is given here. The specimen was obtained from the Derwent estuary and was donated by Dr M.R. Banks. Figure 2 is traced from photographs. The hyoid and branchial arches have been removed from one side, and the epibranchials, pharyngobranchials and some of the branchiostegals from the other.

The skull is broad and flat, achieving maximum width (65 mm) between the preoperculars and tapering forward. The right frontal slightly overlaps the left, and the two form a fairly deeply concave interorbital area, the width of which is about three-quarters the transverse diameter of the orbit. The anterior dorsal process of the palatine lies above the shaft of the maxilla and is sutured to the nasal medially and to the inner arm of the lacrymal. The anterior ends of the premaxilla and maxillae are thickened and have backward-projecting processes. Two small, fused, rod-like bones link the mesethmoid to the premaxillary symphysis. Teeth are borne on the anteroventral surface of the premaxillae and are larger near the symphysis. The dentary is a long, curved bone which tapers anteriorly and bears teeth of fairly uniform size on its rather narrow dorsal surface.

Ventrally, the scale-like mesopterygoid overlaps the posterior part of the palatine, disguising the bifurcated nature of the bone. The vomer is a thin bone which tapers posteriorly and has a band of teeth around its curved anteroventral border. The narrow lamina of bone sutured to the lateral margin of the mesopterygoid, the posterior tip of the palatine and the anterior border of the quadrate lamina is the pterygoid (ectopterygoid). The metapterygoid is sutured to the quadrate lamina and the symplectic laterally and to the hyomandibular posteriorly. The symplectic is a small, flat, elongated, slightly curved bone which widens posteriorly and is sutured to the quadrate, metapterygoid and hyomandibular. The interhyal is a short bone sutured to the end of the epihyal and to the cartilaginous area between the preopercular, hyomandibular and symplectic. The two short buttresses on the urohyal serve for the attachment of short rods of cartilage.

The thin flat bone attached to the operculum and lying inside the preopercular is the interopercular. The lower preopercular spine is nearly twice as long as the upper. Teeth are borne on the posterior pair of epibranchials and the corresponding pharyngobranchials, and on the under surface of the fifth ceratobranchial.

COMPARISON WITH THE FOSSIL SKULL

A comparison of some dimensions on the two skulls is given below:-

	<i>Fossil</i>	<i>Modern</i>	<i>Ratio Fossil:Modern</i>
Interorbital width	≈13 mm	11 mm	1.18
Transverse diameter of orbit	≈20 mm	16 mm	1.25
Longitudinal diameter of orbit	25 mm	20 mm	1.25

	<i>Fossil</i>	<i>Modern</i>	<i>Ratio Fossil:Modern</i>
Width across prefrontals	26 mm	21 mm	1.23
Length from mesethmoid spur to occipital crest	78 mm	61 mm	1.28
Width across sphenotics	31 mm	26 mm	1.19
Length of hyoid bar	54 mm	44 mm	1.23

The dimensions show a fairly constant proportionality, but measurements on a number of modern skulls would be necessary to test the significance of this. The estimated overall body length of the fossil fish, calculated from the relative dimensions of a number of modern *P.bassensis* specimens (Miss L.B. Denne, pers. comm. 1963) is about 0.41 m. This is about the maximum length attained by *P.bassensis*.

The very close similarities between a number of the prominent bones of the two skulls is indicated in Figure 3. Some differences are also apparent, as listed below, but it is possible that these lie within the range of variation of the modern species.

1. The bony ridges on the dorsal surface of the cranium of the fossil are sharper and more pronounced. To some extent this could be due to post-burial solution effects. In arrangement and orientation the ridges are fairly similar, although the curvature of the main supraorbital ridges of the modern skull is more accentuated.
2. The marked overlap of the left frontal by the right on the modern skull is not shown on the fossil. This could be due to breakage and removal of part of the right frontal on the fossil, where the bone has been depressed below the level of the left.
3. The maximum width across the frontals appears to be proportionately greater on the modern skull.
4. The mesethmoid spurs on the fossil are narrower and form a more acute angle.
5. The band of teeth along the ventro-lateral surface of the palatine is narrower on the fossil.
6. The anterior border of the quadrate lamina is slightly thicker on the fossil.
7. The sides of the foramen magnum, as formed by the exoccipitals, are considerably steeper on the fossil.

CONCLUSIONS

The fossil skull is that of a flathead belonging to the genus *Platycephalus* Block 1795, and is strikingly similar to that of the modern sand flathead *P.bassensis*. This suggests there may have been little evolutionary change in the species in the 20 million years or so since the Early Miocene. According to Quilty (1972) the Fossil Bluff Sandstone was deposited in an open marine bay, probably seaward of the mouth of a river - i.e. in the same environment in which *P.bassensis* occurs abundantly today.

ACKNOWLEDGEMENTS

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