V.—*Observations on the* Basilosaurus *of* Dr. Harlan (*Zeuglodon cetoides*, Owen).

By RICHARD OWEN, Esq., F.G.S., F.R.S.

[Read January 9, 1839.]

Plates VII., VIII., and IX.

In the recent discussion on the Stonesfield fossil jaws, one of the arguments adduced in support of the Saurian hypothesis of these jaws was founded on the presumed existence of a reptile possessing teeth with double fangs, this reptile being the *Basilosaurus* of Dr. Harlan*. I refused to admit the validity of this argument until the teeth had been subjected to a re-examination, with an especial view to their alleged mode of implantation, and I adduced as reasons for my objection, the instance of the *Megatherium*, in which the highest authority in Comparative Anatomy had been deceived in regard to this very point of structure. (See ante, p. 61.) But the appeal to the *Basilosaurus* had rendered it desirable to determine, not only the actual mode of implantation, but also the general conditions of the teeth of that interesting and problematical fossil, and I felt more especially desirous to apply to them a test founded on the microscopic examination of their intimate structure, which in many other cases I had found to afford very satisfactory and unexpected results. The arrival of Dr. Harlan in this country with some of the remains of the extinct animal in question, and the permission which he has liberally granted me of having the sections of his valuable fossils made which I required, have enabled me, much sooner than I could possibly have hoped, to arrive at such conclusions, as to the nature of the *Basilosaurus*, as can be safely founded on the dental characters ascertainable by this mode of investigation; and I now, in compliance with Dr. Harlan's request, proceed to recount the details of this examination.

The parts of the *Basilosaurus*, relating to the present subject, brought over by Dr. Harlan, and now on the table, are two portions of bone belonging to the upper jaw; the larger one containing three teeth (Pl. VII.), the smaller one the sockets of two others.

The crowns of the teeth in the larger portion are more or less perfect, and are contiguous to each other; but they are placed rather obliquely, so that the inner surface

* Medical and Physical Researches, 8vo, 1835, pp. 337, 349.

of the anterior part of the crown of the hinder tooth is on the same line as the outer surface of the posterior part of the tooth next in front. They are compressed and conical, with an obtuse apex: the longitudinal diameter of the middle one (*b.*) is three inches, the transverse diameter of the same is one inch two lines; the height above the alveolar process two inches and a half. The crown is contracted in the middle, so as to give its transverse section somewhat of the hour-glass form* (Pl. VIII. fig. 1); and the opposite wide longitudinal grooves, which produce this form, become deeper as the crown approaches the socket, and at length meet, and divide the root of the tooth into two separate fangs: this fact, which was not clearly demonstrated in the original fossil, is proved by the transverse sections below the crown of one of the teeth (Pl. VIII. fig. 2). The anterior tooth (Pl. VII. *a.*) is somewhat smaller than the posterior ones, and presents also a more simple structure. The vertical groove is deeper in the two posterior teeth, and, in the hindmost (*c.*), which is much broken, it gives the appearance of two distinct simple teeth. Besides the teeth implanted in the jaws as above described, there is a fragment of a tooth imbedded in the matrix containing the above pieces, and consisting of the base of the crown and beginning of the fangs. The crown of this tooth, which is equal in size to the posterior one in place, and was probably a tooth of the same jaw, is partly worn down and partly broken, but is so blended with the matrix, that its exact form could not be determined. Of this tooth I had a transverse section made near to the base of the crown, which presents the figure represented in Pl. VIII. fig. 1, and is that form which we may reasonably suppose would be characteristic of the old and worn-down teeth of the *Zeuglodon.* The crown is divided into two irregular rounded portions or lobes, placed one before the other, and joined by a narrow neck or isthmus. The anterior lobe is the broadest, its grinding surface is subovate, and placed obliquely; it measures one inch, three lines in the long diameter, one inch in the short diameter; the posterior lobe is narrower, more regularly ovate with the long diameter (which is one inch, three lines), placed parallel with the axis of the jaw. The isthmus is about three lines in breadth and two in length; but the breadth diminishes while the length increases as the tooth descends in the socket, until it finally disappears, and the two portions take on the character of separate fangs. It is evident that the pulp which, from the form and structure of the crown, was originally simple, has soon become divided into two parts, and that its calcification has proceeded towards two distinct centres, which are each separately surrounded by concentric striæ of growth, the exterior of which sends an acute-angled process into the isthmus uniting the two portions. The *cavitas pulpi*, which is very small in the crown

* The term *Zeuglodon* (Ζευγλη, a yoke, οδους, a tooth,) which I have substituted for that of *Basilosaurus*, is expressive of this form of the teeth, which resembles two simple teeth linked or yoked together.

of the tooth, becomes contracted as the fangs descend, and is almost obliterated near their extremities, proving that the pulp of the teeth once calcified is not renewed, so that their growth is limited.

In a fractured anterior portion of the hindmost tooth, the pulp-cavity is seen to widen as the tooth descends in the jaw; it is not, however, surrounded, as in the section above-described, by concentric striæ, but enlarges towards that side next the posterior portion of the tooth, as if it were continuous with the enlarged pulp-cavity of that portion; from this appearance it is evident that the growth of this tooth was less advanced than the preceding, as might be expected from its position in the jaw. The sockets in the anterior fragment of the upper jaw were filled with the hard calcareous matrix, and their condition and extent were but obscurely seen: the first is described as being the socket of *a double molar*, i. e. of a molar with two distinct fangs, and the two corresponding cavities are so represented in Dr. Harlan's work*. To remove all doubt upon this point, I have caused to be made a transverse horizontal section of the alveolar margin, which shows clearly that the sockets of both the absent teeth are single, and that they had single fangs. In the anterior one there is an indication of the transverse median contraction of the tooth, which shows that this tooth resembled in form, to a certain degree, the posterior tooth. The longest diameter of this socket is two inches, four lines, the shortest one inch. The other socket is of a more simple form, viz. elliptical, measuring one inch, five lines, by eleven lines; it appears to have originally lodged a tooth further displaced from the jaw. The interspace between these teeth is one inch, five lines; the interspace between the second tooth and the one behind it, one inch, ten lines.

Of the fragment of the lower jaw of the *Zeuglodon* there is a plaster-cast in the Society's Museum. It contains four teeth, of which the two posterior are nearly contiguous; the next is separated from them by an interval of an inch and a half, and the most anterior is placed at a distance of two inches from the preceding. The anterior tooth is here of smaller size and apparently of more simple form than those behind, and it is described by Dr. Harlan as a canine. This interesting fragment is preserved in the Museum of the Philadelphian Academy; it confirms the evidence afforded by the fragments of the upper jaw, viz. that the teeth in the Basilosaur were of two kinds, the anterior being smaller, more simple in form and more remote from each other, than those behind.

Now the animals which have teeth lodged in distinct alveoli, and with which therefore we have to compare the *Zeuglodon*, are certain fishes, as the *Sphyræna* and its congeners; certain reptiles, as the plesiosauroid and crocodilian Sauria,

* *Loc. cit.* (Fig. 1. B.C. Pl. XXVI.).

and the class Mammalia. As there is no known instance of either fish or reptile having its teeth implanted by two fangs in a double socket, I shall proceed in the first place to compare the above-described general and obvious characters of the teeth of the *Zeuglodon* with those of the Mammalia which most nearly resemble them in these respects; and then point out more particularly the discrepancies which, in a similar comparison, are observable in the teeth of Reptiles.

In the true or zoophagous Cetacea, the teeth in each species resemble one another in form and structure, and are invariably implanted by a broad and simple basis in the socket, and never have two fangs. This uniformity and simplicity of structure does not, however, prevail in the herbivorous section of the cetaceous order, but the species differ considerably both as to the structure, form, number, and mode of implantation of the teeth. In the Manatee the molars have two long and separate fangs lodged in deep sockets; and the anterior teeth, when worn down, present a form of the crown somewhat similar to that of the *Zeuglodon*, but broader, and with the opposite indentations less deeply penetrating the crown of the tooth (Pl. VIII. fig. 4). These teeth however, when entire, present a form of the grinding surface very different from those of the *Zeuglodon*, inasmuch as it supports two transverse conical ridges; while the hinder molars differ still more, in having three transverse ridges.

The Dugong presents a nearer general resemblance to the *Zeuglodon* in its molar teeth, the anterior ones being smaller and more simple than the posterior, and the complication of the latter being due to exactly the same kind of modification as in the hinder teeth of the *Zeuglodon*. The posterior molar has its longitudinal diameter increased, and its transverse section also gives an approach to the hour-glass figure, in consequence of the tooth being traversed longitudinally by two grooves, which encroach upon the substance of the tooth from opposite sides (Pl. VIII. fig. 3); there is also in this tooth a tendency to the formation of a double fang, and the establishment of two centres of radiation for the calcigerous tubes of the ivory; yet the molar teeth are not separated by wide intervals, as in the *Zeuglodon*.

In the scattered position of the teeth and their general size, we have an equivalent to the extinct *Zeuglodon* in the Cachalot; but the teeth in this Cetacean, besides being almost confined to the lower jaw, are, as before stated, simple and with single fangs.

After a comparison of the teeth of the *Zeuglodon* or Basilosaur with those of the true Saurians, I cannot find that they possess any one of the known dental peculiarities of that class. For first, besides their implantation in the jaw by double-fangs, they differ from the teeth of all known Saurians in their more complex and various forms.

They differ from those of the great *Mosasaurus* and all the Lacertian Reptiles, in being freely implanted in sockets, and not anchylosed to the substance of the jaws.

They differ from the teeth of the *Ichthyosaurus* in being implanted in distinct sockets, and not fixed in a common and continuous groove.

There remain then only the *Plesiosaurus*, *Megalosaurus*, *Thecodonsaurus*, and the Crocodilian reptiles with which to compare the teeth of the *Zeuglodon*. Now in these higher reptiles, which have the teeth implanted in distinct sockets, the part of the tooth so inserted is always single, and maintains, as it descends, a broad base, which is hollow. But in the *Zeuglodon*, on the contrary, the two fangs diminish in size as they sink in the socket, and become consolidated by the progressive calcification of a temporary pulp. In all Saurians, moreover, there are one or more new or successional teeth in different stages of formation, situated close to, or contained in the cavity of the base of the protruded tooth; but no trace whatever of this characteristic Saurian structure has yet been detected in the jaws of the *Zeuglodon*.

If, therefore, I had had to give an opinion on the nature and affinities of the *Zeuglodon* from the obvious external characters alone of its teeth, I should have concluded from these characters that it was no Reptile, but a mammiferous animal, most probably belonging to the cetaceous order, and more nearly allied to the herbivorous than to the piscivorous sections of that order as it now stands in the Cuvierian System.

As, however, the so-called Basilosaur has been regarded by some able anatomists as affording an exceptional example among the Reptilia of teeth having two fangs, contrary, indeed, to all analogy, so in like manner they may prefer to consider the facts above-cited, relating to the solidification of the fangs and the absence of numerous successional teeth, as exceptional dental conditions in an extinct Saurian form, rather than as evidence of the mammiferous nature of the fossil in question: I have therefore proceeded to investigate the intimate structure of the dental substance in the *Basilosaurus*, with a view to ascertain whether the evidence thus afforded would be contradictory to the previous inferences of its mammiferous nature, or give cumulative proofs of their correctness.

I may premise, that the teeth of the *Sphyræna* and allied fossil fishes, which are implanted in sockets, are distinctly characterized by a continuation of medullary or pulp canals, arranged in a beautifully reticulate manner, extending through the entire substance of the tooth, and affording innumerable centres of radiation to extremely fine calcigerous tubes.

In the Enaliosaurs and Crocodiles, the pulp-cavity of the tooth, which is analogous to the subdivided medullary canals in the sphyrenoid fishes, is simple and

central, as in the Mammalia. The calcigerous *tubuli* radiate from this centre to every part of the circumference of the tooth, to which they are generally placed at right angles*. The whole of the 'dentine,' or ivory of the tooth, is composed of these minute tubules and their connecting tissue; but that part of the dentine which forms the crown is covered with enamel, while that part which is placed in the alveolus is surrounded with a thick layer of cortical substance, filling up the grooves of the fluted base of the tooth.

In the Dolphins, which have simple conical teeth like the higher reptiles, the inserted base is likewise covered with cæmentum, but the crown with enamel.

In the teeth of the Cachalot there is no true enamel, but the whole exterior is invested with a thick layer of cæmentum, which is sometimes as thick as the included portion of true tubular ivory.

In the Dugong, also, both the exposed and inserted parts of the molar teeth are coated with cæmentum, and this substitute for enamel presents the same characteristic radiated corpuscles or cells as were discovered by Purkinjé in the cæmentum of the human teeth, and of other animals; but the cæmentum of the Dugong differs from that of the Pachyderms and Ruminants in being traversed by numerous fine tubes, pretty closely aggregated, and giving off numerous branches, the corpuscles or cells being scattered in the interspaces of the tubes, which here and there communicate with the true calcigerous tubes of the ivory. Now the crowns of the teeth of the *Zeuglodon* evidently exhibit in many parts an investment of a thin layer of a substance distinct from the body or ivory of the tooth, the real nature of which investment microscopic examination could alone determine.

In a fine section of this part of the tooth of the *Basilosaurus*, taken from about the middle of the exposed crown, I find that this investment is cæmentum and not enamel, and that it presents the same microscopic characters as the cæment of the crown of the teeth of the Dugong. The Purkinjean cells are scattered in some places irregularly, in others arranged in parallel rows; they are about $\frac{1}{250}$th of a line in diameter, generally of an oval form, but with very irregular outlines: the tubes radiating from the cells are wider than usual at their commencement, but soon divide and subdivide, forming rich reticulations on the interspaces, and communicating with the branches of the parallel larger tubes. These are placed, as in the Dugong, perpendicularly to the superficies of the tooth, but are less regularly arranged than the calcigerous tubes of the ivory, with which, however, they form numerous continuations. There is a greater proportion of the cæmentum at the isthmus of the tooth than elsewhere.

The entire substance of the ivory of the tooth consists of fine calcigerous tubes,

* The general direction of the calcigerous tubes is indicated by the fine white lines in figs 1 and 2, Pl. VIII.

radiating in the section examined from two centres, one in each lobe, without any intermixture of coarser medullary tubes, such as characterize the teeth of the *Iguanodon*, and without the slightest trace of the reticulate canals which distinguish the texture of the teeth of the Shark, the *Sphyræna* and its congeners.

The breadth of the calcigerous tubes in the *Zeuglodon* is equal to one-eighth of the diameter of an ordinary human blood-disk or globule; they present a regular undulating course, and, like the calcigerous tubes of the Dugong, exhibit more plainly the primary dichotomous bifurcations, and the subordinate lateral branches, which are given off at acute angles.

Upon the whole, the microscopic characters of the texture of the teeth of the *Zeuglodon* are strictly of a mammiferous character, and the nature of their investing substance limits the comparison of these teeth with those of the few Mammalia in which the teeth are devoid of enamel. Among these are the Edentata, including the *Megatherium* and its congeners, the Morse, the Dugong and the Cachalot. The tooth of the *Megatherium* contains two kinds of dentine; the first is a coarse central portion with large medullary canals, giving off the short calcigerous tubes which occupy the interspaces of the canals, similar to the substance which composes the entire tooth of the *Orycteropus*; and the second is a fine and dense dentine, composed of minute parallel calcigerous tubes. The cæmentum of the *Megatherium* is also distinguishable by the large medullary canals which traverse it, and which anastomose by loops close to the true or dense ivory. We have therefore sufficient evidence that the *Zeuglodon* is not a gigantic edentate Mammal.

From the *Toxodon* it differs in the fangs of its teeth, and also in the fact that the teeth of the *Toxodon* are partially covered with true enamel.

It is to the teeth of the Cachalot and Dugong that those of the Basilosaur offer the nearest resemblance in the particulars already cited, and I conceive its position in the natural system to have been in the cetaceous order, intermediate between the Cachalot and the herbivorous species.

Dr. Harlan, who has examined with me the sections of the various teeth above alluded to, and who is willing to admit the arguments deducible from them in favour of the mammiferous nature of the Basilosaur, has himself suggested the propriety of substituting another generic name more in accordance with the true affinities of the animal, and has consented that the gigantic monarch, as it was deemed, of the saurian race, should be deposed*.

* The fragments of jaw and teeth, humerus, and fragments of rib, were discovered in a limestone rock, supposed to belong to a formation more recent than the Maestricht beds, in the Alabama territory. The vertebræ of the *Zeuglodon* were discovered by Judge Bree in a tertiary stratum, associated with conglomerate masses of small marine shells, principally belonging to an extinct species of *Corbula*; they were imbedded in a hill about two hundred yards from the Owachita or Washita river, Arkansas territory, in the state of Louisiana. The circumstances which led to their discovery are thus described:—

The idea, indeed, that the *Zeuglodon* was a reptile was not suggested by an examination of the teeth, but of the vertebræ, of which the most entire specimen is now on the table, being the original from which Dr. Harlan's figure is taken, and respecting which M. Duméril* has already expressed his opinion, that it presents the characters rather of a cetaceous than a saurian animal (Pl. VIII. fig. 6).

This vertebra most resembles, in fact, the anterior caudal vertebræ of the *Hyperoodon*. The most characteristic proof of its cetaceous nature is afforded by the traces of the original separation and subsequent union of the epiphyseal laminar pieces constituting the anterior and posterior articulating surfaces of the body, while the actual union of these plates indicates a tendency to a higher mammiferous character; the same epiphyses, for example, become anchylosed to the bodies of the vertebræ in the herbivorous Cetacea as in the mammiferous quadrupeds.

In the bodies of the smaller vertebræ of the *Zeuglodon*, however, the articular epiphyses are wanting; and Dr. Harlan himself infers, from the common occurrence of this condition, that there were originally three separate points of ossification in the body of the vertebra†. It is the persistence of this structure, which does not exist in any Saurian, that forms the most prominent character of the vertebræ of the Cetacea. It is to the presence of the two depressions or perforations in the lower part of the body of the vertebræ, and to the supposition that this structure peculiarly characterized the *Plesiosaurus*, that the belief of the saurian character of the *Zeuglodon* is mainly attributable; but the fact that this structure is present in the vertebræ of many Mammalia, and especially of the Whales, entirely invalidates the inference.

The vertebræ of most Sauria exhibit the articular depressions for the superior arch, which, from the want of more intimate union with the body, is generally lost in fossil vertebræ; but in the large vertebra of the Basilosaur we have clear proof

"After the occurrence of a long spell of rainy weather, a part of the hill slid down near to the water's edge, and thereby exposed twenty-eight of these bones, which had been until then covered by an incumbent mass of earth about forty feet thick. When these bones were first seen they extended in a line, which, from what the person living near the place showed me, comprised a curve, measuring upwards of 400 feet in length, with intervals which were vacant. The person referred to destroyed many of the bones by employing them instead of andirons in his fire-place, and I saved what remained from the same fate. I think, however, that a great many more bones belonging to the same animal are yet covered, and will gradually appear as the soil and marl shall be washed off by the rain."—*Extract from a letter from Mr. H. Bree in Dr. Harlan's Medical and Physical Researches*, 8°, 1835, p. 337.

* Compte Rendu des Séances de l'Académie des Sciences, Oct. 22, 1838. Dr. Buckland gave a similar opinion on the vertebræ of the *Basilosaurus* on the occasion of the discussion of the affinities of the *Thylacotherium*, November 21, 1838.

† *Loc. cit.* p. 356.

that the superior arch was continuous with the body of the vertebræ, as is always the case in the mature Mammalia.

Another argument for the mammiferous and cetaceous character of the *Zeuglodon* may be drawn from the great capacity of the canal for the spinal chord, which, in the Cetacea, is surrounded by an unusually thick plexiform stratum of both arteries and veins. The cetaceous character is further manifested in the short antero-posterior extent of the neurapophyses, as compared with that of the body of the vertebra, in their regular concave posterior margin, and the development of the articular apophyses only from their anterior part.

In one of the caudal vertebræ of the *Hyperoodon*, which measured $8\frac{1}{2}$ inches in length and $4\frac{3}{4}$ inches in height, the base of the superior arch was four inches in longitudinal extent, and occupied the same relative position as in the *Zeuglodon*. In the short-tailed Plesiosaurs the bodies of the vertebræ are always shorter in proportion to their breadth, and the superior arch springs from nearly the whole length of their upper surface, and they have no anchylosed transverse processes. In the Crocodile, where these processes are present, they are situated higher up on the body of the vertebræ. In those vertebræ of the Cetacea, with which I have compared the vertebra of the *Zeuglodon*, the transverse processes have the same relative position, but they are more depressed. The *Zeuglodon*, therefore, in this respect again shows a tendency to the higher mammiferous character; the transverse processes of the caudal vertebræ of the Manatee and Dugong are relatively thicker than in the carnivorous Cetacea. Lastly, I may observe that the articular surfaces of the body of this vertebra of the *Zeuglodon*, besides both being more uniformly convex than in any saurian vertebræ which I have seen, also present the strongly-marked concentric striæ which characterize the flat or slightly convex articular surfaces of the Mammalia.

With respect to the other bones of the *Zeuglodon*, I may observe that the fragments of the ribs present a thick, expanded form and dense texture, which strikingly resemble the ribs of the Manatee, and clearly bespeak an aquatic Mammal; but the excentric laminated structure of these bones, which Dr. Harlan has well described and figured, is peculiar, and unlike any structure which I have yet observed in the ribs of either Mammal or Saurian, and it resembles most the texture of the petro-tympanic bone of the Cetacea (Pl. VIII. fig. 5).

One of the fragments of the ribs is decisive also against the supposed affinity of the *Zeuglodon* to the Plesiosaur, since it presents an articular surface on the tubercle as well as on the head of the rib.

The hollow structure of the lower jaw has been adduced as evidence of the

saurian nature of the *Zeuglodon*, but it stands equally good for its cetaceous character, as a section of the lower jaw of the Cachalot demonstrates.

In the compressed shaft of the humerus (Pl. IX.) and its proportion to the vertebra, the *Zeuglodon* approximates to the true Cetacea, as much as it recedes from the Enaliosauria; but in the expansion of the distal extremity and in the form of the articular surface, the humerus of the *Zeuglodon* stands alone. No one can contemplate the comparative feebleness of this, the principal bone of the anterior extremity, without feeling the justice of Dr. Harlan's conclusion, that the tail must have been the main organ of locomotion of this stupendous denizen of the deep. But assuming the humerus to have been part of the same skeleton with the vertebra, and that this bone truly indicates the power and application of the vertebral column of the *Zeuglodon*, can we suppose this flexible region of the spine to have been encumbered with a sacrum and pelvis and hinder extremities?

To this conclusion we must arrive if we admit the correctness of Dr. Harlan's determination of the bone which he has described and figured as the tibia. Now in this bone, which is fortunately among the portions of the *Zeuglodon* brought over by Dr. Harlan, the enlarged end, called distal, is fractured, so that no part of the articulating surface remains; and the projections, called internal and external malleolus*, are the results of accidental fracture.

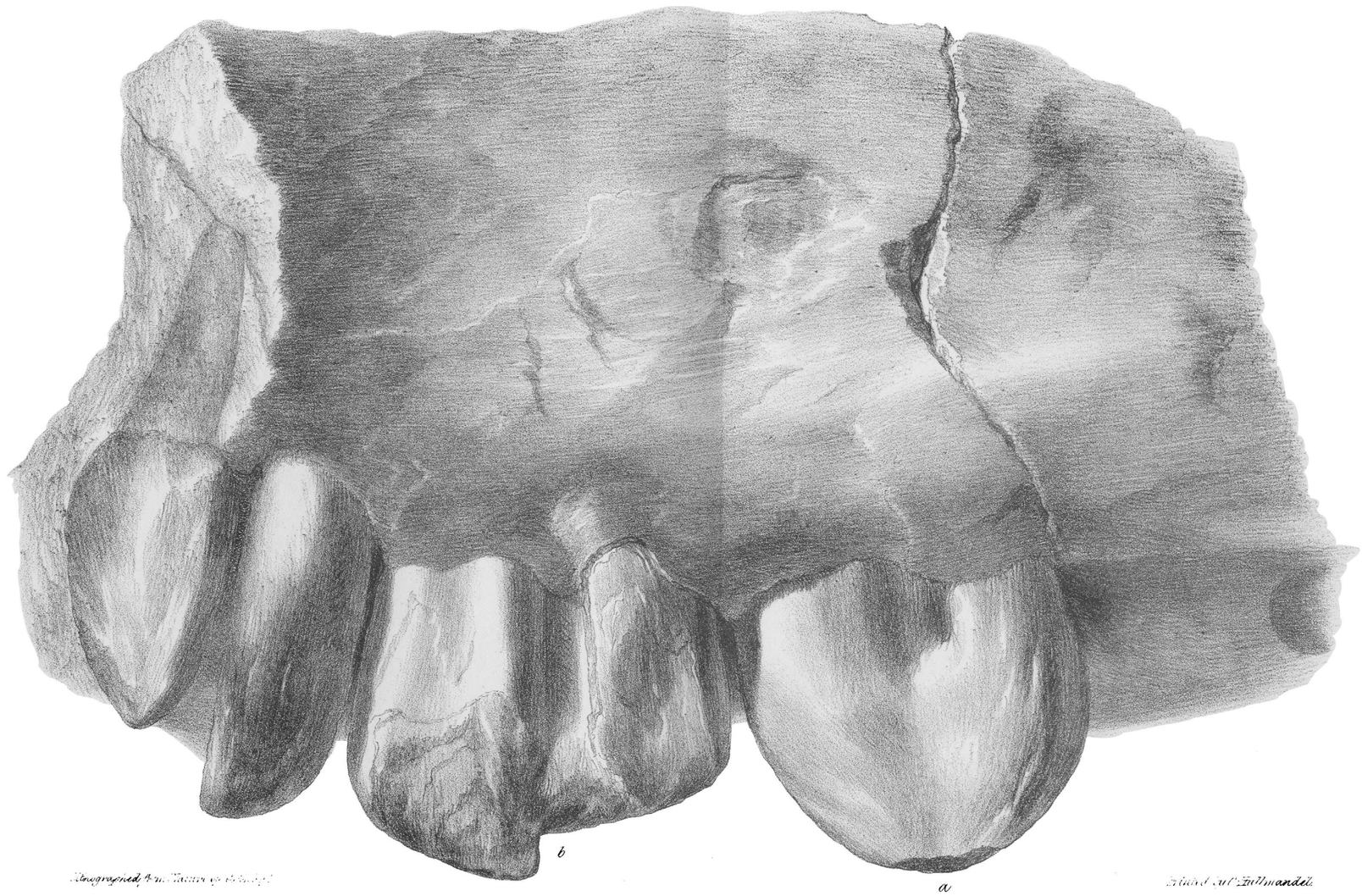
The texture of the bone is laminated and dense like the ribs. The whole fragment presents a much less compressed form than we should expect to find in one of the long bones of the arm or leg of a marine Mammal or Saurian, and it seems to be a more probable conjecture, that it is a portion of one of the larger anterior ribs than a bone of a hinder extremity.

In recapitulating the chief points of evidence which, at present, can be brought to bear on the question of the affinities of the *Zeuglodon* or *Basilosaurus*, it may be stated, that the form of the humerus, though unlike that of any known vertebrate animal, yet approaches much closer to the mammalian than to the saurian type; the vertebræ, which we have been enabled to examine, not only present a strictly mammalian organization, but also the cetaceous modification of that type. The teeth being of two kinds, some with single, others with double fangs,—being freely implanted in distinct sockets,—consisting only of dentine and cæment, and both these presenting an intimate structure most closely resembling that of the same

* Harlan, *loc. cit.* p. 358.

constituents of the teeth of certain aquatic Mammals, as the Dugong,—afford a body of evidence which is conclusive as to the class of Vertebrata to which the extinct animal has belonged, and point with a high degree of probability to the order and family to which it bore the closest affinities. But the organization of the *Zeuglodon*, so far as it is at present known, forbids any closer approximation with the types of existing species.

The teeth, in their combination of an exaggerated condition of the conjugate form,—which is but indicated in certain teeth of the Dugong, with two distinct fangs, in their oblique position in the jaw, and the irregular interspaces of their alveoli,—present very striking and singular peculiarities; and when to these dental characters we add the remarkable and abrupt contraction of the distal end of the humerus, which is nevertheless provided with an articulating surface for a ginglymoid joint, and its remarkably diminutive size,—a cetaceous character, which, likewise, is here carried to an extreme,—and when we also consider the dense laminated structure of the ribs, and the third exaggeration of a cetaceous structure in the extreme elongation of the body of the caudal vertebræ,—we cannot hesitate in pronouncing the colossal *Zeuglodon* to have been one of the most extraordinary of the Mammalia which the revolutions of the globe have blotted out of the number of existing beings.



Zeuglodon Cetoides (Owen).
Portion of Upper Jaw (Nat: Size) p 69 et seq.

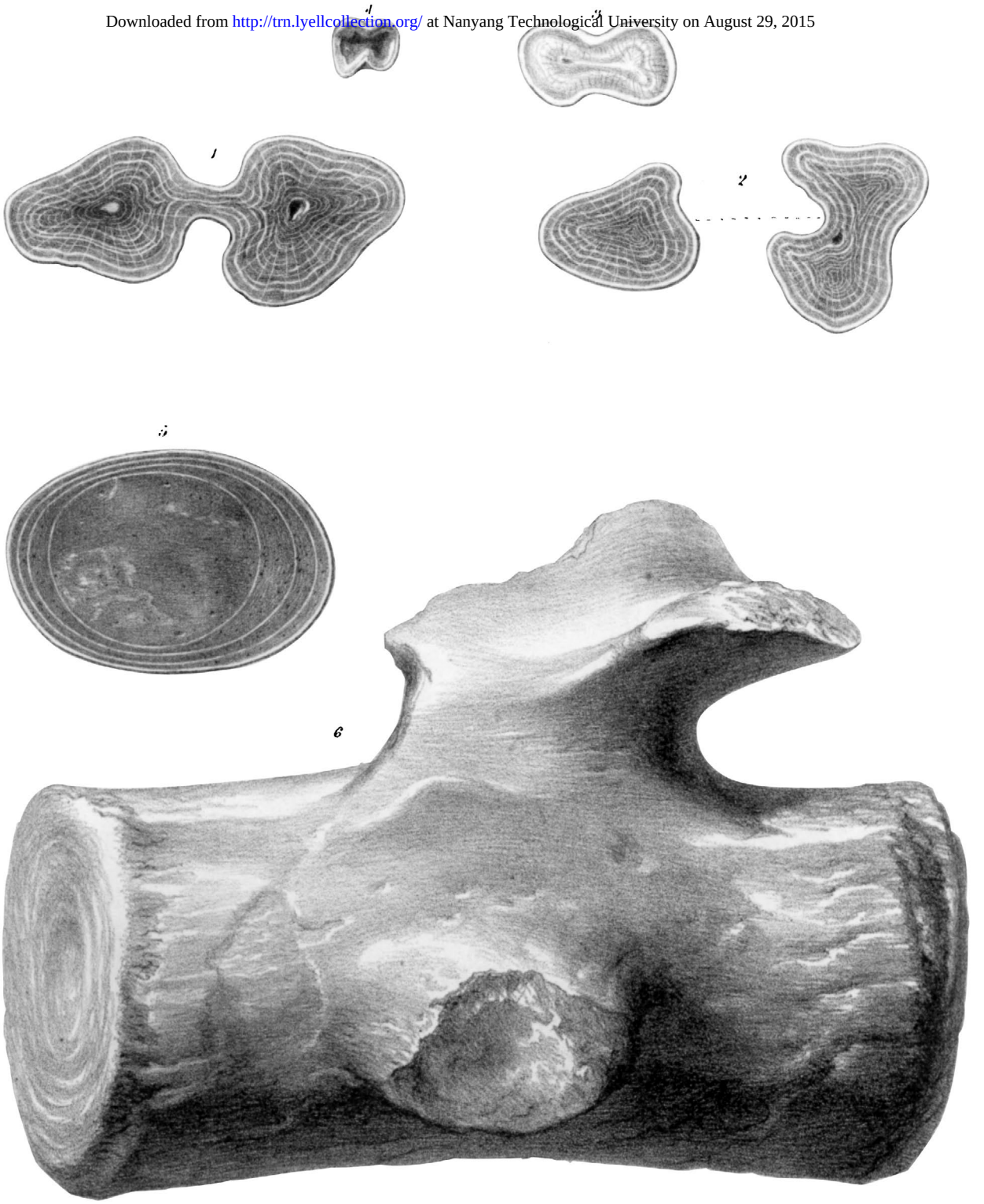


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Fig. 1, 2, 5 & 6. Zeuglodon Cetoides. (Owen).

Fig. 1 & 2 Sections of Teeth. p. 70. Fig. 5. Section of a Rib. p. 77.
Fig. 6. Caudal Vertebra. p. 76.
Fig. 3. Transverse Section posterior molar Dugong. p. 72.
Fig. 4. Crown of a worn molar of the Manatee. p. 72.

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Humerus of the Zeuglodon Cetoides (Owen.)

Half the Nat. Size.