The archosaurs (Reptilia) from the Upper Jurassic – Lower Cretaceous of Galve (Teruel, Spain)

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ABSTRACT

Various remains of archosaurs from the Upper Jurassic (Kimmeridgian) — Lower Cretaceous (Barremian) of Galve (Teruel, Spain) are described and discussed. The dinosaur material includes tooth crowns attributable to Megalosauridae indet., a tooth identified as cf. *Hypsilophodon* sp., and a fragment of tooth crown and vertebral remains attributable to *Iguanodon bernissartensis*. The study of the crocodile material is based on an analysis of morphological and morphometric data. 27 isolated teeth were studied. Four morphotypes are proposed and, in some cases, the analysis allowed the separation of submorphotypes. The following attributions are proposed for these morphotypes. Goniopholididae indet., Bernissartidae indet., and cf. *Theriosuchus* sp. (Atoposauridae).

KEYWORDS: ARCHOSAURIA, UPPER JURASSIC—LOWER CRETACEOUS, GALVE, TERUEL, SPAIN.

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INTRODUCTION

The archosaur fauna from Galve is composed essentially of dinosaurs and crocodiles, although Kühne (1966) cited the appearance of isolated pterosaur teeth.

The earliest citations of dinosaurs in the Galve region were published by Fernández Galiano (1958, 1960). These remains were studied by Lapparent in 1960 and identified as an ornithopod, *Iguanodon bernissartensis* ("La Maca"), and a "camarasaurid" sauropod ("Las Zabacheras"). A tooth found by Dr. José María Herrero (near Galve) around Las Zabacheras, was considered by Sanz (1982) as possibly attributed to the same form, which the author included under the subfamily Brachiosaurinae. In 1982 Estes and Sanchíz identified in Galve various types of dinosaurs based on small, isolated teeth: aff. *Echinodon* sp. (Fabrosauridae), Coeluridae? indet. and cf. *Hypsilophodon* sp. This final specimen was identified by means of a very worn fragment that the authors attributed to a juvenile. The tooth published in this manuscript (a level of similar identification: cf. *Hypsilophodon* sp.) shows far less wear and, based on its size, is attributed to an adult example.

The earliest notices of Cretaceous crocodiles from Galve date back to 1966, the year Kühne mentioned remains of isolated teeth and indeterminate osteoderms. Berg and Crusafont (1970) cited the discovery molariform-type teeth in Galve, referred to *Allognathosuchus*, even though they very possibly pertain to *Bernissartia* sp. (Buffetaut and Ford, 1979). Subsequent works have provided better faunistic descriptions of Galve (Estes and Sanchíz 1982). These authors proposed a first identification at the family level. Finally, a recent discovery by Dr. J. M. Herrero of a

complete crocodile specimen has been studied by Buscalioni, Buffetaut, and Sanz (submitted).

The diverse deposits in the Galve area have been considered as Barremian–Aptian (Crusafont and Gibert, 1976). Despite this, a recent careful stratigraphic revision has revealed that the terrigenous materials from the base of the series are of Kimmeridgian age, while the top is Barremian (M. Díaz, personal communication). The diverse deposits cited in the text will be arranged in their precise position in the series, giving a broad diversity in age.

The archosaur fauna from Galve and other Spanish regions (See Sanz, 1982, 1983, Sanz et al. 1982, 1983) are similar to those of the classic European Weald facies, with characteristic outcrops in England and central Belgium.

The structure of the aforementioned systematic paleontology with respect to the crocodiles is not similar to that followed for the dinosaurs. This is due to the specific characteristics of the crocodile material studied (mostly isolated teeth), which requires developing a specific methodology with respect to morphotypes with morphological and morphometric definition.

ORDER SAURISCHIA

Fam. *Megalosauridae*

Megalosauridae indet.

Description

This is a practically complete tooth crown of which only a tiny portion of the apex and perhaps a piece of the base are missing, which comes from the deposits known as "El Pielago" (Galve, Teruel). The tooth is relatively compressed in the buccolingual direction, tall, elongate, about 60 mm in height including the reconstructed apex (see Fig 1.) The medial edge has a smoothly sigmoidal path and develops from about 20 mm from the base. The diameters of this end are 20 mm (mesiodistal) x 10 mm (buccolingual). The distal edge presents a more symmetrical run than the mesial and probably starts at the base of the crown. Both edges are imperceptibly crenulated. The crenulation is most evident toward the apex where there are 14-16 denticles every 5 mm. This figure is considerably larger toward the base (much smaller denticles). The buccal and lingual faces are practically smooth.

Discussion

The general morphological characteristics of the tooth, such as its size, seem to indicate that it belongs to the family Megalosauridae, one of the most highly debated taxa among all dinosaurs with respect to criteria for taxonomy and classification. The ignorance of different kinds of variability (intra-generic, intra-individual, ontogenetic) and the probably process of parallelism, advise against proposing a determined genus.

Nevertheless, the tooth from Galve has been compared with diverse megalosaurids such as *Antrodemus* (*Allosaurus*) (Gilmore, 1920; Madsen 1976); *Dryptosaurus* (Lambe, 1904); *Carcharodontosaurus* ("*Megalosaurus saharicus*", Depéret and Savornin, 1927); *Chilantaisaurus* (Hu, 1964) and *Szechuanosaurus* (Young and Sun, 1975). In every case the specimen from Galve appears to be more slender, in the sense of having a smaller relative buccolingual dimension, with a greater relative height of the crown. From this point of view the Galve tooth appears similar to material attributed to *Megalosaurus insignis* by Lapparent, 1943; Lapparent and Zbyszewski, 1957; and *Megalosaurus ingens* proposed by Janensch in 1925, although it is considerably smaller in relation to both examples. In comparison to other Spanish megalosaurids, the specimen from Galve is very different from Morella form (Sanz et al. 1982): much more compressed buccolingually and with a relatively more elevated and practically smooth crown.
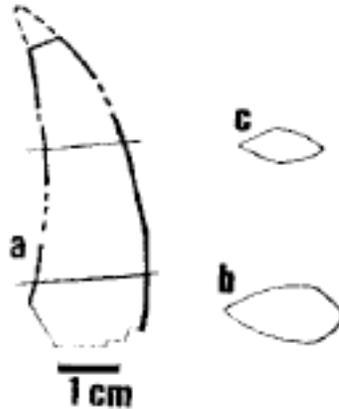

Fig. 1.—*Schematic drawing of the tooth from Galve identified as Megalosauridae indet. from "El Pielago" (Galve). a) Lateral outline. b) Outline of the basal cross-section of the crown. c) Outline of the crown at the base of its apical third.*

ORDER ORNITHISCHIA

Fam. *Hypsilophodontidae*

cf.   *Hypsilophodon sp.*

Description

This small ornithopod is identified based on a tooth (probably implanted in the right maxilla, see the paragraph following the discussion). It comes from the "Cabezo de las Zabacheras". The crown is relatively flattened buccolingually, defined mesially and distally by two crests bearing relatively developed denticles (see Fig 2, a and b). Its maximum anteroposterior dimension is 9 mm. The posterior crest has nearly completely disappeared, owing to a large wear facet of sub-hemicircular outline situated on the lingual face (Fig. 2a). The buccal face is flattened, with an enamel cap, and is crossed by three crests, the central one being the largest. Nevertheless, the interpretation of these structures is problematic due to the state of degradation of this crown zone. The buccal face presents no enamel, as is typical in many ornithopods. Its outline is concave in the occlusal-radial direction and convex in the mesiodistal direction. This face develops the root in structural continuity.

Discussion

It is difficult to pinpoint the topographical position of the tooth due to its state of preservation. The limited grade of development of the buccal edge appears to indicate that it was a tooth implanted in the maxilla (see Swinton, 1936 and Galton, 1974). The mesiodistal orientation of the wear plane, as well as the position of the aforementioned anterior crest, place the piece in the right maxilla, but without allowing specification of its position in the series. Other forms related to Hypsilophodontidae, such as *Alocodon kuehnei*, from the Upper Jurassic of Portugal (Thulborn, 1973) have the wear facet placed on the lingual side in the maxillary teeth, which would confirm the proposal about the zone of implantation of the tooth from Galve.

Ornithopods present a certain morphological dental constancy, especially with respect to synchronous groups. Perhaps three very general levels can be established: 1) Primitive forms (Triassic) such as Pisanosauridae and Heterosontosauridae[*]. 2) Predominately Jurassic–Cretaceous groups such as Hypsilophodontidae

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[*] *sic*: Heterodontosauridae.

and Iguanodontidae. 3) Upper Cretaceous forms (Hadrosauridae). Group 2 is characterized especially by the presence of tooth morphotypes with spatulate, relatively low crowns, with denticulate medial and distal crests, and smooth crests along the enamel zone of the crown. This morphotype does not consider the premaxillary teeth of hypsilophodontids, which are absent in the majority of iguanodontids. The tooth from Galve is clearly included in this second group. Its general morphology, such as its relative dimensions, conform to those of *Hypsilophodon* (see Swinton, 1936; Galton, 1974). Nevertheless, given the relative morphological dental constancy between diverse groups of ornithopods from the Jurassic and Cretaceous, and the unknown population and ontogeny variability, we propose the Galve tooth as cf. *Hypsilophodon* sp.
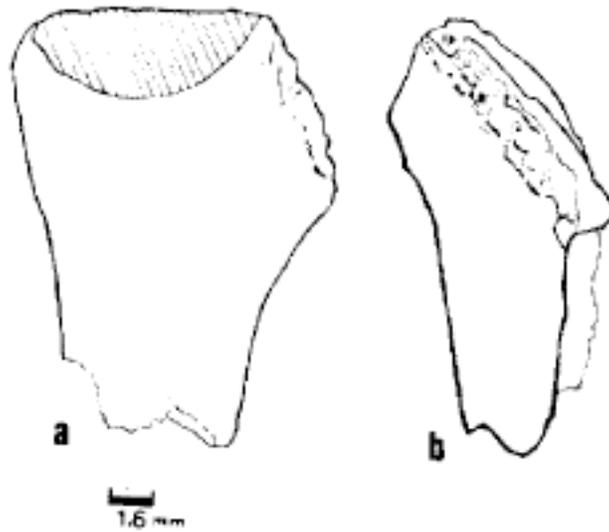

Fig 2.—*Schematic drawing of the tooth identified as cf. Hypsilophodon sp. from the "Cabezo de las Zabacheras" (Galve). It is probably a right maxillary tooth. a) Lingual view. The shaded region corresponds to the wear facet. b) Mesial view (root partially fractured).*

Fam. *Iguanodontidae*

Gen. *Iguanodon*

I. bernissartensis

Description

The material attributed to *I. bernissartensis* consists of a fragment of tooth crown from "Cuesta de los Corrales" and two vertebral fragments from "La Maca".

The tooth morphology of *Iguanodon* is very well known, due to the works of Dollo (1883 a), Hooley (1925), and Norman (1980). Specifically of note is the presence of enamel on both faces (buccal and lingual) of the crown, although presenting a thicker coat on the flattened surface (in this case, a mandibular tooth, oriented lingually). Its maximum mesiodistal dimension is 34 mm.

The vertebral remains found in "La Maca" include a distal fragment of a rib-supporting process and a left postzygapophysis. The anterior surface of the first vertebrae is typically planoconcave, defined ventrally by a sharp crest. The dorsal and posterior regions are regularly convex. The zygapophysis presents a sharp distal end, with a smooth dorsal crest that axially defines the totality of the structure. Its maximum anteroposterior width is 33 mm.

Discussion

The relatively elevated mesiodistal dimension of the crown, and the development and position of the principal crest indicate that it is a tooth from the left mandible.

The distal fragment of the transverse process pertains to a presacral vertebrae, suggested because the caudals are dorsoventrally flattened (see Norman, 1980; Sanz et al. 1982). Its subtriangular cross-section is typical of the dorsal region. The great relative development of the postzygapophysis and its pointed morphology seem to indicate that it pertains to a cervical vertebra.

Both the tooth crown fragment, as well as the vertebrae, match perfectly in size and morphology with *Iguanodon bernissartensis* (see Norman, 1980; Sanz et al. 1982).

ORDER CROCODYLIA

Materials and Methods

The sediment recovered from Galve corresponds to locality named "Cuesta de los Corrales" and was treated subsequently in our laboratory. We have found 27 isolated teeth of which the sizes range from 0.76 mm to 2.24 mm.

All of these teeth have been studied with a binocular loupe and camera lucida. With the goal of arriving at a better morphotype differentiation, some teeth

were studied in the Electron Microscope. Finally, a quantitative analysis based on metric parameters accompanies each morphotype.

Introduction to the morphotypes considered

The particular conditions of the crocodilian dentition makes it difficult to interpret the diverse morphotypes proposed. Variability is caused by the following factors: (1) Possible modifications with ontogenetic development (Mook, 1921; Kälin, 1955; Webb and Messel, 1978). (2) The morphological differentiation of the teeth according to their implantation and function. (3) The great intraspecific variability, characteristic, for the most part, of most groups of reptiles. (4) The possibility of the existence of sexual dimorphism (Nichols and Chabreck, 1980).

Furthermore, the attribution of each morphotype to a taxonomic group is made more difficult by the scarce appearance of crania with associated teeth and in our case the small number of teeth studied further complicated the statistical analysis.

The morphological study of crocodile teeth was based on criteria used by various authors (Owen, 1878, 1879; Mook, 1925; Buffetaut and Ford, 1979) which, however, have never been systematized: (1) The general form. (2) The outline of the base of the crown. (3) The type of ornamentation. (4) The lateral profile and (5) the pulp cavity.

The intent of minimizing the factors of the previously cited variability in the morphometric analysis, has led to the proposal of parametric relationships based on the following metric characters:

mb – maximum dimension of the base of the crown
mib – minimum dimension of the base of the crown
ba – total height from the base of the crown to the apex
mcp – maximum mesiodistal dimension of the pulp cavity
lcp – maximum buccolingual dimension of the pulp cavity

and the following relationships are considered:

BC (base of the crown) = mib / mb

RC (relation of the crown) = mb / ba

CP (pulp cavity) = mcp / lcp

Thus both types of criteria can be used, morphological and morphometric, in order to discern the tooth morphotypes. Once separated morphologically a bivariate

analysis was performed (BC / RC) on all the teeth (See Fig. 3). The results of this analysis yield four morphotypes.
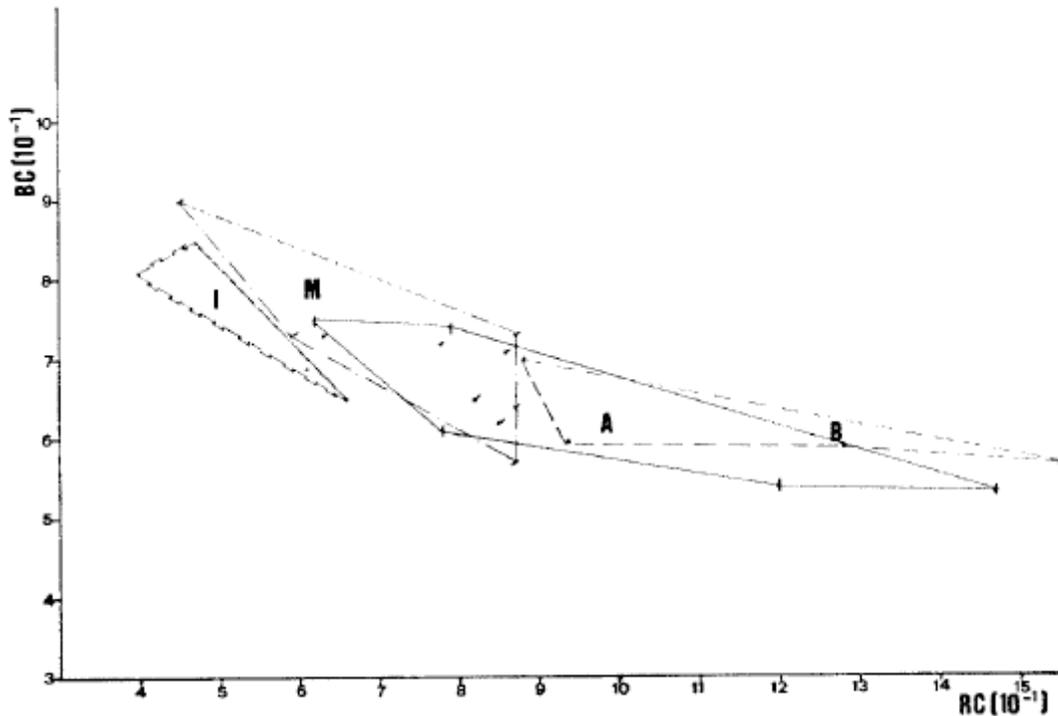

Fig. 3. – *Bivariate analysis of the sample of isolated crocodile teeth from "La Cuesta de los Corrales" (Galve). X-axis: RC (ratio of the crown, see text). Y-axis: BC (Base of the crown, see text). A,B,M, and I are the morphotypes considered (see text).*

Morphotypes

Morphotype A corresponds to the teeth designated A-CCG/1 to A-CCG/6. The morphological features of this type are: (1) General shape lanceolate, pointed. (2) Lateral compression of the tooth in the buccolingual direction. (3) Absence of mesial and distal edges, understood as a structure with a cutting function as occurs in goniopholidids (see Fig. 4, a). (4) Profile with the appearance of a cutting bade. (5) Neck of the root lightly constricted. (6) In radial view the pulp cavity is subellipsoid in the anteroposterior direction. (7) The ornamentation of the enamel is typical: fine oblique crests, more or less parallel, localized in the central region of the crown (buccal and lingual). The oblique striae converge on a festooned structure with a fine

edge. The basal zone of the crown is not ornamented (see Pl. 1, a). (8) The lingual zone is concave while the buccal is convex.

These characters present certain shades of variation depending on the position of the tooth (Owen, 1879; Buffetaut, 1983). In this way, two submorphotypes were separated.

A-I. General shape lanceolate, crown relatively tall, acuminate. Oblique ornamentation very evident, longitudinal crests culminate at the apex of the crown clearly separated from one another.

A-II. General shape oval, crown relatively much lower, could be acuminate but shows strong apical wear. Longitudinal ornamentation tighter.

Morphotype B, noted as B-CCG/1 to B-CCG/4, presents the following characteristics: (1) Teeth voluminous in general. (2) Crowns relatively low. (3) Profile rounded. (4) Radial contour subellipsoid with the major axis directed anteroposteriorly. (5) Absence of a pulp cavity (see discussion). (6) A basal constriction between the crown and root is observed in some teeth. (see Pl. 1, b). (7) Ornamentation of longitudinal crests.

Within this tooth type are certain variations that are possibly due to the topographical position of the tooth in the mandible (Dollo, 1883 b; Buffetaut and Ford, 1979). Due to this, two submorphotypes were separated:

B-I. Conical teeth with a crown taller than wide, apex never acute. Base of the crown constrained. Ornamentation of the longitudinal crests well separated and do not reach the base of the crown.

B-II. A more voluminous type with a relatively lower crown, ending in a blunt apex. In occlusal view they present a reniform silhouette. The base of the crown is wider anteroposteriorly and more compressed laterally than submorphotype B-I. The enamel crests are radial from the apex, fine and appressed, presenting a cut view of the cross-section of the tooth. The lingual and labial zones can be distinguished, the apex being curved slightly lingually (see Buffetaut and Ford, 1979, p. 906, pl. 122, Figs. 3, 9, 10, 11).

Morphotype M is more variable in size and this acronym is noted as

M-CCG/1 to M-CCG/10. Their number is also greater, always appearing in higher proportion within the sediment. In general these teeth are: (1) Robust, conical, ending in a more or less blunt point. (2) Curved lingually (Owen, 1878). (3) Between the concave (lingual) and convex (buccal) surfaces of the tooth are two sharp edges (in mesial and distal positions) that are developed from the apex to the base of the crown. (4) In radial view the contour is subcircular. (5) The pulp cavity is always visible. (6) The enamel of the tooth presents excavated longitudinal zones separated by fine crests of continuous disposition along the entire crown. In some cases anastomosed crests appear. (7) This morphotype is defined by its typical cross-section (see Fig. 4, a).

Two submorphotypes have been separated along morphological criteria.

M-I. Robust teeth, patent excavated facets of the crown, some anastomosis in the crests preferentially in the basal region. In radial view the facets of the crown are visible. Median number of crests in lingual view is 9, with approximate range of 9 ± 2. Within this submorphotype we group two trends: "Anterior", crown relatively tall, conical teeth and well-developed mesial and distal edges, reaching the base of the crown. Dull apex. "Posterior", edges do not reach the base of the crown, crown is lower, teeth are generally straighter.

M-II. Teeth gracile. Facets of the crown with lower degree of excavation. Crests fine and numerous, with range of variation 14 ± 2 (in lingual view). Anastomosis of the crests principally at the tooth apex. Mesial and distal edges more gracile in general. Crown more pointed. Two trends can be appreciated in this submorphotype: "Anterior", crowns relatively taller, curved slightly lingually. Mesial and distal edges reach the base of the crown. "Posterior", crowns relatively lower, teeth straight, edges do not reach the base of the crown.

Morphotype I, noted as I-CCG/1 to I-CCG/6, is formed by a small group of teeth very much alike: (1) conical, acuminate, with tall crowns. (2) Without lateral compression. (3) In mesial or distal view the buccal region is slightly concave, although the basal zone is straight. (4) A slight folding appears anteriorly and posteriorly that does not reach the base of the crown and that progressively diminishes toward the apex. (5) The base of the crown is subcircular, as is its pulp

cavity. (6) Ornamented with multiple fine crests separated from one another, of parallel disposition longitudinally (in labial or lingual view). In the mesial or distal regions are presented oblique crests united to the fold that are constructed of a different form from those of morphotype A (See Pl. 2, a and b).
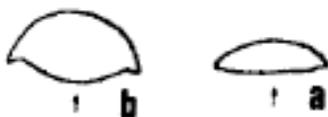

Fig. 4.—*Schematic drawing of the cross-section of the crown of an atoposaurid (morphotype A) (a) and goniopholidid (Morphotype M) (b) tooth. The arrows indicate the lingual region.*

Discussion

Morphometrics

As can be appreciated in Fig. 3, there exists a trend toward separation of the morphotypes previously proposed through morphological criteria. Nevertheless, there appear zones of overlap primarily on the basis of index BC. A trend of morphotypes M and I toward basally subcircular forms can be appreciated, similar to the trend toward subellipsoidal forms in groups A and B. The most significant parametric index that has been found is the ratio RC. With respect to this ratio, groups M and I display relatively taller crown forms than those of A and B, which show a trend toward lowering the height of the crown. This index permits the separation (in light of the relatively low sample presently studied) of morphotype B relative to M and I. Something similar can be established for the differentiation of morphotypes M and I, in this case based on the conjunction of both BC and RC indices, although a larger sample would probably result in great overlap of the distribution areas of these morphotypes. Table 1 expresses the range of variation of these indices for each morphotype.

Certain results have been obtained from the data analysis (see Table 1), with a view toward differentiating the submorphotypes. The RC ratio differentiates teeth with relatively low crowns A-II, B-II; M-II (M-CCG/1/6/10, Posterior and M-I (M-CCG/7/8/9, Posterior). The RC ratio for A-II and B-II is greater than one, while for M it is placed between the values 0.45–0.87. This indicates a marked heterodonty in

morphotypes A (Atoposauridae) and B (Bernissartidae). In contrast for M (Goniopholididae) the morphological difference between posterior and anterior teeth does not indicate strong changes in morphology. Modern forms present certain degrees of heterodonty similar to morphotype B (*Osteolaemus tetraspis*, Buffetaut and Ford, 1979) and M (*Crocodylus*, similar in this respect to *Goniopholis gilmorei*, see Mook, 1925).

We consider that for morphotypes A and B the position of the teeth would be A-I, B-I anterior and A-II, B-II posterior. In both cases it is impossible to know the mesial and distal zones of the crown, which in turn prevents knowing whether they are left or right teeth. To this we add the possibility that the maxillary and mandibular teeth are identical (which could occur in morphotype A (Owen, 1879) as in the case of *Theriosuchus*), it seems even more difficult to establish the location of the teeth.

The BC ratio defines the contour of the crown base. For submorphotypes A-II and B-II this ratio is less than that for A-I and B-I. For morphotype M, in contrast, there appears to be no appreciable difference. Similar values for the BC ratio are manifest both in A-II and B-II, having to resort to morphological criteria to differentiate between the two: —strong lateral compression of the crown (A) versus the crown voluminous without compression (B). Other referred differences in the ornamentation of the crown separated both morphotypes (see description).

A third ratio, CP, quantifies the morphology of the contour of the pulp cavity. As observed in morphotype A (Atoposauridae) this structure is subellipsoidal, subcircular for M (Goniopholididae), while for morphotype B (Bernissartidae) no pulp cavity is seen. For this morphotype it is understood that the concavity occupying the entire base of the crown pertains to the dentine while the flange of the base is formed by enamel.

Nothing can be said of morphotype I from the analysis of the data in the tables, although their ratios appear to keep within a limited set of low values.

Taxonomic assignments

Morphotype A included in the family Atoposauridae, Gervais 1871 presents the distinctive characteristics of this family in the broad sense: lanceolate or oval teeth,

ornamentation of fine longitudinal crests, lateral compression of the crown, manifest heterodonty (Wellnhofer, 1971; Steel, 1973). As such, Estes and Sanchíz (1982) proposed the presence of this family in Galve. Nevertheless, certain refinements of morphotype A and other matters relating to the discovery of procoelous vertebrae in this locality (Mr. Herrero Collection) and a detailed description of the skull with associated teeth of *Theriosuchus pusillus* described by Owen, 1879, have led us to consider the possibility that this morphotype pertains to this genus.

Effectively, Owen (ob. cit.) considered the tooth morphology of *Theriosuchus* as less frequent among crocodiles and this view is further maintained in recent descriptions of isolated teeth from this same genus (Buffetaut, 1983). Owen (1879) differentiated functional zones in the maxillary tooth series for *Theriosuchus pusillus*, proposing a progressive gradation from the 6th maxillary tooth: diminution in height and augmentation in width of the crown base. To this zone ("trenchant or carnassial molars" sensu Owen, 1879 p. 11) pertain submorphotypes A-I and A-II. The similarity between morphotype A and *Theriosuchus* led us to propose the identification of said morphotype as cf. *Theriosuchus* sp.

Morphotype B is distinguished by its peculiar morphology: low crown, voluminous, some of molariform aspect, characteristics attributable to the family Bernissartidae Dollo 1883. This family appears in the Lower Cretaceous of Belgium and England. It is, nevertheless, the only representative form of "tribodont" crocodiles (Buffetaut and Ford, 1979) in the European Lower Cretaceous; other forms with similar dentition occupy higher levels (Lower Paleogene in Europe and North America, (*Allognathosuchus*) and Upper Cretaceous of North America (*Brachychampsa*).

Morphotype M presents diverse characteristics: —typical cross-section (Fig. 4, a), excavated facets on the crown and the existence of mesial and distal edges. These characteristics define the family Goniopholididae, of wide distribution throughout temporal regions (Middle Jurassic–Upper Cretaceous, Buffetaut, 1982). That family seems to present a great morphological constancy (Buffetaut, 1982). The dentition is similar in many respects. Nevertheless, the greater or lesser degree of excavation of the facets, the BC ratio, the development of the anterior and posterior edges, and the fame of the apex, differentiate on some level the diverse genera of this family. The dentition of the majority of forms of goniopholidids (*Goniopholis simus*, Owen, 1878; *G. tenuidens*,

Owen, 1879; *G undidens*, Sauvage, 1888; *G. gilmorei*, Mook, 1925; *G. affinis*, Mook, 1925; *Amphicotylus lucasii*, Mook, 1942) has been established by comparison with *G. crassidens* Owen 1842.

This family presents a low heterodonty in the posterior tooth series (teeth with relatively low crowns and anterior and posterior edges that do not reach the base of the crown, Owen, 1878). Those taken as possible posterior teeth showed the trends defined for both submorphotypes M-I and M-II.

These particularities, along with the difficulty in refining amongst the BC and RC and the low number of teeth within the sample, impede better results in the evaluation of the submorphotypes. The general assignment, evidently, is very conflicting and bears the possibility of grouping each submorphotype as a distinct taxon.

Morphotype I is of doubtful attribution and is placed between the diverse characteristics of morphotype M (tall crowns, subcircular bases) and A (incipient, oblique mesial and distal crests; see Pl. 2, b). At the moment it has not been possible to precisely define this tooth type, and in accordance with this mixture of characters we discuss its possible attribution.

In the first place, there exists the possibility that they are the first maxillary teeth of *Theriosuchus.* According to Owen, (1879): …"The maxillary teeth are divisible into laniaries and carnassial or trenchant molars. The first maxillary tooth is small; the second and third gain quickly in size, the latter assuming the character of a canine; the fourth tooth is a still large canine…" (p. 11). According to Steel (1973), in *Theriosuchus* one can see a: "Dentition tumid and very irregular…One mandibular tooth and the 3rd and 4th members of the maxillary series are caniniform" (p. 14). Another base of reference is Buffetaut (1983), with respect to the isolated teeth attributed to the same genus, and considered by this author as difficult to interpret due to their similarity to the dentition common to the majority of crocodiles. This morphology is evidently primitive, therefore of low diagnostic relevance.

On the other hand, the low knowledge of juveniles forms in the family registry of Goniopholididae (*Nannosuchus*, Owen, 1879 juvenile form of *Goniopholis simus* according to Joffe, 1967), makes the interpretation of morphotype I difficult. *Nannosuchus* presents large, gracile, sharp, slightly curved teeth with subcircular cross-sections and fine crests (Owen, 1879), allowing morphotype I to be referred to this latter form. Although it might not be the same genus, it could be included perhaps in this family, considering as pertaining to individuals of lesser ontogenetic development.

Sig.	ba	mb	mib	mcp	lcp	SubM.	RC	BC	CP	loc.
A-CCG/1	1.56	1.24	0.92	0.48	0.32	A-I	0.79	0.74	1.5	
A-CCG/2	1.80	1.12	0.84	0.60	0.28	A-I	0.62	0.75	1.5	
A-CCG/3	1.32	1.04	0.64	0.44	0.24	A-I	0.78	0.61	1.83	
A-CCG/4	0.8	0.96	0.52	0.40	0.16	A-II	1.2	0.54	2.5	
A-CCG/5	0.76	1.12	0.60	—	—	A-II	1.47	0.53	—	
A-CCG/6	1.12	0.82	0.64	—	—	A-I	0.78	0.72	—	
B-CCG/1	1.0	1.28	0.76	—	—	B-II	1.28	0.59	—	
B-CCG/2	1.44	2.42	1.28	—	—	B-II	1.55	0.57	—	
B-CCG/3	1.88	1.60	1.12	—	—	B-I	0.88	0.7	—	
B-CCG/4	1.52	1.60	0.96	—	—	B-I	0.95	0.6	—	
M-CCG/3	1.28	0.76	0.56	0.24	0.24	M-I	0.59	0.78	1.0	a
M-CCG/4	1.84	1.40	0.96	0.44	—	M-I	0.76	0.68	—	a
M-CCG/7	1.60	1.40	0.80	0.72	0.32	M-I	0.87	0.57	2.25	p
M-CCG/8	1.36	1.16	0.72	0.24	0.20	M-I	0.85	0.62	1.2	p
M-CCG/9	1.32	0.84	0.64	—	—	M-I	0.63	0.76	—	p
M-CCG/1	1.28	1.12	0.72	—	—	M-II	0.87	0.64	—	p
M-CCG/2	1.92	0.88	0.8	0.32	0.28	M-II	0.45	0.90	1.14	a
M-CCG/6	1.48	1.28	0.92	0.60	0.40	M-II	0.86	0.71	1.5	p
M-CCG/10	1.12	0.92	0.60	—	—	M-II	0.82	0.65	—	p
I-CCG/1	1.36	0.92	0.60	0.32	0.30	I	0.67	0.65	1.14	
I-CCG/2	1.68	1.04	0.72	—	—	I	0.61	0.69	—	
I-CCG/3	1.8	—	—	—	—	I	—	—	—	
I-CCG/4	1.68	0.80	0.62	0.28	0.22	I	0.47	0.85	1.27	
I-CCG/5	2.16	0.88	0.72	0.28	0.28	I	0.40	0.81	1.0	
I-CCG/6	2.24	1.04	0.88	0.24	0.20	I	0.46	0.84	1.2	
M-CCG/5 M-CCG/11	—	—	—	—	—	M	—	—	—	

Table of various morphometrics of the twenty-seven crocodile teeth from the sediment processed from "La Cuesta de los Corrales"(Galve). The left column (Sig.) numbers the acronyms of each tooth grouped into morphotypes. The parameters ba, mb, mib, lcp, and the indices RC, BC, and CP are discussed in the text (in Introduction to the morphotypes). The central column labeled SubM. indicates each of the proposed submorphotypes. The right column (loc.) signals the possible placement of the teeth in morphotype M (a = Anterior, p = Posterior). The teeth noted as M-CCG/5 and M-CCG/11, at the end of the table, have only been considered from a morphological point of view, due to a high degree of wear.

ACKNOWLEDGMENTS

BIBLIOGRAPHY

[Not included.]

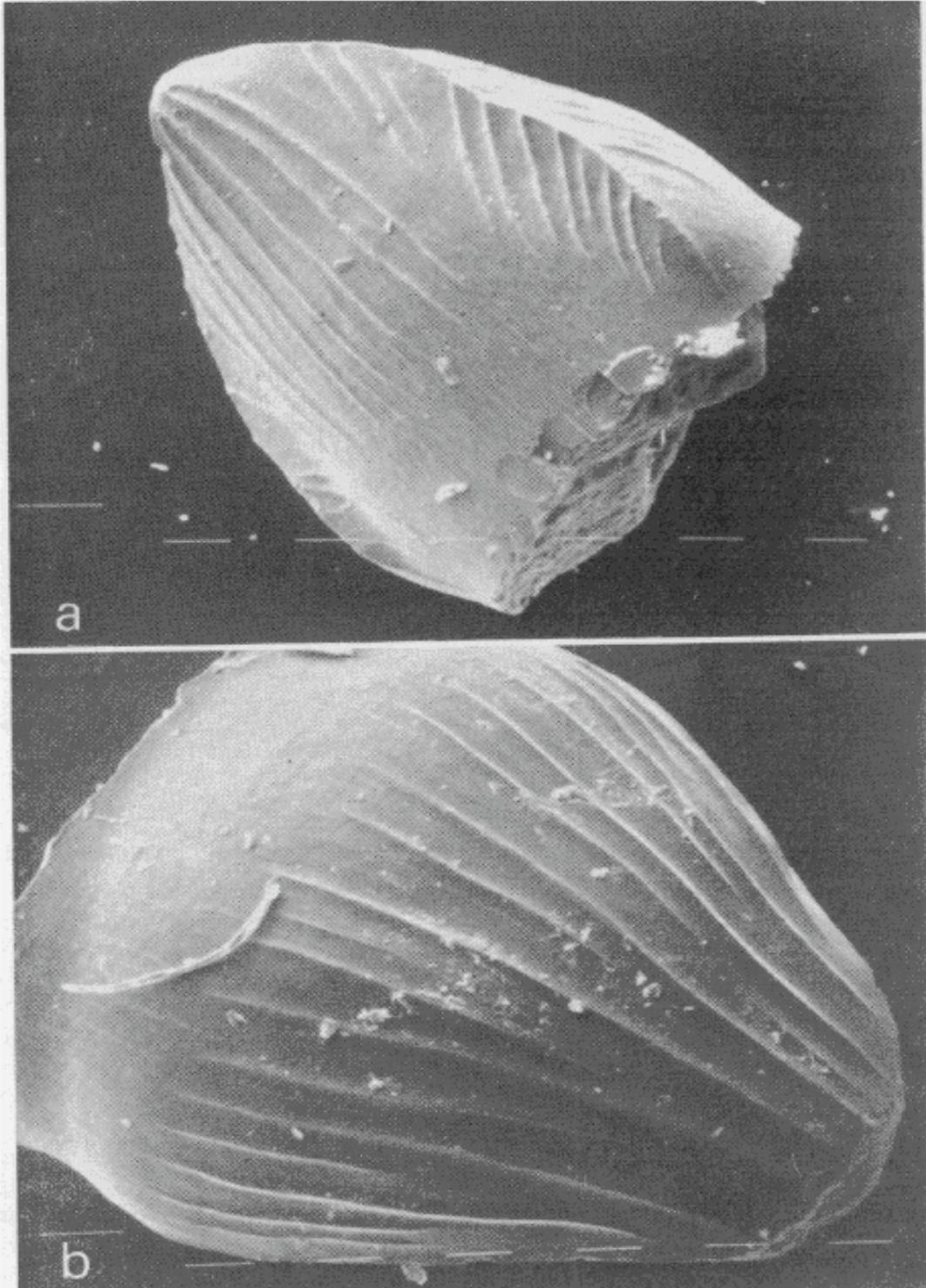**Plate I.**—*a) Scanning electron microscope photograph of specimen A-CCG/6, attributed to the family Atoposauridae (morphotype A). (x 80). Each line represents a distance of 100 m.*
b) Scanning electron microscope photograph of specimen B-CCG/4, attributed to the family Bernissartidae (morphotype B). (x 80). Each line represents a distance of 100 m.
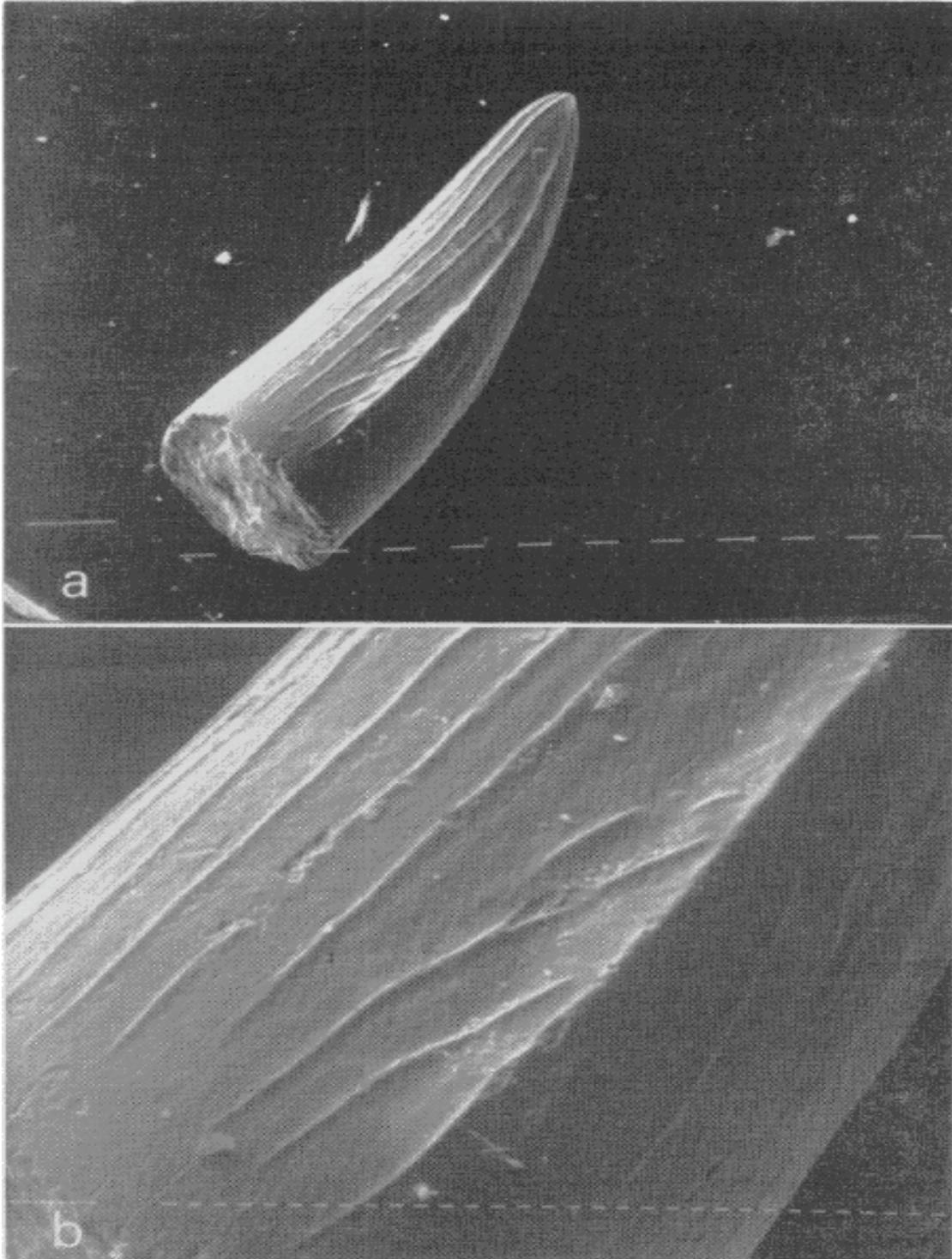
Plate II.—*a) Scanning electron microscope photograph of specimen I-CCG/6, described as morphotype I of doubtful attribution (see discussion, Order Crocodylia). (x 40). Each line represents a distance of 100 m.*
b) Detail of the preceding specimen. Observe the characteristic structuring of the fold (mesial or distal) and the crested ornamentation of the crown (x 160). Each line represents a distance of 10 m.