

**Crocodylian and Palaeobotanical Findings from the Tertiary Lignites  
of the As Pontes Basin (Galicia, NW-Spain)  
(Crocodylia, Plantae)**

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**key words:** crocodylia-*Diplocynodon*, fructifications, pollen, lignites,

**Abstract**

From the Tertiary As Pontes basin (Galicia, Spain) the first reptilian remains (*Crocodylia*, *Diplocynodon* s.l.) are described. Together with these findings palaeobotanical data (pollen, fructifications) result from the same sediment sampled. They are used for stratigraphical and palaeoecological interpretations. Due to these palaeontological informations one might interpret the lower As Pontes lignites as belonging to the Paleogene, most probably Oligocene. Nevertheless complementary data are needed to confirm this stratigraphic contribution.

**Resumen**

Los primeros restos de reptiles fósiles (*Crocodylia*, *Diplocynodon* s.l.) hallados en la cuenca Cenozoica de As Pontes son descritos. Estos restos, junto con los pólenes, las fructificaciones y los rasgos sedimentológicos señalan el desarrollo persistente de biotopos dominados por medios lacustres y pantanosos. Los datos paleontológicos aquí presentados apuntan una posible edad oligocénica para las sucesiones inferiores de la cuenca, aunque se requerirán datos complementarios para confirmar esta atribución estratigráfica.

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## **Kurzfassung**

Von der tertiären Braunkohlenlagerstätte As Pontes (Galizien, Spanien) werden die ersten fossilen Wirbeltierreste (*Crocodylia*, *Diplocynodon* s.l.) beschrieben. Stratigrafische und palökologische Informationen basieren neben diesen Funden noch auf paläobotanischen Belegen (Pollen, Fruktifikationen) und sedimentologischen Gegebenheiten. Basierend auf den paläontologischen Ergebnissen wäre ein paläogenes, bzw. oligozänes Alter anzunehmen, obwohl weiteres Material diese stratigrafische Einstufung bestätigen sollte.

## **Introduction**

The Cenozoic As Pontes de García Rodríguez basin is located in Galicia/NW Spain (Fig. 1) and is one of the several Cenozoic basins developed in the northwestern corner of the Iberian plate (SANTANACH et al., 1988). The As Pontes Basin is one of the better known in Galicia thanks to the coal well exploration and open pit mining developed during the last twenty years (BACELAR et al., 1988). The here described fossil remains include the first vertebrate findings being published from this basin. A stratigraphical interpretation based on the fossil crocodile together with plant remains, as well as the palaeoecological conditions are discussed.

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## **Geological setting**

The As Pontes basin is 7 km long and 1.5 to 2.5 km wide, with a NW-SE orientation parallel to a major strike-slip fault (fig. 2). The basin resulted from lateral movements along this major fault which generated overthrusts and reverse faults which bound the northern basin margin. Normal faults which also controlled the basin evolution and divided the basin into two sub-basins (see BACELAR et al. 1988, 1992) were formed in the basin, too. To the south the basin infill deposits overlay unconformably the substratum.

The basin was infilled by non-marine deposits. Alluvial systems spread mainly from the active tectonic basin margins and from the eastern basin end and graded laterally into lacustrine-palustrine palaeoenvironments where coal accumulation was significative. The successions in the basin are made up of alluvial, swampy and lacustrine deposits the latter occurring only in the lower part of the basin infill. Coal seams are frequent in the sequences which developed in the central and southern parts of the basin. The coal bearing sequences pass by lateral and vertical transitions to the alluvial dominated ones which consists mainly of mudstones, sandstones and gravels which were deposited in fluvial plain environments.

## **Basin-Stratigraphy**

The sedimentary record of the basin usually started with the deposition of discontinuous, lenticular thin monomictic breccia levels which record the development of colluvial sedimentation with a minor clast reworking. The remaining sedimentary sequences overlay these basal deposits. On the basis of the relative development of terrigenous alluvial and lacustrine-palustrine deposits (including some of the lignite seams), the basin infill can be split into four major units, whose lithological composition and thickness change depending on its location in the diverse basin zones. A synthetic longitudinal stratigraphic section of the basin (Fig. 2, see fig. 1 for location) shows the major features of these units.

**Unit 1** This lower unit is up to 120 m thick in the western sub-basin and attains nearly up to 100 m in the eastern one. In the western sub-basin the lower part of this unit is formed by alluvial and lacustrine green mudstones and marls which bear bioclastic accumulations of limnic gastropods and ostracods. These lower terrigenous facies alternate with lignite seams and the whole succession is overlain by the first thick (up to 30 m) and complex coal bearing packet in the basin ("H" packet) which passes laterally into the marginal

alluvial facies of the western sub basin.

In the eastern sub-basin Unit 1 displays different facies with the development of a lower alluvial-lacustrine terrigenous dominated succession where limnic gastropods and ostracods occur. No major coal formation is recorded. The uppermost levels of the unit consist of bioclastic, sandy and carbonaceous mudstone deposits. The whole lacustrine terrigenous sequence passes also laterally into the alluvial marginal facies of the northern basin margin as well as into the alluvial facies coming from the eastern basin end zone.

- Unit 2 This unit is up to 120 m thick in the western sub-basin and attains up to 100 m in the eastern one. Differing from the underlying unit, coal deposits were formed in both sub-basins, where this unit shows similar lithological features. It consists in the inner basin zones of alternances of alluvial sandstones and mudstones and laterally extensive coal seams, up to several meters thick. These alternances of alluvial and lacustrine-swampy coal facies make up sequences, up to some meters in thickness.
- Unit 3 This unit is up to 30-40 m thick in both sub-basins and it is nearly exclusively made up by gray sandy mudstones, mudstones and whitish arkosic quartz sands, gravels and sandstones. The whole unit is dominated by the stacking up of proximal to distal alluvial deposits. Neither major coal deposits nor lacustrine facies occur in this unit. The whole unit records a wide spreading and progradation of the alluvial-fluvial facies coming from the surrounding basin areas on the pre-existing palustrine-swampy coal generating zones which were obliterated.
- Unit 4 This unit is up to 180 m thick in the western sub-basin and attains up to 140 m in the eastern one. Coal deposition took place in the whole basin and this unit shows similar lithological features in both sub basins. The unit consists in the inner basin zones of sequential alternances from a few to ten meters, of alluvial sandstones and mudstones and laterally extensive coal seams. No major lacustrine influence is observed in this unit which lower part includes one of the thickest (up to 30-40 m ) coal seam-packets in the basin. In the upper part of this unit the alluvial deposits become more and more dominant and no coal deposits occur in the uppermost sequences.

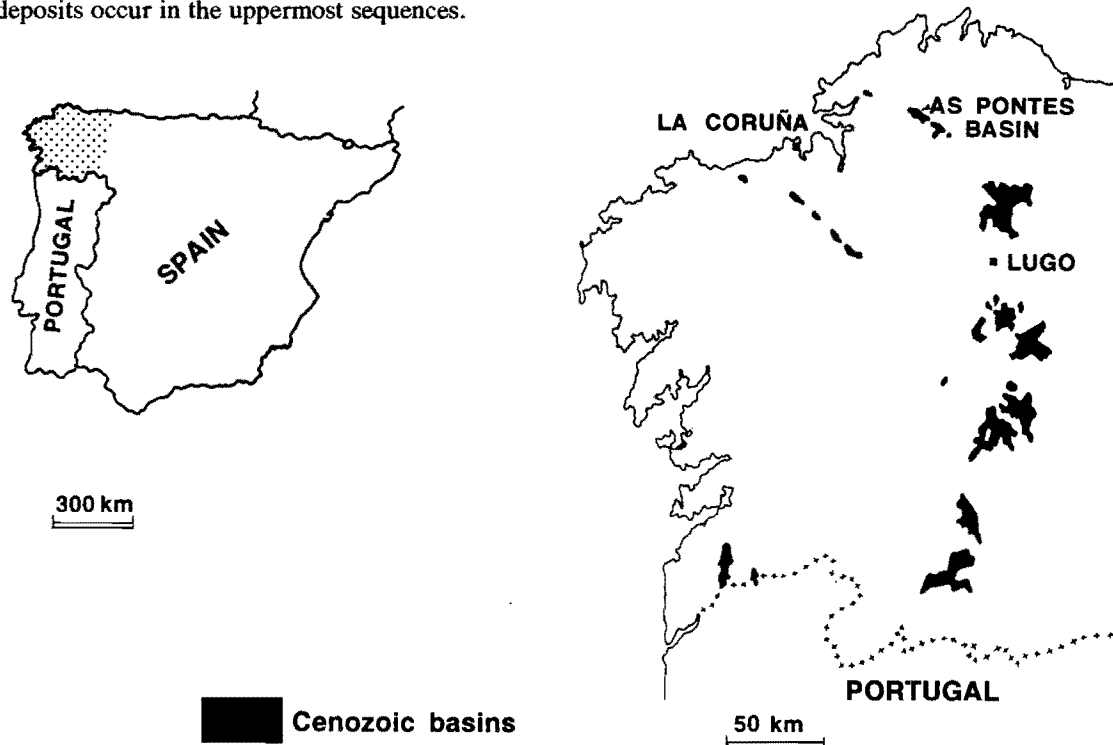


Fig. 1: Location of the As Pontes Cenozoic basin. The basin was formed by the activity of a NW-SE orientated strike-slip fault.

The available sedimentological data on the studied sequences show a noticeably change of the palaeoenvironmental conditions from the lower to the upper units. Thus the lower units 1 and 2 were deposited under environmental constraints which included perennial, closed lacustrine conditions, especially well developed in the lower unit 1. The sedimentary record of the exclusively alluvial unit 3, shows a distinctive change in the basin depositional framework. Neither major coal nor lacustrine deposits were deposited in this unit. Unit 4 records a partial return to the earlier coal generating conditions, but no lacustrine deposits were formed.

Most of the up to date available crocodilian remains have been recovered from the coal seam packet "H" in the W sub-basin (Fig. 2). They consist of several isolated teeth of diverse size, osteoderms and one lower jaw fragment. Teeth and osteoscutes were found in the upper part of the "H" packet, either completely isolated, scattered or forming minor bedded accumulations while the fragmented dentary was found in the open labour trench, in the "H" packet. The lignite and mudstone facies of the "H" packet records sedimentation developed in inner lacustrine and marginal lacustrine-palustrine zones influenced by minor terrigenous contributions impinged from terminal alluvial zones. The mudstones often display burrowing and in some cases bear limnic gastropodes (*Planorbidae*, *Lymnaea*). The jaw fragment has been recovered from a carbonaceous mudstone with coaly vegetal debris and seeds.

The fossil reptile remains were deposited after a reworking which caused a major disarticulation of the skeletons and a fragmentary record. In the eastern sub-basin the remains consist of isolated teeth which were found during the study of some of the coal well cores. The remains have been found isolated in carbonaceous, laminated lacustrine clays. These remains were recorded in levels which are correlatable with those of the "H" packet or with slightly upper levels.

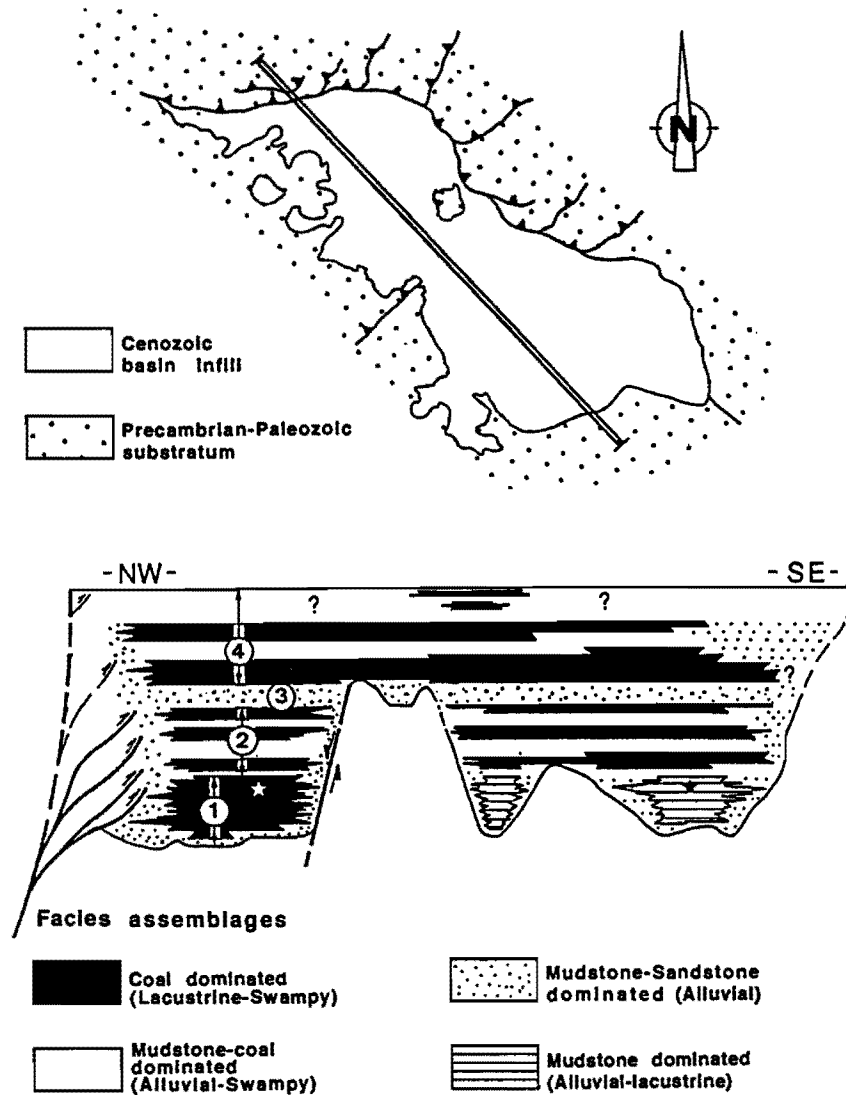


Fig. 2: Structural features of the As Pontes basin and lithological sketch (simplified from BACELAR et al. 1988, 1992) showing the four major sedimentary units there defined (numbers 1 to 4). Stars indicate the precedence of the crocodile fossil remains described in the paper, from coal packet "H" and the lacustrine facies of the eastern subfacies. See text for further explanation.

## The fossil material

### Vertebrate Remains

Crocodylidae GRAY, 1825

Alligatorinae KÄLIN, 1940

*Diplocynodon* POMEL, 1847

### *Diplocynodon* spec.

#### Material:

A left fragmentary dentary (dentale sinistral), isolated teeth and osteoderms. Original in the collection of As Pontes lignite mining industry (Colección de la Sección de Geología, ENDESA, Mina de As Pontes-La Coruña (Spain); casts deposited in the Instituto de Paleontología Dr.M.CRUSAFONT/E-Sabadell and in the Institute of Palaeontology, Bavarian State Collection (BSP Inv. Nr.1993 I 2).

#### Description:

A 94,1 mm long fragmentary left dentary with the linguodorsally well preserved symphysis has been taken out from a lignite block.

The generical attribution is based on the traditional characters of enlarged double alveole 3/4, shape of teeth, osteoderms (see MARTIN DE JESUS et al., 1987) and general morphological features. The alveolary pits 3, 8, 9 and 10 are empty, alveolaries 2 and 4 contain the broken tooth basis. Alveolaries 4, 5, 6, 7, 9 possess the germinating replacement tooth just reaching the jaw's ridge. The anterolateral part of the dentary is broken, as well as the posterior part at the height of the 10. tooth. The lingual area shows characteristic v-shaped striations originating posterobasally with anterodorsal ascending furrows.

The alveolaries 10 and 11 are broken at their bases. The labial area is typically crocodylid rugose, the upper labial half of that part of the jaw (from the 6th alveolary onwards) is smooth and with labial foraminas between the smooth and rugose surface texture.

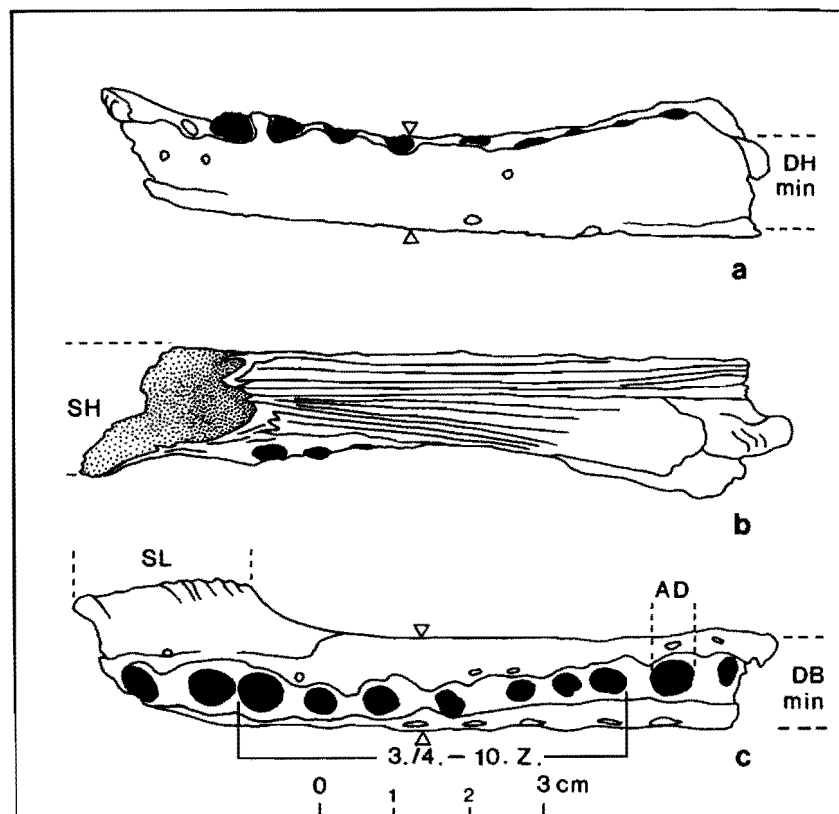


Fig. 3: Fragmentary left dentary from Puentes/Galicia and the biometrical parameters being taken (amplified from BERG, 1966).

Together with some biometrical values of the As Pontes specimen measurements, two furthermore species are added as they were not known to BERG (1966) and extend the ranges in the diagrams given by the latter author. Biometrical values sensu BERG (1966; amplified):

*Diplocynodon* spec. from As Pontes

Symphysenhöhe	16,6 mm
Symphysenlänge	25,6 mm
min. Unterkieferhöhe	13,0 mm
Länge 3/4 bis 10. Zahn	47,5 mm
Symph. L/H ratio %:	154 %
DHmin/L3,4-10Z ratio %:	27 %
medialer Symphyseninnenrand - Außenkante Alveole	23,7 mm
min Dextralebreite auf Höhe 6./7. Zahn:	13,6 mm

max. (=ant.-post.) Alveolendurchmesser (AD) in mm:

A1?, A2:5,9, A3:5,5, A4:5,3, A5:3,5, A6:4,1, A7:3,9, A8:3,7, A9:3,4, A10:4,5, A11:5,7

Other *Diplocynodon* taxa from different old known tertiary localities

	<i>D. buetikonensis</i> from Germany Sandelzhausen (MN 6, BSP 1959 II 417)	<i>D. levanticum</i> from Bulgaria (Pliocene, cast: BSP 1980 I 27)	<i>D. tormis</i> from Salamanca (Eocene, IPMC)
Symphysenhöhe	11,2 mm	16,8 mm	(9,3) mm
Symphysenlänge	30,6 mm	32,2 mm	(22,5) mm
min. Unterkieferhöhe	12,2 mm	16,0 mm	</= 10 mm
Länge 3/4 bis 10. Zahn	42,5 mm	63,1 mm	- mm
Symph. L/H ratio %:	273 %	192 % (STEEL:210%)	(230 %)
DHmin/L3,4-10Z ratio %:	29 %	30 %	
medialer Symphyseninnenrand - Außenkante Alveole			11,0 mm
min Dextralebreite auf Höhe 6./7. Zahn:			

( ): values estimated as not being preserved isolated

Discussion:

According to the traditional knowledge the generic attribution of the As Pontes specimen is doubtless, but the specific level is uncertain as it is in most of the fossil material of *Diplocynodon* s.l. From Europe probably the youngest record is given by the ?Pliocene *Diplocynodon levanticus* HUENE 1963 from Bulgaria and still undescribed material from Southern Spain, while the older ones date back to the Eocene. BUSCALIONI et al. are listing 9 different species for the Tertiary of Europe. The As Pontes specimen has been related to the diagrams given by BERG (p.45/46) for biometrical values of the lower jaws. Thus one approaches to values being given for *D. darwini/eberti* and *D. hantoniensis* (Fig. 3b in BERG) or *D. rateli/gracilis* (Fig. 3c in BERG). Latter one might be due to the juvenile size of the As Pontes specimen that here generally lies in the range of the regressive curve of *D. hantoniensis*, too. *D. darwini/eberti* is known from Lutet, *D. hantoniensis* from Ludien to Sannoisien. The most recent publication by BUSCALIONI et al. (1992) revealed that *D. eberti* might be an invalid taxon and belongs to *Baryphracta* FREY. According to these authors only three species are now restricted to the genus: *Diplocynodon tormis*, *D. rateli* and *D. gervaisi*. But as the results of BUSCALIONI et al. still needs furthermore to be extended we continue with the elder systematical interpretation of the group: "The genus is restricted to the terminal taxa of the clade" (BUSCALIONI et al., p.23), but further informations for the bulk of the remaining species of the traditional taxa are completely disregarded and the question must arise what the real value of such cladistical treatment shall be. Additionally, the new specific name, referring to the river Tormes as *D. tormis* should be *tormensis*, according to a verbal communication by M.L. CASANOVAS. In respect to the high variability of the crocodilian skulls also mentionworth seem the detailed phenetical analysis on crocodilian skulls given by KÄLIN (1933) focusing on the extreme variabilities amongst crocodilian skulls.

Due to these incompletenesses of this recentmost description/revision it is argued here -by all respect to cladistical analysis- for continuation of the maintenance of the traditional genus *Diplocynodon* until a more comprehensive study/revision of the whole genus (*Diplocynodon* s.l.) is given.

The only partially revision of the former genus *Diplocynodon* also lacks information on the lower jaw bones

even for the new species *D. tormis* BUSCALIONI et al. (1992) as well as biometrical values. Neither indications on the intra-, inter-specific, intergeneric variabilities are given nor are the paratypes described. BUSCALIONI herself is writing: (pag.6) "Nevertheless, a new approach is necessary to understand variability that is seen in the Spanish material (ORTEGA, 1990; ORTEGA & BUSCALIONI, in prep.), in light of the divergence in the conformation of the skull structure of certain recent crocodylians (eg. *Caiman crocodilus*)."

Whether fragmentary jaw remains or isolated teeth might furtheron still taxonomically be treated -like thoroughly presented by MARTIN DE JESUS et al. is not expressed by BUSCALIONI et al. and future taxonomy thus remains still uncertain.

Due to the above mentioned circumstances, the present description must lack systematical discussion and is provided just with objective morphometrical characters as a comparative basis for isolated teeth, osteoderms or the dentary has not been given by BUSCALIONI et al. BUSCALIONI (1986) herself mentioned in a former paper numerous localities from the Tertiary with the presence of *Diplocynodon*, but all these references must taxonomically be regarded as being worthless now.

The fossil crocodile record from Spain has been rather comprehensively documented by BUSCALIONI (1986). She recognizes the genera *Asiatosuchus*, *Diplocynodon*, *Hispanochampsia*, *Iberosuchus*, cf. *Tomistoma* and cf. *Pristichampsus*.

From the Tertiary of Europe following crocodile genera, according to recentmost literature are recognized:

**E u s u c h i a**, (ANTUNES 1961, BUFFETAUT et al. 1984)

*Pristichampsus*: BRD-Spain; Cuisien-Lutetien

*Tomistoma*: Portugal- ?Spain, Austria; Miocene, syn. *Gavialosuchus* sensu ANTUNES 1989: Austria-France; Middle Miocene

?*Gavialis*: Miocene - Western Europe

?*Crocodylus*: Oligo-Miocene - Germany (ROGER 1911, SCHLEICH 1986)

*Diplocynodon*: Europe - ?Paleocene, Eocene-Pliocene

*Hispanochampsia*: Spain, Oligocene

*Allognathosuchus*: Germany, Belgium, ?Europe generally (BUFFETAUT 1985)

*Asiatosuchus*: Europe, Eocene

*Baryphracta*: Germany, Eocene

**M e s o s u c h i a**, - (see ANTUNES 1986, BUFFETAUT 1988, GROESSENS VAN DYCK 1982, 1985)

*Bergisuchus*: Germany-Belgium; Lutetien, Sparnacium

*Iberosuchus*: France-Portugal, Lower Lutet-Bartonien, ?Ludien

## Palaeobotanical Remains

### Fructifications

Besides some at the moment not more determinable palaeobotanical macrorests being interpreted as Nymphaean seeds a furthermore half of a seed could be identified as belonging to *Stratiotes*. The seeds of this predominantly limnic restricted genus is characterized by evolutionary morphological changes first interpreted CHANDLER (1923). Besides alterations in form and sculpture, the evolutionary tendencies are recognizable in the position of the hilum, the course of the raphe and the formation of the micropylary ridge (HOLY & BUZEK). These morphological features allow a crude stratigraphical attribution of the fossil.

The 6 mm long and 3 mm wide prominently sculptured seed shows a cylindrical form with a not much separated micropylary ridge and a rather weak dorsal keel, together with a diagonal orientated raphe and a subbasal situated hilum. These features are restricted to the rather rare species *Stratiotes neglectus* CHANDLER.

## Sporomorphs

About 20 sporomorphs have been found in one sample (the crocodile fossil bearing sediment!) and are interpreted as follows:

Sporomorphs	Botanical Interpretation	Stratigraphical Range	Facies and/or climatic interpretation
<i>Leiotriletes maxoides</i>	<i>Lygodium</i>	Eocene - Pliocene	Humid, warm
<i>Ischyosporites foveasolidus</i>	Schizaeaceae	Paleogene, rarely to Miocene	?
<i>Toroisporis</i> spec.	?	Late Triassic-Paleogene-Neogene	?
<i>Baculatisporites nanus</i> cf. <i>baculatus</i>	Osmundaceae	Mio-Pliocene	Humid, ?warm
?	? <i>Lycopodium</i>	?	?
<i>Echinatisporis</i> cf. <i>cycloides</i>	?	?	?
<i>Pityosporites</i> spp.	<i>Pinus</i>	Cretaceous to recent	Ubiquist
<i>Inaperturopollenites concedipites</i>	<i>Taxodium</i> and <i>Glyptostrobus</i>	Eocene - Pliocene	Swamp forests
<i>Sparganiaceapollenites</i> spec.	<i>Sparganium</i>	Paleocene-Pliocene	Verlandungszone
<i>Cyperaceapollis</i> spec.	Cyperaceae	?Eocene - Pliocene	?
<i>Monogemmites</i> spec.	Algal cysts, Hydrocharitaceae, <i>Pandanus</i>		Water, swampy areas
? <i>Nymphaepollenites</i> spec.	?Nymphaeaceae	?	?Water habitats
<i>Emmapollis pseudoemmaensis</i>	?Chloranthaceae	Cretaceous upper - Miocene	-"
<i>Triatriopollenites rurensis</i>	<i>Myrica</i>	Paleocene - Miocene	Swampy moor, brushes
<i>Tricolpopollenites l. liblarensis</i>	Fagaceae	Paleocene - Miocene	Diverse forests
<i>T. quisqualis</i>	Fagaceae	Paleocene-Eo-?Miocene	-"
<i>Tricolporopollenites cingulum fusus</i>	?Fagaceae	<u>Eo</u> - Miocene	-"
<i>T. cing. pusillus/fusus</i>	-?-	<u>Eo</u> - Mio/Pliocene-Recent?	-"
<i>Tetracolporopollenites</i> spec.	Sapotaceae	?Eocene - Miocene	Tropical evergreen forests
<i>Ovoidites</i> spp.	Algal cysts	Ubiquiste	Water habitats

## Palaeoenvironmental and Palaeoclimatological Setting

The palaeoenvironmental setting of the deposits which include the *Diplocynodon* remains were essentially lacustrine-swampy zones developed under at least partially closed conditions. The tectonic structures which generated the basin allowed the generation of these limnic environments at the foot of the terminal alluvial zones. The lignite and mudstone facies of the "H" packet records sedimentation developed in inner lacustrine and marginal lacustrine-palustrine zones influenced by minor terrigenous contributions impinged from terminal alluvial zones. The occurrence of limnic fossil remains (Porifera, Gastropoda) either in the lignites or in the associated mudstones as well as their sedimentological features (frequent fine lamination) point to dominant subaqueous depositional conditions, although with occasional water level oscillations and even subaerial exposure periods. Palaeobotanical remains (palynomorphs, aquatic plant seeds and fructifications) associated to the reptilian fossils have enabled to confirm some of the above mentioned sedimentologically deduced palaeoenvironmental features and to establish some more referred to palaeoclimatic conditions.

The study of the palynomorphs shows the occurrence of algal cysts (*Ovoidites*, *Monogemmites*) and other aquatic plants (Nymphaeaceae, Hydrocharitaceae, etc.), of mesothermic swamp trees (*Taxodium*, *Glyptostrobus*) associated to megathermic plants which require high humidity, either climatic or edaphic (Sapotaceae). Other taxa with high temperature and humidity requirements (*Lygodium*, Osmundaceae) also occur, together with others not determinable or less significative in terms of palaeoclimatology (Schizaeaceae, ?*Lycopodium*, *Pinus*, *Sparganium*, Cyperaceae, Fagaceae). This palynological assemblage shows the dominance of megathermic and mesothermic (subtropical) taxa with high humidity requirements, some of them well represented nowadays in Southeastern Asia.

The aquatic plant remains and the palynomorphs associated with *Diplocynodon* in the lower part of the basin infill in the As Pontes basin confirm the development of aquatic, limnic-swampy dominated environments and point to the existence of warm and humid subtropical palaeoclimatic conditions. These facts agree well with the palaeoenvironmental requirements of the described crocodilian taxon. *Diplocynodon* s.l. might be interpreted as a rather ubiquitary genus, being present throughout the whole Tertiary of Europe, like other herpetofaunistical



elements/genera e.g. *Trionyx* s.l. but still indicating favourable warm climatic conditions like e.g. being known for the extant genus *Alligator*. Only the coexistence with other tropical palaeogene herpetofaunal elements rectify a palaeoclimatological interpretation.

### Stratigraphical Interpretation

According to the existing knowledge, the age of the *Stratiotes neglectus* bearing sediments are to interpret as lower till middle Oligocene. Upto nowadays knowledge, *Stratiotes neglectus* is only known from several localities from England (see CHANDLER). References for a distribution in Poland and possibly from Czechoslovakia are according to HOLY & BUZEK still necessary to be proved.

According to BERG (1966: 45) the relative length of the symphyses (=length/height) is generally shorter in paleogene species of the genus *Diplocynodon* than in neogene forms. Correlating the values of the As Pontes specimen with his diagram (pag. 45, fig. 3b) one reaches the range of the species *styriacus*, *rateli/gracilis*, *darwini* and *hantoniensis*. In diagram 3c (pag. 46) the ratio (%) of min. height of lower jaw : length between 3/4 th and 10th tooth are expressed. This ratio is according to BERG greater in geologically elder forms than in younger ones. In this case, the As Pontes specimen lies in the range of *D. rateli/gracilis* and herewith is corresponding to upper Oligocene and Lower Miocene forms.

In terms of establishing the possible chronostratigraphy of the lower part of the As Pontes basin infill the study of the *Diplocynodon* remains and the associated palynomorphs and vegetal macrorests have enabled to establish:

1. The biometrical data of the studied specimen of *Diplocynodon* from As Pontes show affinities with forms known from the Paleogene.
2. The palynomorph assemblage here described does not show any characteristic form exclusively restricted to the Paleogene although some of the recognized forms (*Ischyosporites*, *Toroisporis*, *Tricolporopollenites quisqualis* and *T. fusus*) are specially frequent in pre-neogene sequences.
3. The aquatic *Stratiotes neglectus* has been recorded up to date in oligocene sediments.

These data can be contrasted against previously available palynological data (MEDUS, 1963; NONN & MEDUS, 1963; BALTUILLE et al. 1990, 1992) which have arisen in diverse chronostratigraphic interpretations. Palynological assemblages resulting from an exhaustive sampling of the middle and upper parts of the basin infill have been attributed to the Middle-Upper Miocene age (MEDUS, 1963; NONN & MEDUS, 1963). Other investigators have established on the basis of a preliminary sampling, the presence of floral elements which they interpret as characteristic of the Late Oligocene-Early Miocene? (BALTUILLE et al., 1992)

The new data contributed in the present paper are not considered significant enough to precise the As Pontes basin infill dating, although the possibility of an Oligocene-Early Miocene age, at least for the lower parts of the sequences, seems to be reinforced. Nevertheless it must be emphasized that the cenozoic palaeoclimatic changes in the Galician region could imply a peculiar evolution of the vegetal assemblages, resulting from its geographical location in the northwestern corner of Iberia, facing the Atlantic Ocean. A longer persistence until the Miocene, of some plant taxa which could disappear earlier in other western european zones cannot be disregarded. Complementary informations are necessary to confirm or refuse this possibility.

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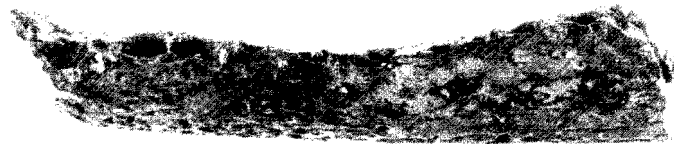
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1a



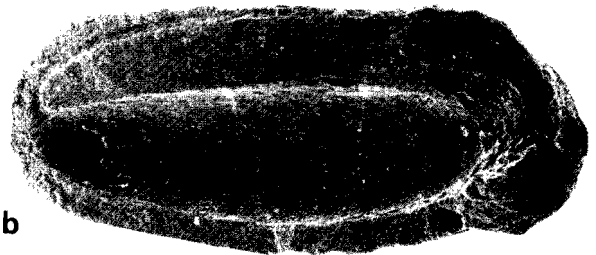
1b



1c



a

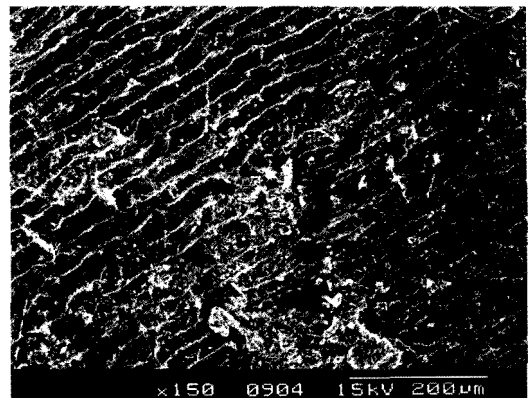
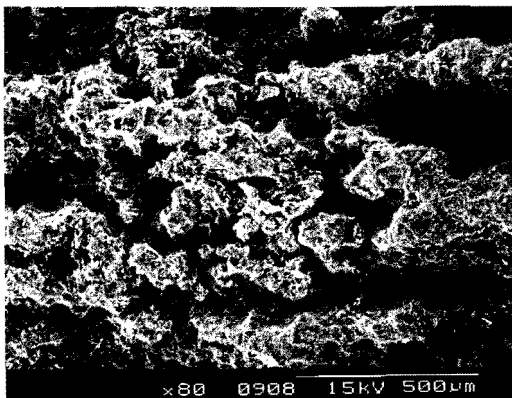


b

2

c

d



## Plate 1

Fig. 1: *Diplocynodon spec.*, As Pontes (Galicia, Spain), Oligocene. Original lignite mining industry As Pontes, cast Bayerische Staatssammlung f. Paläontologie & Hist. Geologie BSP 1993 I 2.

Fragmento del Dentale izquierda de *Diplocynodon spec.* de Puentes/Galicia (original Puentes/Galicia)

- a) vista oclusal,
- b) vista lingual,
- c) vista dorsolabial

Fig. 2: *Stratiotes neglectus* CHANDLER, 1923, As Pontes (Galicia, Spain), Oligocene.

- a) external view,
- b) internal view showing the raphe in the uppermost ridge
- c) detail of external view,
- d) detail of internal celular structur