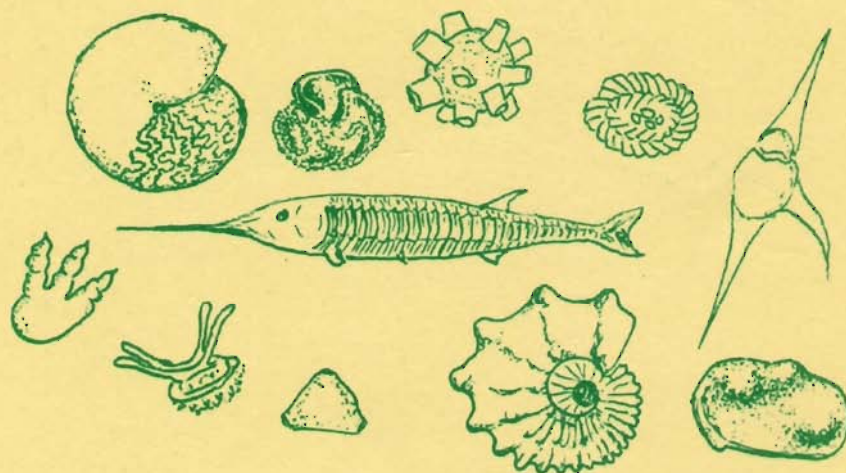


STRATIGRAPHIC RANGE OF CRETACEOUS MEGA- AND MICROFOSSILS OF BRAZIL

Edited by

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INSTITUTO DE GEOCIÊNCIAS



4.2. The Rio do Peixe Basin

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Characterization of the basin

The Rio do Peixe Basin is a little interior sedimentary area of approximately 1,080 km² localized in the State of Paraíba, North-eastern Brazil. The outcrops are of easy access through the roads between Sousa and Aparecida, Brejo das Freiras and Cajazeiras, Antenor Navarro and Sousa, Poço and Uiraúna, and Brejo das Freiras and Uiraúna near the Passagem river (Fig. 1).

The basin evolved during a transcurrent fault system displacement at the beginning of South America-Africa drifting during Cretaceous times (Fig. 1). The resulting graben is internally faulted by a main E-W striking fault.

Its sedimentary infill was deposited in a nonmarine depositional environment under hot climatic conditions, and comprises mainly aluvial clastics, which interfingers with sediments of fluvial and lacustrine origin. The lakes were temporary.

The section is constituted of about 260 meter thick red beds, distributed in a long and irregular belt, and comprises three lithostratigraphic units. Coarse clastics of the basal Antenor Navarro Formation interfinger with rhythmic sandstones, siltstones and shales of the Sousa Formation. Coarse clastics of the uppermost Piranhas Formation finishes the sedimentary cycle (Fig. 2).

Fossil content

The Sousa and Antenor Navarro formations contain a poor invertebrate fossil assemblage, in general preserved as impressions or molds. The described invertebrate fossils are several conchostraceans (Carvalho, 1989 (5); Tinoco and Katoo, 1975 (11)), ostracods (Braun, 1966, 1969, 1970 (2, 3, 4); Mabeoone and Campanha 1973/74 (9)) and some invertebrate ichnofossils (Carvalho, 1989 (5); Muniz, 1986 (10)). But dinosaurs footprints (Leonardi, 1979, 1984 (6, 7)) also occur in the same formations.

Lima and Coelho, 1987 (8) were the only authors to publish palynological data on the Rio do Peixe Basin. The studied material comes from a borehole of 1000 m, at the locality of Lagoa do Forno. The assemblages are dominated by rimulate pollen grains (up to 92%). Inaperturate and monocolpate forms are also important. Trilete spores become important in the upper part of the section. The occurrence of several dissacate pollen species show an unknown diversity for the Brazilian Lower Cretaceous.

The ostracod record suggests an age ranging from Rio da Serra through Alagoas (Braun, 1966, 1970 (2, 4); Mabeoone and Campanha

1973/74 (9)). Recent biostratigraphic analysis of the palynological content (Lima and Coelho, 1987 (8)) indicates that the sedimentary sequence were deposited during a much shorter time interval, probably corresponding to the Aratu.

Identified fossils

Conchostraceans

Cyzicus (*Lioestheria*) *barbosai* (Almeida, 1950) (5, 11)
Estheriella fernandoi (Cardoso, 1965) (5, 11)
Estheriella lucianoi (Maury, 1934) (5)
Estheriina freibergeri Cardoso, 1971 (5, 11)
Palaeolimnadiopsis cf. *P. reali* Teixeira, 1960 (5, 11)

Ostracods

Bisulcocypris sp. (9)
Brasacypris sp. (9)
Brasacypris ovum Krömmelbein, 1965 (4)
Candona cf. *C. condensa* Krömmelbein, 1962 (9)
Candona cf. *C. redunca* Krömmelbein, 1962 (9)
Candona sp. (3)
Cypridea cf. *C. ambigua* Krömmelbein, 1962 (3)
Cypridea lunula Krömmelbein, 1962 (9)
Cypridea vulgaris Krömmelbein, 1962 (2)
Darwinula sp (2)
Darwinula cf. *D. leguminella* (Forbes), 1855 (9)
Darwinula cf. *D. oblonga* (Roemer, 1839) (9)
Ilyocypris sp. (3)
Paraschuleridea sp. 5 (3)
Paraschuleridea micropunctata n. nud. (9)

Vertebrates

Lepidotes sp. (1)

Ichnofossils

- Invertebrate ichnofossils

? *Arenicolites* sp. (5)
Cochlichnus sousensis Muniz, 1986 (10)
? *Lophoctenium* sp. (5)
? *Taenidium* sp. (5)

- Vertebrate ichnofossils

Caririchnium magnificum Leonardi, 1984 (7)
Moraesichnium barberenae Leonardi, 1979 (6)
Sousaichnium pricei Leonardi, 1979 (6)
Staurichnium diogenis Leonardi, 1979 (6)

Plants

Otozamites sp. (3)
 Podozamites sp. (3)

Spores

Acanthotriletes varispinosus Pocock, 1964 (8)
Appendicisporites parviangulatus Döring, 1966 (8)
Appendicisporites sellingsii Pocock, 1964 (8)
Biretisporites potoniaei Delcourt & Sprumont, 1955 (8)
Bullasporis aequatorialis Krutzsch, 1959 (8)
Cicatricosisporites crassistriatus Burger, 1965 (8)
Cicatricosisporites exilioides (Malyawkina, 1949) Dörhöfer, 1977 (8)
Cicatricosisporites microstriatus Jardine & Magloire, 1965 (8)
Cicatricosisporites reticicatricosus Döring, 1965 (8)
Cicatricosisporites sewardi Delcourt & Sprumont, 1965 (8)
Cicatricosisporites subrotundus Brenner, 1963 (8)
Cicatricosisporites cf. *C. augustus* Singh, 1971 (8)
Concavisporites obtusangulus (Potonié, 1934) Flug, 1953 (8)
Concavissimisporites variverrucatus (Couper, 1958) Brenner, 1963 (8)
Deltoidospora hallii Miner, 1935 (8)
Deltoidospora juncta (Kara Murza, 1956) Singh, 1964 (8)
Densoisporites microrugulatus Brenner, 1963 (3)
Dictyophyllidites harrisi Couper, 1958 (8)
Echinatisporis sp. (8)
Gemmatriletes cf. *G. clavatus* Brenner, 1963 (8)
Ischyosporites variegatus (Couper, 1958) Schultz, 1967 (8)
Leiotriletes cf. *L. breviradiatus* Döring, 1965 (8)
Leptolepidites crassibalteus Filatoff, 1975 (8)
Leptolepidites major Couper, 1953 (8)
Leptolepidites verrucatus Couper, 1953 (8)
Matthesisporites tumulosus Döring, 1964 (8)
Perotriletes pseudoreticulatus Couper, 1953 (8)
Pilosporites cf. *P. semicapillosus* Dörhöfer, 1977 (8)
Stereisporites psilatus (Ross, 1949) Manun, 1954 (8)
Todisporites major Couper, 1958 (8)
Undulatisporites pannuceus (Brenner, 1963) Singh, 1971 (8)
Undulatisporites undulapolus Brenner, 1963 (8)

Pollen grains

Alisporites bilateralis Rouse, 1957 (8)
Araucariacites limbatus (Balme, 1957) Habib, 1969 (8)
Bennettitaepollenites minimus Singh, 1971 (8) cf. *Bennettitaepollenites* sp. (8)
Circulina parva Brenner, 1963 (8)
Classopollis minor Pocock & Jansonius, 1962 (8)
Classopollis simplex (Danze-Corsin & Laveine, 1963) Reiser & Willians, 1969 (8)
Classopollis torosus (Ressinger, 1950) Couper, 1958 (8)
Cedripites cretaceous Pocock, 1964 (8)
Coptospora aequalis Tralau, 1968 (8)
Coptospora kutchensis Venkatachala, 1968 (8)
Cycadopites carpentieri (Delcourt & Sprumont, 1955) Singh, 1971 (8)
Cycadopites follicularis Wilson & Webster, 1946 (8)

- Cycadopites giganteus* Stanley, 1965 (8)
Cycadopites glottus (Brenner, 1963) Wingate, 1980 (8)
Cycadopites minimus (Cookson, 1947) Pocock, 1964 (8)
Cycadopites cf. *C. dijksrae* Jansonius, 1962 (8)
Cycadopites sp. 1 (8)
Cycadopites sp. 2 (8)
Dicheiropollis etruscus Trevisan, 1971 (8)
Equisetosporites cancellatus Paden Phillips & Felix, 1971 (8)
Equisetosporites ovatus (Pierce, 1961) Singh, 1971 (8)
Equisetosporites virginiaensis Brenner, 1963 (8)
Eucommiidites minor Groot & Penny, 1960 (8)
Eucommiidites troedssonii (Erdtman, 1948) Hughes, 1961 (8)
Eucommiidites sp. 1 (8)
Eucommiidites sp. 2 (8)
 cf. *Exesipollenites tumulus* Balme, 1957 (8)
Gamerroites sp. 1 (8)
Gamerroites sp. 2 (8)
Gnetaceaepollenites boltenhageni Dejax, 1985 (8)
Gnetaceaepollenites lajwantis Srivastava, 1968 (8)
Gnetaceaepollenites uesuguii Lima, 1980 (8)
Gnetaceaepollenites sp. (8)
Inaperturopollenites turbatus Balme, 1957 (8)
Inaperturopollenites cf. *I. dubius* (Potonié & Venitz, 1934) Thomson & Pflug, 1953 (8)
Inaperturopollenites cf. *I. pattellaeformis* Pflug & Thomson, 1953 (8)
Peltrandipites sp. (8)
Phyllocladidites inchoatus (Pierce, 1961) Norris, 1967 (8)
Pinuspollenites sp. (8)
Podocarpidites alareticulosus Sah & Jain, 1965 (8)
Podocarpidites biformis Rouse, 1957 (8)
Podocarpidites ellipticus Cookson, 1947 (8)
Podocarpidites epistratus Brenner, 1963 (8)
Podocarpidites typicus Sah & Jain, 1965 (8)
Podocarpidites cf. *P. arcticus* Pocock, 1964 (8)
Podocarpidites cf. *P. fangii* Pocock, 1964 (8)
Podocarpidites cf. *P. multesimus* (Bolikhovitina, 1956) Pocock, 1962 (8)
Podocarpidites cf. *P. selowiformis* (Zaklinskaya, 1957) Drugg, 1967 (8)
 cf. *Rugubivesiculites* sp. (8)
Sergipea cf. *S. naviformis* Regali et alii, 1974 (8)
Sergipea cf. *S. simplex* Regali et alii, 1974 (8)
Sergipea cf. *S. variverrucata* Regali et alii, 1974 (8)
Steevesipollenites sp. (8)
Vitreisporites pallidus (Reissinger, 1950) Nilsson, 1958 (8)
Vitreisporites cf. *V. itunensis* Pocock, 1964 (8)
Zonallapollenites dampieri Balme, 1957 (8)
Zonallapollenites microvelatus Schultz, 1966 (8)
Zonallapollenites trilobatus Balme, 1957 (8)

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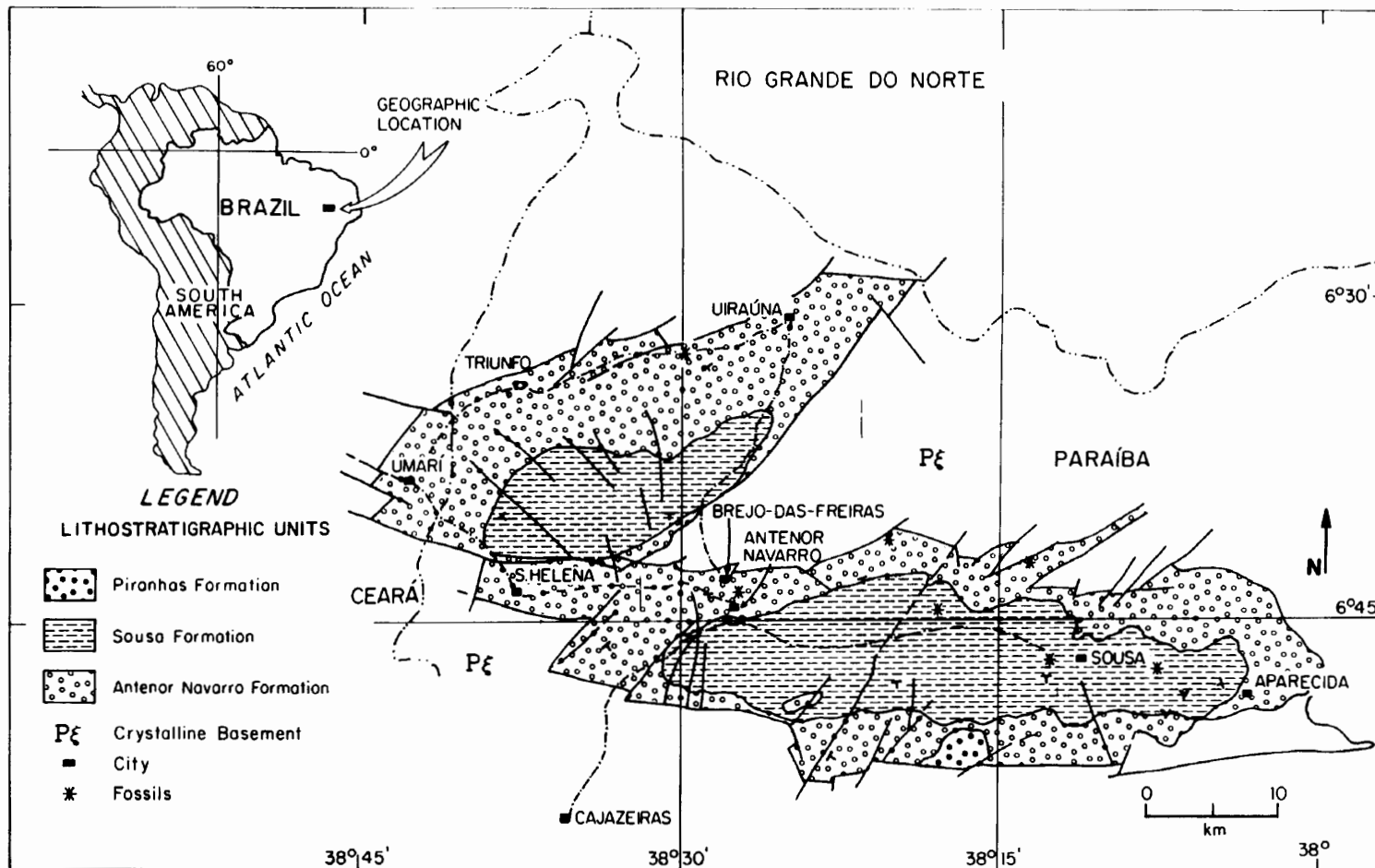


Figure 1

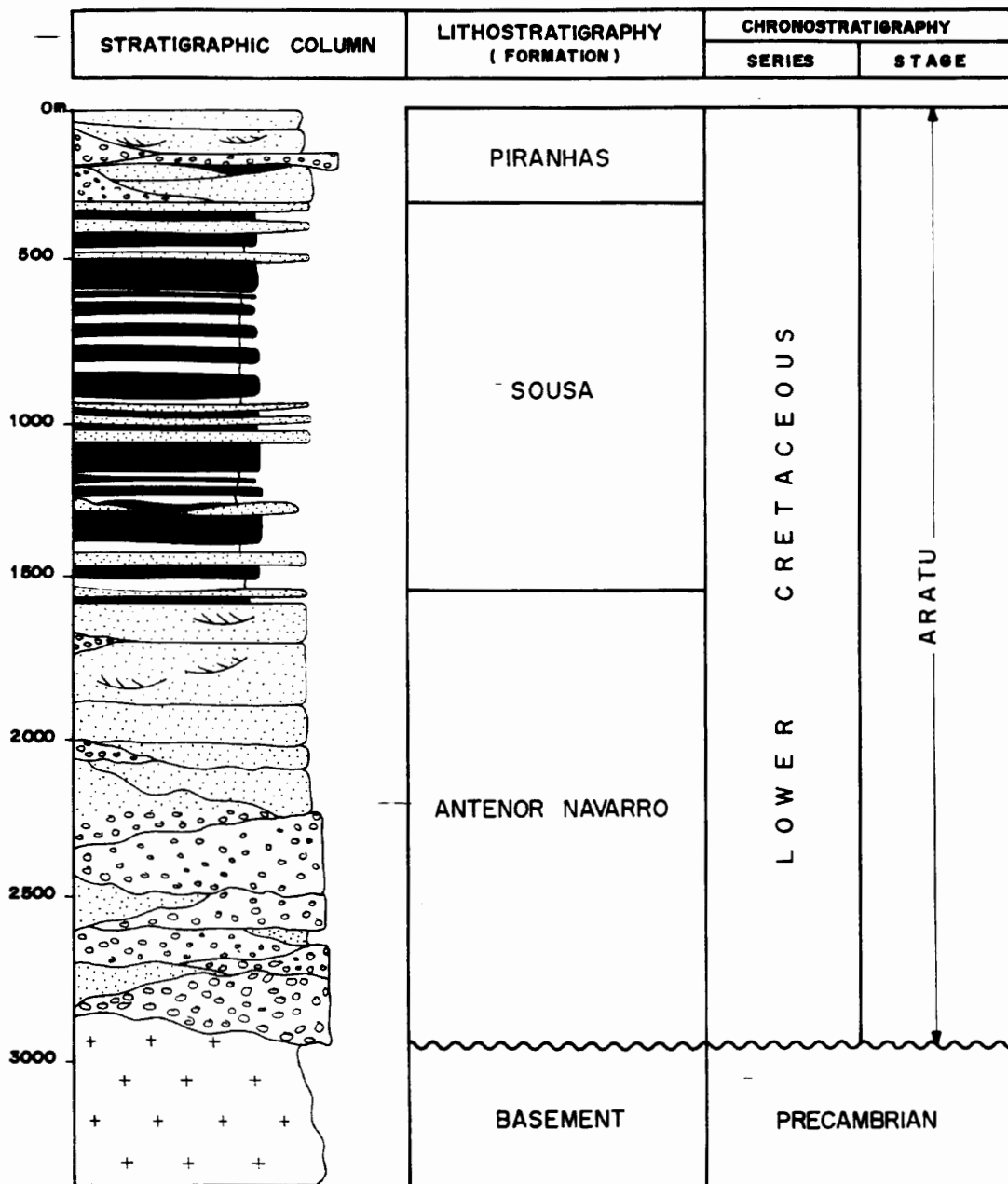


Figure 2 - Rio do Peixe basin stratigraphy.

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
<i>Acanthotriletes varispinosus</i> (8)						
<i>Appendicisporites parviangulatus</i> (8)						
<i>Appendicisporites selligii</i> (8)						
<i>Biretisporites potoniaei</i> (8)						
<i>Bullasporis aequatorialis</i> (8)						
<i>Cicatricosisporites crassistriatus</i> (8)						
<i>Cicatricosisporites exilioides</i> (8)						
<i>Cicatricosisporites microstriatus</i> (8)						
<i>Cicatricosisporites recticicatricosus</i> (8)						
<i>Cicatricosisporites sewardi</i> (8)						
<i>Cicatricosisporites subrotundus</i> (8)						
<i>Cicatricosisporites cf. C. augustus</i> (8)						
<i>Concavisporites obtusangulus</i> (8)						
<i>Concavissimisporites variverrucatus</i> (8)						
<i>Deltoidospora hallii</i> (8)						
<i>Deltoidospora juncta</i> (8)						
<i>Densoisporites microrugulatus</i> (8)						
<i>Dyctyophyllidites harrisi</i> (8)						
<i>Echinatisporis sp.</i> (8)						
<p>————— common</p> <p>REMARK: Spores</p>						

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN				ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES				
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	
<i>Gemmatriletes</i> cf. <i>G. clavatus</i> (8)					
<i>Ischyosporites variegatus</i> (8)					
<i>Leiotriletes</i> cf. <i>L. breviradiatus</i> (8)					
<i>Leptolepidites crassibalteus</i> (8)					
<i>Leptolepidites major</i> (8)					
<i>Leptolepidites verrucatus</i> (8)					
<i>Matthesisporites tumulosus</i> (8)					
<i>Perotriletes pseudoreticulatus</i> (8)					
<i>Pilosporites</i> cf. <i>P. semicapillosus</i> (8)					
<i>Stereisporites psilatus</i> (8)					
<i>Todisporites major</i> (8)					
<i>Undulatisporites pannuceus</i> (8)					
<i>Undulatisporites undulapulus</i> (8)					
<p>————— common</p> <p>REMARK: Spores</p>					

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
Alisporites bilateralis (8)						
Araucariacites limbatus (8)						
Bennettitaecuminella sp. (8)						
Bennettitaepollenites minimus (8)						
Circulina parva (8)						
Classipollis minor (8)						
Classipollis simplex (8)						
Classipollis torosus (8)						
Ceproidites cretaceus (8)						
Coptospora aequalis (8)						
Coptospora kutchensis (8)						
Cycadopites carpentieri (8)						
Cycadopites follicularis (8)						
Cycadopites giganteus (8)						
Cycadopites glottus (8)						
Cycadopites minimus (8)						
Cycadopites cf. C. dijkstrae (8)						
Cycadopites sp. 1 (8)						
Cycadopites sp. 2 (8)						
<p>————— common</p> <p>REMARK: Pollen Grains</p>						

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN				ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES				
	RIO DA SERRA	ARATU	BURACICA	JIQUEIA	
<i>Dicheiropollis etruscus</i> (8)					
<i>Equisetosporites cancellatus</i> (8)					
<i>Equisetosporites ovatus</i> (8)					
<i>Equisetosporites virginiaensis</i> (8)					
<i>Eucommiidites minor</i> (8)					
<i>Eucommiidites troedssonii</i> (8)					
<i>Eucommiidites</i> sp. 1 (8)					
<i>Eucommiidites</i> sp. 2 (8)					
cf. <i>Exesipollenites tumulus</i> (8)					
<i>Gameroites</i> sp. 1 (8)					
<i>Gameroites</i> sp. 2 (8)					
<i>Gnetaceaepollenites boltenhageni</i> (8)					
<i>Gnetaceaepollenites lajwantis</i> (8)					
<i>Gnetaceaepollenites uesuguii</i> (8)					
<i>Gnetaceaepollenites</i> sp. (8)					
<i>Inaperturopollenites turbatus</i> (8)					
<i>Inaperturopollenites</i> cf. <i>I. dubius</i> (8)					
<i>Inaperturopollenites</i> cf. <i>I. pattellaeformis</i> (8)					
<i>Peltrandipites</i> sp. (8)					

—— common

REMARK: Pollen Grains

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JIQUEIA	ALAGOAS	
Phyllocladites inchoatus (8)						
Pinuspollenites sp. (8)						
Pocarpidites alareticulosus (8)						
Podocarpidites biformis (8)						
Podocarpidites ellipticus (8)						
Podocarpidites epistratus (8)						
Podocarpidites typicus (8)						
Podocarpidites cf. P. arcticus (8)						
Podocarpidites cf. P. fangii (8)						
Podocarpidites cf. P. multisimus (8)						
Podocarpidites cf. P. selowiformis (8)						
cf. Rugubivesiculites sp. (8)						
Sergipea cf. S. naviformis (8)						
Sergipea cf. S. simplex (8)						
Sergipea cf. S. variverrucata (8)						
Steevesipollenites sp. (8)						
Vitreisporites pallidus (8)						
Vitreisporites cf. V. itunensis (8)						
Zonallapollenites dampieri (8)						
<p>————— common</p> <p>REMARK: Pollen Grains</p>						

EARLY CRETACEOUS TAXA PALYNOMORPHS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
Zonallapollenites trilobatus (8)						
<p>————— common</p> <p>REMARK: Pollen Grains</p>						

EARLY CRETACEOUS TAXA OSTRACODA RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
Bisulcocypris sp. (9)						
Brasacypris sp. (9)						
Brasacypris ovum (4)						
Candona sp. (3)						
Candona cf. C. condensa (9)						
Candona cf. C. redunca (9)						
Cypridea cf. C. ambigua (3)						
Cypridea lunula (9)						
Cypridea vulgaris (2)						
Darwinula sp. (2)						
Darwinula cf. D. leguminella (9)						
Darwinula cf. D. oblonga (9)						
Ilyocypris sp. (3)						
Paraschuleridea sp. 5 (3)						
<p>———— common</p>						

EARLY CRETACEOUS TAXA CONCHOSTRACA RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
<i>Cyzicus (Lioestheria) barbosai</i> (5,11)						
<i>Estheriella fernandoi</i> (5,11)						
<i>Estheriella lucianoi</i> (5)						
<i>Estheriella freibergeri</i> (5,11)						
<i>Palæolimnadiopsis cf. P. reali</i> (5,11)						
<p>—— common</p>						

EARLY CRETACEOUS TAXA VERTEBRATE RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
PISCES						
Lepidotes sp. (1)						

— common

Obs.: Stratigraphic range of the specimen during Early Cretaceous

EARLY CRETACEOUS TAXA PLANTAE RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
Otozamites sp. (3)						
Podozamites sp. (3)						
<p>———— common</p>						

EARLY CRETACEOUS TAXA ICHNOFOSSILS RIO DO PEIXE BASIN	NEOCOMIAN TO EARLIEST ALBIAN					ALBIAN (PARS)
	BRAZILIAN LOCAL STAGES					
	RIO DA SERRA	ARATU	BURACICA	JQUIÁ	ALAGOAS	
INVERTEBRATE ICHNOFOSSILS						
? Arenicolites sp. (5)						
Cochlichnus sousensis (10)						
? Lophoctenium sp. (5)						
? Taenidium sp. (5)						
VERTEBRATE ICHNOFOSSILS						
Caririchnium magnificum (7)						
Moraesichnium barberenae (6)						
Sousaichnium pricei (6)						
Staurichnium diogenis (6)						
<p>————— common</p>						