



NEW GENUS AND NEW SPECIES OF ECHINOID  
(ECHINODERMATA, ORTHOPSIDAE) FROM THE ALBIAN (LOWER  
CRETACEOUS) OF SERGIPE-ALAGOAS BASIN, BRAZIL <sup>1</sup>

(With 4 figures)

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**ABSTRACT:** *Cuscuzispina riachuelensis* n.gen. and n.sp. is described from the lower Cretaceous (Albian) Riachuelo Formation, Sergipe Sub-Basin, Northeastern Brazil. Although somewhat similar to another Cretaceous echinoid *Orthopsis*, *C. riachuelensis* differs from that genus in its highest test, by the presence of interambulacral depressions, the width of the ambulacral plates near the apical system, and shape of the genital plates. *Cuscuzispina's* morphology suggests that this echinoid lived in a protected shallow-water environment, with stabilized sedimentary substrata where it was a grazing feeder.

**Key-words:** Echinoidea, Orthopsidae, Albian, Systematics, Palaeoecology.

**RESUMO - Novo Gênero e Nova Espécie de Equinóide do Cretáceo (Albiano) da Bacia de Sergipe-Alagoas, Brasil (Echinodermata, Orthopsidae).** *Cuscuzispina riachuelensis* gen.n. e sp.n. é descrito do Cretáceo inferior (Albiano) da Formação Riachuelo, sub-bacia de Sergipe, Nordeste do Brasil. Embora um tanto semelhante a *Orthopsis*, outro equinóide do Cretáceo, *C. riachuelensis* difere deste gênero pela altura da carapaça, na presença de depressões interambulacrais, na largura das placas ambulacrais próximas ao sistema apical e no formato das placas genitais. A morfologia da carapaça de *Cuscuzispina* sugere que este equinóide viveu em ambiente relativamente raso, protegido, formado por sedimento estabilizado, alimentando-se de algas e/ou detritos diretamente do fundo.

**Palavras-chave:** Echinodermata, Orthopsidae, Albiano, Sistemática, Paleoecologia.

## INTRODUCTION

An extensive field campaign was accomplished between 1999 and 2003 focusing the echinoid fauna from the Aptian-Albian section (Riachuelo Formation) of the Sergipe Sub-Basin (the southern portion of the Sergipe-Alagoas Basin), Northeastern Brazil (Fig.1). A rich and diversified fauna was obtained, composed of nearly a thousand specimens, whose results are found in MANSO (2003). Many of the collected specimens were characterized as new occurrences for the basin and even for Brazil, and some were further published (MANSO & SOUZA-LIMA, 2003a, 2003b, 2005). Among these materials there was an unique, but much peculiar specimen of an Orthopsidae, which was initially supposed to represent the genus *Orthopsis* Cotteau, 1864. However, a more detailed analysis showed that in reality this specimen could

not be satisfactorily referred to this genus.

## GEOLOGICAL SETTING

The studied specimen was collected at a small excavation (Fig.1) that exposed packstones to bioclastic grainstones of the Maruim Member of the Riachuelo Formation (Fig.2). This stratigraphic unit records the first open-marine environments established on the Sergipe Sub-Basin from Aptian to Albian times, related to the initial South Atlantic opening. This outcrop was positioned at the Lower Albian based on the presence of the ammonite *Dowvilleicerias mammillatum* (Scott & Kidson, 1977). The methodology used for outcrop description follows that adopted by BENGTON (1983), for the Sergipe-Alagoas Basin. The coordinates was obtained with a GPS on the Córrego Alegre datum, and then converted for the local Aratu datum.

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The coordinates are referred to UTM projection, at the central meridian 39°, and were rounded to the closest 50 metres.

Sítio Novo 1 (SN-01) - UTM 8.819.800N/715.500E. Topographic sheet map: SC24-Z-BIV-2.

Outcrop with less than 0,5 meter high, on the east side of the BR-101 road, next to the PETROBRAS well-base CP-346. *Krm*: Bioclastic packstones to grainstones of Maruim Member, Riachuelo Formation

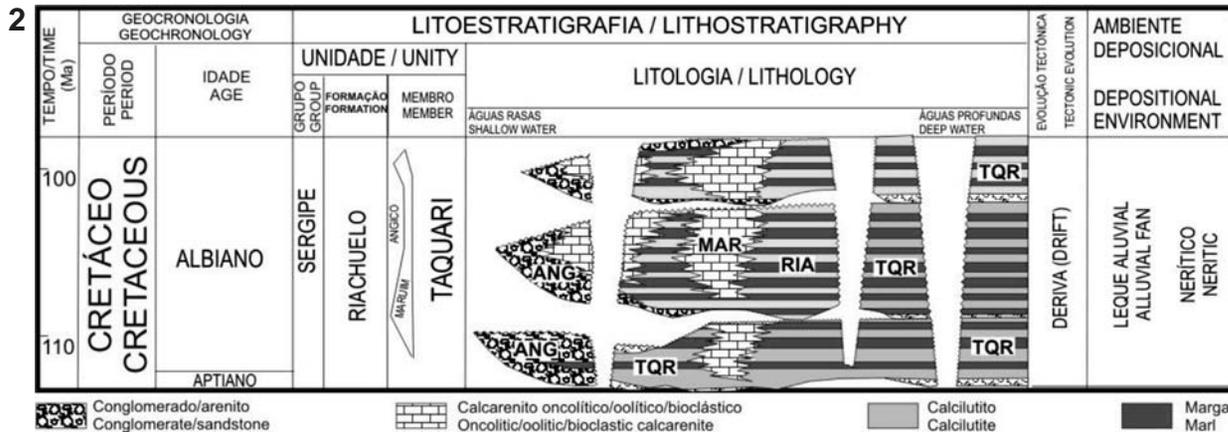
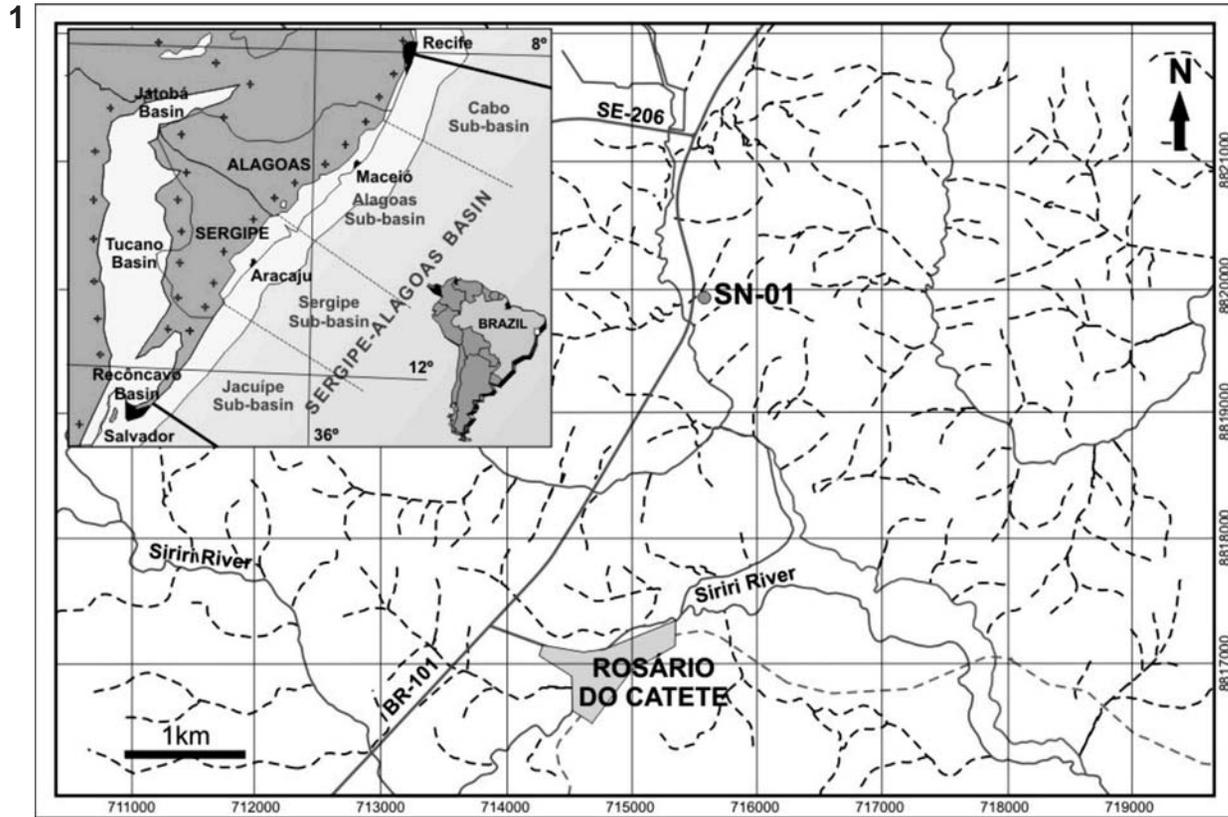


Fig.1- Location map of the Sítio Novo 1 (SN-01) outcrop; fig.2- Simplified stratigraphic chart of the Aptian-Albian marine section of Sergipe Sub-basin (Modified from Souza-Lima *et al.*, 2002)

## SYSTEMATIC PALEONTOLOGY

Class Echinoidea Leske, 1778  
 Infraclass Acroechinodea Smith, 1984  
 Cohort Echinacea Claus, 1876  
 Plesion (Order) Orthopsida Mortensen, 1942  
 Family Orthopsidae Duncan, 1889

Genus *Cuscuzispina* n.gen.

Type species – *Cuscuzispina riachuelensis* n.sp.

Etymology – *Cuscuz* (from the Arab kuskus) is a typical north-eastern Brazilian food, whose format, like a cake, resembles the echinoid test; and *spina*, Latin name for spine.

Diagnosis – *Orthopsis*-like member of the Orthopsidae with a small dicyclic apical disc; circular periproct; trigeminate ambulacra, uniserial pore-pairs; depressed interambulacral zones towards the apex. Test moderate in size and depressed under the ambitus; exhibiting tubercles in a regular series; with perforated and non-crenulate primary tubercles; well developed secondary tubercles, though not as large as primaries; peristome large with shallow but distinct buccal notches.

*Cuscuzispina riachuelensis* n. sp.  
 (Figs.3-4)

Diagnosis – Same as for the genus, by monotypy.

Etymology – *Riachuelensis*, in reference to the Riachuelo Formation, the stratigraphic unit where the fossil was collected.

Material – One unique specimen (the holotype), deposited in the collection of Paleoinvertebrados do Departamento de Geologia e Paleontologia do Museu Nacional/Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, at number MN 8253-I.

Type-locality – BRAZIL, SERGIPE, Lower Cretaceous (lower Albian), Sergipe Sub-Basin, Riachuelo Formation, Maruim Member, Sitio Novo 1.

Description.

Test: High, rigid test, measuring 33.4mm in diameter. Sub-pentagonal in outline with a sub-conical profile. Test height corresponds to 61.3% of test diameter; ambitus located at one quarter of the height measured above the base (Fig.3).

Apical disc: Dicyclic with the ocular plates I and V exsert. The apical disc occupies 32.9% of the test diameter. Genital plates are longer than larger, slightly concave

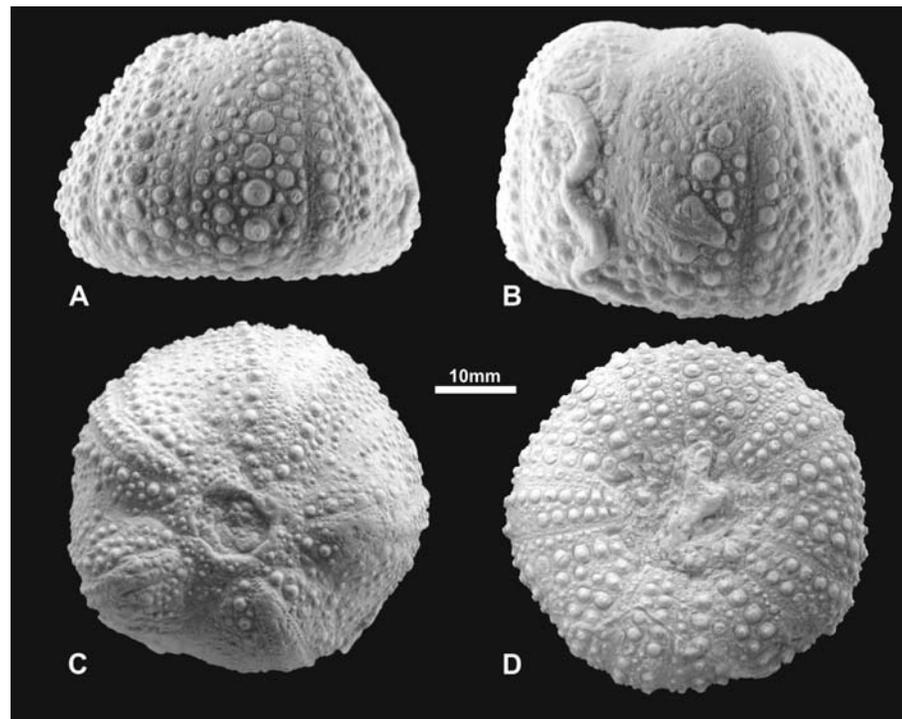


Fig.3- *Cuscuzispina riachuelensis* (MN 8253-I) in lateral (A, B), Apical (C), and adoral (D) views.

towards the proximal region and with small tubercles and granules over the surface. Madreporite larger than the other genital plates. Ocular plates are small and pentagonal, with granules throughout the surface. Periproct almost circular in outline measuring 16.4 % of the test diameter (Fig.4A).

Ambulacra: Width corresponds to 16.4% of the test diameter at the ambitus and to 10% close to the apex. Trigeminated plating throughout the ambulacrum and pore-pairs arranged uniserially (Fig.4C). Adorally the first three or four pore-pairs are offset to form a weak phyllode. All the elements are narrow and elongated, reaching the perradium. Primary tubercles perforated and non crenulate, occupying two of three elements in each compound plate. The third element has two small tubercles.

There are ca. 80 pore-pairs in each column.

Interambulacra: Width corresponds to 41.9% of the test perimeter at the ambitus. Plates depressed towards the apex; 18 plates in each column. The plates are short and wide at the ambitus, each carrying one primary perforated and non-crenulate tubercle, and one or two smaller secondary tubercles. The rest of the plate carries scattered tertiary tubercles and granules (Fig.4B). In each plate below the ambitus there are two secondary tubercles. Between the ambitus and the apical disc there is only one primary tubercle, with or without secondary tubercle and granules.

Peristome: Measures 36% of test diameter. It is slightly invaginated, with distinct buccal notches that advance towards the second interambulacral plate.

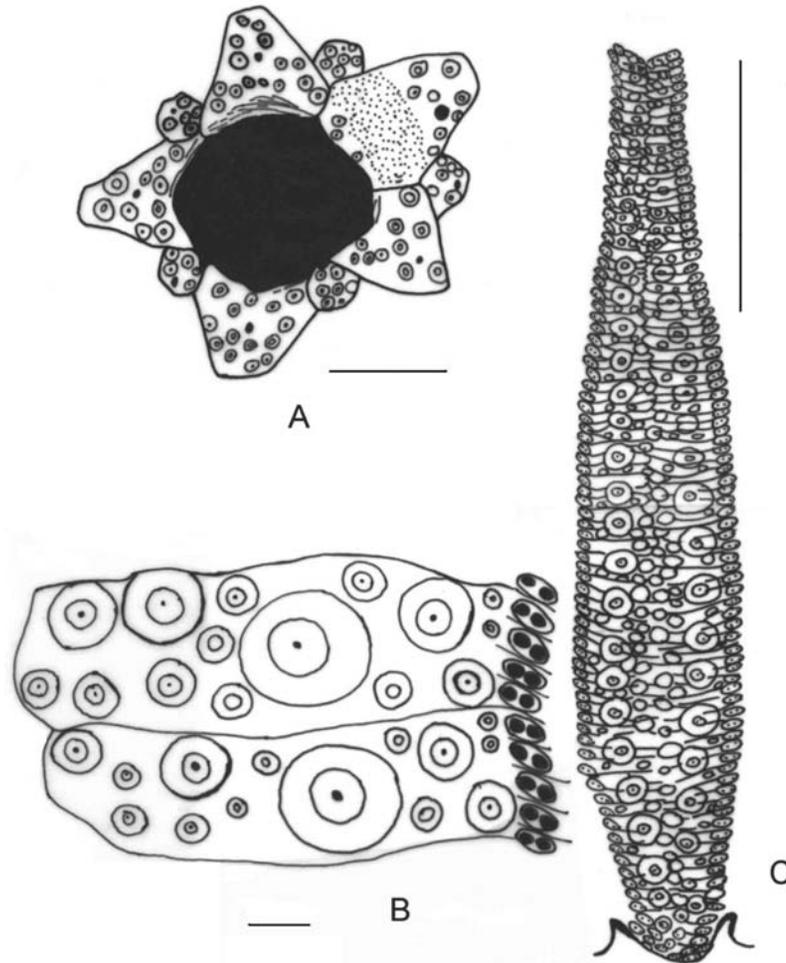


Fig.4- Illustrations of the apical system (A), interambulacral plates (B), and ambulacra (C) of *Cuscutispina riachuelensis*. Scale bars: A=3mm; B=5mm; C=10mm.

## DISCUSSION AND CONCLUSION

## SYSTEMATIC

Similarities between *Cuscuzispina* and another Orthopsidae like *Orthopsis* and *Pseudorthopsis* Sánchez Roig, 1949 are strong enough to allow a prompt assignment to the family Orthopsidae. *Cuscuzispina*, *Orthopsis*, and *Pseudorthopsis* share characters like small size dicyclic apical disc with relatively large periproct; ambulacra narrow and compound in acrosaleniid style; all plates reaching the perradial suture; primary tubercle uniting two of the three plates, with granules only over the third element; primary tubercles perforated and non-crenulate; primary tubercles on interambulacral and ambulacral plates similar in size; large peristome with shallow but distinct buccal notches (SMITH & JEFFERY, 2000). However, the morphology of the studied specimen clearly differentiates it from all other described Orthopsidae. Its test is the highest among all other representatives, and the interambulacral plates became depressed and the ambulacral plates are gradually shortened towards the apical system.

Ambulacra arrangement and the shape of primary tubercles is a useful taxonomic attribute for the identification of regular echinoids. *Cuscuzispina* can be distinguished from *Orthopsis* for its higher test, narrower and longer genital plates, and depressed interambulacral plates.

*Pseudorthopsis* differs from *Cuscuzispina* by its larger and depressed test with rounded ambitus and pore-pairs arranged in oblique triads at the ambitus with every third pore-pair distinctly displaced rather than in a single series.

Although *Cuscuzispina* possesses interambulacral depressions, they cannot be readily assigned to any of the adapical or lateral marsupial categories distinguished by PHILIP & FOSTER (1971). JAGT & IDEMA (2002), revising the Cenozoic echinoid *Temnechinus woodii* (Agassiz in AGASSIZ & DESOR, 1846), didn't find much distinction among specimens of *T. woodii* with interambulacral depressions of variable depth and width, and those without. According to these authors, those without the depressions could be male specimens of a sexually dimorphic species.

## PALEOECOLOGY

The echinoid assemblage of the *Cuscuzispina riachuelensis* site includes *Pseudholaster tricarinatus* Lambert, 1924 and *Hemiaster proclivus* Cotteau, Peron & Gauthier, 1878.

SMITH (1984) suggested that the habitat and life-style of the echinoids is partially reflected by the skeletal morphology. SMITH (1995) recognised some palaeoenvironmental settings of late Campanian-Maastrichtian echinoids analyzing its detailed functional morphology. It is expected that *C. riachuelensis*, that share several characteristics with *Orthopsis miliaris* (Archiac, 1835), might have lived in a similar habitat as suggested for this genus by SMITH (1995). This should be a protected, shallow water environment, within wave base influence, but not subjected to strong currents or wave surge, over or close to consolidated bottoms or stabilized sedimentary substrata. However, as *C. riachuelensis* had the test higher than *O. miliaris*, maybe it could have lived on slightly deeper environments than *O. miliaris*. *Cuscuzispina riachuelensis* shows still delicate phyllodes, with increasing pore-pairs density on oral region, possibly related to specialized gaseous exchange (e.g. Smith, 1995). *C. riachuelensis* was probably grazer, feeding on encrusting or boring algae or plants and removing algae from the substratum.

There is a serpulid polychaete tube attached to the test of *C. riachuelensis* (Fig.3B). This is definitively an epibiont which encrusted the test after the echinoid died

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