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SINOPSE

ABSTRACT
This study deals with the systematic of the species of the genus Caudites Coryell & Fields, 1937, found in the Brazilian Continental Shelf. It is proposed the emend of the diagnosis of this genus with the inclusion of new and important differential morphological characters. Four new species of Caudites are found and redescribed for the studied region: C. ohmerti, C. vandenboldi, C. iluminensis and C. gronus. For the first time, the occurrence of C. nepentes Bold, 1946 is registered in the Brazilian Coast. This species is redescribed and an emend is proposed for its diagnosis.

INTRODUCTION
The 720 samples used in the study on the taxonomy of the subfamily Orionininae Puri, 1973 and its distribution in the Brazilian Coast were obtained through the Centro de Estudos de Geologia Costeira e Oceanográfica da Universidade Federal do Rio Grande do Sul (CECO). These samples belong to REMAC Project - Cruzeiro Woods Hole, Águas Rasas - Coordinated by Petróleo Brasileiro S.A. (Petrobras), GEOMAR II/III of the Diretoria de Hidrografia e Navegação da Marinha do Brasil (DHN).
The sampling area comprises all the Brazilian Continental Shelf from latitude 05°N to latitude 15°S. Due to the vast extension of the studied area the work was divided in several stages. The first stage deals with the taxonomical data on this subfamily and on the species of the genus Orionina Puri, 1953, found in the Brazilian Coast. The second stage developed in this paper deals with the taxonomical study on the species of the genus Caudites Coryell & Fields, 1937. The third stage will be the study of the ecological data and geographical distribution of this subfamily in the Brazilian Continental Shelf.

REPOSITORY The type material is deposited in the collection of the Museu de Paleontologia at the Universidade Federal do Rio Grande do Sul, under numbers M.P., UFRGS, MP-1007 to 1035.

SYSTEMATICS

Phylum ARTHROPODA
Sub Phylum Mandibulata
Classis Crustacea
Sub Classis OSTRACODA Latreille, 1806
Ordo Podocopida Müller, 1894
Sub Ordo Podocopina Sars, 1865
Super Familia Cytheracea Baird, 1850
Familia Hemicytheridae Puri, 1953
Sub Familia Orionininae Puri, 1973

Genus Caudites Coryell & Fields, 1937 emend.
Coimbra & Ornellas, 1986.

DIAGNOSIS Orionininae with carapace from subrectangular to subtriangular in lateral view. Surface with variable number of ridges. Intercostal reticulation, when rarely present very weak. Strong ventral and anterior submarginal ridges. Eye tubercles present. Three or four frontal muscle scars, five to eight adductor scars and one dorsal which may be subdivided. Hinge holamphidont.

TYPE SPECIES: Caudites mediator Coryell & Fields, 1937, p. 10-11, fig. 12a-d.

REMARKS The genus Caudites, when established by Coryell & Fields, (1937), was monotypical. According to Hartmann (1964), Pokorný (1970) and Ohmert (1971), important taxonomical morphological characteristics were
not present in the diagnosis of the genus, since it is based on a single species. For instance, the secondary fusion areas of the inner lamella were not included, although they are very important for the systematic determination of the genus. Coryell & Fields (sp. cit.), described Caudites as a genus with small and subtriangular carapace in lateral view, hinge of the right valve with crenulate socket and groove and triangular posterior tooth. However these characteristics present clear variations in this genus, as follows: the size of C. sellardii Bold, 1946 (0.51 mm), C. alatus Ohmert, 1971 (1.08 mm); shape of carapace subrectangular in lateral view - C. clathratus (Hartmann, 1962), C. van denboldi sp. nov.; hinge of right valve with smooth socket and groove, as in C. nipponensis Swain & Gilby, 1974, and with rectangular posterior tooth in C. ctacea Bate, Whittaker & Mayes, 1981.

Moore (1961) includes Caudites in the subfamily Hemicytherinae, and does not register in the diagnosis the presence of secondary fusions in the inner lamella.

Morkoven (1963) registered as characteristics of this genus the complete absence of small posteroventral vestibulum. However, these morphological features present a great change among several species of Caudites.

Yajima (1982) includes Caudites in the tribe Orionininae Puri, 1974. He registers in the diagnosis, as constant characteristics, carapace with compressed sides in dorsal view and a strong ridge which runs from the anteroventral angle to the posterodorsal one. Nevertheless, these morphological features present clear variations in the great amount of species of the genus.

For this reason it is proposed a diagnosis for Caudites, where it is included the amplitude of morphological variations presented by the inner lamella.


Pl. 1, Fig. 1-24.

Holotypus: collection of the Institute of Geology and Mineralogy of Utrecht University, no. 15040.
Locus Typicus: sample T 1451.
Stratum Typicum: Miocene.
Plesiotype: Carapace, M.P., UFRGS, no. MP-O-1507 to MP-O-1012.
Locus: East/Northern Brazilian Continental Shelf, samples 3690 (Lat. 02°07'S - Long. 41°55'W, prof. 80m), 3699 (Lat. 02°21'S - Long. 39°36'W, prof. 35m), 3708 (Lat. 02°53'S - Long. 39°28'W - prof. 18m) and 3716 (Lat. 02°58'S - Long. 39°01'W, prof. 37m).
DIAGNOSIS Small carapace. Subtriangular in lateral view. Primary ornamentation constituted by ridges. Secondary ornamentation constituted by residual reticula with small delicate cells, restricted to the small depression areas around the ridges. Ventral and dorsal ridges and the ascendent branch of the ventral one presenting each one a node. Discreet caudal process. Carapace laterally compressed in dorsal view, maximum width in the median posterior region. Anterior region prominent and relatively wide. Anterior marginal zone with four areas of secondary fusion in the inner lamella. Some specimens present the pattern of ornamentation of the left valve similar to the one of Caudites sellardi (Howe & Neill, 1935) (in Howe et alii, 1935).

DESCRIPTION External view - Carapace subtriangular in lateral view. Clear posterior and anterior cardinal angles. Maximum height coincident with the eye tubercle region and the anterior cardinal angle. Right valve with the dorsal margin almost straight sloping backwards. Anterior margin strongly rounded, sometimes finely denticulate. Ventral margin sinuous. Posterior margin truncated with concave upper portion. Discreet caudal process. Surface with ridges and nodes, small and delicate residual reticula restricted to the narrow depression areas, around the ridges. Delicate submarginal ridge parallel to the free margin. From the eye tubercle, a strong ridge runs parallel to the anterior end. Ventral ridge parallel to the correspondent margin with a node just after the mid-length from where the ridge bifurcates. The ascendent main branch presents, near the posterior cardinal angle, a posterodorsal node. Two ridges, one dorsal and the other posterior rise from this node. The anterior one and the ascendent branch of the ventral ridge form deep angular inflection which characterizes the normal ornamental pattern of the species. The small dorsal ridge presents a node before the mid-length. Perpendicular short and incipient ridges rise from the anterior ridge. They form small cells in the anterior end (Pl. 1, Fig. 12, 15 and 17). The left valve is higher and differs from the right by presenting the posterior cardinal angle more prominent. Carapace, laterally compressed in dorsal view, with three pairs of symmetrical prominences by the presence of the nodes. Maximum width, in the median posterior region near the node of the ventral ridge. The posterior edge tape-rig abruptly to form the caudal process. Some specimens present the left valve with the ornamentation similar to that of Caudites sellardi (Howe & Neill, 1935) (in Howe et alii, 1935) and the right valve with a slight difference from the...
normal ornamentation of the species (Pl. 1, Fig. 11 and 18). The bifurcation of the ventral ridge occurs, approximately on the middle of the secondary branch and not directly from the node as in the normal ornamentation.

The left valve does not present the deep angular inflection of the ventral ridge in the ventroposterior region. Instead of this, the ridge rises up in an almost parallel line to the posterior edge forming four angles. Internally - Hinges holamphidont. The right valve with steg ped anterior tooth; rounded socket; smooth groove and subtriangular posterior tooth. Anterior marginal zone with four areas of secondary fusions in the inner lamella. The dorsal anterior one is oval; followed by other larger subtriangular; the oval anteroventral one is the largest and presents a constriction caused by the presence of normal pore canals; the ventral is smallest and kidney-shaped. They present slight variations in size and shape. Several straight marginal pore canals in all extension of the duplicature. Most of them simple. Line of concretion coincident with internal margin, except in the anterior and posterior regions. Central muscle scars hardly visible being three frontal in oblique row, followed by a group of six scars. Left valve with hinge elements complementary to the right.

**DIMENSIONS**

Plesiotype: Carapace, M.P., UFRGS, MP-O-1007; right valve, length: 0.3984 mm; height: 0.1826 mm; left valve, length: 0.3984 mm; height: 0.1992 mm.

Carapace, MP-O-1008; length: 0.3984 mm; width: 0.1577 mm.

Carapace, MP-O-1009; right valve, length: 0.3652 mm; height: 0.1826 mm; left valve, length: 0.3652 mm; height: 0.1952 mm.

Carapace, MP-O-1010; right valve, length: 0.3818 mm; height: 0.1826 mm; left valve, length: 0.3818 mm; height: 0.1992 mm.

Carapace, MP-O-1011; length: 0.3818 mm; width: 0.1494 mm.

Carapace, MP-O-1012; right valve, length: 0.3652 mm; height: 0.1826 mm; left valve, length: 0.3652 mm; height: 0.1992 mm.

**REMARKS**

The present species was determined, described and illustrated by Bold (1946). Although the internal characteristics were not described, they were referred to be as very similar to *Caudites sellarsi* (Howe & Neill, 1935) (in Howe et alii, 1935).

Nevertheless, it is not possible to compare the internal structures like the secondary fusion areas of the inner lamella between *C. nipeensis* and *C. sellarsi* since they were not described either. Bold
(1963a) illustrates, just for comparison, the right valve of *C. nippenii* but does not describe it. He represents four secondary fusions of the inner lamella and the muscle scars.

Morkoven (1962, 1963) also illustrates internally the right valve of this species presenting the internal features, but they are not formally described.

As none of all previous consulted papers on *C. nippenii* presents diagnosis, description and illustrations showing in details their inner and outer structures a diagnosis is proposed and the species is described and illustrated again.

**MATERIAL** One hundred ninety carapace and thirty six valves were examined.

**OCURRENCE** Miocene of Cuba, Trinidad and Tobago, San Martin, Recent sediments of Trinidad and Tobago, Venezuela, Hatteras Cape, Gulf of Paria and Gulf of México.

In the Brazilian Continental Shelf, Leg 4, sample 3378; Leg 6, samples 3606, 3607, 3608, 3609, 3610, 3615, 3616, 3624, 3636, 3637, 3672, 3679, 3680, 3685, 3686, 3689, 3690, 3698, 3699, 3705, 3706, 3709, 3710, 3711, 3716, 3717, 3721, 3722, 3726, 3743, 3747, 3750, 3823; Leg 7, samples 3765, 3820, 3847, 3863, 3884, 3902, 3904, 3906, 3908, 3922, 3935; GEOMAR III, samples g-148, g-150, g-184, g-185, g-188, g-190, g-200, g-218, g-2467, g-2469, g-2528.

**GEOGRAPHICAL DISTRIBUTION** in the Brazilian Coast – Lat. 04°26'N to 21°02'S.

**STRATIGRAPHIC DISTRIBUTION** – Middle Miocene to Recent.

**Caudites ohmerti** Coimbra & Ornellas, sp. nov.

1977 *Caudites* sp. Vicalvi, Kotzian & Porti-Esteves, p.83, pl. IV, fig.1.

Pl. 2, Fig. 1-33

**Derivatio nominis:** in honor to Dr. Wolf Ohmert.

**Holotypus:** Female – Carapace, M.P., UFRGS, n° MP-O-1013.

**Paratypus:** Female – Carapace, n° MP-O-1014 to MP-O-1015.

**Male – Carapace,** n° MP-O-1016 to MP-O-1018.

**Young Instars:** Right valves, n° MP-O-1019 to MP-O-1021.

**Locus typicus:** Continental Shelf of Rio de Janeiro, sample 3286 (Lat. 22°24'8" S- Long. 41°19'8" W, prof. 34 m).

**Stratum typicum:** Recent.
DIAGNOSIS  Carapace subrectangular in lateral view. Surface with ridges. Intercostal reticulation inconspicuous or absent. The ventrolateral ridges with short and ascendent branch in the beginning of the last third.

In the female this ridge presents a weak and sometimes discontinuous connection with the median one in the posterior portion.

In the male, they connect through strong, vertical and arched ridge. Four areas, of secondary fusions in the inner lamella are little clear. Central fusion larger and more conspicuous. Hinge with a horizontal blade sickle-shaped in the inner anterior edge.

DESCRIPTION  External view - Carapace subrectangular in lateral view. Anterior cardinal angle, prominent than posterior. Right valve presents a slight sinuous dorsal margin with a bland concavity at the limit of the anterior edge; anterior margin rounded, ventral one sinuous, posterial margin concave in the dorsal half and posteroventral conspicuous caudal process. Surface with ridges. Intercostal area with slight and inconspicuous reticulation or smooth. Submarginal ridge parallel to the free margin and more developed in the anterior end. From the anteroventral portion of this ridge rises another bifurcated one. Its upper branch forms the ventrolateral ridge and the lower the ventral one. This branch extends subparallelly to the correspondent margin. After the mid-length it fusionates again with the anteroventral elongate cell. The ventrolateral ridge presents in the last third a short and ascendent vertical branching. From the submarginal ridge arise three very short anterodorsal ridges which converge and fusionate to form the median one. The median ridge overpasses the upper part of the subcentral tubercle, reaches the posterior cardinal angle, connects with weak and ascendent posterior ridge. This one joined with the dorsal ridge which bifurcates just before the mid-length. The left valve differs from the right by being higher, the cardinal angles more clear and the edge of the caudal process in some specimens slightly crenulate. Dorsal view - Maximum width in the last third of the length. Posterior end tapering in a caudal process with sinuous dorsal commissure.

Internal view - Hinge holamphidont. Right valve with anterior tooth simple and prominent, socket, smooth groove, and rectangular lobate posterior tooth. The inner anterior edge of the hinge presents a laminar, horizontal projection sickle-shaped (Pl. 2, Fig. 6, 9, 14, 19 and 29). The four areas of secondary fusion not easily seen. The dorsal one approximately oval; the next and the largest clearly heart-shaped;
the third with an irregular outline; the ventral very small and approximately kidney-shaped.

Numerous marginal pore canals straight, most of them simple and concentrated in the anterior and posterior extremities.

Anterior vestibulum narrow and the posterior vestigial. Central muscle scars not clear being three frontal in oblique line and seven scars in a double row. The caudal process presents a distal slight concavity margined internally by the selvage (Pl. 2; Fig. 8 and 15).

Left valve with complementary hinge elements of the right. Secondary fusions of the inner lamella with slight variations in shape. The male differs from the female by the relatively longer and narrower carapace with shorter caudal process; by presenting a strong, neat, continuous and arched posterior vertical ridge, joined to the ventral, median and dorsal ones and by presenting the anterior tooth of the right hinge sharper.

**DIMENSIONS**

**Holotypus:** Female - Carapace, M.P., UFGRS n° MP-Q-1013; right valve, length: 0.6474 mm; height: 0.2988 mm; left valve, length: 0.6474 mm; height: 0.3154 mm.

**Paratypi:** Female - Carapace, MP-Q-1014; length: 0.6474 mm; width: 0.2822 mm.

Female - Carapace, MP-Q-1015; right valve, length: 0.5644 mm; height: 0.2739 mm; left valve, length: 0.5644 mm; height: 0.2822 mm.

**Male** - Carapace, MP-Q-1016; right valve, length: 0.7138 mm; height: 0.3154 mm; left valve, length: 0.7138 mm; height: 0.3320 mm.

**Male** - Carapace, MP-Q-1017; length: 0.6972 mm; width: 0.2573 mm.

**Male** - Carapace, MP-Q-1018; right valve, length: 0.6142 mm; height: 0.2822 mm; left valve, length: 0.6142 mm; height: 0.2988 mm.

**Juvenile instars:** right valve, MP-Q-1019; length: 0.4814 mm; height: 0.2573 mm.

**Juvenile instars:** right valve, MP-Q-1020; length: 0.4482 mm; height: 0.2498 mm.

**Juvenile instars:** right valve, MP-Q-1021; length: 0.3818 mm; height: 0.1992 mm.

**REMARKS** This species is greatly related to *Caudites jacksonvillensis* Swain, 1951, and *Caudites gnomus* sp. nov. It resembles, also, *Caudites diagonalis* Sanguinetti, 1979, and *Caudites posdiagonalis* Ornellas, 1981 (unpublished). All these species, present similarities in the ridge patterns what makes them a characteristic group in the genus. However they have well-defined specific characteristics easily recognizable.
C. ohmei differs from C. jacksoniillensis by presenting clear differences in the relation length-height; by the presence of posterior vertical ridge arched connecting the dorsal, the median, the ventrolateral ones, stronger in the male carapace; by presenting the vertical ridge in the last third of the ventrolateral one and the lower branch of the dorsal ridge longer. It was not possible to compare morphological inner structures because, according to Swain (1951), his material was badly preserved, making the identification of these structures impossible.

C. ohmei differs from C. gnomus mainly by presenting larger size; strong and clear ornamentation; sinuous ridges; vertical posterior ridge arched connecting the dorsal, ventrolateral and median ridges, incipient in the female and conspicuous in the male; sickle-like blade in the inner anterior edge of the hinge. Anterior tooth of the right hinge sharper and the posterior rectangular and lobate. C. gnomus is more rectangular and presents the area between the ventral ridge and the correspondent margin as well as the posterior region clearly lowered.

C. ohmei differs from C. diagonalisis by being larger and by presenting the median ridge horizontal rather than diagonal. The median and the ventrolateral ridges are approximately parallel being H-shaped in the anterior portion instead of V-shaped what is characteristic of C. diagonalisis. C. ohmei still differs by the subrectangular shape of the carapace in lateral view; by the rectangular and lobate posterior tooth of the right valve; by the number and shape of the secondary fusions of the inner lamella; and by the sickle-like blade in the inner anterior edge of the hinge.

C. ohmei differs from C. posdiagonalisis by presenting a larger caudal process; less developed intercostal reticulation; outline of the anteroventral margin bland and continuous without angle; subcentral tubercle without posterior sulcus; marginal pore canals not bulbous; central muscle scars more numerous; and by presenting the pattern of secondary fusions of the inner lamella. It differs, yet, by the presence of a sickle-like blade in the inner anterior edge of the hinge.

Vicalvi et alii (1977), when studying the Quaternarian microfauna of the Sao Paulo Continental Shelf, registered the occurrence of Caudites sp. The comparison between males of Caudites ohmei and the illustration presented by those authors shows an identical ornamentation, indicating that they belong to the same species.
MATERIAL Among the species belonging to the subfamily Orioniniae this one is the most abundant in the Brazilian Continental Shelf. It is represented in the samples by one hundred and fifty-one carapaces, and six hundred and eight-nine isolate valves, including males, females and young instars.

OCCURRENCE Brazilian Continental Shelf, Leg. 1, samples 3002, 3003, 3004, 3006, 3008, 3010, 3020, 3026, 3028, 3030, 3031, 3060, 3096; Leg 2, samples 3154, 3163, 3171, 3194, 3201, 3205, 3206, 3208, 3211; Leg 3, samples 3227, 3228, 3229, 3231, 3234, 3236, 3243, 3244, 3246, 3250, 3251, 3254, 3257, 3264, 3273, 3283, 3286, 3293, 3316; Leg 7, samples 3923, 3928, 3929, 3940, 3945, 3947, 3949, 3950, 3955, 3957, 3963; GEOMAR VI, samples g-326, g-333, g-346, g-349, g-362, g-370; El Austral, samples A-6702, A-6704, A-6705, A-6714, A-6726, A-6738.

GEOGRAPHICAL DISTRIBUTION On the Brazilian and Uruguayan Coast. Lat. 19°32' to 35°06'S.

STRATIGRAPHIC DISTRIBUTION Recent.

Caudites gen. nov. Coimbra & Ornellas, sp. nov.
1975 Caudites sp. Bertels, p. 335, pl. 9, fig. 6.
Pl. 1, fig. 25-44.

Derivatio nominis: due to the small size of the specimens.
Paratypi: Female - Carapace, n° MP-O-1023 and MP-O-1024.
Male - Carapace, n° MP-O-1025 and MP-O-1026.
Locus typicus: Continental Shelf of the Rio de Janeiro State, sample 3945, Lat. 22°18'S - Long. 40°57'W, depth 44 m.
Stratum typicum: Recent.

DIAGNOSIS In lateral view subrectangular carapace. Weak ornamentation, with ridges without intercostal reticulation. Median and ventrolateral ridges connected in the posterior region by a vertical and straight ridge, present in the female as well as in the male. Ventral ridges relatively strong. Lowered area limited by the ventral and posterior ridges. In dorsal view the pattern of dorsal ridges forms an isosceles triangle in the posterior half of the carapace. Anterior marginal zone with four areas of secondary fusions in the inner lamella.

DESCRIPTION External view - Female carapace subrectangular in lateral view. Cardinal angles clear. Maximum height coincident with the anteri-
or cardinal angle, and the incipient eye tubercle. Right valve with the
dorsal edge slightly convex sloping down towards the posterior car­
dinal angle. Anterior margin rounded. Ventral margin sinuous. Posterior
margin concave in the upper portion and truncate in the lower, forming
a conspicuous quadrangular caudal process. Surface of the carapace or­
namented with ridges, without intercostal reticulation. Submarginal
ridge parallel to the free margin more developed in the anterior end.
From this ridge arise, in the anterior region, two lateral ridges, one
ventral and the other, median. The ventrolateral bifurcates in its be­
ginning. The lower branch forms the strong ventral ridge. The upper
branch follows in ascendent, oblique line until the incipient subcen­
tr al tubercle from which it inflects downwards fusionating again with
the ventral ridge. It forms, in the anterior region, a cell similar to
a scalene triangle and continues sinuously backwards in a slight ascen­sion. Before reaching the caudal process it bifurcates the weak branch
ending in the inferior angle of the caudal process. The other one forms,
abruptly, the clear vertical posterior ridge and connects with the
terminal portion of the median ridge. The peripheral posterior and ver­
tical area is lowered and limited by the correspondent rige s. The medi­
an ridge, reaches the subcentral tubercle and runs in ascendent sinuous
line until the posterior dorsal region. The dorsal ridge rises, in the
posterior cardinal angle and runs parallel to the correspondent edge
until the third fifth of the length, where bifurcates. The lower
branch slopes and reaches the median ridge in the first fifth of the
length. The upper branch ends in the median region of the dorsal margin.
The left valve differs from the right by being higher; the limit of the
anterior and dorsal edges convex, and by the more conspicuous anterior
cardinal angle. In dorsal view presents straight and almost parallel
sides. The posterior portion tapers abruptly forming the caudal proc­
ess. The group of dorsal ridges form an isosceles triangle in the pos­
terior dorsal half. Maximum width in the last third of the carapace.
Internal view - Hinge holamphidont. The right valve with anterior
tooth simple, socket rounded, groove and the posterior tooth smooth.
Anterior marginal zone with four areas of secondary fusion in the inner
lamella. The dorsal fusion is approximately oval, and the second is
the largest, both present irregular outline due to the location of nor­
mal pore canals; the third fusion is partially eroded; the ventral and
kidney-shaped one is the smallest. Marginal pore canals more numerous
in the anterior portion, being straight and most of them simple. The
caudal process presents a distal slight concavity, limited internally
by the selvage. Anterior vestibulum narrow and the posterior very reduced. Central muscle scars, little clear, presenting three anterior scars almost in vertical line followed by a group of seven scars. The left valve with the complementary hinge elements of the right, being the anterior median tooth shorter and rounded, the bar sinuous. Posterior socket with a central hole in a drop-like shape. The left valve does not present the anterior vestibulum. The secondary fusions shows a variation in shape. Sexual dimorphism present. In dorsal view the male differs from the female by the longer and narrower carapace with the sides converging backwards. Shorter caudal process. Stronger ornamentation. Internally the male shows the anterior tooth of the right hinge longer and narrower; slight variations in the outline of the secondary fusions of the inner lamella; and the valves do not present the posterior vestibulum.

DIMENSIONS

Holotypus: Female - Carapace, M.P., UFRGS, no MP-O-1022, right valve, length: 0.5478 mm; height: 0.2822 mm; left valve, length: 0.5478 mm; height: 0.2905 mm.
Paratypi: Female - Carapace, MP-O-1023; length: 0.5644 mm; width: 0.2324 mm.
Female - Carapace, MP-O-1024; right valve, length: 0.5644 mm; height: 0.2739 mm; left valve, length: 0.5644 mm; height: 0.2822 mm.
Male - Carapace, MP-O-1025; length: 0.5610 mm; width: 0.1992 mm.
Male - Carapace, MP-O-1026; right valve, length: 0.5810 mm; height: 0.2490 mm; left valve, length: 0.5810 mm; height: 0.2573 mm.

REMARKS C. gnomus sp. nov. is compared with the topotype material of Caudites sp. Bertels, 1975 from the Pleistocene of Argentina, kindly sent us for study by Dr. Alwine Bertels. The comparison of the Brazilian and Argentinean specimens shows that they present identical internal and external morphologic characteristics.

C. gnomus resembles Caudites ohmerti sp. nov., from which it differs by presenting a small size; little clear ornamentation; less sinuous ridges; posterior ridge straight and vertical, both in male and female; it does not present a short and ascendent branch in the beginning of the last third of the ventrolateral ridge; the area between the ventral ridge and the correspondent margin as well as the posterior region are clearly lowered; anterior tooth of the right valve more rounded and the posterior smooth.

MATERIAL Twenty-eight carapaces and six valves, most of them females.
OCURRENCE Pleistocene of Argentina.
Brazilian Continental Shelf, Leg. 2, sample 3133; Leg. 3, samples 3215, 3281, 3296, 3297, 3311, 3312; Leg. 7, samples 3928, 3945; GEOMAR VI, sample g-362.

GEOGRAPHICAL DISTRIBUTION on the Brazilian Coast - Lat. 19°30'S to 31°06'S.

STRATIGRAPHIC DISTRIBUTION Pleistocene to Recent.

Caudites fluminensis Coimbra & Ornellas, sp. nov.
Pl. 3, Fig. 1-16.

Derivatio nominis: from the occurrence in the coast of the Rio de Janeiro State.

Paratypli: Male - Carapace, n° MP-O-1028 and MP-O-1029.
Female - Carapace n° MP-O-1030.
Locus typicus: Continental Shelf of the Rio de Janeiro State, sample 3929 (Lat. 22°01'S - Long. 40°35'W, Depth 42 m).
Stratum typicum: Recent.

DIAGNOSIS Large carapace. In lateral view rectangular and elongate. Surface punctate and with delicate reticulum just visible in electron microscope. Subcentral tubercle very weak. Four incipient longitudinal ridges. In the posteroverentral region presents an independent node. Four areas of secondary fusions in the inner lamella, being the central one the largest. The internal anterior margin of the hinge presents very developed horizontal laminar projection sickle-shaped.

DESCRIPTION External view - Male carapace rectangular in lateral view. Cardinal angles very clear. Maximum height coincident with the anterior cardinal angle and with the eye tubercle. Right valve with dorsal margin slightly sinuous and concave in the limit of the anterior margin. Anterior margin strong and evenly rounded. Ventral margin sinuous.

Posterior margin concave in the dorsal half and truncate in the ventral, with caudal process. Weak sucentral tubercle. Surface with incipient longitudinal ridges ending in nodes in the last third of the length. Submarginal ridge parallel to the free margin more developed in the anterodorsal and posterodorsal portions. Two ridges, rise from the anterior portion of this ridge, one ventrolateral and the other, median. Both converging towards the weak and incipient subcentral tubercle. Just after this, the median ridge bifurcates. The upper branch upwards obliquely and presents a node before reaching the posterior
cardinal angle. The lower branch is very weak and almost reaches the posteroventral independent node. The ventrolateral ridge bifurcates immediately after its origin and forms a stronger ventral ridge subparallel to the correspondent margin. After the mid-length it fusionates again with the ventrolateral ridge to form in the anteroventral half a cell like a scalene triangle and ends by a ventrolateral node. This is more developed and prominent than the other nodes. The weak dorsal ridge runs from the correspondent node forward.

Surface presents, in electron microscope, numerous puncta and a very slight reticula with small irregular cells specially clear in the anterodorsal region. The left valve differs from the right by being higher, anterodorsal region more convex, the sinuosity of dorsal margin more stressed, the posterior cardinal angle heart-shaped, the lower branch of the median rib weaker. Carapace is compressed in dorsal view, with three prominences in each side corresponding to the nodes and with the posterior portion steppe-shaped. Maximum width coincident with the prominent node of ventrolateral ridge. Posterior extremity tapering in a caudal process. Internal view - Hinge holamphidont. The right valve of the male presents the anterior tooth stepped, with the anterior portion lower, rounded socket, smooth groove, posterior tooth lobate and less prominent than the anterior. Hinge inner margin presents a laminar well-developed projection sickle-shaped. Four secondary fusion areas in the inner lamella. The dorsal one oval; the median largest, rounded and with two strong reentrances by the presence of normal pore canals; the anteroventral one not clear and often eroded; the ventral elongate is the smallest one. Marginal pore canals straight, mostly simple and more abundant in the anterior extremity. Anteroventral and vestigial vestibulum. The distal portion of the caudal process presents a concavity internally marginated by the selvage. Central muscle scars not visible in the male, but clear in some females. Left hinge with the complementary elements of the right. Through the electron microscope it shows a small central drop-shaped hole inside of the posterior socket (Pl. 3, Fig. 8). The secondary fusions of the inner lamella with small variation in shape. Sexual dimorphism present. The only three female carapaces found were not externally illustrated because they were accidentally damaged. However, it was possible to observe that the female differs from the male externally by presenting a more inflate carapace, the node of the ventrolateral ridge forms an alar process. Internally - Three frontal muscle scars in oblique row, followed by a group of eight scars: five large, three small and one supracentral large.
DIMENSIONS

Holotypus: Male - Carapace, M.P., UFRGS, n° MP-O-1027; right valve, length: 0.7636 mm; height: 0.3486 mm; left valve, length: 0.7636 mm; height: 0.3569 mm.

Paratypi: Male - Carapace, MP-O-1028; length: 0.7802 mm; width: 0.3652 mm.

Male - Carapace, MP-O-1029; right valve, length: 0.7802 mm; height: 0.3403 mm; left valve, length: 0.7802 mm; height: 0.3569 mm.

Female - Carapace, MP-O-1030; right valve length: 0.7553 mm; height: 0.3237 mm; left valve, length: 0.7553 mm; height: 0.3403 mm.

REMARKS The present species resembles to C. vandenboldi sp. nov., but differs by being larger, alar process less prominent, posterior portion in dorsal view steppe-shaped; less developed caudal process; presence of an independent posteroventral node; surface of the carapace puncate and with a delicate reticula; very developed horizontal laminar projection sickle-shaped in the internal anterior margin of the hinge. Central muscle scars more numerous.

MATERIAL The specimens of this species are very scarce. There were found only six carapace and five isolate valves, most of them males.

OCCURRENCE Brazilian Continental Shelf, Leg 7, samples 3920 and 3945.

GEOGRAPHICAL DISTRIBUTION on the Brazilian Coast - Lat. 22°01'S to 22°18'S.

STRATIGRAPHIC DISTRIBUTION - Recent.

Caudites vandenboldi Coimbra & Ornellas, sp. nov.
Pl. 3, Fig. 17-31.

Derivatio nominis: in honor of Dr. William van den Bold.


Paratypus: Carapace, n° MP-O-1032 to MP-O-1033.

Juvenile instars: Right valves, n° MP-O-1034 to MP-O-1035.

Locus typicus: Southernmost of the Continental Shelf of the Espírito Santo State, sample 3301.

Stratum typicum: Recent.

Juvenile instars: Right valves n° MP-O-1034 and MP-O-1035.
DIAGNOSIS. Subrectangular carapace in lateral view. In dorsal view sagitate with elongate and prominent caudal process. Two alar processes, the ventral one inflate. Surface with very weak ornamentation and incipient ventrolateral and median ridges. Four secondary fusion areas in the inner lamella, being the median the largest and the most irregular in shape. Laminar process sickle-shaped in the anterior inner margin of the hinge little developed.

DESCRIPTION. External view - Subrectangular carapace in lateral view. Clear cardinal angles. Maximus height coincident with the eye tubercle and the anterior cardinal angle region. Right valve presents the dorsal margin straight, anterior margin strongly rounded, almost straight in the limit with the dorsal one; ventral margin sinuous; posterior margin strongly concave in the upper portion and truncate in the lower region with conspicuous caudal process.

Surface with two strong alar processes, a wide ridge little prominent in all free margin and two weak ridges: one ventrolateral; the other median. Intercostal reticulation absent. The ventrolateral and the median ridges rise in the anterior submarginal region. Both converge to the weak subcentral tubercle, after diverge again and end in the apex of the correspondent alar process. The median ridge bifurcate after the mid-length, the weak and lower branch ends in the apex of the ventral alar process. The ventrolateral ridge has the anterior half arched, forming with the ventral ridge a cell scalene shape. There is also a ventral ridge which fusionates anteriorly with the ventrolateral ridge and posteriorly with the correspondent alar process.

The left valve differs from the right by being higher; by presenting a slighter concavity of the posteroverentral region; and the posterior cardinal angle less conspicuous. In dorsal view, carapace arrow-shaped and posteriorly inflate. It tapers strongly after its last third, forming a well-developed caudal process. Maximum width in the beginning of the last third, coincident with the greater expansion of the ventral alar process and the most inflate region. Internal view - Hinge holamphidont. Right valve with smooth and high anterior tooth; socket stepped shape; smooth groove and lobate posterior tooth. In the anterior inner margin of the hinge there is a small laminar and horizontal projection sickle-shaped. Four areas of secondary fusions in the inner lamella. The dorsal fusion oval; the median larger and with irregular outline by the presence of the normal pore canals, the anteroverentral slightly heart-shaped and the ventral one smaller and kidney-shaped. Straight marginal pore canals simple and more numerous in the
anterior region. Line of concrecens and inner margin coincident, except in the anteroventral portion where forms a vestibulum. In the distal portion of the caudal process the selvage separates from the edge, forming a concave region. Central muscle scars hardly seen constituted of three frontal scars followed by a group of seven scars. Left hinge with complementary elements of the right. Secondary fusion areas present variations in size and shape. The median one with more irregular outline. Some specimens present four or five small denticles in the anterodorsal edge, coincident with the area of the anterior elements of the hinge (Pl. 3, Fig. 28). Sexual dimorphism not present.

DIMENSIONS

Holotypus: Carapace, M.P., UFRGS, n° MP-O-1031; right valve, length: 0.6474 mm; height: 0.3320 mm; left valve, length: 0.6474 mm; height: 0.3486 mm.

Paratype: Carapace, n° MP-O-1032; length: 0.6972 mm, width: 0.2573 mm.

Carapace, n° MP-O-1033; right valve, length: 0.5976 mm; height: 0.2905 mm; left valve, length: 0.5976 mm; height: 0.3071 mm.

Juvenile instar: MP-O-1034; right valve, length: 0.4897 mm; height: 0.2490 mm.

Juvenile instar: MP-O-1035; right valve, length: 0.3486 mm; height: 0.1826 mm.

REMARKS The species which present the most similar morphological characteristics to C. vandenboldi sp. nov. are C. alatus Omerti, 1971 and C. fluminensis sp. nov. The present species differs from the first mainly by presenting smaller size; little clear ridges, absence of intercostal reticulation; hinge with smooth groove and little number of secondary fusions in the inner lamella. From C. fluminensis it differs specially by presenting smaller size; more developed alar process; surface of the valves without puncta or reticula; more elongate caudal process; horizontal laminar projection sickle-shaped in the inner anterior margin of the hinge less developed; and by little number of central muscle scars.

MATERIAL Twenty-one carapace and fifty valves, including juvenile instars.

OCCURRENCE Brazilian Continental Shelf, Leg. 1, sample 3004; Leg. 2, sample 3133; Leg. 3, samples 3215, 3281, 3301, 3311, 3312, 3325, 3352; Leg. 7, samples 3807, 3808, 3811, 3812, 3834, 3906, 3909, 3910, 3912, 3917, 3921, 3923, 3928, 3929, 3939, 3945; GEOMAR VI, sample 9-362.
CONCLUSION

The systematic study of Caudites Coryell & Fields, 1937 in the Brazilian Continental Shelf lead to the following comments and conclusions:

- Proposition of a new diagnosis for the genus Caudites. Structures presented by all species of the genus, important for its determination like: secondary fusion areas of inner lamella and variation of carapace in size and in shape are included. Some variables characters, which may or may not present in the species of the genus like: crenulation of the hinge elements, posteroventral vestibulum, carapace with compressed side in lateral view and the strong ridge which runs from the anteroventral angle to the posterodorsal one are excluded.

- A diagnosis to Caudites nipeensis Bold, 1946 is proposed. The species is described and illustrated again, because none of all previous consulted papers presents diagnosis, complete description and illustration in detail of their inner and outer structures.

- In the Brazilian Continental Shelf five species of Caudites occur: C. nipeensis Bold, 1946 and four new species, here described: C. ohmertii sp. nov., C. gnemus sp. nov., C. fluminensis sp. nov. and C. vandenboldi sp. nov.

- By the identity of internal and external morphologic characteristics, Caudites sp. Bertels, 1975 is a synonymous of Caudites gnemus sp. nov. and Caudites sp. Vicalvi, Kotzian et Porti-Estevés, 1977 is a synonymous of Caudites ohmerti sp. nov.

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BIBLIOGRAPHY


Plesiotypus n. MP-O-1007: 1. LV, lateral view; 2. RV, lateral view.
Plesiotypus n. MP-O-1008: 3. Carapace, dorsal view.
Plesiotypus n. MP-O-1009: 4. LV hinge, dorsal view (approx. 96X); 5. RV, hinge, dorsal view (approx. 95X); 6. LV, posterior marginal pore canals (approx. 84X); 7. LV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 84X); 8. RV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 82X); 9. RV, posterior marginal pore canals (146.3X); 10. LV, muscle scars (approx. 82X).
Plesiotypus n. MP-O-1010: 11. RV, in lateral view; 12. RV, ornamentation of anterior portion.
Plesiotypus n. MP-O-1012: 13. LV, hinge, dorsal view (approx. 88X); 14. RV, hinge, dorsal view (approx. 88X).
Plesiotypus n. MP-O-1010: 17. LV, ornamentation of anterior portion; 18. LV, lateral view.
Plesiotypus n. MP-O-1012: 21. RV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 84X); 22. RV, posterior marginal pore canals (approx. 84X); 23. LV, posterior marginal pore canals (approx. 82X); 24. LV, anterior marginal pore canals and secondary fusion in the inner lamella (approx. 82X).

Figures 25-44. Caudites globula Coimbra et Ornellas, sp. nov.

Holotypus n. MP-O-1022: 25. Female LV, lateral view; 26. Female RV, lateral view.
Paratypus n. MP-O-1023: 27. Female carapace, dorsal view.
Paratypus n. MP-O-1024: 28. Female LV hinge, dorsal view (approx. 84X); 29. Female RV, hinge, dorsal view (approx. 84X).
Holotypus n. MP-O-1022: 30. Female LV, hinge detail.
Paratypus n. MP-O-1024: 31. Female LV, muscle scars (approx. 84X).
Holotypus n. MP-O-1022: 32. Female LV, hinge details.
Paratypus n. MP-O-1024: 34. Female LV, posterior marginal pore canals (approx. 84X); 35. Female LV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 84X).
Paratypus n. MP-O-1026: 36. Male LV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 84X); 37. Male RV, posterior marginal pore canals (approx. 84X).
Paratypus n. MP-O-1026: 41. Female RV, anterior marginal pore canals and secondary fusions in the inner lamella (approx. 83X); 42. Female RV, posterior marginal pore canals (approx. 83X).
Paratypus n. MP-O-1026: 43. Male LV, hinge, dorsal view (approx. 93X); 44. Male RV, hinge, dorsal view (approx. 93X).

PLATE 2

Figures 1-33. Caudites oblati Coimbra et Ornellas sp. nov.

Holotypus n. MP-O-1013: 1. Female LV, lateral view; 2. Female RV, lateral view.
Paratypus n. MP-O-1016: 3. Female carapace, dorsal view.
Paratypus n. MP-O-1015: 4. Female LV hinge, dorsal view (approx. 96X); 5. Female RV, hinge, dorsal view (approx. 96X).

Pesquisas n.19. 1987
Paratypus n9 MP-O-1015: 8. Female LV, posterior marginal pore canals (approx. 90X); 9. Female LV, anterior marginal pore canals and secondary fusions of the inner lamella (approx. 90X).

Holotypus n9 MP-O-1013: 10. Female RV, median posterior vertical branch of the ventrolateral ridge; 11. Female RV, normal pore canal of the median posterior vertical branch of the ventrolateral ridge; 12. Female RV, hinge detail; 13. Female RV, hinge detail.

Paratypus n9 MP-O-1016: 14. Female RV, anterior marginal pore canals and secondary fusions of the inner lamella (approx. 95X); 15. Female RV, posterior marginal pore canals (approx. 95X).


Holotypus n9 MP-O-1013: 18. Male LV, posterior marginal pore canals (approx. 163X); 19. Male LV, anterior marginal pore canals and secondary fusions of the inner lamella (approx. 95X).


Paratypus n9 MP-O-1018: 23. Male LV, hinge, dorsal view (approx. 103X); 24. Male RV, hinge, dorsal view (approx. 103X); 25. RV, anterior marginal pore canals and secondary fusions of the inner lamella (approx. 81X); 26. Male RV, posterior marginal pore canals (approx. 81X).


Paratypus n9 MP-O-1019: 30. Immature instar, RV lateral view.


Paratypus n9 MP-O-1021: 32. Immature instar, LV lateral view.


Paratypus n9 MP-O-1028: 3. Male carapace, dorsal view.

Paratypus n9 MP-O-1029: 4. Male LV, hinge, dorsal view (approx. 98X); 5. Male RV, hinge, dorsal view (approx. 98X).


Paratypus n9 MP-O-1030: 13. Female LV, muscle scars (approx. 81X).

Paratypus n9 MP-O-1029: 14. Male LV, hinge (approx. 97X); 15. Male RV, anterior marginal pore canals and secondary fusions of the inner lamella (approx. 81X); 16. Male RV, posterior marginal pore canals (approx. 81X).

Figures 17-31. Caudités vandenboldi Coimbra et Ornellas, nov. sp.


Holotypus n9 MP-O-1031: 18. LV, lateral view; 19. RV, lateral view.

Paratypus n9 MP-O-1031: 20. LV, posterior marginal pore canals (approx. 86X); 21. RV, anterior marginal pore canals and secondary fusion in the inner lamella (approx. 86X); 22. RV, anterior marginal pore canals and secondary fusion in the inner lamella (approx. 82X); 23. RV, posterior marginal pore canals; 24. LV, muscle scars (approx. 82X); 25. LV, hinge, dorsal view (approx. 90X); 26. RV, hinge, dorsal view (approx. 90X).

Holotypus n9 MP-O-1031: 27. RV, hinge detail; 28. LV, hinge detail; 29. RV, hinge detail.

Paratypus n9 MP-O-1034: 30. RV, Immature instar.

Paratypus n9 MP-O-1035: 31. RV, Immature instar.

PLATE 3

Figures 1-16. Caudités flaminesis Coimbra et Ornellas, sp. nov.


Paratypus n9 MP-O-1028: 3. Male carapace, dorsal view.

Paratypus n9 MP-O-1029: 4. Male LV, hinge, dorsal view (approx. 98X); 5. Male RV, hinge, dorsal view (approx. 98X).


Paratypus n9 MP-O-1030: 13. Female LV, muscle scars (approx. 81X).

Paratypus n9 MP-O-1029: 14. Male LV, hinge (approx. 97X); 15. Male RV, anterior marginal pore canals and secondary fusion in the inner lamella (approx. 81X); 16. Male RV, posterior marginal pore canals (approx. 81X).

Figures 17-31. Caudités vandenboldi Coimbra et Ornellas, nov. sp.