

PRELIMINARY REPORT ON THE OCCURRENCE OF *Chancelloria* sp. IN THE ITAJAÍ BASIN, SOUTHERN BRAZIL

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INTRODUCTION This note reports the first findings of fossil relicts in the sedimentary record of the Itajaí Basin (Santa Catarina State - Fig. 1). The fossil remains, which belong to *Chancelloria* sp., were recently presented to the 15th Brazilian Paleontological Congress (Leipnitz *et al.* 1997) and support both a marine depositional environment and a Cambrian age of the uppermost unit of the Itajaí Group (Campo Alegre Formation). The conclusions about a Cambrian age and a marine environment are also supported by trace fossils recently described in the same succession (Netto & Zucatti da Rosa 1997).

GEOLOGICAL SETTING The Itajaí Basin has been classically grouped with several other volcano-sedimentary basins of southern Brazil and interpreted as a late Precambrian to early Palaeozoic molasse basin of the Brasiliano Orogeny (Almeida 1967). Taking into account several geological evidence, the Camaqua (Rio Grande do Sul State) and Itajaí basins have been recently correlated to Pan-African basins (Vanhynsdorp and Nama Basins) of southern Africa (Gresse *et al.* 1996).

Until now, the only age constraint for the Itajaí Group was restricted to whole-rock Rb/Sr isochron diagenetic/ sedimentation age of 581 ± 48 Ma (Macedo *et al.* 1984, Basei *et al.* 1987) and whole-rock Rb/Sr isochron age of intrusive rocks - 544 ± 20 Ma of the alkaline Apiuna Rhyelites and 546 ± 10 Ma of the Subida Granite (Basei *et al.* 1987). Therefore, the Itajaí Group would be older than 545 Ma, with a depositional age about 580 Ma, and hence ascribed to the Vendian Period.

Although a marine environment was previously suggested for the subaqueous facies of the Itajaí Group (e.g. Appi *et al.* 1987, Krebs *et al.* 1990, Mora 1993, Gresse *et al.* 1996), no conclusive evidence of a marine setting has been presented. Therefore, several previous papers use terms such as basinal or subaqueous sedimentation instead of marine (Basei *et al.* 1987, Appi & Souza Cruz 1990, Rostirolla & Figueira 1995). Furthermore, in other coeval Brazilian molasse basins, the only published evidence of marine life are represented by trace fossils described in the Camaqua Basin (Netto *et al.* 1992) and Camarinha Formation (Ciguel *et al.* 1992).

THE FOSSIL REMAINS The fossils were found approximately 2 km southeasterward from the main road of the region (BR 470) in a relatively small road cut located at 27°

05' 47" N and 49° 25' 53" W (Fig. 1) which is included within the lower part of the Campo Alegre Formation (Fig. 2). At least in this outcrop, the fossils occur within a single interval, about 0,5 m thick, (Figs. 3A and 3B), at the bedding planes of normal graded, thinly-bedded siltstones and claystones interpreted as the product of low-density turbidity currents (Tde) deposited in interchannel areas of a submarine-fan complex.

The fossil remains comprise amalgamated, sometimes broken sclerites presenting 4 to 6 tangential rays 2,0 to 7,5 mm long that thin out from the central 1 to 3 mm diameter disk (Fig. 3D). Some rays have a smooth, longitudinal depression on their axial portions (Fig. 3C). These remains were classified as follow:

Phylum and Class uncertain

Order Coeloscleritophora (Bengtson & Missarzhevsky, 1981)

Family Chancelloriidae Walcott, 1920

Genus *Chancelloria* Walcott, 1920

FINAL REMARKS *Chancelloria* has been found in North America (Canada and USA), South America (Argentina), Europe (Spain, Great Britain, France, Italy and Greenland), Asia (Soviet Union, China and Iran), Africa (Senegal and Guinea) and Australia, as resumed in Table 1. The genus always occurs within Cambrian strata and hence is considered a Cambrian taxon (Morris 1992). Considering the worldwide occurrence of this fossil, mostly in Lower to Middle Cambrian strata, the assignment of the Campo Alegre Formation to the Cambrian Period is here proposed, in disagreement with the radiometric age of 580 Ma previously proposed for the Itajaí Group. In addition, a marine environment is now better supported for the stratigraphic level containing the fossil remains and hence a near or below sea level setting should be considered in future geological models proposed for the Itajaí Basin.

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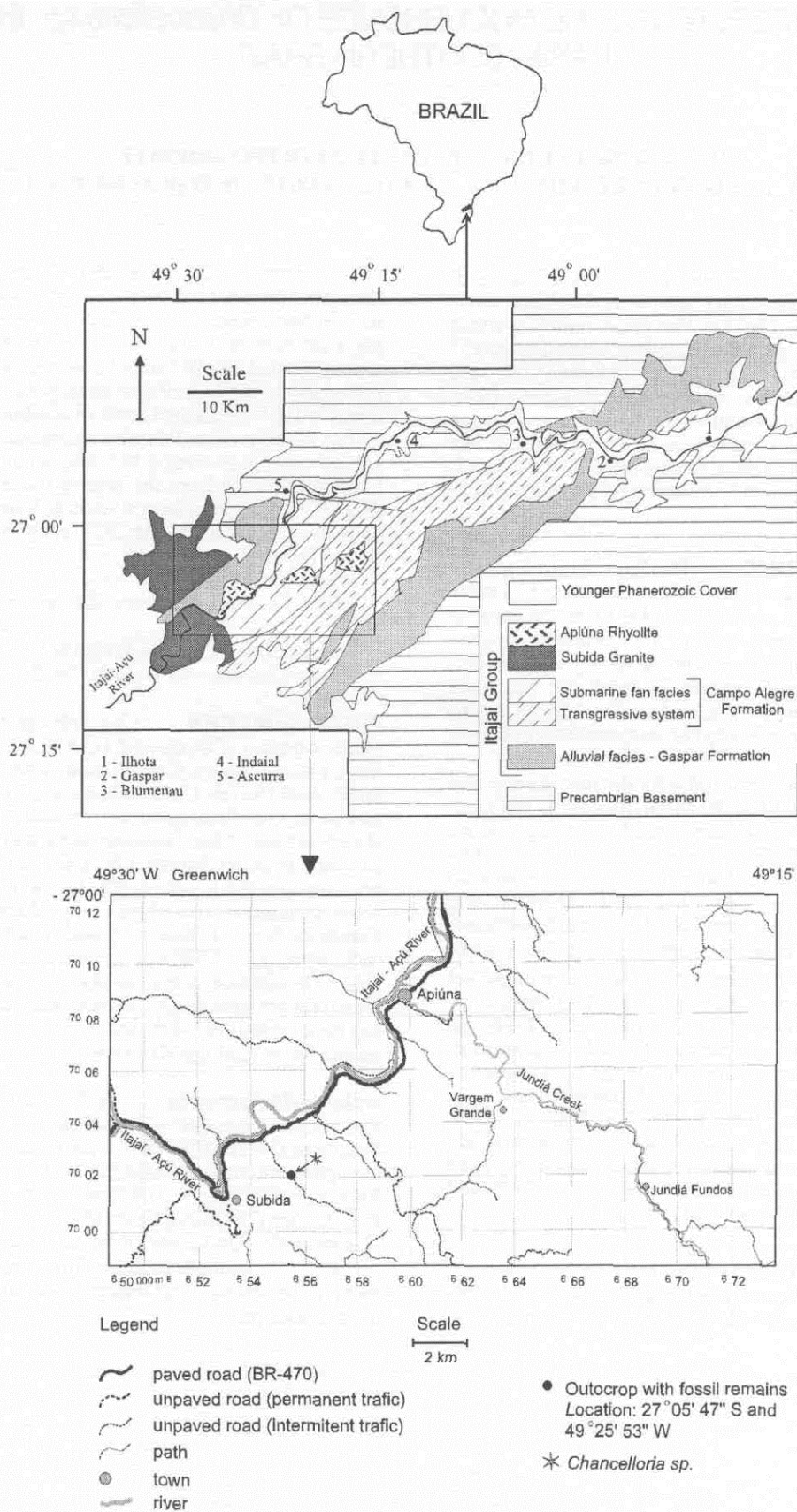


Figure 1 - Location and geological setting of the Itajaí Basin (modified from Rostirolla 1991) and location of the road cut containing the fossils here described.

Figura 1 - Localização e contexto geológico da Bacia do Itajaí (modificado de Rostirolla 1991) e localização do afloramento contendo os fósseis descritos neste artigo.

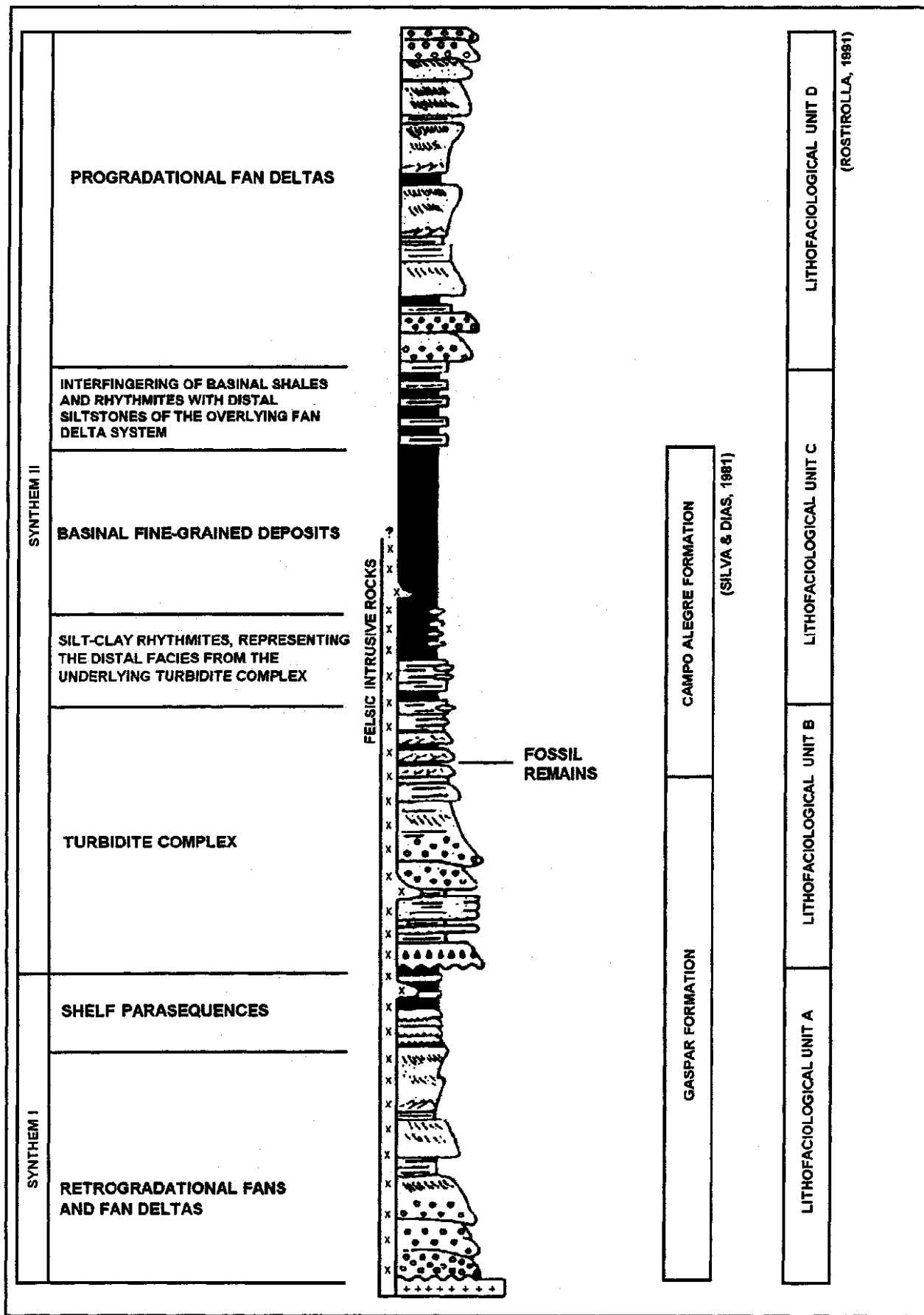


Figure 2 - Schematic geological column of the Itajai Basin (modified from Rostirotta & Figueira 1995).
 Figura 2 - Coluna geológica esquemática da Bacia do Itajai (modificado de Rostirola & Figueira 1995).

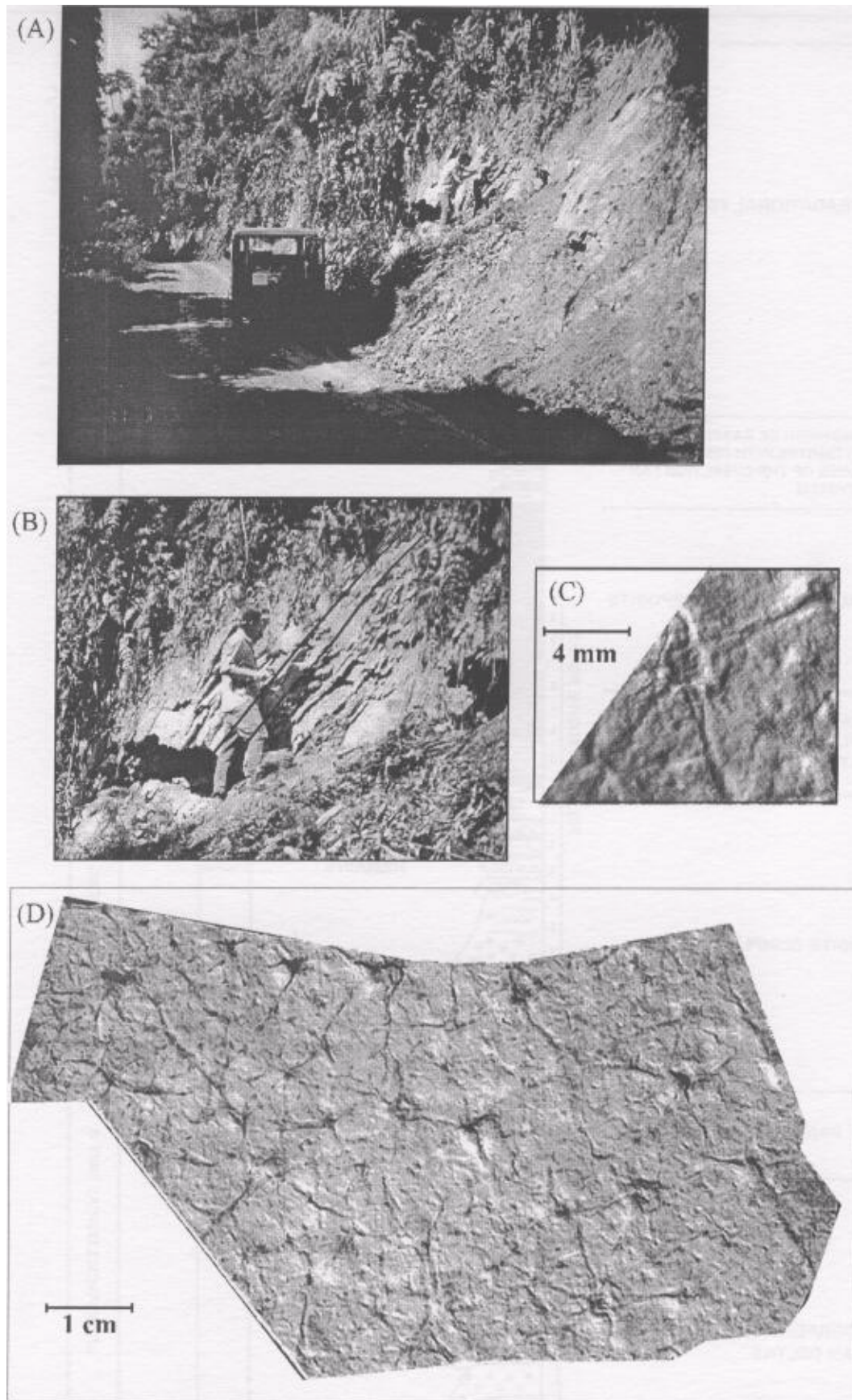


Figure 3 - (A) General view of the outcrop here described; (B) closer view of the outcrop indicating the fossiliferous horizon (between the black lines); (C) detailed view of a sclerite showing the central disk and the tangential rays thinning out from the central disk and presenting smooth, longitudinal depressions; and (D) general view of amalgamated and broken sclerites. Figura 3 - (A) Vista geral do afloramento descrito; (B) vista de detalhe do afloramento com a indicação do horizonte fossilífero (entre as linhas negras); (C) vista de detalhe de um esclerito mostrando o disco central e os braços afinando a partir do disco central e apresentando suaves depressões longitudinais; e (D) vista geral dos escleritos amalgamados e parcialmente quebrados.

Table 1 - Age and global distribution of *Chancelloria* sp.
Tabela 1 - Idade e distribuição global da *Chancelloria* sp.

Country	Locality and Geological Unit	Age	Author
Canada	Mount Cap Fm - Mackenzie Mountains	early Middle Cambrian	Butterfield (1995)
Canada	Mount Cap Fm - Little Bear Shale - Mackenzie Mountains	Lower to Middle Cambrian	Butterfield & Nicholas (1996)
Canada	Burgess Shale - British Columbia	Cambrian	Morris (1992)
USA	Wheeler Shale - Utah	Middle Cambrian	Gunther & Gunther (1981)
USA	Slade belt - New York	late Early Cambrian	Landing & Bartowski (1996)
USA	Marjum Limestone - House Range and Drum Mountains Utah	Lower Cambrian	Rigby (1983)
Greenland	Paradisfjeld Group	early Middle Cambrian	Peel & Higgins (1980)
Great Britain	Comley Limestone	Cambrian	Reid (1959)
France	"Gres et Calcaires de Limousis" and "Gres de Marcory" Montagne Noire	Lower Cambrian	Geyer (1986)
Italy	Cabitzia Fm (Nodular Limestone Member) - SW Sardinia	Middle Cambrian	Cherchi & Schroeder (1984)
Soviet Union	Siberia/Mongolia	Lower Cambrian Tommotian/Botomian	Roanov & Zhuravlev (1992)
Soviet Union	Siberia	Tommotian	Missarzhevsky & Roanov (1981)
Soviet Union	Lena River Section	Tommotian	Matthews & Missarzhevsky (1975)
China	Yangtze region	Lower Cambrian (Meishucunian)	Zhi-Wen (1992)
China		Lower Cambrian (Tommotian)	Pojeta & Zhang (1983)
Spain and North Africa		Lower to Upper Cambrian	Sdzuy (1969)
Senegal and Guinea	Taoudeni Basin West Africa	Early/Middle(?) Cambrian	Culver et. al. (1996)
South Australia		Early Cambrian	Bengtson et al. (1990)
Australia	Wirrealpa Limestone (Flinders Ranges)	Cambrian (Toyonian)	Brock & Cooper (1993)
Argentina	Formacion Empozada (Mendoza)	Cambrian	Beresi & Heredia (1995)
Argentina	La Laja Fm and San Isidro Fm - Chica de Zonda Range/ Empozada Gulch	upper Lower to Middle Cambrian	Beresi & Rigby (1994)

REFERENCES

- Almeida, F. F. M. de. 1967. *Origem e evolução da plataforma brasileira*. Rio de Janeiro. DNPM/DGM, 36p (Boletim 241).
- Appi, C. J.; Souza Cruz, C. E.; Barrocas, S. L. & Freitas, E. L. 1987. Modelo deposicional dos turbiditos do Proterozóico Superior do Grupo Itajaí - SC. *Boletim do Núcleo de Minas Gerais da SBG*, 6: 31-46.
- Appi, C. J. & Souza Cruz, C. E. 1990. Estratigrafia de Sequencias na Bacia do Itajaí. In: CONGRESSO BRASILEIRO DE GEOLOGIA, 36, Natal, 1990. *Anais...*, Natal, SBG, V.1, p.93-107.
- Basei, M. A.; Kawashita, K. & Siga Jr., O. 1987. Idade, características litoestratigráficas e estruturais do Grupo Itajaí, Santa Catarina. In: SIMPÓSIO SUL-BRASILEIRO DE GEOLOGIA, 3, Curitiba, 1987. *Atas...*, Curitiba, SBG, V. 1, p. 93-106.
- Bengtson, S.; Morris, S. C.; Cooper, B. J.; Jell, P. A. & Runnegar, B. N. 1990. Early Cambrian fossils from South Australia. *Assoc. of Australasian Palaeontologists, Memoir* 9: 45-47.
- Bengtson, S. & Missarzhevski, V. V. 1981. Coeloscleritophora - a major group of enigmatic Cambrian metazoans. *United States Geological Survey Open File Report*, 81-743: 19-21.
- Beresi, M. S. & Rigby, J. K. 1994. Sponges and Chancelloriids from the Cambrian of Western Argentina. *J. Paleont.*, 68 (2): 208-217.
- Beresi, M. S. & Heredia, S. 1995. Asociación de espiculas de poríferos cambrios de la Formación Empozada, Precordillera de Mendoza. *Ameghiniana* (Rev. Assoc. Paleont. Argent.), 32 (4): 401-405.
- Brock, G. A. & Cooper, B. J. 1993. Shelly fossils from the Early Cambrian (Toyonian) Wirrealpa, Aroona Creek, and Ramsay limestones of south Australia. *J. Paleont.*, 67 (5): 758-787.
- Butterfield, N. J. & Nicholas, C. J. 1996. Burgess Shale-type preservation of both non-mineralizing and "shelly" Cambrian organisms from the Mackenzie Mountains, northwestern Canada. *J. Paleont.*, 70 (6): 893-899.

- Cherchi, A. & Schroeder, R. 1984. Middle Cambrian foraminifera and other microfossils from SW Sardinia. *Bollettino della Società Paleontologica Italiana*, **23** (2): 149-160.
- Ciguel, J. H. G.; Góis, J. R. & Acefiolaza, F. G. 1992. Ocorrência de icnofósseis em depósitos molássicos da Formação Camarinha (Neoproterozóico III - Cambriano Inferior), no Estado do Paraná Brasil. Universidad Nacional de Tucuman, *Série Correlation Geológica*, **9**: 157-158.
- Culver, S. J.; Repetsky, J. E.; Pojeta, J. & Hunt, D. 1996. Early and Middle (?) Cambrian Metazoa and Protistan fossils from west Africa. *J. Paleont.*, **70** (1): 1-6.
- Geyer, M. 1986. Découverte de microfaune dans le Cambrien inférieur du versant meridional de la Montagne Noire (Cabardes et Minervois, Aude - France), *Bull. Soc. Hist. Nat. Toulouse*, **122**: 11-17.
- Gresse, P. G.; Chemale Jr., F.; da Silva, L. C.; Walraven, F. & Hartmann, L. A. 1996. Late- to post-orogenic basins of the Pan-African-Brasiliano collision orogen in southern Africa and Southern Brazil. *Basin Research*, **8**: 157-171.
- Gunther, L. F. & Gunther, V. G. 1981. Some Middle Cambrian fossils of Utah. *Geology Studies*, Brigham Young University, 81 pp.
- Krebs, A. S. J.; Lopes, R. C. & Camozato, E. 1990. Caracterização faciológica do Grupo Itajaí na Folha Botuverá (SC). In: CONGRESSO BRASILEIRO DE GEOLOGIA, 36. Natal, 1990. Anais..., V. 1, p. 82-92.
- Landing, E. & Bartowski, K. E. 1996. Oldest shelly fossils from the laconic allochthon and late Early Cambrian sea-levels in eastern Laurentia. *J. Paleont.*, **70** (5): 741-761.
- Leipnitz, I. I.; Paim, P. S. G.; Da Rosa, A. A. S.; Zucatti da Rosa, A. L. & Nowatski, C. H. 1997. Primeira ocorrência de *Chancelloridae* no Brasil. In: CONGRESSO BRASILEIRO DE PALEONTOLOGIA, 15, São Pedro, Agosto de 1997. *Boletim de Resumos*, UNESP, p. 01.
- Macedo, M. H. F.; Basci, M. A. S.; Bonhomme, M. G. & Kawashita, K. 1984. Dados geocronológicos referentes as rochas metassedimentares do Grupo Itajaí (SC). *Revista Brasileira de Geociências*, **14** (1): 30-34.
- Matthews & Missarzhevsky, V. V. 1975. Small shelly fossils of Late Precambrian and early Cambrian age: a review of Recent work. *Quarterly Journal of the Geological Society of London*, **131**: 289-304.
- Missarzhevsky, V. V. & Rozanov, A. Y. 1981. Fossil assemblages and zonal stratigraphy of Cambrian-precambrian boundary deposits of the Siberian Platform. In: RAABEN, M. E. ed. *The Tommotian Stage and the Cambrian Lower Boundary Problem*, p. 62-70.
- Mora, S. 1993. *Stratigrafia física e análise de fósseis do complexo torbidítico Itajaí (Proterozoico Superior)*. Rio de Janeiro, 18p (Relazione de Tirocino -PETROBRÁS).
- Morris, S. C. 1992. Burgess Shale-type faunas in the context of the "Cambrian explosion": a review. *Journal of the Geological Society*, **149**: 631-636.
- Netto, R. G.; Paim, P. S. G. & Da Rosa, C. L. M. 1992. Informe preliminar sobre a ocorrência de traços fósseis nos sedimentos das bacias do Camagua e Santa Barbara. In: WORKSHOP SOBRE AS BACIAS MOLÁSSICAS BRASILIANAS, 1, São Leopoldo, 1992. *Resumos Expandidos*, UNISINOS, p. 90-96.
- Netto, R. G. & Zucatti da Rosa, A. L. 1997. Registro icnofossilífero da Bacia do Itajaí, SC: uma primeira visão. In: CONGRESSO BRASILEIRO DE PALEONTOLOGIA, 15, São Pedro, Agosto de 1997. *Boletim de Resumos*, UNESP, p. 136.
- Nicholas, N. J. 1995. Chancelloriids from the Middle Cambrian of the Mackenzie Mountains: implications for early poriferan evolution. *Geological Society of America*, Annual Meeting, New Orleans, USA, A-269.
- Peel, J. S. & Higgins, A. K. 1980. Fossils from the Paradisfjeld Group, North Greenland fold belt. *Rapp. Grønlands geol. Unders.*, **101**: 28.
- Pojeta, J. & Zhang, R. (1983) The oldest shelly faunas. Abstracts with programs, The British Library (ref. 31549), p. 662.
- Reid, R. E. H. 1959. Occurrence of *Chancelloria* Walcott in the Comley Limestone. *Geological Magazine*, **96**(3): 261-262.
- Rigby, J. K. 1983. Sponges of the Middle Cambrian Marjum Limestone from the House Range and Drum Mountains of Western Millard County, Utah. *Journal of Paleontology*, **57**: 240-270.
- Rostirolla, S. P. 1991. *Tectônica e sedimentação da Bacia do Itajaí - SC*. Ouro Preto, 131p. (Dissertação de Mestrado, Universidade Federal de Ouro Preto).
- Rostirolla, S. P. & Figueira, E. G. 1995. Associação de fósseis turbidíticos do Grupo Itajaí, SC: sedimentação de água profunda em uma bacia de antepaís. *Boletim Paranaense de Geociências*, **43**: 79-94.
- Rozanov, A. Y. & Zhuravlev, A. Y. 1992. The Lower Cambrian fossil record of the Soviet Union. In: Lipps, J. H. & Signor, P. W., eds. *Origin and Early Evolution of the Metazoa*. New York, Plenum Press, p. 205-283.
- Sdzuy, K. 1969. Unter und Mittelkambrische Porifera (*Chancelloriida* und *Hexactinellida*). *Palaont. Z.* **43** (3/4): 115-147.
- Silva, L. C. da & Dias, A. A. 1981. *Projeto Timbo - Barra Velha, Brasil*. Porto Alegre, 282p (Convenio DNP/CPM - relatório inédito).
- Walcott, C. D. 1920. Middle Cambrian Spongiae. *Smithsonian Miscellaneous Collections*, **67**: 261-364.
- Zhi-Wen, J. 1992. The Lower Cambrian fossil record of China. In: Lipps, J. H. & Signor, P. W., eds. *Origin and Early Evolution of the Metazoa*. New York, Plenum Press, p. 311-333.

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