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NOTA BREVE - SHORT NOTE

NEW SYRINGOTHYRIDID GENUS (SPIRIFERINIDA, BRACHIOPODA) FROM THE EARLY PERMIAN OF INTERIOR OMAN

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Riassunto. Nelle faune a brachiopodi del Permiano inferiore, si rinvengono spesso pochi, ma significativi esemplari appartenti alla famiglia Syringothyrididae (Spiriferinida). Le successioni del Permiano inferiore della zona centrale del Sultanato di Oman, si distinguono per la conservazione eccezionale e l'estrema abbondanza di queste forme che arrivano a costituire fino al 90% dell'intera associazione fossilifera. Tali ritrovamenti e la revisione di forme affini hanno permesso di introdurre un nuovo genere, denominato *Pachycyrtella* - con specie-tipo *P. omanensis* n. sp. -comprendente specie gondwaniane precedentemente attribuite a *Cyrtella*, dalla quale si distinguono per l'interarea ventrale alta ed orientata da apsaclina a ortoclina e per l'umbone estremamente ispessito e calloso.

Abstract. Representatives of the Syringothyrididae (Spiriferinida) are a significant component of the Early Permian brachiopod faunas, even if usually subordinate in number of specimens, except for the Interior of Oman, where they dominate the faunal assemblage.

A new genus *Pachycyrtella* - with type-species *P. omanensis* n. sp. - is here established in order to include gondawanan species - previously assigned to the genus *Cyrtella* - characterized by high and apsacline to orthocline ventral interarea, thick umbo and deep dorsal median furrow.

Introduction.

During recent investigations on the mid-upper Sakmarian (Early Permian) brachiopod fauna from the Saiwan Formation (Haushi-Huqf area, Interior of Oman) - coupled with the revision of coeval faunas from the Perigondwanan fringe (Central Aghanistan, Indian Himalaya, Kashmir) - it became apparent that it was necessary to establish a new syringothyridid genus based on the specimens previously determined as *?Cyrtella* aff. *C. nagmargensis* (Bion, 1928) by Angiolini in Angiolini et al. (1997). The new genus is here named *Pachycyrtella* n. gen. because of its thick, heavy umbo and its cyrtelloid shape.

Pachycyrtella omanensis n. gen. n. sp. has been collected chiefly from a 40-cm thick bed of hybrid arenites at the base of the Saiwan Formation at Saiwan (level OL14 in fig. 2 of Angiolini et al., 1997), where it has been recorded in life-position, dominating the faunal assemblage.

Pachycyrtella omanensis n. gen. n. sp. displays the features of a typical opportunist species in a pioneer palaeocommunity: random distribution pattern over a limited area, clustering in groups, numerical dominance (> 85%), suspension feeding, rapid rates of reproduction and growth (r-strategy), early maturity, low mortality of juveniles and mortality rates in the adults which are independent from the density and from the size of the individuals.

The mid-Sakmarian transgression above the glacial to alluvial deposits of the ?Upper Carboniferous-Lower Permian Al-Khlata Formation provides a new habitat, a cool and inorganic nutrient-rich environment, which is colonised by the opportunist *Pachycyrtella omanensis* n. gen. n. sp. showing several morphological adaptations enabling its successful exploitation.

In contrast with the apparent bipolar *Cyrtella*, the new genus was probably confined to the regions located at the Perigondwanan fringe during the Early Permian, such as Oman, Central Afghanistan and the Himalaya. It may have occurred also in eastern Australia.

Systematic Paleontology.

Figured and described specimens are housed in the collections of the Museum of the Dipartimento di Scienze della Terra, Università degli Studi of Milan, Italy (MPUM numbers) and in the Musée de Géologie of Lausanne (MGL numbers).

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Order Spiriferinida Ivanova, 1972

Suborder Spiriferinidina Ivanova, 1972

Superfamily Syringothyridoidea Fredericks, 1926

Family Syringothyrididae Fredericks, 1926

Subfamily Permasyrinxinae Waterhouse, 1986

Remarks - In their preliminary classification of the spiriferid brachiopods for the revised Treatise, Carter et al. (1994) included in the family Syringothyrididae Fredericks, 1926 all the punctate, strophic, biconvex spiriferids with ornamentation of simple ribs, smooth fold and sulcus, and high to very high ventral interarea with perideltidial areas. Based on the presence or the absence of the syrinx and the ventral median septum, they distinguished three subfamilies within the Syringothyrididae. Due to the supposed occurrence of a syrinx they included *Subansiria* Sahni & Srivastava, 1956 in the subfamily Syringothyridinae. However as suggested by Angiolini et al. (1997) *Subansiria* lacks a true syrinx and thus must be included in the subfamily Permasyrinxinae Waterhouse, 1986 together with *Cyrtella* Fredericks, 1924 and *Punctocyrtella* Plodowski, 1968, previously considered synonyms by Carter et al. (1994).

As discussed in Angiolini et al. (1997), *Cyrtella* and *Punctocyrtella* could be regarded as distinct and separate genera and a new genus *Pachycyrtella* is established in order to includ perigondawanan species previously placed in *Cyrtella* and characterized by a high and apsacline ventral interarea and thick umbo.

Genus *Pachycyrtella* n. gen.

Type-species: *P. omanensis* n. sp.

Etymology. Genus named for its thick, heavy umbo (from the ancient greek παχυς) and its *Cyrtella*-like general shape.

Diagnosis. Thick shelled, large species with high apsacline to orthocline ventral interarea. Ventral sulcus usually wide and shallow, dorsal fastigium deeply furrowed. Ornamentation of coarse, adichotomous costae. Interior of ventral valve with variably developed umbonal callus, thick delthyrial plate, long dental plates with ventral adminicula surrounding the posterior part of the muscle field. Interior of dorsal valve with broad sessile cardinal process; socket plates and crural bases fused to the cardinal process by a thick callus.

Discussion. The new genus *Pachycyrtella* is erected in order to include species similar to *Cyrtella* but characterized by a high and apsacline to orthocline ventral interarea, by a thick umbonal callus, and deep dorsal median furrow. In fact, *Cyrtella* differs from *Pachycyrtella* by its **catacline** ventral interarea, smaller callus, more transverse shape and shallower furrow on the dorsal fold. Furthermore, *Cyrtella* has a characteristic internal section with narrow post-delthyrial (central) cavity and much wider umbonal chambers, very different from that of *Pachycyrtella*, characterised by a large central chamber.

Pachycyrtella n. gen. differs from *Permasyrinx* Waterhouse, 1983 by its apsacline-orthocline interarea and the occurrence of a medial sulcus along the fold; from *Pyramidthyris* Hu, 1983, *Pseudosyringothyris* Fredericks, 1916 and *Tuotalania* Hu, 1983 by the orientation of the ventral interarea and the dorsal fastigium which in the latter genera is not sulcate.

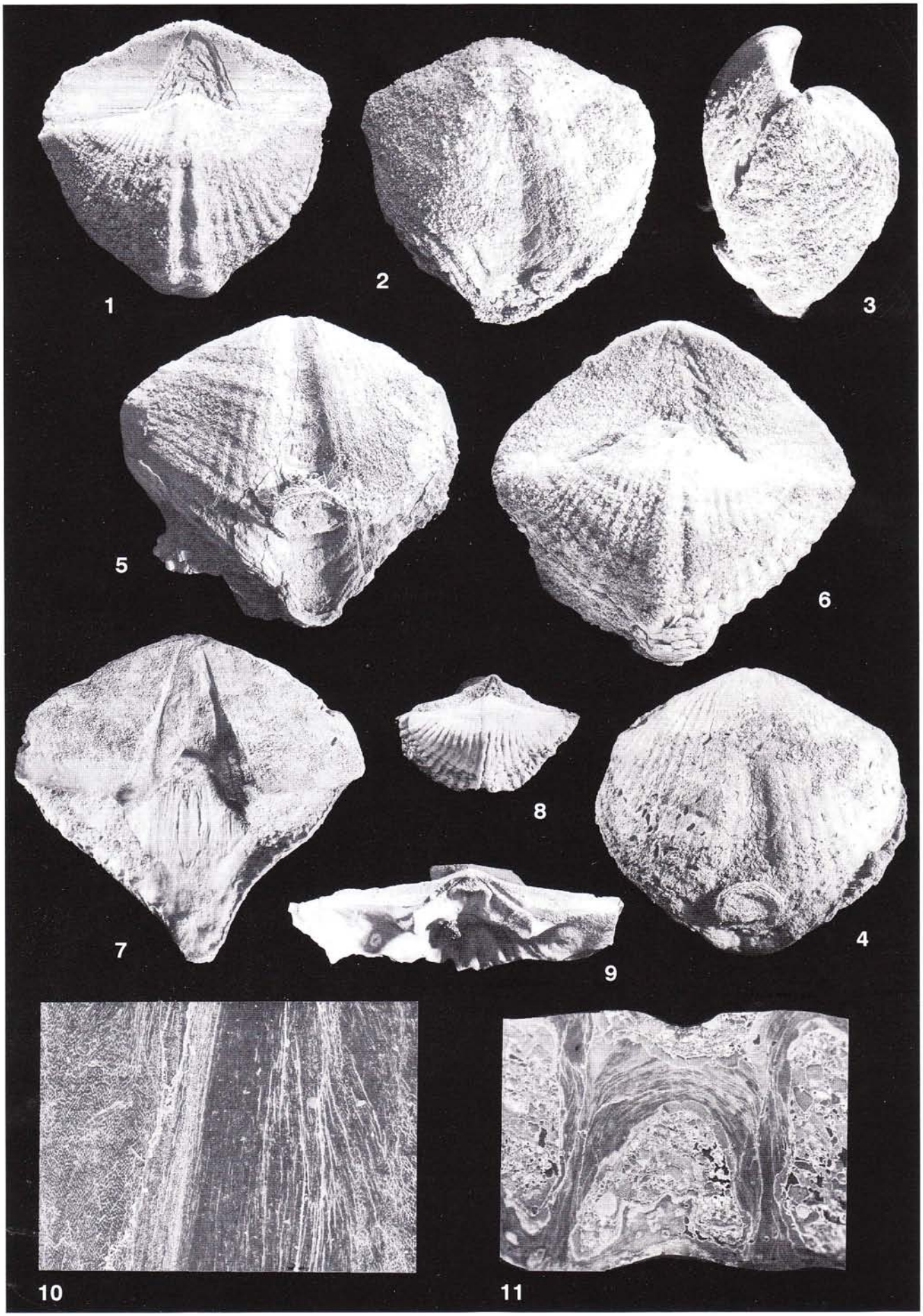
The specimens determined as *S. nagmargensis* by Termier et al. (1974) from the Sakmarian of Central Afghanistan are assigned to the new genus *Pachycyrtella* because of their apsacline interareas and thick umbones. The same holds true for those determined as *Cyrtella* nagmargensis by Archbold & Gaetani (1993) from the Late Sakmarian Chumik Formation Member A of Zanskar (India). *Cyrtella subparallela* Waterhouse 1987 from the Early Sakmarian Elvinia Fm. of SE Bowen Basin (E Australia) is probably related to *Pachycyrtella*, having an apsacline ventral interarea and a heavy umbonal thickening.

On the contrary, examination of replicas of the type material of *Cyrtella nagmargensis* (Bion, 1928) from Kashmir - kindly shown to me by Dr. G. Plodowski of Senckenberg Museum (Frankfurt) - has pointed out that

PLATE 1

(All x 1, except when specified)

Fig. 1 - *Pachycyrtella omanenis* n. gen. n. sp. Holotype, dorsal view of complete specimen MPUM 8425.
Fig. 2 - *Pachycyrtella omanenis* n. gen. n. sp. Holotype, ventral view of complete specimen MPUM 8425.
Fig. 3 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, lateral view of complete specimen MPUM 8426.
Fig. 4 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, ventral view of complete specimen MPUM 8426, bearing a cemented specimen of *Etherilosia* sp.
Fig. 5 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype , ventral view of complete specimen MPUM 8428, bearing a cemented specimen of *Etherilosia* sp.
Fig. 6 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, dorsal view of a complete specimen MPUM 8429.
Fig. 7 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, ventral valve interior, specimen MPUM 8431.
Fig. 8 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, dorsal view of complete specimen of a juvenile MPUM 8427.
Fig. 9 - *Pachycyrtella omanenis* n. gen. n. sp. Paratype, dorsal valve interior, specimen MPUM7975
Fig. 10 - *Pachycyrtella omanenis* n. gen. n. sp. Secondary layer showing fine punctation, x 52, at 0.77 cm from the umbo (MGL 63121).
Fig. 11 - *Pachycyrtella omanenis* n. gen. n. sp. Section showing dental plates and delthyrial plate x 4 at 1.29 cm from the umbo (MGL 63121).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the original species *nagmargensis* belong to the genus *Cyrtella*. In fact, the Kashmir specimens are characterised by a catacline interarea, transverse shape and internal characters consistent with those of *Cyrtella kulikiana* (Fredericks, 1916), type species of *Cyrtella*. Furthermore, *Cyrtella nagmargensis* from Kashmir is easily distinguishable from the genus *Punctocyrtella* by the orientation and height of its ventral interarea, the ornamentation and the internal characters of the ventral valve.

The Tibetan *C. nagmargensis* from the Late Sakmarian Qudi Formation of Rutog Duoma (Hu, 1983) belongs to the genus *Cyrtella*, based on the orientation of the interarea and the internal sections.

The Western australian *C. australis* Thomas, 1971 from the Lyons Group and Callytharra Formation is to be retained in the genus *Cyrtella*, according to the orientation of the interarea. *C. koopi* Archbold, 1990 from the Sakmarian Cuncudgerie Sandstone (Cunning Basin) is difficult to judge being an internal mould.

Occurrence. Early Permian of South Oman, Central Afghanistan, Zanskar (India), ? E Australia.

Pachycyrtella omanensis n. sp.

1959 *Asyrinx haushiensis* Hudson & Sudbury, p. 46-47, pl. 5, fig. 2.
1959 *Pseudosyrinx* sp. - Hudson & Sudbury, p. 46, pl. 5, fig. 1a-b.
1997 *Cyrtella* aff. *C. nagmargensis* - Angiolini et al., p. 391, fig. 11.1-6, text fig. 8,9,11, tab. 5.

Holotype .A complete specimen: MPUM 8425.

Paratypes. 6 complete specimens: MPUM 8426, MPUM 8427, MPUM 8428, MPUM8429, MPUM 8430, MPUM 7960.

2 ventral valves: MPUM 8431, MGL67121.

1 dorsal valve: MPUM 7975.

Etymology. Species named for its provenance, the Sultanate of Oman.

Type locality and age. Saiwan (coord. 20°52'27"N-57°36'26"E), Interior of Oman, basal bed (OL14) of the Saiwan Formation, mid-Sakmarian.

Description. Medium to large-sized biconvex shells with maximum width at hinge line. Cardinal extremities from angular in juveniles to truncated in adults. Shell substance finely punctate and micropunctate.

Ventral valve weakly convex, sub-rhomboidal in outline. Interarea high, generally slightly concave, oriented at a low angle with the commissural plane (from apsacline to nearly orthocline); perdideltidial areas not well demarcated. Delthyrium closed by stegidial plates; hypodeltidial and deltidial furrows separated by a deltidial ridge. Shallow and smooth ventral sulcus arising at umbo, widening anteriorly and protruding anteriorly as a tongue of variable length. Ornamentation of simple rounded costae, numbering 10-12 for each flank. Costae widening anteriorly up to 3-4.5 mm in width at the anterior margin. Growth lamellae of two different sizes occur throughout the valve: coarser and widely spaced versus finer, more numerous and denser. Micrornamentation of minute pustules.

Dorsal valve transverse, strongly arched. Fastigium widening and getting higher anteriorly, bearing a deep and wide median furrow, becoming shallower at the anterior margin. Lateral dorsal margins strongly overlapping the ventral ones. Ornamentation of 10-12 simple rounded costae on each side of the fold. Costae widening anteriorly up to 3-3.8 mm at the anterior margin. Growth lamellae as in the ventral valve.

Ventral valve interior with large and concave delthyrial plate, showing a strongly concave margin towards the hinge line. Umbonal callus variably developed, embedding dental plates and adminicula and filling at variable degree the central cavity below delthyrial plate and the lateral cavities; anterior sides of apical callus deeply pitted by genital markings. Dental plates high, merging with adminicula and concave towards lateral margins. Adminicula surrounding the posterior part of the muscle field. Teeth stout and coarse. Muscle field large, sub-rhomboidal, slightly depressed, dendritic on posterior part and longitudinally striated on anterior part and divided by a myophragm. Dorsal valve interior with a broad, sessil laminated cardinal process; socket plates and crural plates fused to the cardinal process by a callus which is very large in mature specimens. Spiralia broad, tightly coiled, with postero-laterally directed apex. Adductor scars depressed with a thin median myophragm.

Discussion. This description is in total agreement with that of ?*C.* aff. *nagmargensis* published by Angiolini in Angiolini et al. (1997, p. 391-392) to which the reader is referred for details on the ontogentetic variation, intraspecific variability, and serial sections.

The invalidity of the genus *Asyrinx* Hudson & Sudbury, 1959 - based on two non congeneric specimens - has already been pointed out by Angiolini in Angiolini et al. (1997).

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REFERENCES

Angiolini L., Bucher H., Pillevuit A., Platel J.P., Roger J., Broutin J., Baud A., Marcoux J., & Al Hashmi H. (1997) - Early Permian (Sakmarian) brachiopods from Southeastern Oman. *Geobios*, 30: 379-405, Lyon.

Archbold N.W. & Gaetani M. (1993) - Early Permian Brachiopoda and Mollusca from the NW Himalaya, India. *Riv. It. Paleont. Strat.*, 99: 27-56, Milano.

Carter J., Johnson J.G., Gourvennec R. & Hong-Fei H. (1994) - A revised classification of the Spiriferid brachiopods. *Annals of Carnegie Museum*, 63: 327-374, Pittsburgh.

Hu C. (1983) - New genera and species of Spiriferacean brachiopods in the Late Carboniferous to Early Permian from Duoma District, Rutog, Xizang (Tibet), China. *Journal of Wuhan College of Geology*,19: 105-117, Wuhan.

Hudson R.G.S. & Sudbury M. (1959) - Permian Brachiopoda from south-east Arabia. *Notes et memoires sur le Moyen-Orient*, 7: 20-53, Parigi.

Termier G., Termier H., de Lapparent A.F. & Marin Ph. (1974) - Monographie du Permo-Carbonifère de Wardak (Afghanistan Central). *Documents des Laboratoires de Géologie de la faculté des Sciences de Lyon*, H.S., 2: 1-167, Lyon.