

Talcheridium indicum a new acritarch with dinoflagellate-like features from the Permian Barakar Formation of India

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KEY WORDS – *Talcheridium*, *Acritarch*, *Dinoflagellate*, *Barakar Formation*, *Permian*, *India*.

ABSTRACT – *Talcheridium indicum* gen. et sp. nov., from shales of the coal-bearing Barakar Formation, Talcher Coalfield, Orissa, India, encompasses the thin-walled, ornamented acritarchous cysts referred to as "Type A" by Tripathi (1993). Many specimens show polar symmetry, and commonly have a peripheral fold, sometimes also a meridional fold. At one pole a pylome with an irregular (angular) edge is present, but there is no definite evidence of neither an archeopyle or operculum nor tabulation of the cyst wall. The affinity of the new fossil - whether it is a dinoflagellate or is best considered as an acritarch or dinoflagellate - is discussed. *Talcheridium indicum* is associated with *Leiosphaeridia*, *Navifusa*, and *Foveofusa* in an assemblage dominated by striate bisaccate pollen of late Early Permian age.

RIASSUNTO – [*Talcheridium indicum* gen. et sp. nov., un acritarco permiano (con caratteri di dinoflagellato?) della Formazione Barakar, India] – *Talcheridium indicum* gen. et sp. nov., trovato in argilliti della Formazione Barakar, Campo minerario carbonifero di Talcher, Orissa, India, corrisponde alle cisti di acritarchi a parete sottile e ornamentata, pubblicate come "Tipo A" da Tripathi (1993). Molti esemplari mostrano una simmetria polare e comunemente hanno una piega periferica, talora anche meridionale. Ad uno dei poli è presente un piloma con un bordo irregolare (angolare) ma non vi è prova evidente dell'esistenza di un archeopilo o di un opercolo, o di una tabulazione della parete della cisti. L'affinità del nuovo fossile (se sia un acritarco o un dinoflagellato) viene quindi discussa. *Talcheridium* è stato trovato insieme a *Leiosphaeridia*, *Navifusa* e *Foveofusa*, in una associazione dominata da pollini striati bisaccati, della parte alta del Permiano Inferiore.

INTRODUCTION

In 1993, Tripathi recovered abundant and diverse palynomorphs from coal-bearing sediments of the Talcher Coalfield, Orissa, India. Among these, was a new type of organic-walled cyst, then referred to as "Type A". This form is here described as *Talcheridium indicum* gen. et sp. nov. The host sample is a shale from the coal-bearing sequence penetrated in Borehole TCW-25 of the Talcher Coalfield which was dated as late Early Permian (Tripathi, 1993).

The palynoflora also includes representatives of the acritarch genera *Foveofusa* Lele & Chandra, 1970 and *Navifusa* Combaz, Lange & Pansart, 1967, and prasinophyte phycmata belonging to *Leiosphaeridia* Eisenack, 1958 emend. Turner, 1984, but it is dominated by the striate bisaccate genera *Faunipollenites* Bharadwaj, 1962 and *Striatopodocarpites* Zoricheva & Sedova emend. Bharadwaj, 1962. Based on its species composition, Tripathi (1993) correlated the palynoflora with the *Faunipollenites varius* Assemblage Zone of Tiwari & Tripathi (1992). The material studied herein is curated in the collection of the Birbal Sahni Institute of Palaeobotany, Lucknow, India.

SYSTEMATIC PALAEONTOLOGY

Incertae sedis «group» ACRITARCHA Evitt, 1963

Genus TALCHERIDIUM gen. nov.

Etymology – From the Talcher Coalfield, Orissa, India; gender neuter.

Type species (here designated) – *Talcheridium indicum* sp. nov.

Diagnosis – Because *Talcheridium* gen. nov. is presently monospecific, the diagnosis of the type species *T. indicum* sp. nov. may be considered a *descriptio generico-specifica*, according to the International Code of Botanical Nomenclature, Art. 42.1,

Comparison – *Talcheridium* gen. nov. differs from other acritarchous genera in having peripheral and meridional features or folds, an (apical?) opening, and ornamental processes that do not communicate with the vesicle interior. The Silurian genus *Tylotopalla* Loeblich, 1970, is somewhat similar, but lacks a

pylome and has processes that open into the vesicle cavity.

TALCHERIDIUM INDICUM sp. nov.
Pl. 1, figs. 1-16

Diagnosis – Vesicle hollow, pear-shaped to ovaloid or subcircular in outline. Vesicle wall thin (ca. 1 µm), two-layered, with punctate infrastructure and bearing broad-based elements of varying shape (conical or blunt, simple or branched at the tip) produced by the outer layer. Processes evenly distributed over the whole vesicle; bases coalescent, imparting a reticulate pattern to the vesicle surface; processes not communicating with vesicle interior. Compressional folds along the periphery common. Some specimens displaying a meridional fold crossing the peripheral one. At one pole an irregular opening is sometimes evident.

Dimensions (36 specimens) – Vesicle diameter (excluding processes) 65-87.5 x 46-62.5 µm; holotype 69 x 57 µm; processes 1-5 µm high, 1-6 µm wide at base.

Types – Holotype, Pl. 1, fig. 1, BSIP slide 10741, EF L33/4. Paratype, Pl. 1, fig. 5, BSIP slide 12066, EF K15.

Type locality and stratum – Talcher Coalfield, Orissa, India; Borehole TCW-25, sample at 136.00 m depth, Barakar Formation, late Early Permian.

Etymology – From Latin *indicum*, adjective, Indian.

Remarks and comparisons – At one pole (generally the narrower) of some specimens, an opening with an irregular, angular margin is present. However, no clear indication of paratabulation is apparent, and no whole opercula have been observed.

Most specimens show a system of peripheral compression folds. Commonly there is a fold or linear fea-

ture conformable with the specimen outline (Pl. 1, figs. 1, 8, 10); some specimens show a meridional fold crossing the peripheral one. The processes or sculptural elements commonly show a concentric distribution, paralleling the equator, particularly in the more apical part of the vesicle.

The shape of the vesicle and its polar symmetry and apical, angular opening, the two-layered wall, and the aspect of the latter, impart a special appearance to *Talcheridium indicum* reminiscent of the characteristics of some dinoflagellates. However, there is no direct evidence of paratabulation, nor a distinct girdle or ventral depression. For the latter reasons, the fossils are here treated as Acritarcha. Nevertheless, the angularity of the edge of the opening, together with its variable size and shape, suggest that the "pyle" (pylome?, archeopyle?) may result from piecemeal disintegration of a tabulated wall. The peripheral feature is more strongly developed than the meridional, and with circular alignment of processes parallel to it, especially in the episome; this suggests a deeper regular organisation of the structural/sculptural elements. The two-layered structure of the wall is similar to that seen in early dinoflagellates. Clearly this acritarchous form deserves closer scrutiny.

Occurrence – So far known only from the type locality, from the upper Barakar Formation, late Early Permian in age. Not very common, but in a 20 x 40 mm coverslip preparation, some four to eight specimens may be observed.

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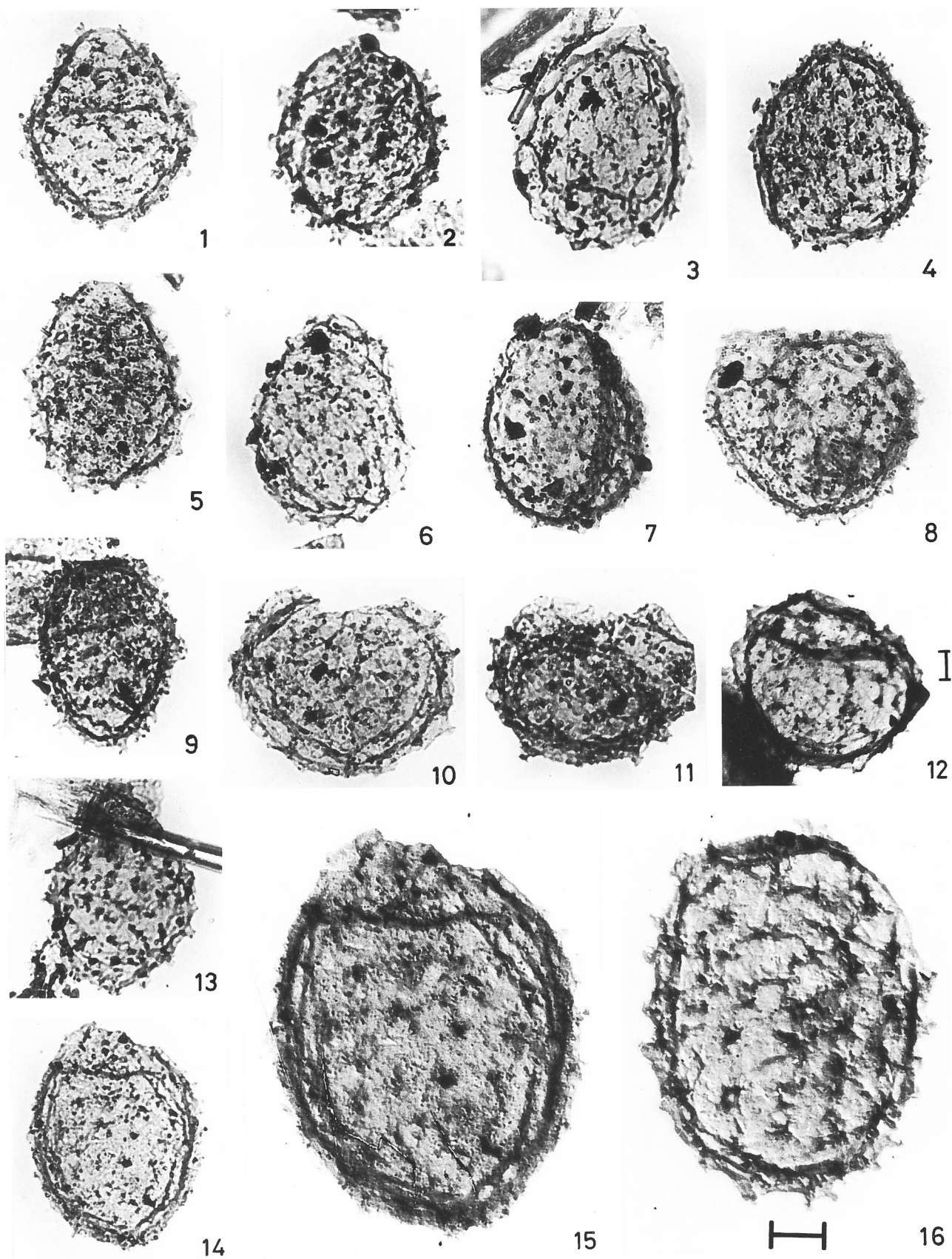
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EXPLANATION OF PLATE 1

Figs. 1-16 - *Talcheridium indicum* gen. et sp. nov. All specimens from upper Barakar Formation, Talcher Coalfield, Orissa, India.

1) Holotype, showing peripheral and meridional fold and characteristics of processes; BSIP slide 10741, EF L33/4. 2) BSIP slide 10741, EF U21/2. 3) BSIP slide 10740, EF R18. 4) BSIP slide 10743, EF O16/4. 5) Paratype, showing flat end; BSIP slide 12066, EF K15. 6) BSIP slide 12067, EF V40/1. 7) BSIP slide 10740, EF Q27/1. 8) Showing peripheral fold and one polar opening; BSIP slide 10739, EF R34/4. 9) BSIP slide 12067, EF N22/3. 10) Showing peripheral fold and irregular opening; BSIP slide 10739, EF J14/4. 11) Showing irregular opening; BSIP slide 10739, EF V25/4. 12) Showing peripheral fold and opening; BSIP slide 12067, EF V12/4. 13) BSIP slide 12067, EF M29. 14) BSIP slide 10740, EF V31. 15) DIC of same specimen as fig. 14, showing punctate vesicle wall, irregular opening, and fold system; x1000. 16) DIC, showing shape and arrangement of processes; BSIP slide 12067, EF P41/4; x1000.

Magnifications x500, unless otherwise stated.



REFERENCES

- LOEBLICH, A.R., JR., 1970, Morphology, ultrastructure and distribution of Paleozoic acritarchs: Proc. North Am. Paleont. Conv., Chicago, 1969, Pt 6: 705-788.
- TIWARI, R.S. & TRIPATHI, A., 1992, Marker assemblage-zones of spores and pollen through Gondwana Palaeozoic and Mesozoic sequences in India: The Palaeobotanist, 40: 194-236.
- TRIPATHI, A., 1993, Palynosequence in subsurface sediments in Talcher Coalfield, Orissa, India: Geophytology, 23: 99-106.

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