

Pseudoschizaea from the Pleistocene sediments in the Ariake Sea area, West Kyushu*

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Introduction

Investigations on the stratigraphy and pollen assemblages of the Pleistocene sediments in the Ariake Sea area were previously made by K. TAKAHASHI, S. KAWASAKI, and H. FURUKAWA (1968, 1969). Besides, the present author (1971) described many microplankton fossils (dinoflagellates, acritarchs, and other microfossils) from the same sediments of the Ariake Sea area.

At that time, the author found some algal cysts which exhibit a circular body with concentric striations on both hemispheres. These cysts are morphologically similar to the forms described by R. A. CHRISTOPHER (1976) from the Pleistocene sediments in Alabama, U. S. A.

In this paper, the author describes and illustrates the present algal cysts from the Pleistocene sediments in the Ariake Sea area.

Acknowledgements

The author thanks Mr. S. KAWASAKI, Kinki Bureau of Agricultural Administration at Kyoto (formerly the Nagasaki Reclamation Office, Ministry of Agriculture and Forest), for his kind offering of the boring cores.

Thanks are also due to Prof. Dr. S. MIGITA, Faculty of Fisheries, Nagasaki University and Prof. Dr. T. YAMAGISHI, Department of Biology, Faculty of Agriculture and Veterinary Science, Nihon University, for their valuable advices and suggestions on algal affinity of the present specimens.

Pseudoschizaea, *Chomotriletes*, and *Circulisporites*

H. WOLFF (1934) first described a palynomorph with concentric striations on both

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hemispheres as *Sporites circulus*, which was obtained from the Pliocene brown coals of Germany.

M. ROSSIGNOL (1962) proposed the form-genus name *Concentricystes* for palynomorphs with concentric ornamentation which is closely similar to that of *Sporictes circulus* Wolff, 1934 and described *Concentricystes rubinus* including two subspecific units, "form A" and "form B". She regrettably provided no description of the genus and designated no holotype for the species.

M. ROSSIGNOL (1964) recognized that *Concentricystes rubinus* is closely similar to *Sporites circulus* and placed *Concentricystes rubinus* in synonymy with *Sporites circulus* Wolff, 1934.

F. THIERGART and U. FRANTZ (1962) proposed the generic name *Pseudoschizaea* for a palynomorph which is morphologically similar to the forms which had previously been reported under the names *Sporites circulus* and *Concentricystes rubinus* and described *Pseudoschizaea ozeanica*, but they presented no description of the genus. After all, R. POTONIÉ (1966) described the generic name *Pseudoschizaea* and appointed *Pseudoschizaea ozeanica* THIERGART and FRANTZ as the type species. He (1966) considered *Concentricystes* to be a hystrichospherid and did not treat it in his Synopsis (R. POTONIÉ, I-V).

R. A. CHRISTOPHER (1976) accepted the similarity between *Pseudoschizaea ozeanica* and *Sporites circulus*, described the generic name *Pseudoschizaea*, and cited *Pseudoschizaea circula* (WOLFF 1934) emend. CHRISTOPHER 1976, as the type species. At the same time, he described *Pseudoschizaea rubina* (ROSSIGNOL) CHRISTOPHER as well.

F. THIERGART and U. FRANTZ (1962) considered the genus *Pseudoschizaea* as belonging to a member of Schizaeaceae. M. ROSSIGNOL (1962, 1964) and R. A. CHRISTOPHER (1976) considered that this genus is probably a form of freshwater algae in origin. The author suspects that the present specimens may be probably zygospores of Zygnemataceae (freshwater algae).

On the other hand, S. N. NAUMOVA (1939) illustrated the azonotrilete spores with concentric projections and she (1953) validated the genus *Chomotriletes* by assignment of the monotypic species, *Chomotriletes vedugensis* NAUMOVA, from the Upper Devonian of the Russian platform. R. POTONIÉ (1958) formulated the diagnosis as follows: Keine oder schwach Y-Strahlen, Äquator unregelmässig kreisförmig, Exine mit unregelmässigen z. T. unterbrochenen Verdickungsstreifen versiert, die konzentrisch verlaufen, ca. 30-65 μ .

A. A. LUBER (1955) described *Chomotriletes alutaceus* LUBER from the Carboniferous of Kasachstan.

L. E. STOVER (1962) established a new form genus *Taurocusporites*. At that time, he assigned three species of *Chomotriletes* (*C. reduncus* BOLCHOVITINA, *C. triangularis* BOLCH., and *C. auristriatus* BOLCH.) to the new genus and emended the genus *Chomotriletes* NAUMOVA to include only alete spores.

S. A. J. POCKOCK (1962) described *Chomotriletes almegrensis* POCKOCK from the Upper Jurassic and Lower Cretaceous of the Western Canada plains and *Chomotriletes fragilis* POCKOCK from the Lower Cretaceous Mannville Formation and stated that these spores are probably of schizaeaceous type.

G. F. HART (1964) gave also the diagnosis which restricts the genus *Chomotriletes* to alete forms.

N. J. de JERSEY (1962) described *Circulisporites parvus* de JERSEY with alete, no definite tetrad marks and exine ornamented by a series of concentric striae or low ridges from the Triassic of the Ipswich coal-field, Queensland, Australia. G. NORRIS (1965) described *Circulisporites parvus* de JERSEY emend. NORRIS and *Circulisporites* sp. from the Upper Triassic Beacon Group, Timber Peak, Antarctica and considered *Circulisporites* to be an acritarch. He, moreover, gave the following remarks: *Circulisporites* is superficially similar to the genus *Chomotriletes* NAUMOVA, but is distinguished by the development of rupture along an equatorial line. In addition, some species attributed to *Chomotriletes* are weakly trilete, although the type appears to be alete. De JERSEY (1962) cited the continuous nature of the concentric ribs of *Circulisporites* as generically characteristic and distinct from the incomplete ribs of *Chomotriletes*. The equally developed ornament on both halves of *Circulisporites*, however, may be a more useful distinguishing character.

K. L. SEGROVES (1967) described *Circulisporites parvus* de JERSEY emend. NORRIS from the Permian of Western Australia.

Pseudoschizaea THIERGART and FRANTZ 1962, ex R. POTONIE 1966, emend. CHRISTOPHER 1976 is similar to *Chomotriletes* NAUMOVA 1939 ex NAUMOVA 1953 and *Circulisporites* de JERSEY 1962, emend. NORRIS 1965. *Chomotriletes* lacks the characteristic polar ornamentation of *Pseudoschizaea*. G. F. HART (1964) mentioned that the concentric muri of *Chomotriletes* may be reduced or absent on one hemisphere (proximal?).

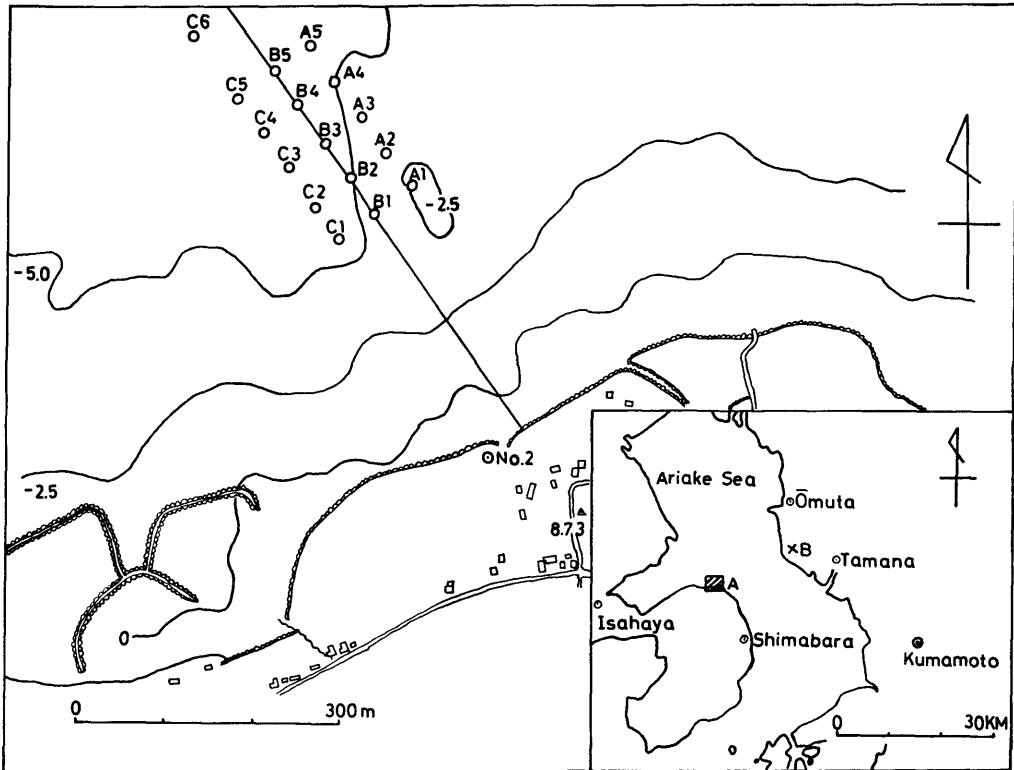
Circulisporites is ornamented with a thickened disc in each polar area, rather than with a complex of muri as in *Pseudoschizaea* and its test separates into two

hemispheres along an equatorial line. The concentric striae of *Circulisporites* are continuous and never bifurcate or spiral as they do on *Pseudoschizaea*.

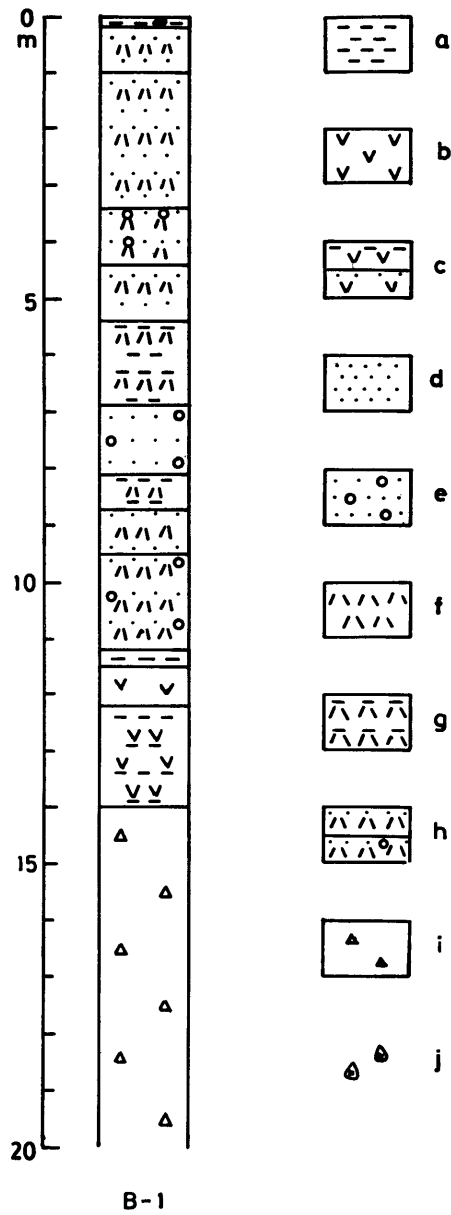
The present specimens belong undoubtedly to *Pseudoschizaea*, because of having the morphological characters emended and described by R. A. CHRISTOPHER (1976).

Samples and method

The examined samples, gray siltstones, were obtained from the bore hole B-1 [12.00-14.10 (13.00) m in depth], 300 m offshore of Kojiro, Mizuho-cho, Minamitakaki-gun, Nagasaki Prefecture and from a outcrop of the Nagasu Formation, near Nagasu, Kumamoto Prefecture.



Text-fig. 1. Location of the boring wells of the Ariake Sea area.



Text-fig. 2. Lithologic section of the boring well B-1.
 a : Silt or clay, b: Humus mud (Dy),
 c : Silt or sand containing carbonized plant fragments,
 d : Sand, e : Gravel, f : Tuff, g : Silty tuff,
 h : Sandy tuff or lapilli tuff, i : Volcanic breccia,
 j : Shell remains.

Preparation for palynological studies was carried out by mechanical and chemical methods (maceration by KClO_3 and conc. HNO_3 , treatment by 15 % KOH and by HF , centrifuging and washing in pure water after each step). The residues were mounted in glycerine jelly. All slides were sealed with a mixture of solid paraffin and Canada balsam.

All specimens illustrated in this paper are in the palynological collection of the Department of Geology, Nagasaki University.

Systematic descriptions

Incertae Sedis

Group Acritarcha EVITT 1963.

Subgroup Sphaeromorphae DOWNIE, EVITT, and SARJEANT 1963.

Genus *Pseudoschizaea* THIERGART and FRANTZ 1962, ex R. POTONIÉ 1966,
emend. CHRISTOPHER 1976.

Type species: *Pseudoschizaea circula* (WOLFF 1934) CHRISTOPHER 1976.

Pseudoschizaea circula (WOLFF) CHRISTOPHER

Pl. 1, figs. 1-4.

1934. *Sporites circulus* WOLFF, Arb. Inst. Palaeobot. Petrogr. Brennst., vol. 5, p. 67, pl. 5, fig. 28.
1962. *Concentricystes rubinus* ROSSIGNOL, Pollen et spores, vol. 4, no. 1, p. 134, pl. 2, fig. 4 (in part; nomen nudum).
1962. *Pseudoschizaea ozeanica* THIERGART and FRANTZ, The Palaeobotanist, vol. 10, nos. 1/2, p. 84, pl. 1, fig. 12 (nomen nudum).
1976. *Pseudoschizaea circula* (WOLFF) CHRISTOPHER, Micropaleontology, vol. 22, no. 2, p. 146-147, pl. 1, figs. 11-12, 22.

Description: Inaperturate cyst. Test originally circular to oval in polar view, biconvex in equatorial view, sometimes splitting into two equal hemispheres along the equatorial plane. Polar area in each hemisphere ornamented with a pattern of bars, spirals or loops, approximately circular to elliptical in form; diameter of the polar area $9 \times 6.2 \mu$ - $14.4 \times 8.6 \mu$; $5 \times 3.3 \mu$; $5.7 \times 4.5 \mu$ - $6.7 \times 6 \mu$; $5.6 \times 5 \mu$ - $9.7 \times 6.3 \mu$. A series of concentric ribs surround the polar area. The concentric ribs are sometimes ringed, bifurcate or spiral. Concentric ribs are flat-topped, measuring $1 \mu \pm$ in width, separated by lumina of 0.6 - 0.8μ in width. Ribs number between 7 and 10 on each hemisphere. Grain size 29 - $37 \mu \times 22.6$ - 30μ in equatorial diameter.

Occurrence : Pleistocene ; lower formaion of the Ariake Sea bottom, off the coast of Kojiro, Shimabara Peninsula, Nagasaki Prefecture; core B-1, depth 12.00-14.10 (13.00) m.

Remarks : The present specimens are very closely similar to *Pseudoschizaea circula* (WOLFF) CHRISTOPHER (pl. 1, figs. 11-20, 22) from the Pleistocene deposits in Alabama, U. S. A., in spite of narrower width of concentric ribs of the present specimens.

Pseudoschizaea rubina (ROSSIGNOL) CHRISTOPHER

Pl. 1, figs. 5-7.

1962. *Concentricystes rubinus* ROSSIGNOL, Pollen et spores, vol. 4, no. 1, p. 134, pl. 2, figs. 5, 6 (in part; nomen nudum).
1964. *Sporites circulus* WOLFF, ROSSIGNOL, Rev. Micropaleont., vol. 7, no. 2, p. 94-98, pl. 3, figs. 17, 18.
1976. *Pseudoschizaea rubina* (ROSSIGNOL) CHRISTOPHER, Micropaleontology, vol. 22, no. 2, p. 147-148, pl. 1, figs. 1-10, 21.

Description: Alete cyst. Test circular to oval in polar view, biconvex in equatorial view, sometimes splitting into two equal hemispheres along the equatorial line. Polar area in each hemisphere ornamented with a series of anastomosing and bifurcating muri, such as a foveolate or fossulate pattern; diameter of the polar area 10 x 9.4 μ ; 24 x 16.7 μ ; 10 x 12.7 μ . A series of concentric ribs surround the polar area. The concentric ribs are sometimes ringed, bifurcate or spiral. Concentric ribs are hemispherical in cross section, measuring 0.7-1.5 μ in width. Ribs are separated by lumina of 0.3-1 μ in width. Ribs number between 9 and 11 on each hemisphere. Grain size 36-47.2 μ x 33-35 μ in equatorial diameter.

Occurrence: Bore hole B-1, 12.00-14.10 (13.00) m in depth, 300 m offshore of Kojiro, Shimabara Peninsula, Nagasaki Prefecture; Nagasu 3-a, Nagasu Formation, near Nagasu, Kumamoto Prefecture.

Remarks: The present specimens are identified with *Pseudoschizaea rubina* (ROSSIGNOL) CHRISTOPHER (pl. 1, figs. 1-10, 21) from the Pleistocene deposits in Alabama, U. S. A.

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Pseudoschizaea from the Pleistocene sediments
in the Ariake Sea area, West Kyushu

Plate 1

Explanation of Plate 1

(Figs. 1-7a X 1000; figs. 7b-c X 400)

Figs. 1-4. *Pseudoschizaea circula* (WOLFF) CHRISTOPHER

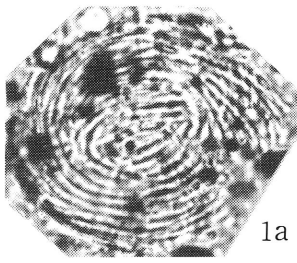
Fig. 1: slide GN 156 ; fig. 2 : slide GN 160;

fig. 3 : slide GN 167 ; fig. 4: slide GN 161.

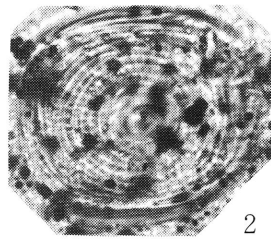
Figs. 5-7. *Pseudoschizaea rubina* (ROSSIGNOL) CHRISTOPHER

Fig. 5 : slide GN 175 ; fig. 6 : slide GN 160 ;

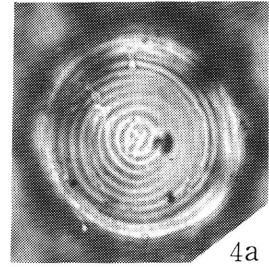
fig. 7: slide GN 592.



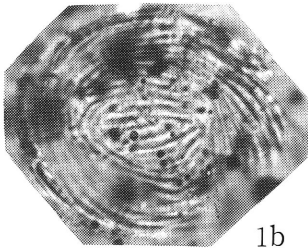
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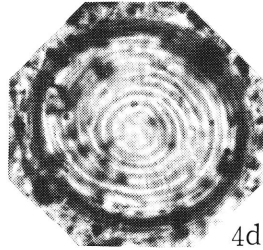
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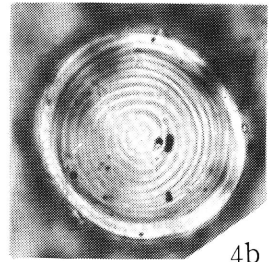
4a



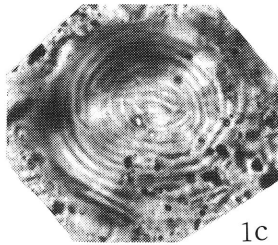
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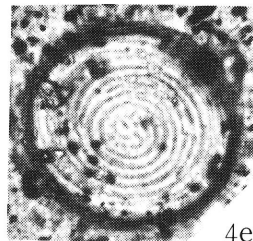
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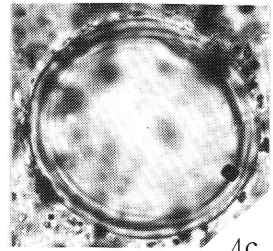
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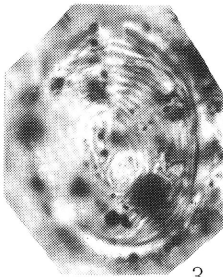
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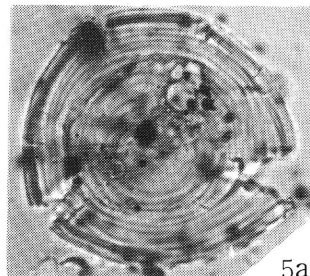
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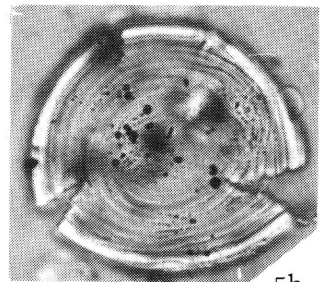
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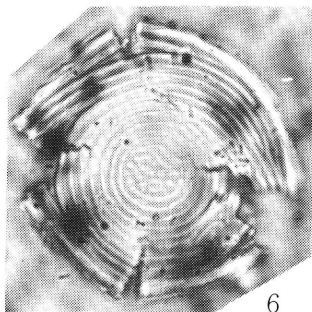
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5a



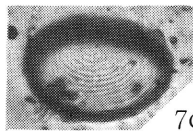
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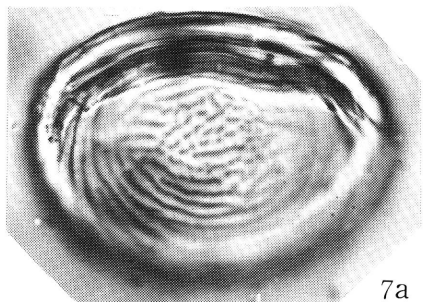
6



7b



7c



7a