



Teresa MARCINKIEWICZ

Remarks to the discussion on distribution of smooth spherules on Mesozoic megaspores with particular references to the species *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz

The smooth glossy spherules were noticed on surface of megaspores *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz, known from the Rhaetic epicontinental deposits of Poland and Western Europe. These spherules occur on some verrucae, being the original ornamentation of this species, and also they are present of some Mesozoic megaspores of genus *Trileites*. That fact indicates the spherules should not be regarded as morphological element, significant for artificial taxonomy of megaspores. Their manner of occurrence on surface of various morphological types of megaspores as *Trileites* and *Verrutriteles* suggests that such phenomenon is accidental, caused by factor of currently unknown character.

INTRODUCTION

Referring to continuing from several years discussion on problem of "...hemispherical, red, translucent objects...", occurring on exine surface of some Mesozoic megaspores the author presents here new megaspore material, documenting such phenomena.

The presented here material is stored in the Geological Museum of the Państwowy Instytut Geologiczny (State Geological Institute): collection number — MUZ PIG 506.

Author thanks Prof. W. G. Chaloner from the Birkbeck College in London for the SEM photo of *Trileites murrayi* (Harris) Marcinkiewicz. Other photos were made in the Państwowy Instytut Geologiczny.

MORPHOLOGICAL VARIABILITY OF MEGASPORES
VERRUTRILETES UTILIS (MARCINKIEWICZ) MARCINKIEWICZ

Megaspores known currently from literature as *Verrutrilletes utilis* (Marcinkiewicz) Marcinkiewicz were found at first by C. A. Wicher (1942, some specimens on review photos — Pl. 27a) in borehole Alsentrasse in Berlin within sediments of Ober-Rät. In his later work (1951, Pl. 1, Figs. 3, 4) these spores were determined as megaspore 792 and documented with drawings (without descriptions). Photos of similar megaspores from the Rhaetic deposits from borehole Hollviken II in Scania were presented by F. Brotzen (1950, p. 3, some specimens on Fig. 8, without description). In work of H. J. Will (1953), spreaded as microfilm copy of typescript but published in 1969, these megaspores were described as *Triletes wicheri* Will and illustrated with small photos, with poorly visible details (H. J. Will, 1969)

In Poland numerous specimens, belonging to this species, were found in upper series of the Rhaetic epicontinental deposits in borehole Mechowo IG 1. These megaspores characterize with massive smooth exine — they were illustrated and described in work of T. Marcinkiewicz (1962, Pl. I, Figs. 1–4) as *Trileites utilis* Marcinkiewicz. During later studies new megaspore material was collected from samples from boreholes located on the Polish Lowland. Observations of large amount of specimens indicated that relatively high variability occurs documented with transitions from specimens with smooth exine to ones with more or less distinctly ornamented with verrucae. As characteristic feature of these spores were also settled the oblique folds on the contact areas. New materials involved real necessity to supplement the earlier description and refixing of megaspores known as *Trileites utilis* Marcinkiewicz to genus *Verrutrilletes* as *V. utilis* (Marcinkiewicz) Marcinkiewicz (T. Marcinkiewicz, 1969, p. 101; 1971, p. 32–33, Pl. III, Figs. 6–8, Pl. IV, Figs. 1–6, Pl. V, Figs. 1–3).

It is interesting that in some samples were found specimens, having except of characteristic ornamentation in form of verrucae also spherules attached to mentioned verrucae¹ (Pl. I, Figs. 2–4, Pl. II, Figs. 1–3, Pl. III, Figs. 2–4).

Such variability of morphological features within mentioned species was earlier indicated by H. J. Will (1969). These observations were later confirmed by F. Bertelsen (F. Bertelsen, O. Michelsen, 1970, Pl. III, Figs. 1–6, Pl. IV, Figs. 1–3), who has found in borehole Rødbj (southern Denmark) within the Rhaetic deposits both megaspores without ornamentation and ones with hemisphere verrucae.

According to results of these studies it seems that in megasporangia of parent plant have originated both megaspores sculptured with low, hemispherical verrucae and megaspores without ornamentation.

¹ F. Bertelsen (F. Bertelsen, O. Michelsen, 1970) presented several photos of *Verrutrilletes utilis* (Marcinkiewicz) Marcinkiewicz, illustrating ornamentation of various specimens of this species. Basing on this photos, it could be supposed that fragment of megaspore *V. utilis* (Marcinkiewicz) Marcinkiewicz from Pl. IV, Fig. 1, SEM, x 360, shows spherules attached to some verrucae — but this fact was not indicated by author in text.

But mentioned above spherules, observed on surface of *Verrutriletes utilis* (Marcinkiewicz) Marcinkiewicz could not be regarded as morphological detail of significant value or discussed as an aspect of variability of morphological features because similar spherules — as it is noticed in literature — are also present on megaspores of genus *Trileites*.

Such phenomenon of occurrence of these type spherules on megaspores — as it seems according to actual knowledge of it — is caused by other factors of undefined character.

STRATIGRAPHIC RANGE OF *VERRUTRILETES UTILIS* (MARCINKIEWICZ) MARCINKIEWICZ

This species occur often in the assemblage *Trileites pinguis* distinguishing in investigated Polish profiles (T. Marcinkiewicz, 1962, 1971) and in Western Europe (Germany: C. A. Wicher, 1951; G. Beutler, 1976; E. Dreyer, 1967; H. Kozur, 1972; Sweden: F. Brotzen, 1950; Denmark: F. Bertelsen, O. Michelsen, 1970) where it appears together with other species typical for deposits of the Upper Rhaetic epicontinental facies, rarely — in the Middle Rhaetic (*sensu germanico*).

Individual findings of *Verrutriletes utilis* (Marcinkiewicz) Marcinkiewicz were noticed also in lowermost members of the Lias.²

OCCURRENCE OF SMOOTH SPHERULES ON MESOZOIC MEGASPORES IN THE ASPECT OF NEW DATA

Megaspores with smooth exine, belonging to genus *Trileites* with scattered spherules on their surface, were several times described and documented in works of many authors (S. J. Dijkstra, 1949, 1951, 1961; T. Marcinkiewicz, 1962, 1971, 1979, 1980; J. Taugourdeau Lantz, P. Donze, 1971; G. Pelzer, W. Riegel, 1982; R. Huckriede, 1982; F. M. Hueber, 1982; Yang Iiduan, Sun Suying, 1982; M. Waksmundzka, 1982, 1985; J. Banerji et al., 1984; E. Knobloch, 1984a, b; M. E. Collinson et al., 1985; A. M. Baldoni, T. N. Taylor, 1985; D. J. Batten, D. J. P. Ferguson, 1987; D. J. Batten, 1988; E. B. Koppelhus, D. J. Batten, 1989).

These spherules, described by S. J. Dijkstra as "...hemispherical, translucent objects ..." last time were the subject of discussions in works of several authors. T. Marcinkiewicz (1979) has presented the Jurassic megaspores *Trileites murrayi* (Harris) Marcinkiewicz with single or irregularly spaced smooth, glossy spherules on their surface.

² Megaspores determined by E. Knobloch (1984a, b) as *Trileites utilis* Marcinkiewicz were found in the Upper Cretaceous (Conacian – Santonian) of Southern Czecho-Slovakia. According to T. Marcinkiewicz they represent other species as is indicated by different development of tetrad mark, visible on specimens photos in works of this author.

Author indicated that these spherules are attached to smooth exine surface with short neck-like appendages as is visible on the SEM photos at high magnifications. Concluding such phenomena author supposed that these spherules, attached to surface of *T. murrayi* (Harris) Marcinkiewicz were not elements of ornamentation but probably resulted from activity of organisms similar to saprophytic fungi ("fungi like forms").

According to other authors as R. Potonié (1956) and F. M. Hueber (1982) such spherules have originated from substance like resins, pressed outside megaspore and which after hardening retained its glossy surface. Similar suggestions had also E. Knobloch (1984a,b), who supposed that globular ornaments were secretions of exine of not explained so far genesis.

J. Jansonius and L. V. Hills (1982) stated that such spherules could be remains of tapetum. M. Waksmundzka (1985) examined thin sections of the Cretaceous megaspores with spherules *Verrutriteles imitatus* (Dijkstra, 1961) Waksmundzka (1982) in TEM and she has found these spherules were elements of ornamentation (verrucae) and on such basis she has included these megaspores to genus *Verrutriteles* (van der Hammen, 1954) ex Potonié, 1956.

D. J. Batten and D. J. P. Ferguson have also regarded spherical objects as "...form of sculpture and not the product of fungal attack, reference to *Trileites* is also inappropriate...". Due to that all hitherto known Mesozoic megaspores of *Trileites* type, with spherules, were related to new created genus *Cabochnicus* (D. J. Batten, D. J. P. Ferguson, 1987; D. J. Batten, W. Z. Kovach, 1990).

Presented here new documentary material allows author to participate in actual discussion on origin of spherules. It was found that described here megaspores, belonged to *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz, except of verrucae, being original ornamentation of this species, have also spherules attached to mentioned verrucae. Studies indicated that such spherules are not a real element of sculpture of megaspores *V. utilis* (Marcinkiewicz) Marcinkiewicz because these spores have their characteristic morphological features in form of verrucae, different in structure from spherules.

There are no principles, from morphological point of view, to regard such type of spherules, occurring both on smooth walled species and on with spores typical morphological features (verrucae), as elements of sculpture.

Other observations indicated that spherules of discussed type dissolve in an acid without leaving a trace on exosporium that was stated by J. Banerji et al. (1984) at their studies of the Cretaceous megaspores from Kachchh (India). It suggests that spherules have different composition than spore wall.

Significant conclusion of these studies is the opinion that these spherules are not a real element of artificial taxonomy of megaspores and they should not be considered in diagnosis. But analysis of manner of spherules occurrence and their irregular distribution on surface of various morphological types of megaspores as *Trileites* and *Verrutriteles* allows to state that such phenomenon is accidental and caused by factors, origin of which is difficult to define now.

Concluding that still is controversial and open problem that discussed here spherules formed from substance like resine or they are results of an activity of fungi-like organisms but they are undoubtedly no sculpture elements.

Translated by Grzegorz Czapowski

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**UWAGI DO DYSKUSJI DOTYCZĄCEJ WYSTĘPOWANIA GŁADKICH KULECZEK
NA POWIERZCHNI MEGASPOR MEZOZOICZNYCH ZE SZCZEGÓLNYM UWZGLĘDNIENIEM
GATUNKU *VERRUTRILETES UTILIS* (MARCINKIEWICZ) MARCINKIEWICZ**

S t r e s z c z e n i e

Przedstawiono megaspory *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz znane z epikontynentalnego retyku Polski i Europy Zachodniej. Omówiono ich zmienność morfologiczną i zwrócono uwagę na fakt, że na powierzchni niektórych megaspor występują gładkie, lśniące kuleczki. Fotografie w mikroskopie SEM wykazują, że kuleczki występują na brodawkach typu *verrucae*, które stanowią właściwe urzeźbienie u tego gatunku.

Jak wynika z doniesień w literaturze, obecność kuleczek tego rodzaju stwierdzono także na powierzchni innych megaspor mezozoicznych o gładkiej egzynie typu *Trileites*. Zostały one zinterpretowane jako rezultat działalności grzybów, jako substancje żywiczne wyciśnięte na zewnątrz megaspory bądź też jako elementy rzeźby, co było powodem zaliczenia takich megaspor do rodzaju *Verrutriteles*, a ostatnio do nowo utworzonego rodzaju *Cabochoenicus*.

Jednakże stwierdzenie obecności takich samych kuleczek u *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz, mającego rzeczywiste morfologiczne cechy w postaci brodawek, wskazuje, że nie stanowią one zasadniczej rzeźby u tego gatunku. Biorąc pod uwagę sposób występowania kuleczek, należy uznać, iż jest to zjawisko przypadkowe spowodowane czynnikami, które w chwili obecnej trudno jest wyjaśnić. Istotnym wnioskiem wynikającym z tych spostrzeżeń jest to, że kuleczki nie stanowią elementów o istotnym znaczeniu dla klasyfikacji sztucznej megaspor, a zatem nie powinny być brane pod uwagę przy precyzowaniu diagnoz.

PLATE I

Fig. 1. *Trileites murrayi* (Harris) Marcinkiewicz

Proximal surface of megaspore with spherules, Grojec near Kraków, enl. x 100

Powierzchnia proksymalna megaspory z kuleczkami, Grojec k. Krakowa, pow. 100 x

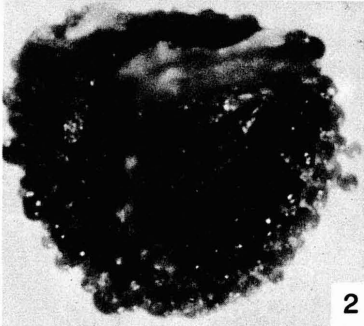
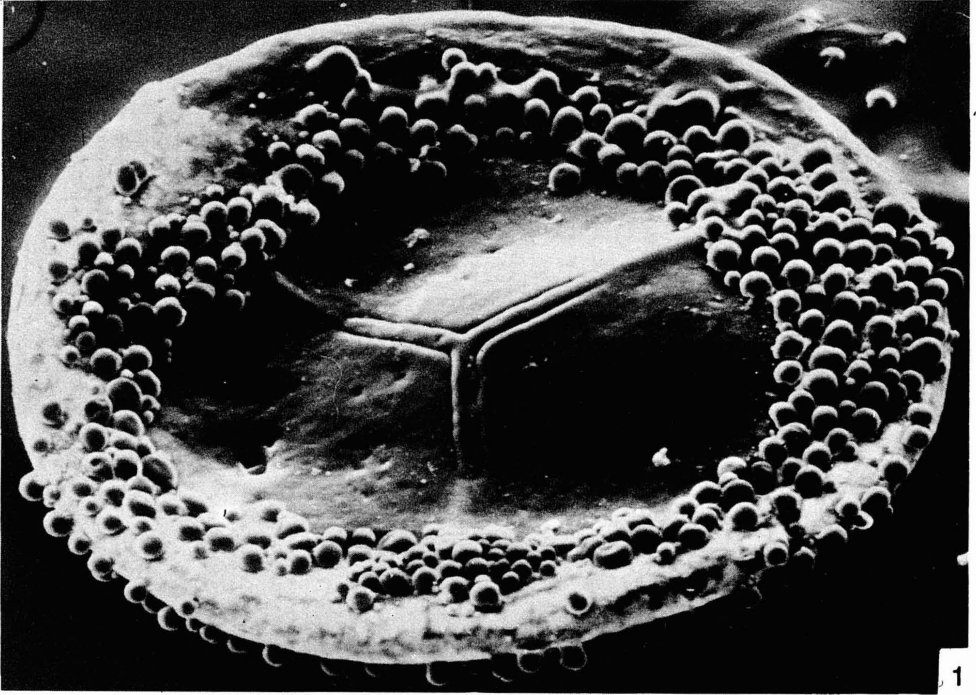
Figs. 2-4. *Verruiletes utilis* (Marcinkiewicz) Marcinkiewicz

2 — MUZ PIG 506 (152), proximal surface of megaspore; 3 — distal surface of megaspore, Rostoły IG 1, depth 510.0 m, enl. x 100; 4 — fragment of the same specimen, showing ornamentation and attachment of spherules to some verrucae, enl. x 940

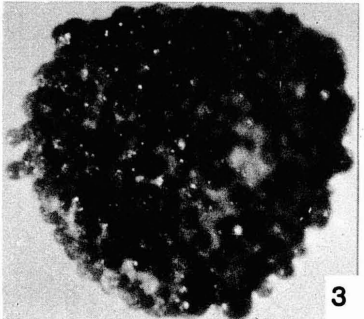
2 — powierzchnia proksymalna megaspory; 3 — powierzchnia dystalna megaspory, Rostoły IG 1, głęb. 510,00 m, pow. 100 x; 4 — fragment tego samego okazu ilustrujący ornamentację i przyłączenie kuleczek do brodawek, pow. 940 x

Figs. 1, 4 — SEM photos, Figs. 2, 3 — photos in reflected light

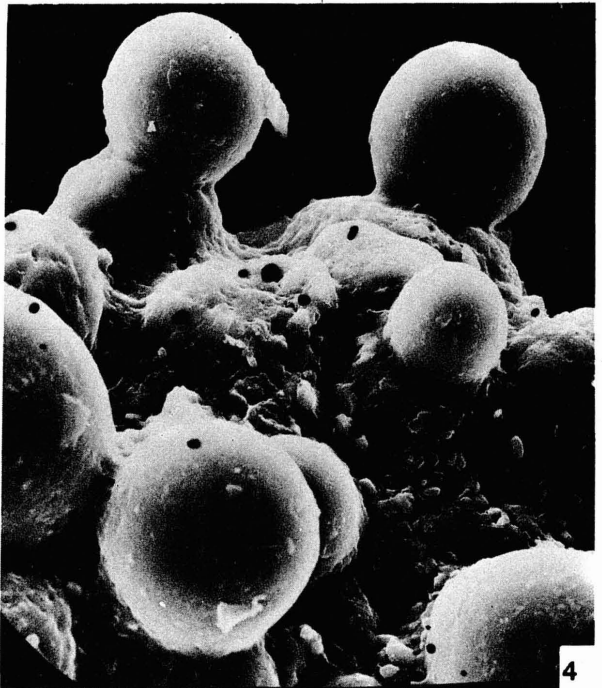
Fig. 1, 4 — SEM, fig. 2, 3 — w świetle odbitym



2



3



4

Teresa MARCINKIEWICZ — Remarks to the discussion on distribution of smooth spherules on Mesozoic megaspores with particular references to the species *Verrutriteles utilis* (Marcinkiewicz) Marcinkiewicz

PLATE II

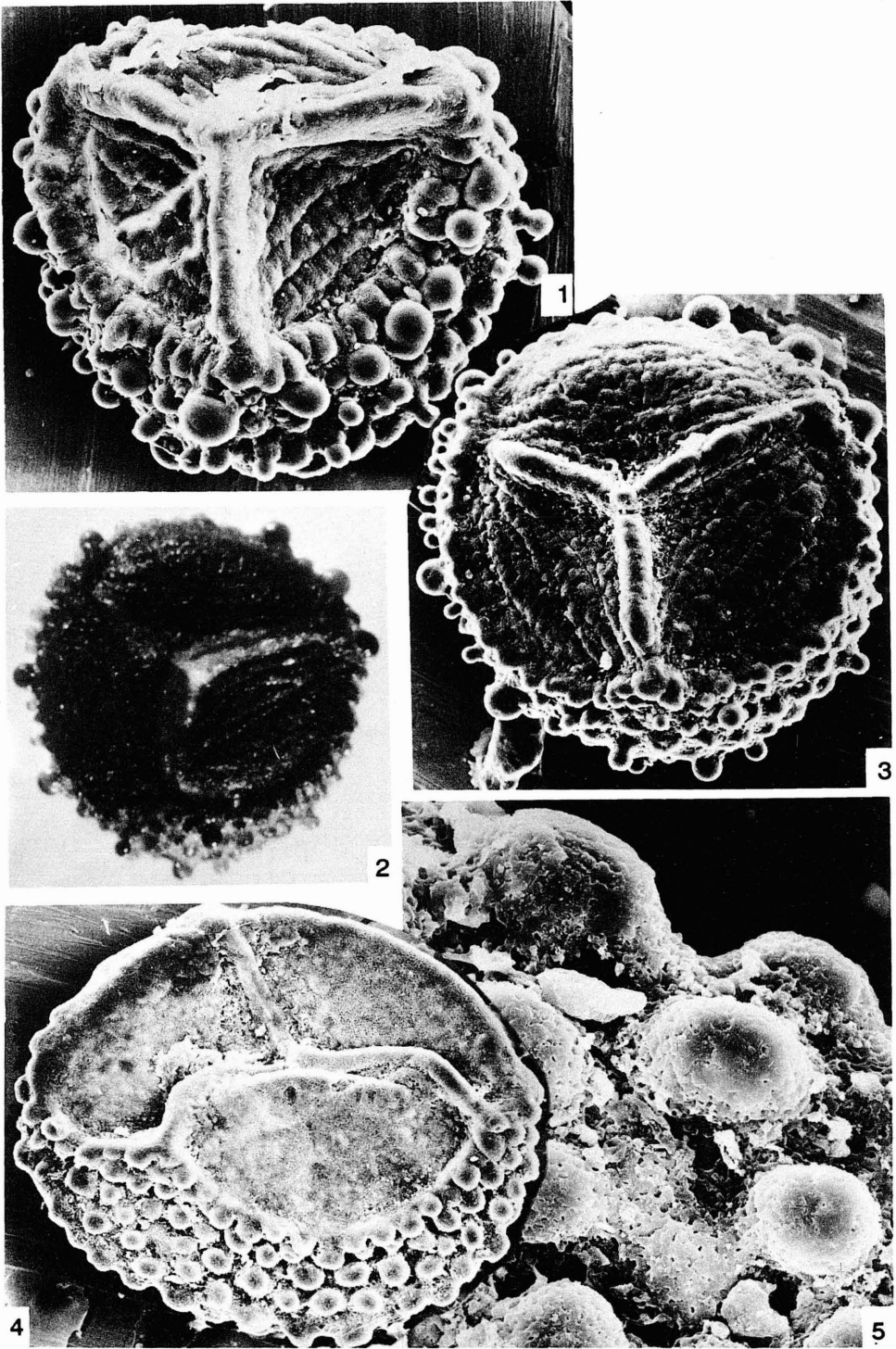
Figs. 1-4. *Verruילות utilis* (Marcinkiewicz) Marcinkiewicz

1 — MUZ PIG 506 (152), megaspore from proximal side, with spherules of various size, attached to some verrucae, Rostoły IG 1, depth 510. 0 m, enl. x 160; 2 — MUZ PIG 506 (156), megaspore from proximal side, with spherules of various size, attached to verrucae, Rostoły IG 1, depth 510. 0 m, enl. x 110; 3 — the same specimen, enl. x 130; 4 — MUZ PIG 506 (145), proximal surface of megaspore, Radzymin IG 1, depth 1565. 5 m, enl. x 130; 5 — fragment of megaspore showing ornamentation, enl. x 780

1 — megaspóra od strony proksymalnej z kuleczkami różnej wielkości przyczepionymi do niektórych brodawek, Rostoły IG 1, głęb. 510,00 m, pow. 160 x; 2 — megaspóra od strony proksymalnej z kuleczkami różnej wielkości przyczepionymi do brodawek, Rostoły IG 1, głęb. 510,00 m, pow. 100 x; 3 — ten sam okaz; pow. 130 x; 4 — powierzchnia proksymalna megaspory, Radzymin IG 1, głęb. 1565,5 m, pow. 130 x; 5 — fragment megaspory ilustrujący ornamentację, pow. 780 x

Figs. 1, 3, 4, 5 — SEM photos, Fig. 2 — photo in reflected light

Fig. 1, 3, 4, 5 — SEM, fig. 2 — w świetle odbitym



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PLATE III

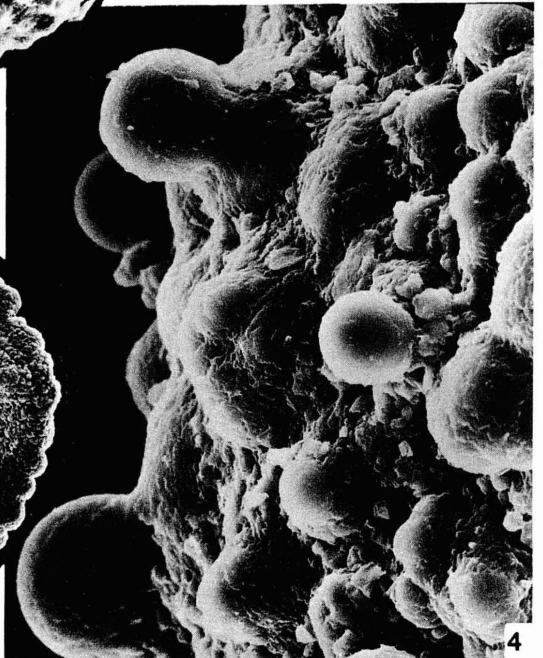
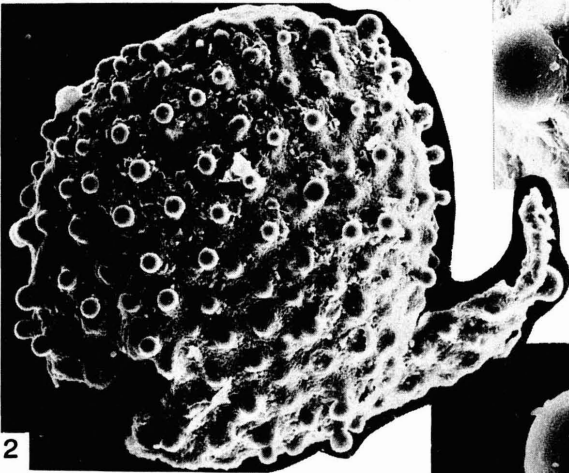
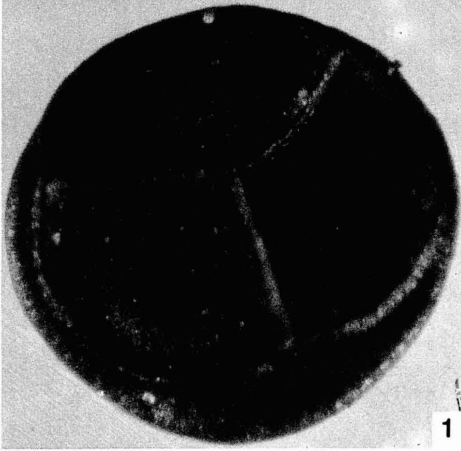
Figs. 1-5. *Verruiletes utilis* (Marcinkiewicz) Marcinkiewicz

1 — megaspore without ornamentation, visible oblique folds on contact areas, Tarnówko 1, depth 344.0 m, enl. x 100; 2 — MUZ PIG 506 (158), megaspore from distal side (damaged specimen), Rostoły IG 1, depth 510.0 m, enl. x 120; 3, 4 — details of ornamentation, enl. x 720; 5 — MUZ PIG 506 (157), megaspore from proximal side, Rostoły IG 1, depth 510.0 m, enl. x 150

1 — megaspóra pozbawiona ornamentacji, widoczne skośne fałdy na polach kontaktowych, Tarnówko 1, głęb. 344,00 m, pow. 100x; 2 — megaspóra od strony dystalnej (okaz uszkodzony), Rostoły IG 1, głęb. 510,00 m, pow. 120x; 3, 4 — szczegóły ornamentacji, pow. 720x; 5 — megaspóra od strony proksymalnej, Rostoły IG 1, głęb. 510,00 m, pow. 150x

Fig. 1 — photo in reflected light, Figs. 2-5 — SEM photos

Fig. 1 — w świetle odbitym, fig. 2-5 — SEM



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