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Tremadocian (Early Ordovician) Acritarchs of the Arburese Unit, Southwest Sardinia (Italy)

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KEY WORDS — Acritarchs, Early Ordovician, Palynology.

SUMMARY — Sixtysix species of acritarchs coming from few rich levels of the detritic Cambro - Ordovician sequence, « Postgotlandiano Auctorum », of southwestern Sardinia, have been studied. Of them, 46 species have been described and fifty-four species have been illustrated. Two new genera, Monocrodium *and* Taricrodium, *and twenty new species have been erected. The age of the studied sediments is Tremadocian, and the correlation is based on the acritarchs.*

RIASSUNTO — [Acritarchi Tremadociani dell'Unità Tettonica dell'Arburese, Sardegna sud occidentale (Italia)] *— Sono state studiate alcune associazioni della successione arenaceo argillosa basale dell'Unità Tettonica dell'Arburese. Cinquantaquattro specie di acritarchi vengono illustrati e quarantasei specie vengono descritte. Due nuovi generi,* Monocrodium *e* Taricrodium, *e venti nuove specie sono inoltre state istituite. La datazione della parte di successione studiata è stata resa possibile per la correlabilità degli acritarchi.*

BRIEF GEOLOGICAL INTRODUCTION

The Arburese tectonic unit was recently established by Barca, Cocozza, Del Rio & Pittau Demelia (1982) for indicating allochthonous terrigenous, carbonatic and volcanic Paleozoic rocks, several hundred meters thick, overthrusted over the Iglesiente-Sulcitano foreland. This tectonic unit was recognized on the basis of acritarchs found in its basal formation, better known in the literature as « Postgotlandiano Auctorum ».

The age of the Arburese Unit, paleontologically documented from the Arburese area, ranges from Tremadocian up to possibly the Silurian-Devonian boundary. The lower limit may be older (possibly Cambrian), if the basal formation (the « Postgotlandiano ») is considered the equivalent of the San Vito Formation as supposed by Barca, Cocozza *et al.*, 1982.

The Arburese Unit includes the following formations, which, in stratigraphic order are:

— i: The « Postgotlandiano », a thick clastic succession consisting of alternating green and blackish-grey sandstone, siltite and anchimetamorphic argillite, with scattered conglomerate intercalations. Sedimentary structures like slumpings, current ripples, erosional channels are also present. On the basis of the depositional characters, the unit has been interpreted as a turbidite sequence ranging from conoid to basin plane. The absence of macrofauna is a peculiar character of this succession;

— ii: Acid volcanics rocks corresponding to the « white and grey porphyrites » (Calvino, 1962) of the Sarrabus region in southwestern Sardinia.

— iii: The detritic sequences (conglomerate, sandstone and siltitic shale) rich in Late Ordovician fossils: Brachiopods, Crinoids, Cystoids, Trilobites, Bryozoans (Taricco, 1922, Barca & Salvadori, 1974; Giovannoni & Zanfrà, 1978).

— iv: Grey limestones and carbonaceous shales intercalated to black silicified limestones bearing Orthoceratids and rare Graptolites of the Silurian-Devonian(?).

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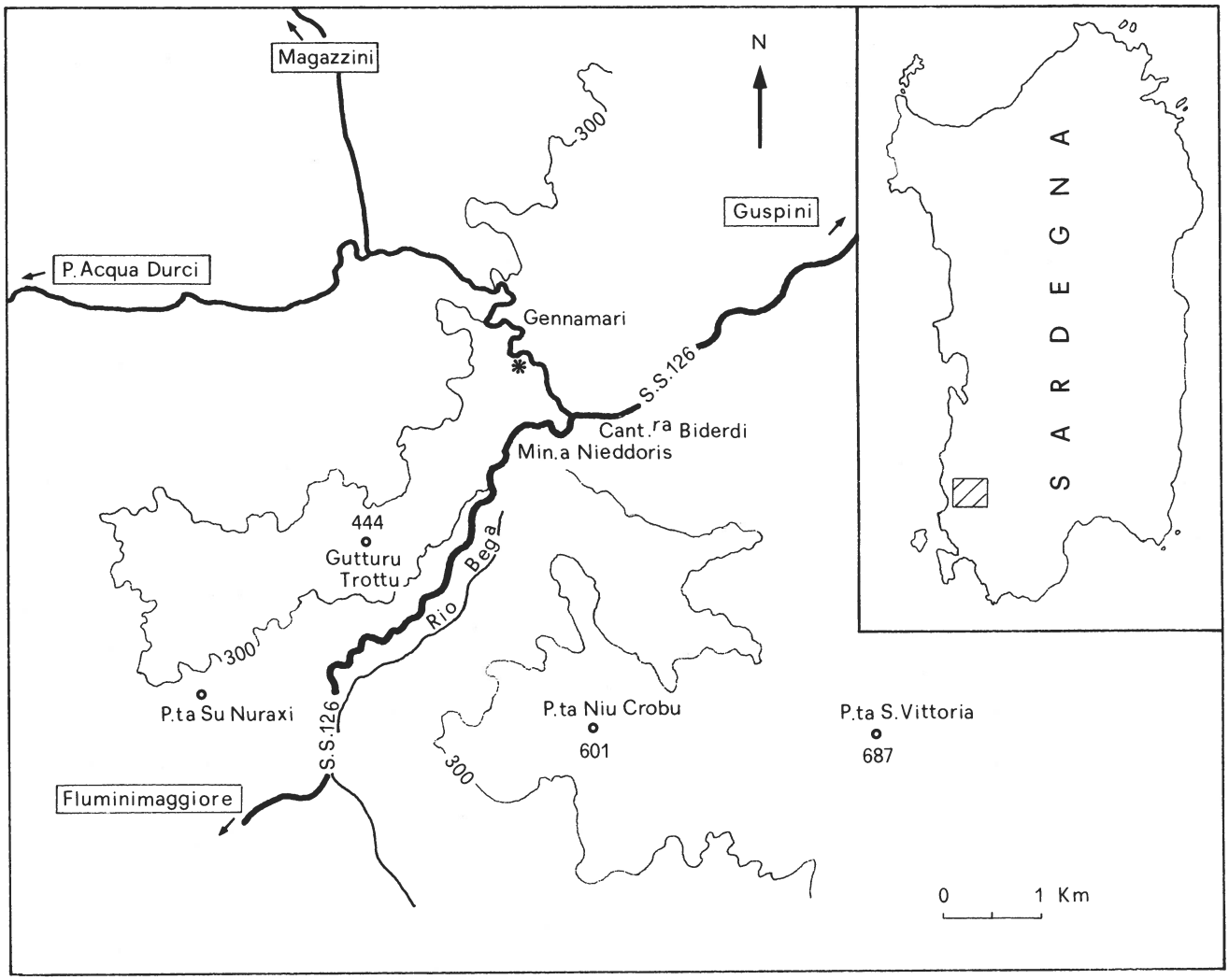


Text-fig. 1a - Topographic scheme of the fossiliferous locality.

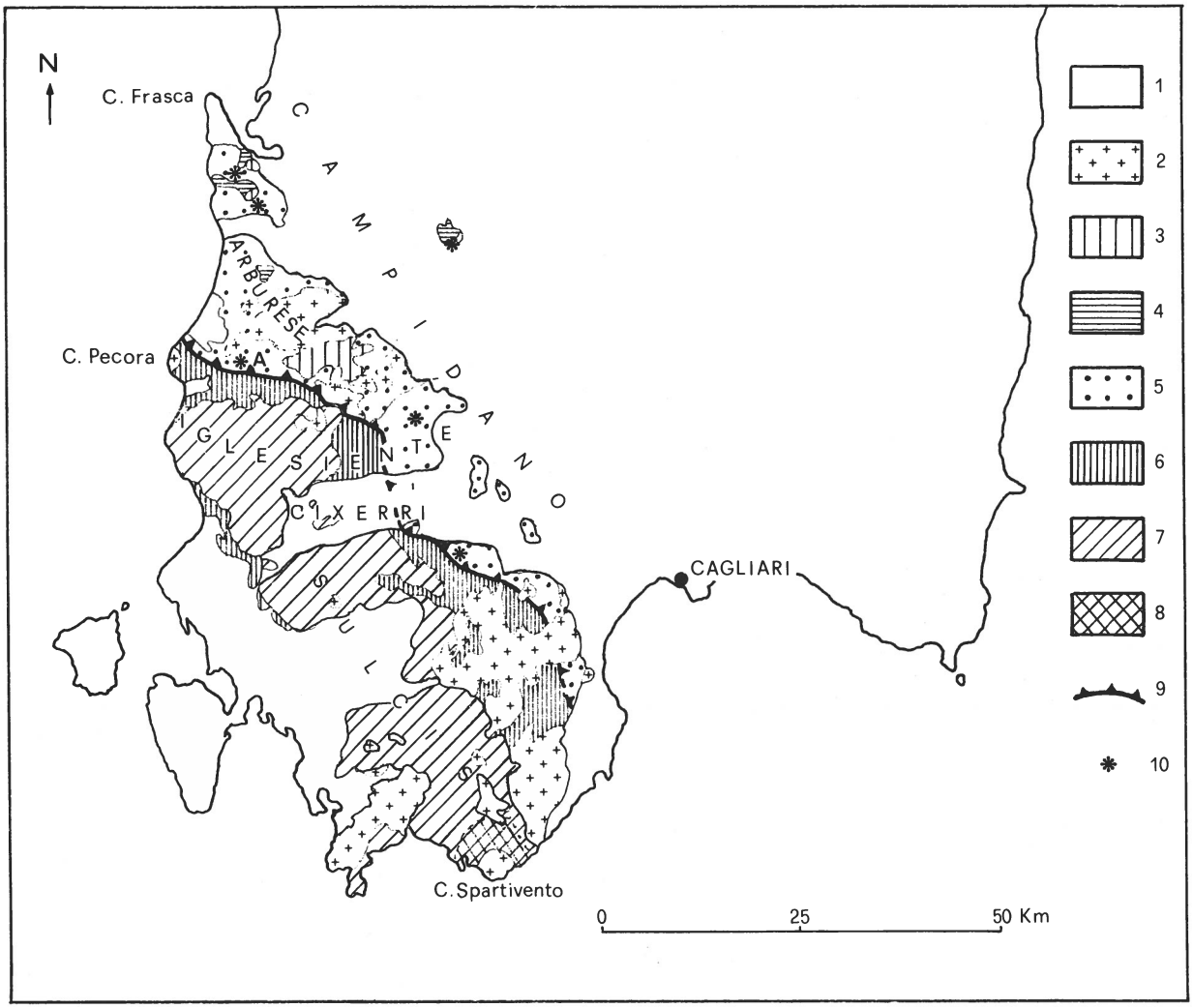
SAMPLING

The samples were collected by Barca, Del Rio and by myself during the numerous geologic field trips in 1980 for the Research Project on Sardinia Paleozoic. The « Postgotlandiano » was sampled at different localities (Text-fig. 1b), roughly along the overthrusting allignement (SE-NW oriented) in the extreme northern and eastern outcrops of the Oristanese region and Campidano plain. The most suitable section for acritarchs resulted to be that of Is Arenas (Text-fig. 1a).

Samples were collected: on the slope of the hill on the right side of the National Road (S.S. 126) Guspini - Fluminimaggiore, near the Km 69; along the path which leads to the Nieddoris Mine, and from the section outcropping on the left side of the Provincial Road that runs between Case Bidderdi and Punta S'Acqua Durci. The numerous acritarchs found are blackish or grey coloured, but, generally, the state of preservation is satisfactory.

LIST OF ACRITARCHS

Abacum rudis (Combaz) n. comb.
Acanthodiacrodium achrasi Martin
Acanthodiacrodium aciculatum (Burmann)
Acanthodiacrodium aclinum n. sp.
Acanthodiacrodium arburensis n. sp.
Acanthodiacrodium commune Timofeev
Acanthodiacrodium convexum Timofeev
Acanthodiacrodium hamatum (Downie)



Text-fig. 1b - Geologic scheme of the south-western Sardinia (from Barca, Cocozza *et al.*, 1982, semplified)
1 — Post-Paleozoic sediments; 2 — Hercynian granitoids; 3 — Undifferentiated paleozoic sediments; 4 — Acid volcanic products (Lower and ?Middle Ordovician); 5 — « Postgotlandiano »; 6 — Sediments of Caradocian- Devonian; 7 — Lower Cambrian to Tremadocian sediments; 8 — Precambrian sediments; 9 — Overthrusting and overfolding limit of the Arburese Unit; 10 — Sampling localities for acritarchs. « A » point corresponds to the Gennamari outcrop.

Acanthodiacrodium hexagonum n. sp.
Acanthodiacrodium mamillatum n. sp.
Acanthodiacrodium partiale Timofeev
Acanthodiacrodium prolatum Timofeev
Acanthodiacrodium serotinum (Timofeev)
Acanthodiacrodium simplex Combaz
Acanthodiacrodium tumidum (Deunff)
Acanthodiacrodium spinutisum Timofeev
Cristallinium cambriense (Slavikovà)
Cymatiogalea bouvardi Martin
Cymatiogalea cuvillieri (Deunff)
Cymatiogalea multiclaustra (Deunff)
Dasydiacrodium dicaudatum n. sp.
Dasydiacrodium sp. a
Goniosphaeridium cuspidatum (Timofeev) n. comb.
Goniosphaeridium dentatum (Timofeev)
Goniosphaeridium pungens (Timofeev)
Goniosphaeridium sardum n. sp.
Goniosphaeridium uncinatum (Timofeev)
Hemisphaeridium sp.
Impluviculus campidanius n. sp.
Impluviculus cleae (Martin)
Impluviculus stellaris (Martin)
Leiofusa acuminata n. sp.
Leiofusa angulata n. sp.
Leiofusa gravida n. sp.

Leiofusa orbicularis n. sp.
Leiofusa somniculata n. sp.
?Leiofusa stoumonensis Vanguestaine
Lophodiacrodium gigino n. sp.
Micrhystridium radians Stockmans & Williére
Micrhystridium shinetonensis Downie
Monocrodium mediterraneum n. gen. et n. sp.
Monocrodium sp.
?Petaloferidium florigerum (Vavrdovà)
Protosphaeridium sp.
Retisphaeridium dichamerum Staplin, Jansonius & Pocock
Stelliferidium cortinulum (Deunff)
Stelliferidium distinctum (Rasul)
Stelliferidium gautieri (Martin) n. comb.
Stelliferidium pseudoornatum n. sp.
Stelliferidium philippoti (Henry)
Stelliferidium cf. *philippoti*
Stelliferidium simplex (Deunff)
?Striatotheca foraminifera n. sp.
Tariccrodium bifidum n. gen. et n. sp.
Tariccrodium elegantulum n. gen. et n. sp.
Timofeevia phosphoritica Vanguestaine
Trunculumarium sp. a
Veryhachium downiei Stockmans & Williére
Veryhachium gibbosum n. sp.
Veryhachium martinum n. sp.
Veryhachium trisulcum (Deunff)
Veryhachium minutum Downie
Vulcanisphaera africana Deunff
Vulcanisphaera britannica Rasul
Vulcanisphaera tuberata (Downie)
Zonosphaeridium ovillensis Cramer & Diez

Repository — The acritarchs studied and described in this paper are deposited in the Palynological Collection of the Dipartimento Scienze della Terra of the Cagliari University. The assemblage numbers correspond to the numbers of the slide on which the acritarchs are stored.

STRATIGRAPHY

The preliminary stratigraphic conclusions regarding the finding of these acritarch assemblages in the thick sequence of the « Postgotlandiano », outcropping in the south-western Sardinia, were drawn by the present author in an earlier paper (Barca *et al.*, 1982). In the studied sequence, which is at least 600 m thick, only few levels yielded acritarchs and so the stratigraphy of the sequence is only partially known. The fossiliferous levels belong to the upper part of the formation, whereas the lower part is only supposed to be Cambrian in age for the analogies with the San Vito Sandstone formation, of the Sarrabus region (south-eastern Sardinia) (Barca *et al.*, 1982), and with the fossiliferous Early Cambrian to Tremadocian carbonatic and detritic sequence of the Iglesiente area. Infact, the recent discovery of Tremadocian acritarchs and *Dictyonema flabelliforme* (by the present author and Dr. Pillola, Cagliari) in the Cabitza shales suggests that the « Postgotlandiano » of south-western Sardinia is age equivalent of the classic Cambrian and Early Tremadocian formations of the Iglesiente (Barca *et al.*, 1985).

The range chart of the identified taxa (see Tab. 1) shows that Assemblage 1076 is the richest in species; similar to it is Assemblage 1078, while Assemblages 1074 and 1075 are poorly diversified and badly preserved.

ASSEMBLAGE 1079 (Gennamari outcrop). Acritarchs are blackish or grey blackish; it is composed by the following taxa, with one of them new:

Acanthodiacrodium simplex
Acanthodiacrodium sp. indet.
Cristallinium cambriense
Cymatiogalea cuvillieri
Impluviculus campidanius n. sp.
Impluviculus cleae
Impluviculus stellaris
Micrhystridium shinetonensis
Stelliferidium cortinulum
Timofeevia phosphoritica
Trunculumarium sp.

Major components of the assemblage are: *Impluviculus cleae, I. stellaris, I. campidanius* n. sp., *Acanthodiacrodium simplex*, and *Stelliferidium cortinulum*. One small sized new species of *Acanthodiacrodium* (Pl. 4, fig. 16) is fairly common, while *Cymatiogalea cuvillieri* is only represented by scanty fragments. The presence of *Trunculumarium* sp. and of *Timofeevia phosphoritica* is noteworthy and must be discussed.

The only species of that genus, known up to now, is *Trunculumarium revinium* (Vanguestaine) which is stratigraphically restricted to the *Parabolina spinulosa* Zone (middle Late Cambrian) and is geographically distributed from North Africa (Baudelot & Gery, 1979) to eastern Canada (Martin, 1981) through Europe, Belgium and England (Vanguestaine, 1974; Potter, 1974).

Timofeevia phosphoritica ranges from Middle Cambrian through up to the *Peltura* inclusive Zone (Latest Cambrian). It was only found in undated sediments of Belgium (Vanguestaine, 1978), in age controlled strata from the *Paradoxides paradoxissimus* Zone to the *Parabolina spinulosa* above Zone in England and in Late Cambrian up to the *Peltura* Zone in eastern Canada (Martin, 1981). Then, the concurrent presence of these two taxa might indicate a Late Cambrian age.

The lowest appearance of *Cymatiogalea cuvillieri* is within the *Acerocare* Zone (see Martin, 1982) which is the uppermost zone of the Late Cambrian according to the Norwegian stratigraphy.

Acanthodiacrodium simplex and *Impluviculus* have not been found in eastern Canada; they are reported

from the Lower Tremadocian of Europe, France and Belgium, and North Africa. *Impluviculus* is also found throughout the Upper Cambrian of England, from the *Agnostus pisiformis* Zone to the *Parabolina spinulosa* Zone (Potter, 1984), but *Acanthodiacrodium simplex* was never reported either from the Merioneth Series or from the Shineton Shales. Continuous sequence straddling the Cambrian - Ordovician boundary are very rare in the North African-European block and when they occur they are unfossiliferous (Romano, 1982). For the time being, the total range of *Acanthodiacrodium simplex* in the Mediterranean area is still not perfectly known. *Cymatiogalea* and *Stelliferidium* have been found by Potter (cit. op.) from the *Olenus* Zone. Vanguestaine (1974, 1978) mentioned the occurrence of *Stelliferidium* (as *Priscogalea*) and *Cymatiogalea* from strata correlated with the Late Cambrian.

Thus, on the basis of our present knowledge 1) Assemblage 1079 may be dated as latest Cambrian (*Acerocare* Zone equivalent). This age, however, desagrees with that inferred from the presence of *Trunculumarium* sp. 2) the age is may be as young as the earliest Tremadocian and *Timofeevia phosphoritica* and *Trunculumarium* are reworked elements.

The second hypothesis may be more realistic.

ASSEMBLAGES 1074 AND 1075 — These assemblages were yielded by the only fossiliferous levels from the section outcropping at the 69th Km of the National Road (S.S. 126). The assemblages are poorly diversified. Some taxa, like species belonging to the genera *Stelliferidium* (*S. distinctum*) and *Acanthodiacrodium* (*A. partiale*) are more abundant than in Assemblage 1079. Baltispherids with short processes, fragments of *Vulcanisphaera africana* and *Vulcanisphaera britannica* are also present. Index taxa are absent, then the assemblages may be referred only to the Tremadocian without better specification.

ASSEMBLAGE 1077 (Gennamari outcrop). The major components of the assemblage are:

Acanthodiacrodium prolatum
Acanthodiacrodium micronatum
Stelliferidium simplex
Stelliferidium cortinulum

A new species here referred to the genus *Striatotheca, S. foraminifera* n. sp. is not common, but a discrete component.

Minor elements are:

Zonosphaeridium ovillensis
Stelliferidium pseudoornatum n. sp.
Lophodiacrodium gigino n. sp.
Pterospermella sp.
Veryhachium minutum

This assemblage is not homogeneous because together with diacrodians and with large operculate herkomorphids which are typical Tremadocian assemblage, *Zonosphaeridium ovillensis* also occurs. The latter species is a Middle and Late Cambrian species. In eastern Canada is reported by Martin from the middle Late Cambrian, but is also reported by Fombella (1978; 1979) in the upper part of the Oville Formation, which is dated Tremadocian on the basis of Acritarchs.

Z. ovillensis must be regarded as reworked elements and Assemblage 1077, must be looked as a typical Tremadocian association.

ASSEMBLAGES 1078 AND 1076 (Gennamari outcrop).

Major components are:

Goniosphaeridium dentatum
Vulcanisphaera tuberata

various species of *Acanthodiacrodium* and *Stelliferidium* (*S. cortinulum* and *S. simplex* among others) and different netromorphs which show stricking similarities with younger taxa: it is the case of the specimen illustrated at the Plate 10, fig. 6, which seems related to *Pirea*, a marker genus of the Arenigian, or the case of *?Petaloferidium florigerum* (Pl. 9, fig. 11) similar to that figured by Vavrdovà (1972), from the Arenigian of Bohemia. One noteworthy character is also the presence of different veryachids, not all specifically determined because the high degree of variability shown in the process morphology and in the body shape. The presence even sporadic of *Veryhachium downiei* and *Verychachium trisulcum*, two common components of the Late Ordovician and Silurian palynofacies, which are also known from the Arenigian of Europe (compare the stratigraphic distributions of the two species), let me consider the age of the associations very high in the Tremadocian. On the other hand, the complete absence from Assemblages 1078 and 1076 of acritarchs belonging to *Arbusculidium* (except *A. rommelaeri*), *Vogtlandia,* typical *Striatotheca* and *Coriphydium* seem to exclude a clear Arenigian age.

Thus, considering the new character of the latter associations in between the so far known European and North-African Tremadocian palynofacies, given also by the finding of new species and genera, we suggest for Assemblages 1078 and 1076 an age at the Tremadocian - Arenigian boundary.

A stratigraphic order was identified and, including Assemblage 1079, the studied interval spans from Latest Cambrian-Ordovician boundary or Earliest Tre-

STRATIGRAPHY	LATEST EARLY CAMBRIAN TREMADOCIAN	TREMADOCIAN				? ARENIGIAN
SPECIES \ SAMPLES	1079	1074	1075	1077	1078	1076
Acanthodiacrodium commune						
Acanthodiacrodium simplex						
Cristallinium cambriense						
Cymatiogalea cuvillieri						
Impluviculus campidanius n.sp.-						
Impluviculus cleae						
Impluviculus stellaris						
Stelliferidium continulum						
Timofeevia phosphoritica						
Trunculumarium sp.a						
Acanthodiacrodium hexagonum n.sp.						
Acanthodiacrodium partiale						
Micrhystridium shinetonensis						
Protosphaeridium sp.						
Vulcanisphaera africana						
Vulcanisphaera britannica						
Acanthodiacrodium prolatum						
Cymatiogalea multiclaustra						
Goniosphaeridium pungens						
Stelliferidium pseudoornatum n.sp.						
?Striatotheca foraminifera n.sp.						
Zonosphaeridium ovillensis						
Acanthodiacrodium aciculatum						
Acanthodiacrodium aclinum n.sp.						
Acanthodiacrodium hamatum						
Acanthodiacrodium serotinum						
Acanthodiacrodium tumidum						
Cymatiogalea bouvardi						
Dasydiacrodium sp.a						
Goniosphaeridium dentatum						
Hemisphaeridium sp.						
Leiofusa acuminata n.sp.						
Leiofusa somniculata n.sp.						
Micrhystridium radians						
Retisphaeridium dichamerum						
Stelliferidium gautieri						
Stelliferidium philippoti						
Stelliferidium simplex						
Tariccrodium elegantulum n.gen. et n.sp.						

Tab. 1 *(continue)*

STRATIGRAPHY	LATEST CAMBRIAN – EARLY TREMADOCIAN	TREMADOCIAN			? ARENIGIAN
SPECIES \ SAMPLES	1079	1074	1075	1077	1078	1076
Veryhachium martinum n.sp.						
Veryhachium minutum						
Vulcanisphaera tuberata						
Acanthodiacrodium achrasi						
Acanthodiacrodium arburensis n.sp.						
Acanthodiacrodium convexum						
Acanthodiacrodium mamillatum n.sp.						
Acanthodiacrodium spinutisum						
Dasydiacrodium dicaudatum n.sp.						
Goniosphaeridium cuspidatum						
Goniosphaeridium sardum n.sp.						
Goniosphaeridium uncinatum						
Leiofusa angulata n.sp.						
Leiofusa gravida n.sp.						
Leiofusa orbicularis n.sp.						
?Leiofusa stoumonensis						
Lophodiacrodium gigino n.sp.						
Monocrodium mediterraneum n.gen. et n.sp.						
Veryhachium downiei						
Veryhachium gibbosum n.sp.						
Veryhachium trisulcum						
Taniccrodium bifidum n.gen. et n.sp.						

Table 1 - Distribution chart of acritarchs in the studied formation.

madocian to Latest Tremadocian or to the Tremadocian-Arenigian boundary.

TAXONOMY

Genus Abacum Fombella 1978

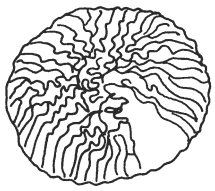
Type-species — *Abacum normale* Fombella 1978.

Abacum rudis (Combaz 1967) n. comb.
Pl. 8, figs. 9, 14; Text-fig. 2

1967 *Virgatasporites rudi* Combaz, Pl. 1, figs. 27, 28.

Description — Spherical vesicle; its surface is ornamented by muri radially oriented from the centre of the vesicle and separated by furrows of the same width. The muri run sinuously and sometimes like a zigzag in the polar area; towards the perifery of the vesicle they split dichotomically. The height of the muri is 1.5 μ. The vesicle shows to open equatorially.

Dimensions — Diameter of the vesicle 26 μ.



Text-fig. 2 - *Abacum rudis* n. comb. x 1000.

Remarks — Combaz (1967) considered this palynomorph as belongig to the Sporomorphitae. The nature and the aspect of it seems comparable to the sphaeromorphs, and even considering that the rocks including these organisms date back to the Tremadocian, I think that the proper genus for this species might be *Abacum* Fombella 1978, and not the genus *Virgatasporites*.

Occurrence — Level 1076, not common.

Stratigraphic distribution — Tremadocian of Sahara (Combaz, 1967); Tremadocian of Central Sardinia, Solanas Formation (Pittau, unpublished data).

Genus ACANTHODIACRODIUM Timofeev 1958 emend. Deflandre & Deflandre-Rigaud 1962

Type-species — *Acanthodiacrodium dentiferum* Timofeev 1958.

ACANTHODIACRODIUM ACICULATUM (Burmann) Eisenack, Cramer & Diez 1976
Pl. 5, fig. 13

1976 *Acanthodiacrodium aciculatum* Burmann n. comb. - EISENACK, CRAMER & DIEZ, p. 5.

Description — See Burmann 1970, p. 315.

Dimensions — Height of vesicle 22 to 25 μ; width of vesicle 15 μ; length of processes 7 to 10 μ.

Remarks — Dimensions given by Burmann are slightly higher: 30 x 24 μ.

Occurrence — Not common; level 1978.

Stratigraphic distribution — Upper Llanvirnian, D.D.R. (Burmann, 1970).

ACANTHODIACRODIUM ACHRASI Martin 1973
Pl. 5, fig. 12

1973 *Acanthodiacrodium achrasi* MARTIN, Pl. 5, fig. 11; Pl. 6, figs. 8, 11, 19; Pl. 8, figs. 1, 2, 4.
1981 *Acanthodiacrodium achrasi* Martin - COCCHIO, Pl. 2, fig. 20.
1981 *Acanthodiacrodium achrasi* Martin; MARTIN *in* MARTIN & DEAN, p. 13.

Description — Prolate vesicle with polygonal outline. Eight, nine simple and conical processes emerging from each pole. The outer surface of vesicle and processes is covered by small hair-like or granulations ornamental structures.

Dimensions — Height of the body, 27 to 30 μ; width, 17μ; length of processes 7 μ.

Occurrence — Not very frequent; level 1076.

Stratigraphic distribution — Tremadocian of Montagne Noire, France (Martin, 1973); Tremadocian of the Massif de Mouthoumet, France (Cocchio, 1981); Upper Cambrian (?) and Tremadocian of eastern Newfoundland (Martin, 1981).

cf. ACANTHODIACRODIUM ACHRASI Martin 1973
Pl. 5, fig. 17

Description — The same characters of *Acanthodiacrodium achrasi* except the outer surface of the vesicle wall which is structureless.

Dimensions — Height of the body 27 to 30 μ; width, 17 μ; length of processes 6, 7 μ.

Remarks — The absence of ornamental structures of the vesicle would justify the creation of a new species also because this acritarch is fairly abundant in the studied level. I prefer not to do it because this species is variable in between *Acanthodiacrodium achrasi* and *Acanthodiacrodium partiale*.

Occurrence — Frequent; level 1976.

ACANTHODIACRODIUM ACLINUM n. sp.
Pl. 5, figs. 2, 5, 19; Text-fig. 3

Derivatio nominis — From greek *clinos* = to fold; *a* privative; *aclinos* = which does not fold.

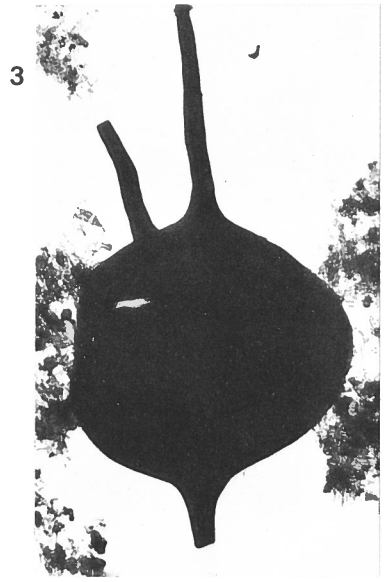
Holotype — Pl. 5, fig. 5.

EXPLANATION OF PLATE 1

Fig. 1 - *Taricrodium elegantulum*, n. gen. *et* n. sp. (Type species). 1076 C1; 11M81; Gennamari.
Fig. 2 - *Taricrodium elegantum* n. gen. *et* n. sp. 1076 C1; Gennamari.
Fig. 3 - *Taricrodium elegantulum* n. gen. *et* n. sp. 1076 C; 6CI85; Gennamari.
Fig. 4 - *Taricrodium bifidum* n. sp. 1076 CI; 37CH85; Gennamari.
Fig. 5 - *Taricrodium bifidum* n. sp. (Holotype). 1078 A; 9CH85; Gennamari.
Figs. 6-8 - Processes of *Taricrodium* n. gen. 1076; Gennamari.
Magnification x 900.


1


2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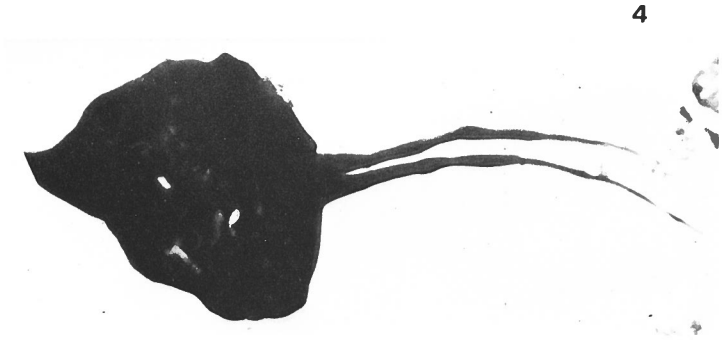
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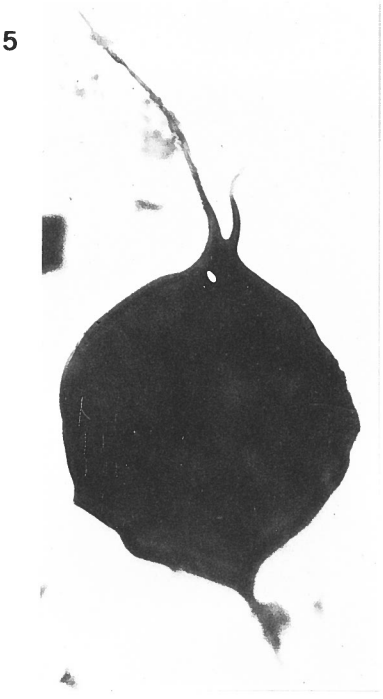
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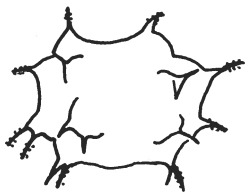
6


7


8

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.



Text-fig. 3 - *Acanthodiacrodium aclinum* n. sp. x 1000.

Diagnosis — Vesicle longitudinally elongate, irregularly polygonal with straight to concave sides in the equatorial zone. Polar caps with numerous conical protuberances which bear one spine-like process on each one. The processes, hairs ending, are ornamented with very small granulations. On each pole are five to seven processes, the base of which freely communicate with the interior cavity. The vesicle surface is chagrenate and no longitudinal ribs nor equatorial constriction have been observed. The equatorial zone free from processes is 10 μ high.

Dimensions — Longitudinal length of vesicle, 21 to 25 μ; equatorial diameter, 16, 17 μ; processes, 2 to 5 μ lenght.

Remarks — *Acanthodiacrodium aclinum* n. sp. differs from *Acanthodiacrodium micronatum* Timofeev 1959 for its smaller sizes (14 to 20 μ of difference), for the polygonal outline (not elliptical as in *Acanthodiacrodium micronatum*) and in the number of processes. It shows some similarities with *Acanthodiacrodium ignoratum* (Deunff) Deflandre and Deflandre-Rigaud 1962, but it differs in the less low number of processes.

Occurrence — Level 1976, common. Level 1078, less common.

ACANTHODIACRODIUM COMMUNE Timofeev 1959
Pl. 5, fig. 3

1959 *Acanthodiacrodium commune* TIMOFEEV, Pl. 6, fig. 31.

Description — Ellipsoidal vesicle with pointed polar caps. Equatorial area, slightly constricted, 10 μ high. The numerous (11) conical protuberances bear one spine-like process each.

Dimensions — Height of vesicle 25 μ; width 22 μ; length of processes 5 μ.

Remarks — Dimensions given by Timofeev are higher.

Occurrence — Not very common, levels 1079, 1078, 1076.

Stratigraphic distribution — Tremadocian, U.S.S.R. (Timofeev, 1959).

ACANTHODIACRODIUM ARBURENSIS n. sp.
Pl. 5, figs. 20, 21; Text-fig. 4

1977 *Acanthodiacrodium complanatum* (Deunff) - MARTIN, Pl. 3, fig. 6, not fig. 12.

Derivatio nominis — From Arburese, name of the region in which the studied formation is widespread.

Holotype — Pl. 5, fig. 20.

Locus typicus — Gennamari, Provincial Road, from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Longitudinally elongate vescicle with polygonal outline and rounded poles; straight or slightly concave lateral sides and six to ten conical spine-like processes on each pole. The cavity of the processes is virtual and they are rigid, unflexuous. The vesicle

EXPLANATION OF PLATE 2

Fig. 1 - *Monocrodium mediterraneum* n. gen. *et* n. sp. (Type species). 1076 C; 16CI85; Gennamari.
Fig. 2 - *Monocrodium mediterraneum* n. gen *et* n. sp. 1076 C1; 32CH85; Gennamari.
Fig. 3 - *Monocrodium mediterranem* n. gen. *et* n. sp. 1076 C; 12CI85; Gennamari.
Fig. 4 - *Monocrodium* sp. a. 1076 C1; 17N81; Gennamari.
Fig. 5 - *Leiofusa orbicularis* n. sp. 1076 A; 23CG85; Gennamari.
Fig. 6 - *Leiofusa orbicularis* n. sp. (Holotype). 1076 C; 4O81; Gennamari.
Fig. 7 - *Leiofusa orbicularis* n. sp. 1076 C; 31CG85; Gennamari.
Magnification x 900.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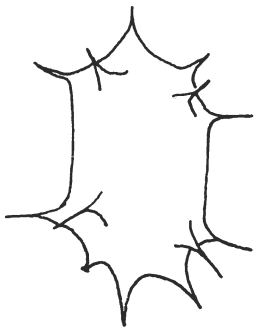


Text-fig. 4 - *Acanthodiacrodium arburensis* n. sp. x 1000.

wall is unilayered and the outer surface is chagrenate or very weakly structured.

Dimensions — Height of the vesicle 30 μ; width 20 μ; lenght of processes 6 to 10 μ.

Remarks — *Acanthodiacrodium arburensis* n. sp. is similar to *Acanthodiacrodium achrasi* Martin in the general shape, but it differs in having a more stiff vesicle and the outer surface structureless. It differs also from *Acanthodiacrodium complanatum* in the vesicle shape having the latter flattened poles. For this reason I think the specimen illustrated by Martin 1977 at Pl. 3, fig. 6 may be better ranged under this new species.

Occurrence — Frequent; levels 1076 and 1078.

ACANTHODIACRODIUM CONVEXUM Timofeev 1959
Pl. 6, fig. 12

1959 *Acanthodiacrodium convexum* TIMOFEEV, Pl. 6, fig. 50.
1981 *Acanthodiacrodium rotundatum* Gorka - COCCHIO, Pl. 2, fig. 22.

Description — Globular vesicle with equatorial constriction and a double polar cap bearing processes. The outline is roundly quadrangular. Five to seven short and conical processes emerge from each pole and their insertion is not direct but gradual. The outer surface is chagrenate.

Dimensions — Height of vesicle 30 μ; equatorial width 22 μ; equatorial constriction 5 μ high; lenght of processes 3 to 5 μ.

Discussion — The specimen illustrated by Cocchio (1981) at Pl. 2, fig. 22, is very similar to the Sardinia one. *Acanthodiacrodium convexum* differs from *Acanthodiacrodium rotundatum* Gorka 1967 in the insertion of processes which is direct in *Acanthodiacrodium rotundatum* and gradual in *Acanthodiacrodium convexum*. Moreover, the dimensions given by Gorka are enormously different from the Sardinia and Cocchio's species. Timofeev's specimen is 40 to 50 μ high.

Occurrence — Not common; level 1076.

Stratigraphic distribution — Tremadocian, U.S.S.R. (Timofeev 1959).

ACANTHODIACRODIUM HAMATUM (Downie) Martin 1973
Pl. 5, figs. 7, 18

1958 *Hystrichosphaeridium hirsutoides* var. *hamatum* DOWNIE, Pl. 16, fig. 1; fig. 2 (j, k).
1973 *Acanthodiacrodium hamatum* (Downie) n. comb. MARTIN 1973, Pl. 3, fig. 16; Pl. 5, fig. 25.

Description — Globular vesicle with ovoidal outline. Conical and simple processes emerge from the two poles of the vesicle. The processes are of different lenght and they are closed (secondary filled ?); their number is 7 to 10 per pole. The vesicle surface is chagrenate.

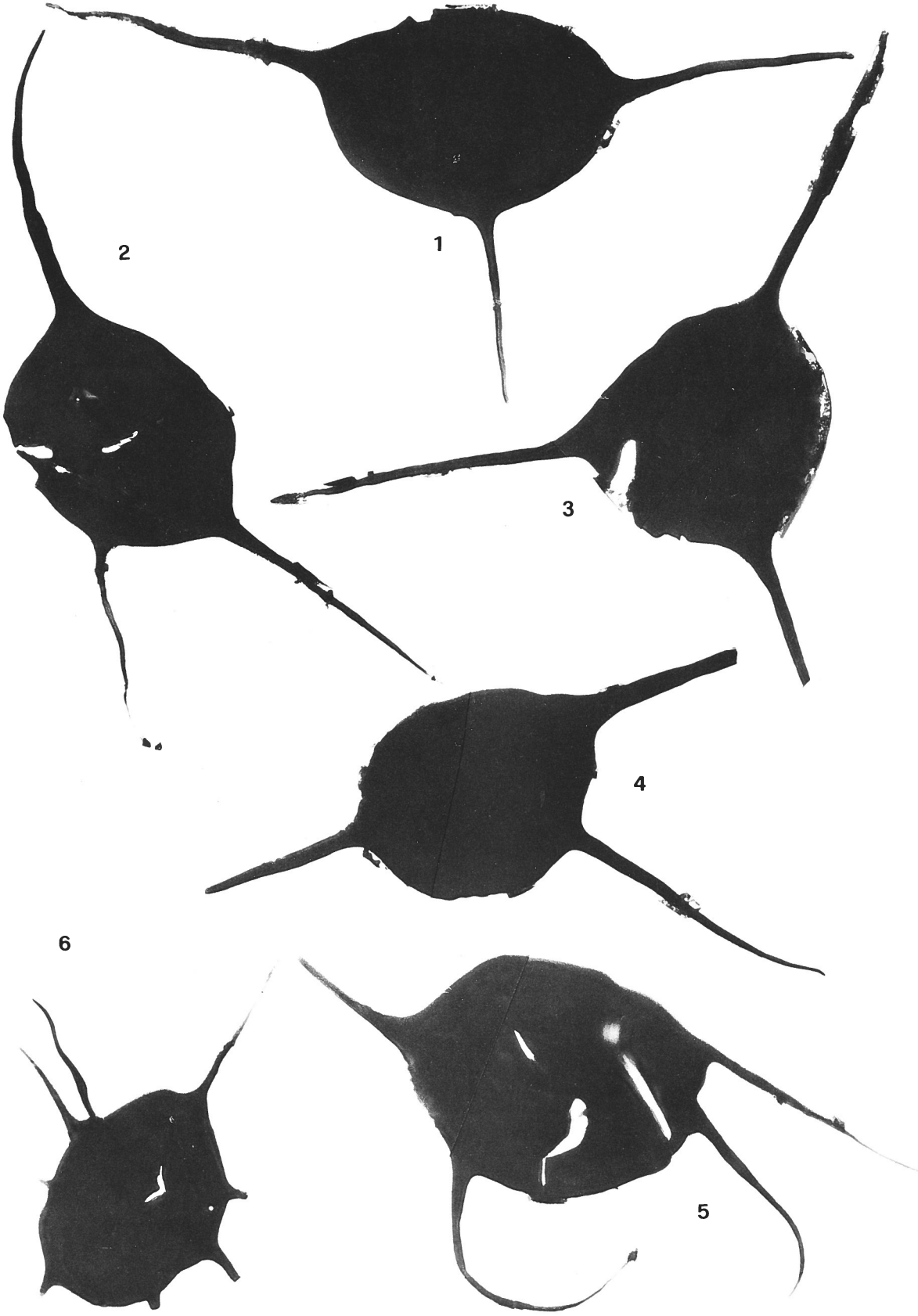
Dimensions — Height of vesicle 28 to 30 μ; length of processes 4 to 10μ; width of vesicle 22, 24 μ.

Occurrence — Frequent in levels 1078 and 1076.

Stratigraphic distribution — Tremadocian, England (Downie, 1958); Tremadocian, Montagne Noire, France (Martin, 1973).

EXPLANATION OF PLATE 3

Fig. 1 - *Veryhachium martinum* n. sp. (Holotype). 1076 C1; 17M81; Gennamari.
Fig. 2 - *Veryhachium martinum* n. sp. 1076 C; 34CG85; Gennamari.
Fig. 3 - *Veryhachium martinum* n. sp. 1076 A; 18CG85. Gennamari.
Fig. 4 - *Veryhachium martinum* n. sp. 1078 C; 37CG85. Gennamari.
Fig. 5 - *Veryhachium martinum* n. sp. 1078 B1; 11L81: Gennamari.
Fig. 6 - cf. *Veryhachium martinum*. 1076 A.
Magnification x 900.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ACANTODIACRODIUM HEXAGONUM n. sp.

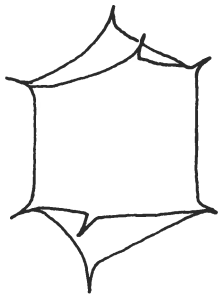
Pl. 5, fig. 8; Text-fig. 5

Derivatio nominis — From latin *hexagonum* = six sided geometrical figure; it is referred to the vesicle outline.

Holotype — Pl. 5, fig. 8.

Locus typicus — 69th Km of the Guspini-Fluminimaggiore Provincial Road.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1075.



Text-fig. 5 - *Acanthodiacrodium hexagonum* n. sp. x 1000.

Diagnosis — A species of *Acanthodiacrodium* with polyhedral vesicle. The shape is that of a triangular or rectangular parallelepiped. At each corner of the vesicle, one simple and short spine-like process is present. The sides of the vesicle are straight or slightly concave. The outer wall is chagrenate. Neither equatorial constriction, nor excystment structure have been found.

Dimensions — Height of the vesicle 30 μ; width of vesicle 22 μ; process 2.5 to 4 μ long.

Remarks — *Acanthodiacrodium hexagonum* n. sp. is different from *Acanthodiacrodium complanatum* (Deunff) Martin 1977 because the latter has different processes and has the two poles slightly asymmetrical. It also differs from *Acanthodiacrodium celticum* in having larger dimensions and because of the processes, which are very long in *Acanthodiacrodium celticum*.

Occurrence — Levels 1074 and 1075; not common.

ACANTHODIACRODIUM MAMILLATUM n. sp.

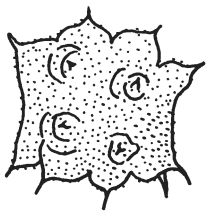
Pl. 5, figs. 10, 14; Text-fig. 6

Derivatio nominis — From latin *mamilla* = mamma; *mamillatus* is referred to the presence of protuberances.

Holotype — Pl. 5, fig. 10.

Locus tipicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

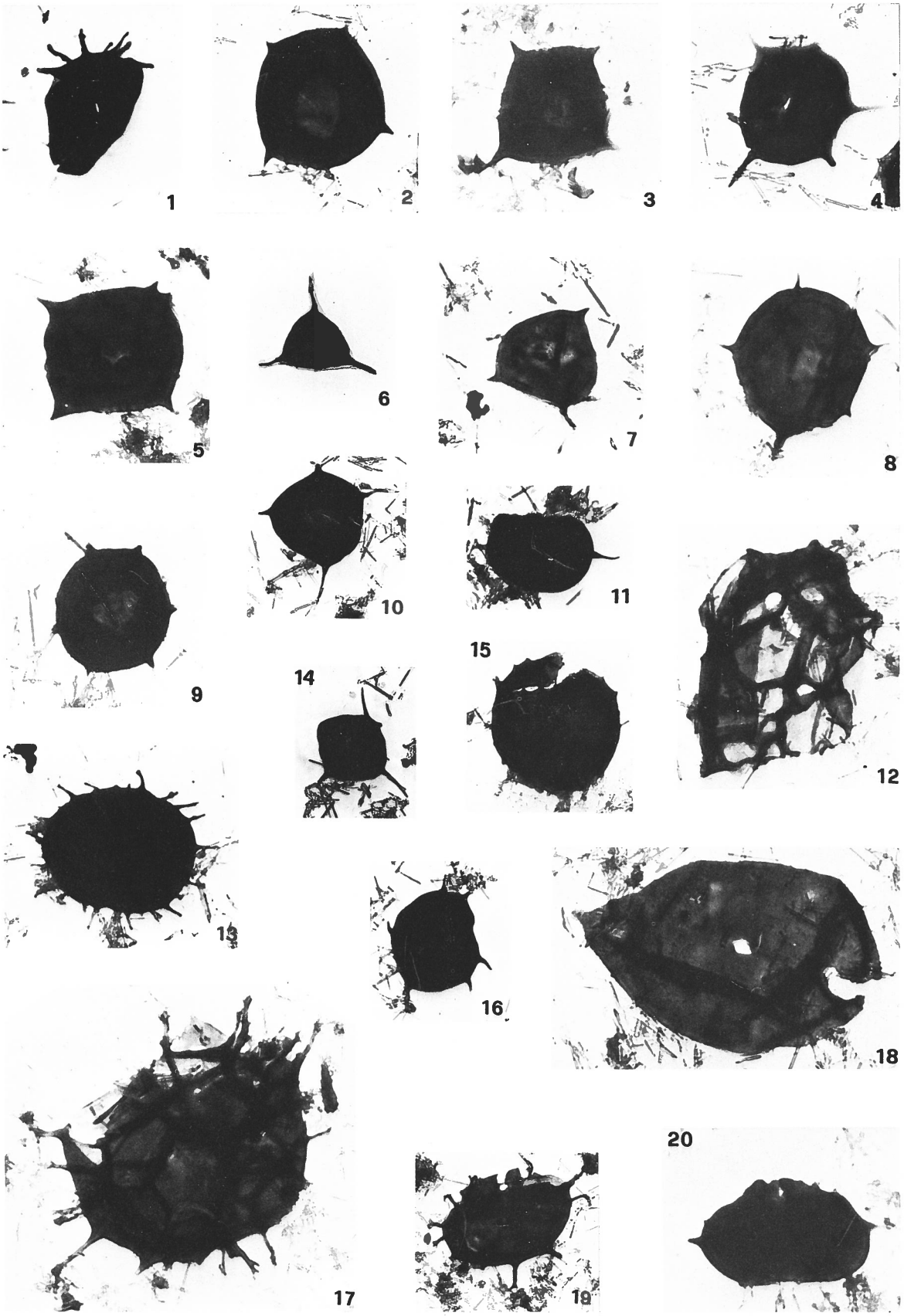
Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.



Text-fig. 6 - *Acanthodiacrodium mamillatum* n. sp. x 1000.

EXPLANATION OF PLATE 4

Fig. 1 - *Trunculumarium* sp. a. 1079 D4; 9AS82. x 900.
Figs. 2, 3, 6, 7, 10 - *Impluviculus campidanus* n. sp. Fig. 10 Holotype, 1079 B; AR82. Fig. 6, 1079 B1; 1AS82. Figs. 2, 3, 7 are x about 1350; figs. 6, 10 x 900.
Fig. 4 - *Impluviculus stellaris*. 1079 A; 12CO85. x 1350.
Figs. 5, 14 - *Impluviculus stellaris*. 1079 A; CO85. Fig. 5 is x 1350; fig. 14 is x 900.
Figs. 11, 20 - *Acanthodiacrodium simplex*. Fig. 11 is x 900; fig. 20 is x 1350. 1079 A; CO85.
Fig. 12 - Fragment of *Cristallinium cambriense*. 1079 A; 14CO85. x 1350.
Fig. 13 - *Stelliferidium simplex*. 1079 B1; AS82. x 900.
Fig. 15 - *Cymatiogalea cuvillieri*. 1079 A; CO85. x 900.
Fig. 16 - *Acanthodiacrodium* sp. new species; x 900.
Fig. 17 - *Timofeevia phosphoritica*. 1079 A; 18CO85. x 1350.
Fig. 18 - Indetermined genus; netromorph. 1079 A; 15CO85. x 1350.
Fig. 19 - *Stelliferidium* sp. 1079 B1; AS82. x. 900.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Diagnosis — Polygonal vesicle with conical projections of the vesicle wall on the two polar areas. The equatorial constriction may be present; five to seven protuberances per pole, each bearing one spine-like process, short and tipped. The ectoderm is punctate or granulate; the equatorial strip is 5 to 8 μ wide.

Dimensions — Height of vesicle 22 to 27 μ; processes 1 to 3 μ long.

Remarks — This species shows a variability in the vesicle outline towards *Vulcanisphaera tuberata* (Downie) Eisenack, Cramer & Diez 1976.

Occurrence — Level 1076, common; level 1078, less common.

ACANTHODIACRODIUM PARTIALE Timofeev 1959

Pl. 6, figs. 1, 2

1959 *Acanthodiacrodium partiale* TIMOFEEV, Pl. 6, fig. 46.
1968 *Acanthodiacrodium partiale* Timofeev - MARTIN, Pl. 1, fig. 2.

Description — Globular vesicle with equatorial and polar axes equidimensional or the first being slightly larger than the second. Five or six short conical spine-like processes emerge from each pole. The equatorial zone devoided of processes or striation is 12 μ high.

Dimensions — Height of vesicle 28 to 30 μ; lenght of processes 2.5 μ.

Remarks — Russian holotype is larger (35 to 50 μ).

Occurrence — Frequent; level 1076.

Stratigraphic distribution — Upper Cambrian, Belgium (Martin, 1968); Lower Tremadocian, U.S.S.R. (Timofeev, 1959) and Bohemia (Jagielska, 1962).

ACANTHODIACRODIUM PROLATUM (Timofeev) Deflandre & Deflandre-Rigaud 1962

Pl. 6, figs. 4, 8

1959 *Acanthorytidodiacrodium prolatum* TIMOFEEV, Pl. 7, fig. 1.
1962 *Acanthorytidodiacrodium* = *Acanthodiacrodium*, DEFLANDRE & DEFLANDRE-RIGAUD, p. 194.

Description — Globular vesicle quadrangular in outline with very rounded poles. Numerous, more than twenty, short and conical processes emerge from each pole. The equatorial strip free from processes is 7 μ high. The outer surface is chagrenate.

Dimensions — Height and width equidimensional, about 25 μ.

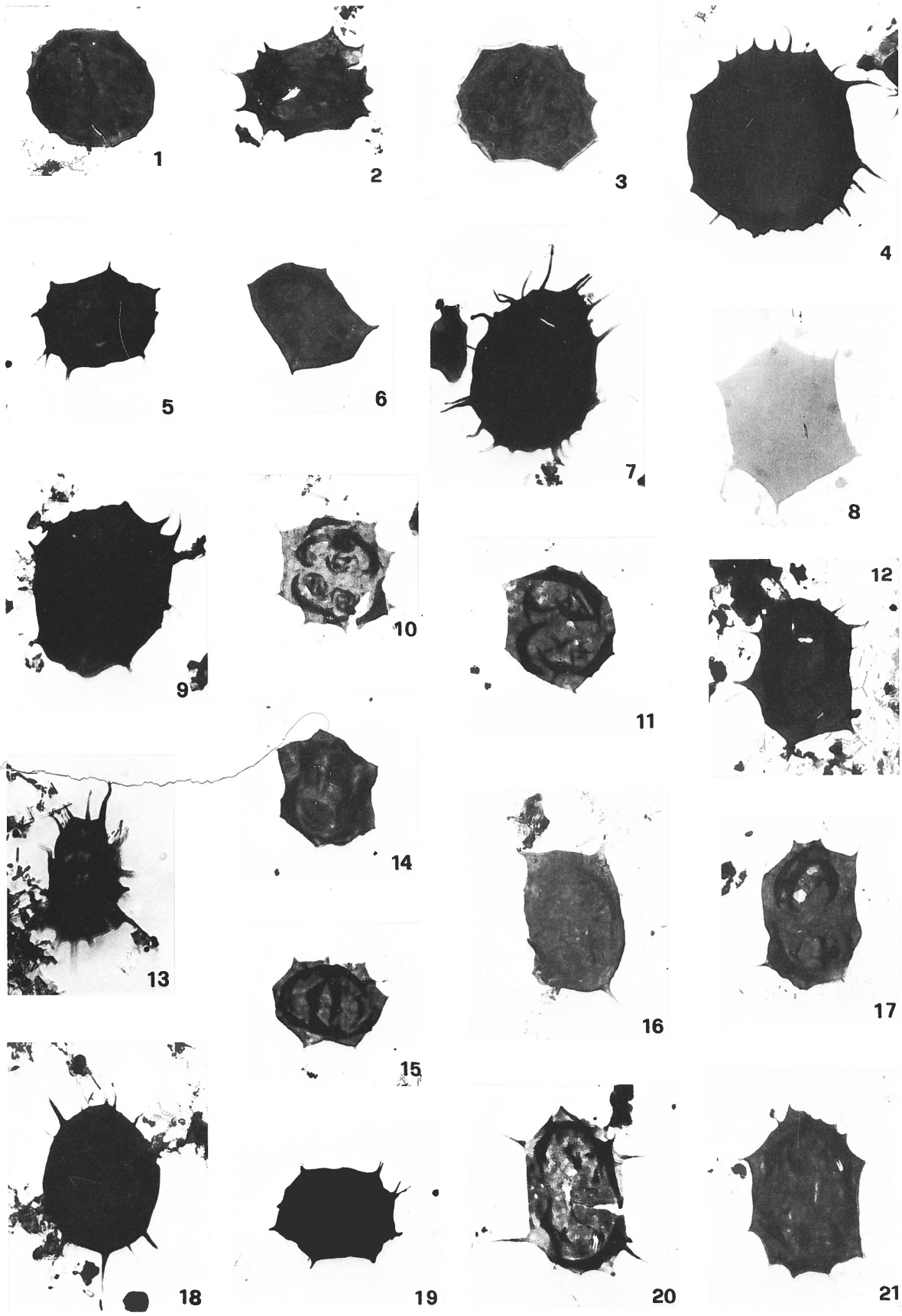
Remarks — Russian holotype is larger (35 to 55 μ).

Occurrence — Frequent; levels 1077 and 1076.

Stratigraphic distribution — Lower Tremadocian, U.S.S.R. (Timofeev, 1959).

EXPLANATION OF PLATE 5

Fig. 1 - *Lophodiacrodium gigino* n. sp. (Holotype). 1076 C; 31CM85.
Fig. 2 - *Acanthodiacrodium aclinum* n. sp. 1078 B. Gennamari.
Fig. 3 - *Acanthodiacrodium commune*. 1076 C1; 10N81; Gennamari.
Fig. 4 - *Acanthodiacrodium serotinum*. 1078 B1; 16L81; Gennamari.
Fig. 5 - *Acanthodiacrodium aclinum* n. sp. (Holotype). 1076 C1; 20N81; Gennamari.
Fig. 6 - *Acanthodiacrodium spinutisum*. 1076 C1; 22N81: Gennamari.
Fig. 7 - *Acanthodiacrodium hamatum*. 1078 B1; 17L81; Gennamari.
Fig. 8 - *Acanthodiacrodium hexagonum* n. sp. (Holotype). 1075 A; CL85; Guspini-Fluminimaggiore Road.
Fig. 9 - *Acanthodiacrodium serotinum*. 1078 B; 19I81; Gennamari.
Fig. 10 - *Acanthodiacrodium mamillatum* n. sp. (Holotype). 1076 A; 37CL85; Gennamari.
Fig. 11 - *Acanthodiacrodium* sp. indet. 1076 C. Gennamari.
Fig. 12 - *Acanthodiacrodium achrasi*. 1074 A1; 4CL85; Guspini-Fluminimaggiore Road.
Fig. 13 - *Acanthodiacrodium aciculatum*. 1078 B; 13I81; Gennamari.
Fig. 14 - *Acanthodiacrodium mamillatum* n. sp. 1076 C; 20CM85; Gennamari.
Fig. 15 - *Acanthodiacrodium* sp. indet. 1076 C. Gennamari.
Fig. 16 - *Acanthodiacrodium tumidum*. 1076 A; 32CL85; Gennamari.
Fig. 17 - cf. *Acanthodiacrodium achrasi*. 1076 C; 26CG85; Gennamari.
Fig. 18 - *Acanthodiacrodium hamatum*. 1078 B1; 10L81; Gennnamari.
Fig. 19 - *Acanthodiacrodium aclinum*. 1076 C1; Gennamari.
Fig. 20 - *Acanthodiacrodium arburensis* n. sp. (Holotype). 1076 B; 1CM85; Gennamari.
Fig. 21 - *Acanthodiacrodium arburensis* n. sp. 1076 C; 30CG85; Gennamari.
Magnification x 900.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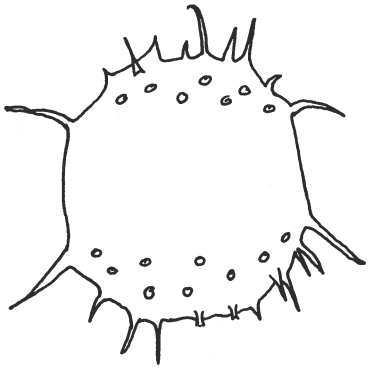
ACANTHODIACRODIUM SEROTINUM (Timofeev) Deflandre & Deflandre-Rigaud 1962
Pl. 5, figs. 4, 9; Text-fig. 7

1959 *Acanthorytidodiacrodium serotinum* TIMOFEEV, Pl. 7, fig. 9.
1962 *Acanthorytidodiacrodium* = *Acanthodiacrodium* DEFLANDRE & DEFLANDRE-RIGAUD, p. 194.



Tex-fig. 7 - *Acanthodiacrodium serotinum* (Timofeev). x 1000.

Description — Globular vesicle with elliptical outline. The two axes (polar and equatorial) are more or less equidimensional. About fifteen conical and simple processes in the outline of each pole. The outer surface is chagrenate; the equatorial strip free from processes is 15 μ high.

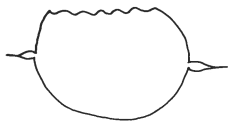
Dimensions — Height of vesicle 30 to 35 μ; width 25 to 33 μ; length of processes 10 μ.

Occurrence — Frequent in level 1078.

Stratigraphic distribution — Lower Tremadocian, U.S.S.R. (Timofeev, 1959).

ACANTHODIACRODIUM SIMPLEX Combaz 1967
Pl. 5, figs. 11, 20; Text-fig. 8

1967 *Acanthodiacrodium simplex* COMBAZ, Pl. 3, fig. 44.

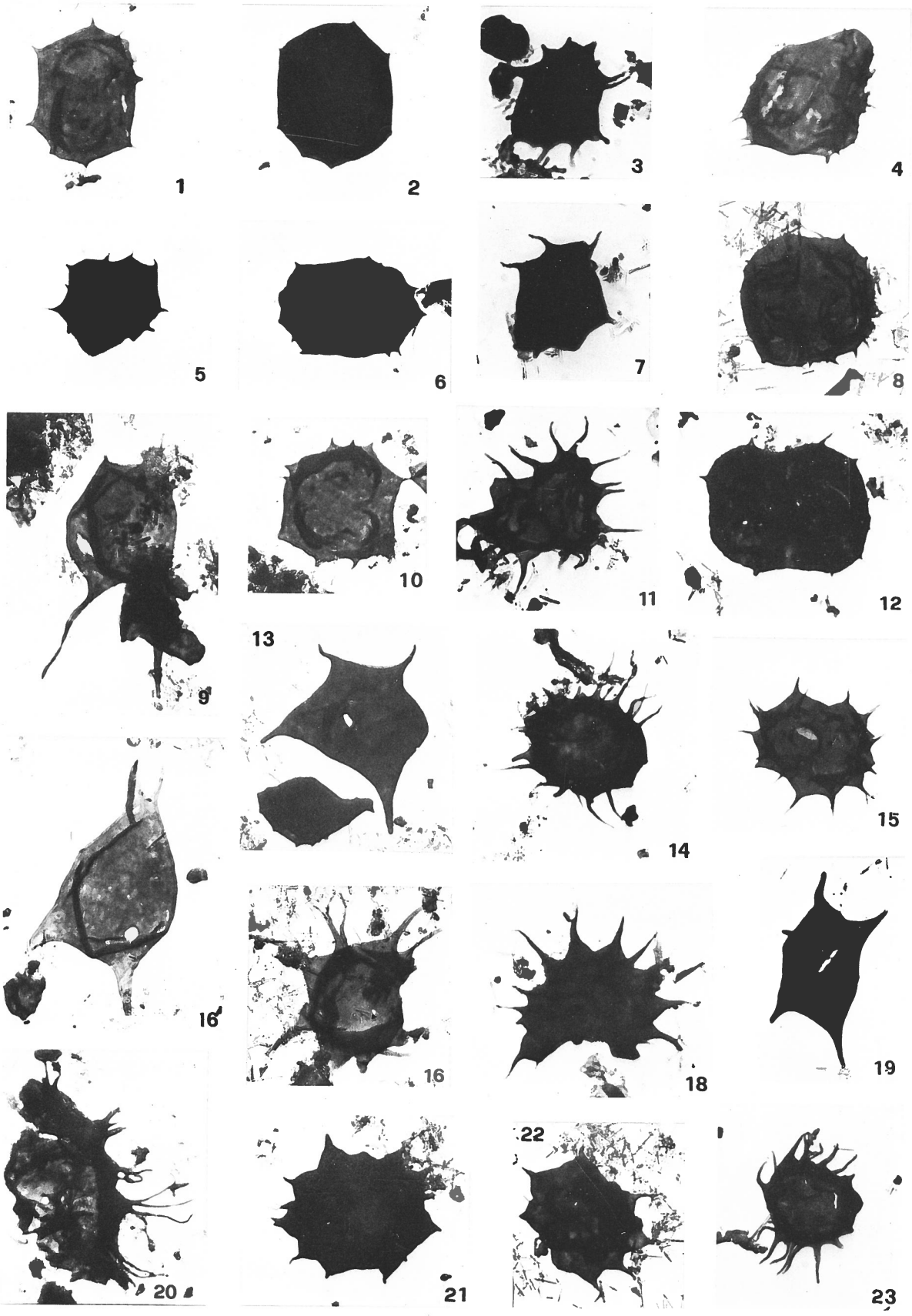


Text-fig. 8 - *Acanthodiacrodium simplex* Combaz. x 1000.

Description — Prolate globular vesicle oval in outline, bearing one process per pole. The process is unbranched, with pointed termination and a constricted base. Internal communication between the body cavity and processes is not visible.

EXPLANATION OF PLATE 6

Fig. 1 - *Acanthodiacrodium partiale.* 1076 C; 23CL85; Gennamari.
Fig. 2 - *Acanthodiacrodium partiale.* 1076 C1; 6N81; Gennamari.
Fig. 3 - *Dasydiacrodium* sp. 1078 B; 17I81; Gennamari.
Fig. 4 - *Acanthodiacrodium prolatum.* 1076 A; 15CG85; Gennamari.
Fig. 5 - *Acanthodiacrodium aclinum* n. sp. 1076 C1; 2N81; Gennamari.
Fig. 6 - *Acanthodiacrodium aclinum* n. sp. 1076 C1; 19M81; Gennamari.
Fig. 7 - *Dasydiacrodium* sp. 1078 B; 15I81; Gennamari.
Fig. 8 - *Avanthodiacrodium prolatum.* 1077 B; 20H81; Gennamari.
Fig. 9 - *Dasydiacrodium dicaudatum* n. sp. (Holotype). 1076 C, 9CI85; Gennamari.
Fig. 10 - *Acanthodiacrodium mamillatum* n. sp. 1076 C; 11CL85; Gennamari.
Fig. 11 - *Goniosphaeridium dentatum.* 1078 B1; 14L81; Gennamari.
Fig. 12 - *Acanthodiacrodium convexum.* 1078 B1; 19L81; Gennamari.
Fig. 13 - *Dasydiacrodium dicaudatum* n. sp. 1076 C; 13CI85; Gennamari.
Fig. 14 - *Goniosphaeridium pungens.* 1076 C; Gennamari.
Fig. 15 - *Goniosphaeridium dentatum.* 1076 C1; 16M81; Gennamari.
Fig. 16 - *Dasydiacrodium dicaudatum* n. sp. 1076 A; Gennamari.
Fig. 17 - *Vulcanisphaera britannica.* 1074 A1; 2CL85; Fluminimaggiore-Guspini Road.
Fig. 18 - *Goniosphaeridium uncinatum.* 1074 A1; 5CL85; Fluminimaggiore-Guspini Road.
Fig. 19 - *Goniosphaeridium cuspidatum* n. comb. 1076 C; 4CM85; Gennamari.
Fig. 20 - *Vulcanisphaera africana.* 1074 A1; 9CL85; Gennamari.
Figs. 21, 22 - *Vulcanisphaera tuberata.* 1078 B1; 22L81; Gennamari.
Fig. 23 - *Goniosphaeridium pungens.* 1078 B1; 13L81; Gennamari.
Magnification x 900.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Dimensions — Height of vesicle 15 to 20 μ; width 12 to 15 μ; length of processes 5 to 7 μ.

Remarks — On some specimens of *Acanthodiacrodium simplex* I have observed a longitudinal linear or oval suture in the equatorial zone. Martin (1973) found in the same acritarch from the Montagne Noire some uncertain structures of dehiscence.

Occurrence — Common in level 1079.

Stratigraphic distribution — Lower Tremadocian, Algeria (Combaz, 1967); Tremadocian of Montagne Noire, France (Martin, 1973; Rauscher, 1971; 1974).

ACANTHODIACRODIUM TUMIDUM (Deunff) Eisenack, Cramer & Diez 1979
Pl. 5, fig. 16

1961 *Priscotheca tumida* DEUNFF, Pl. 3, fig. 6.
1964 *Priscotheca tumida* Deunff - DOWNIE & SARJEANT, p. 141.
1967 *Priscotheca tumida* Deunff - COMBAZ, Pl. 3, fig. 65.
1974 *Priscotheca tumida* Deunff - JARDINÈ, COMBAZ, MAGLOIRE, PENIGUEL & VACHEY, pp. 104, 108-110.
1974 *Priscotheca tumida* Deunff - RASUL & DOWNIE, p. 4.
1979 *Acanthodiacrodium tumidum* (Deunff) - EISENACK, CRAMER & DIEZ, p. 21-22.

Description — See Deunff 1961, p. 43.

Dimensions — The vesicle is 32 μ long and 20 μ wide; the processes are about 6 μ long.

Remarks — The dimensions given by Deunff for the African holotype are larger (60 x 40 μ).

Occurrence — Rare; levels 1078 and 1076.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961); Tremadocian, Hassi-Messaoud, Sahara (Combaz, 1967); Lower Tremadocian to Llanvirnian, Sahara (Jardiné *et al.*, 1974); Tremadocian, England (Rasul & Downie, 1974).

Genus CRISTALLINIUM Vanguestaine 1978

Type-species — *Cristallinium cambriense* (Slavikovà) Vanguestaine 1978.

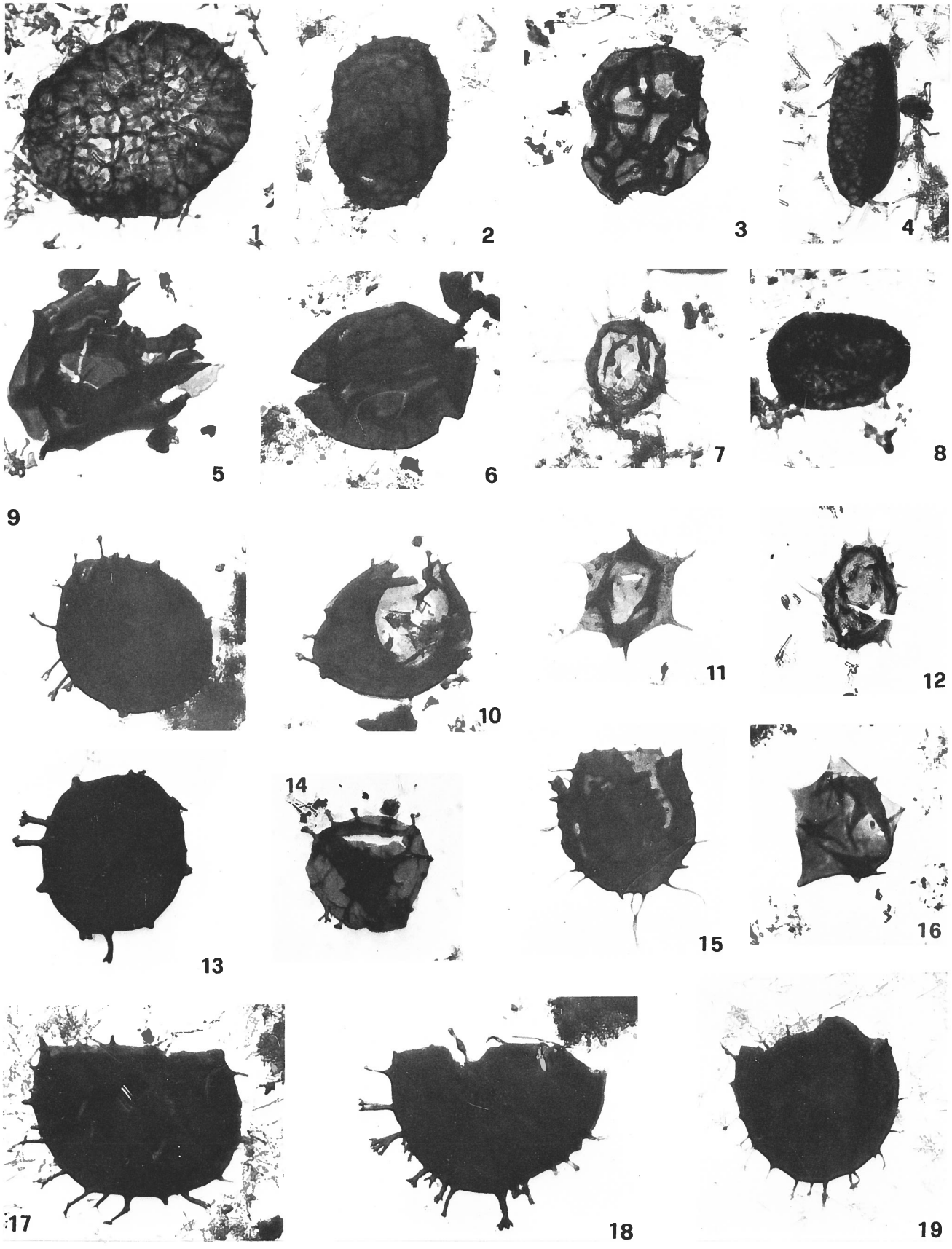
CRISTALLINIUM CAMBRIENSE (Slavikovà) Vanguestaine 1978
Pl. 4, fig. 12; Pl. 7, fig. 3

1968 *Dictyotidium cambriense* SLAVIKOVÀ, Pl. 2, fig. 1, 3.
1971 *Dictyotidium cambriense* Slavikovà - GARDINER & VANGUESTAINE, Pl. 2, figs. 4, 5.
1972 *Cymatiosphaera ovillensis* CRAMER & DIEZ DE CRAMER, Pl. 2, figs. 4, 7, 10.
1973 *Dictyotidium cambriense* Slavikovà - MARTIN, Pl. 2, fig. 13; Pl. 6, fig. 4.
1976 *Staplinia cambriense* (Slavikovà) Vanguestaine - VAVRDOVÀ, Pl. 1, figs. 1, 3, 5, 8.
1976b *Cymatiosphaera favosa* JANKAUSKAS, Pl. 25, figs. 7, 15.
1976b *Cymatiosphaera lazdynica* JANKAUSKAS, Pl. 25, figs. 4, 5, 8, 10.
1977 *Dictyotidium cambriense* Slavikovà - MARTIN, Pl. 4, fig. 12.
1978 *Cymatiosphaera ovillensis* Cramer & Diez - FOMBELLA, Pl. 1, fig. 20.
1978 *Cristallinium cambriense* Slavikovà n. comb. - VANGUESTAINE, Pl. 2, figs. 16,17; Pl. 3, figs. 26, 27.

Description — Vesicle globular, ovoidal in outline with chagrenate surface. Low, continuous septa per-

EXPLANATION OF PLATE 7

Fig. 1 - *Zonosphaeridium ovillensis*. 1077 B; 23H81; Gennamari.
Fig. 2 - *Zonosphaeridium ovillensis*. 1077 B; 22H81; Gennamari.
Fig. 3 - *Cristallinium cambriense*. 1074 A1; 1CL85; Fluminimaggiore-Guspini Road.
Fig. 4 - *Zonosphaeridium ovillensis*. 1078 B; Gennamari.
Fig. 5 - *Retisphaeridium dichamerum*. 1078 B; 21I81; Gennamari.
Fig. 6 - *Hemisphaeridium* sp. 1076 A; 31N81, Gennamari.
Fig. 7 - *Micrhystridium* sp. *affinis Polygonium gracile*. 1076; Gennamari.
Fig. 8 - *Filisphaeridium capillatum*. 1078 B; 8I81; Gennamari.
Figs. 9, 10 - *Stelliferidium cortinulum*. 1076 C1; 29M81; Gennamari.
Fig. 11 - *Goniosphaeridium* sp. 1076; Gennamari.
Fig. 12 - *Micrhystridium radians*. 1076 C; 28CG85; Gennamari.
Fig. 13 - *Stelliferidium* sp. 1076 C1; 1N81; Gennamari.
Fig. 14 - *Stelliferidium gautieri* n. comb. 1078 B; 2I81; Gennamari.
Fig. 15 - *Cymatiogalea multarea*. 1076 C1; 33M81; Gennamari.
Fig. 16 - ?*Micrhystridium stellatum*. 1076 A; 24CG85; Gennamari.
Fig. 17 - *Stelliferidium cortinulum*. 1077 B; 10H81; Gennamari.
Fig. 18 - *Stelliferidium* sp. indet., new species; 1076 A; Gennamari.
Fig. 19 - *Stelliferidium simplex*. 1077 B; 3H81; Gennamari.
Magnification x 900.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pendicular to the vesicle surface delimit polygonal fields. The outer border of each septum is denticulate. Excystment structures have not been observed.

Dimensions — Diameter of vesicle 30 μ; diameter of polygonal fields 10 μ; height of septa 0.5 to 1 μ.

Occurrence — Very rare in levels 1074 and 1079.

Stratigraphic distribution — Middle Cambrian *Eccaparadoxides pusillus* Zone to *Hydrocephalus lyelli* Zone, Jince Formation, Czechoslovakia (Slavikovà, 1968; Vavrdovà, 1976); Middle Cambrian to Tremadocian, eastern Newfoundland (Martin & Dean, 1981); Early Tremadocian, Belgium (Martin, 1977); Tremadocian, France (Rauscher, 1971); Middle Cambrian, Oville Formation, Spain (Cramer & Diez, 1972), p. 25.

Genus CYMATIOGALEA Deunff 1961

Type-species — *Cymatiogalea margaritata* Deunff 1961.

CYMATIOGALEA BOUVARDI Martin 1973
Pl. 8, fig. 3

Description — See Martin 1973, pag. 39.

Dimensions — Diameter of the vesicle 25 μ; length of processes 3 to 8 μ.

Occurrence — Rare, in level 1078.

Stratigraphic distribution — Tremadocian of Belgium (Martin, 1973); Uppermost Cambrian to Tremadocian, (*Peltura* Zone, *Acerocare* Zone and *Parabolina argentina* inclusive Zone) eastern Newfoundland (Martin, 1981).

CYMATIOGALEA CUVILLIERI (Deunff) Deunff 1964

1961 *Priscogalea cuvillieri* DEUNFF, Pl. 1, fig. 2.
1964 *Cymatiogalea cuvillieri* Deunff n. comb. DEUNFF, Pl. 1, fig. 2.
1973 *Priscogalea cuvillieri* Deunff - MARTIN, Pl. 4, figs. 3, 4, 11, 17, 19; Pl. 5, figs. 23, 28; Pl. fig. 5; Pl. 9, fig. 6.
1981 *Priscogalea cuvillieri* Deunff - MARTIN *in* MARTIN & DEAN, p. 13.

Description — See Deunff 1964, p. 194.

Occurrence — Very rare; levels 1079 and 1076. At the studied locality only fragmented vesicles of this species were observed; for this reason the vesicle dimensions are not given.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961); Tremadocian, Montagne Noire, France (Martin, 1973; Rauscher, 1971; 1974); Tremadocian, eastern Newfoundland (Martin, 1981).

CYMATIOGALEA MULTICLAUSTRA (Deunff) Deunff 1964
Pl. 8, fig. 10

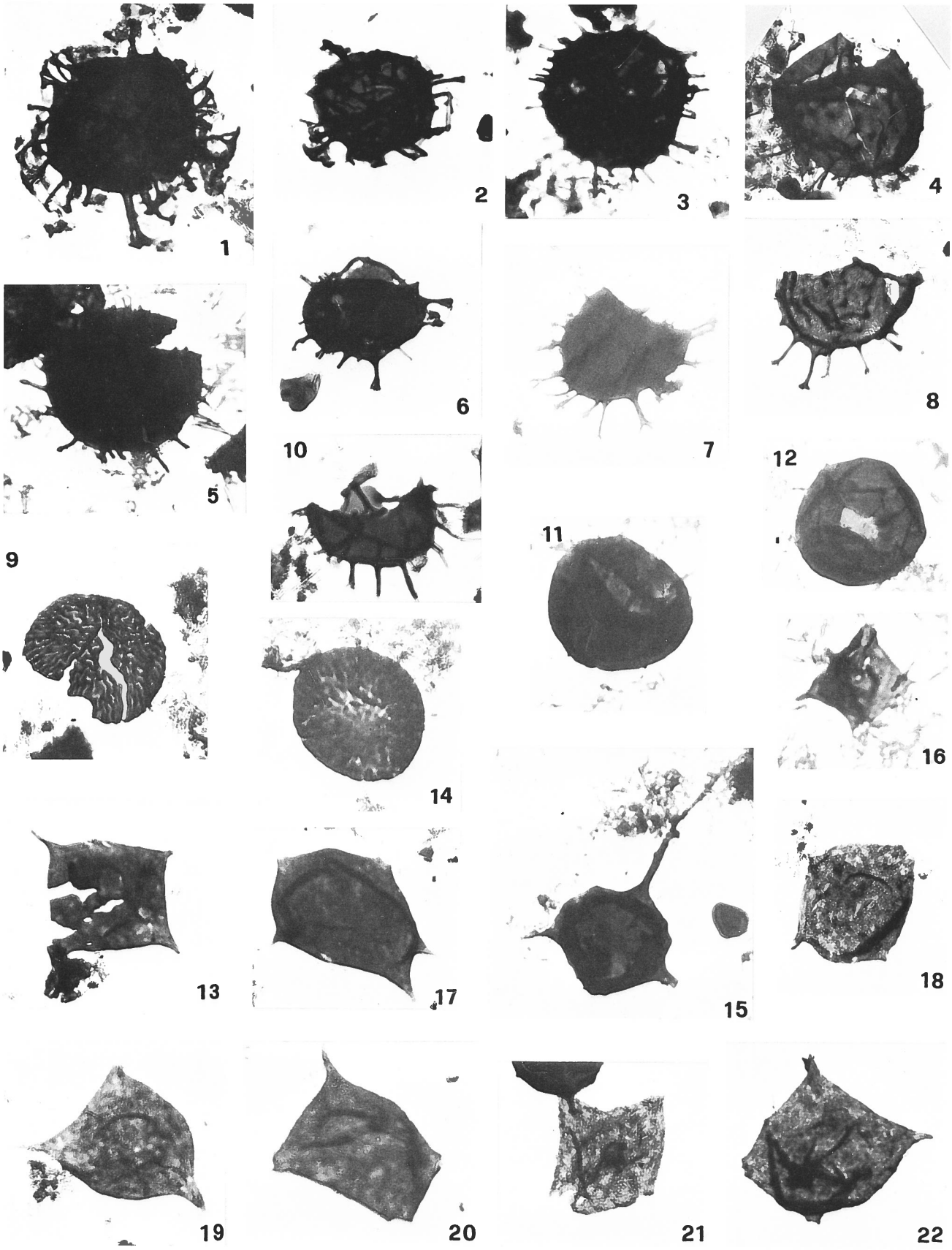
1961 *Priscogalea multiclaustra* DEUNFF, Pl. 2, fig. 4.
1964 *Cymatiogalea multiclaustra* Deunff n. comb. - DEUNFF, p. 121.

Description — See Deunff 1964 p. 121.

Occurrence — Rare, in level 1077. At the studied locality only large fragment of *Cymatiogalea multi-*

EXPLANATION OF PLATE 8

Fig 1 - *Stelliferidium philippoti.* 1078 B; 35H81; Gennamari.
Fig. 2 - cf. *Stelliferidium philippoti.* 1078 B; 9M81; Gennamari.
Fig. 3 - *Cymatiogalea bouvardi.* 1078 B; Gennamari.
Fig. 4 - *Stelliferidium simplex.* 1078 B; 10I81; Gennamari.
Fig. 5 - *Stelliferidium simplex.* 1077 B; 7H81; Gennamari.
Fig. 6 - *Stelliferidium* sp. (compare *Stelliferidium* sp. of Plate 4, fig. 19). 1078 B1; Gennamari.
Fig. 7 - *Stelliferidium distinctum.* 1075 A; Fluminimaggiore-Guspini Road.
Fig. 8 - Fragment of *Stelliferidium striatulum.* 1076 B; Gennamari.
Fig. 9 - *Abacum rudis.* 1076 C; O81. Gennamari.
Fig. 10 - Fragment of *Cymatiogalea multiclaustra.* 1078 B; 7I81, Gennamari.
Fig. 11, 12 - *Stelliferidium pseudoornatum* n. sp. fig. 11 Holotype; 1078 B1; 2L81; Gennamari.
Fig. 13 - *Veryhachium* sp. 1076 A; 17CG85; Gennamari.
Fig. 14 - *Abacum rudis.* 1076 C; O81. Gennamari.
Fig. 15 - *Goniosphaeridium sardum* n. sp. (Holotype); 1076 C; 5CI85; Gennamari.
Fig. 16 - *Veryhachium minutum.* 1076 C; 16CM85; Gennamari.
Fig. 17 - ?*Veryhachium* sp. 1076 C; 7CI85; Gennamari.
Figs. 18-22 - ?*Striatotheca foraminifera* n. sp.; fig. 22 Holotype; 1076 C1; 11N81; Gennamari.
Magnification x 900.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claustra were observed. For this reason the vesicle dimensions are not given.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961).

Genus DASYDIACRODIUM Timofeev 1959 emend. Deflandre & Deflandre-Rigaud 1962

Type-species — *Dasydiacrodium eichwaldi* Timofeev 1959, designated by Deflandre & Deflandre-Rigaud 1969, p. 194.

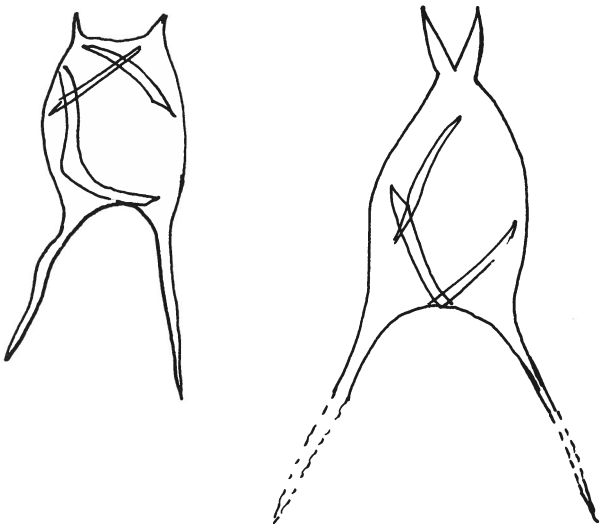
DASYDIACRODIUM DICAUDATUM n. sp.
Pl. 6, figs. 9, 13, 16; Text-fig. 9

Derivatio nominis — From latin *di* = double, and *caudatum* = bearing tail; *dicaudatum* = having a double tail; it is referred to the morphology of the polar process.

Holotype — Pl. 6, fig. 9.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.



Text-fig. 9 - *Dasydiacrodium dicaudatum* n. sp. x 1000.

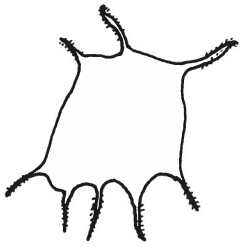
Diagnosis — Tetrangular or triangular vesicle with convex sides and inflated body. Two long, slender and veryachid processes at the corner of one pole; at the opposit pole two very short and closed processes which sometimes are so near to resemble one double process. The ectoderme is chagrenate and is 1 μ thick. Excystment mechanism is produced through an ovoidal (slit-pylome ?) aperture. Arched and crossing plicae are due to compressions.

Dimensions — Height of vesicle 20 to 35 μ; width of vesicle 20 μ; length of processes, 1 to 9 μ.

Remarks — *Veryhachium intermissum* Burmann 1970 differs from *Dasydiacrodium dicaudatum* n. sp. because it has the four processes of the same length.

Occurrence — Not common, level 1076.

DASYDIACRODIUM sp. a
Pl. 6, figs. 3, 7; Text-fig. 10



Text-fig. 10 - *Dasydiacrodium* sp. a x 1000.

Description — Polygonal vesicle with trapezohedral outline and one convex pole. At one pole three to five short and conical processes; at the opposite pole five to eight simple and conical processes. The outer surface is chagrenate or ornamented by pits which are more visible on the processes.

Dimensions — Height of vesicle 20 μ; width vesicle 15 μ; length of processes 4 to 8 μ.

Occurrence — Not very common, in level 1078.

Genus GONIOSPHAERIDIUM Eisenack 1969 emend. Kjellström 1971a

Type-species — *Goniosphaeridium polygonale* Eisenack 1959, Pl. 16, figs. 6-9.

GONIOSPHAERIDIUM CUSPIDATUM Timofeev 1969, n. comb.
Pl. 6, fig. 19; Text-fig. 11

1959 *Archaeohystrichosphaeridium cuspidatum* TIMOFEEV, Pl. 3, fig. 43.

Text-fig. 11 - *Goniosphaeridium cuspidatum* n. comb. x 1000.

Description — Polygonal vesicle with concave sides and quadrangular outline. Five or six processes emerge from the vesicle with a large base and rounded tips; they probably communicate with the interior cavity. The ectoderm is smooth.

Dimensions — Diameter of the vesicle 18-20 μ; length of processes 30 percent of the vesicle diameter.

Occurrence — Very rare; level 1076.

Stratigraphic distribution — Lower Tremadocian U.S.S.R. (Timofeev, 1959).

GONIOSPHAERIDIUM DENTATUM (Timofeev) Rauscher 1974
Pl. 6, figs. 11, 15

1959 *Archaeohystrichosphaeridium dentatum* TIMOFEEV, Pl. 3, fig. 44.
1968 *Baltisphaeridium lucidum* Deunff - MARTIN, Pl. 4, fig. 193 and 195.
1974 *Goniosphaeridium dentatum* Timofeev, n. comb. - RAUSCHER, Pl. 1, fig. 6.

Description — Polygonal vesicle with concave sides in the outline. From the central body emerge twenty-five conical and simple processes whose bases are in continuation with the concave sides of the vesicle. The processes, tipped at their termination are communicating with the body cavity. The vesicle surface is chagrenate. An ovoidal excystment aperture is sometimes observed.

Dimensions — Diameter of vesicle 25 μ; lenght of processes 7 to 13 μ, width of process base 4 to 6 μ.

Occurrence — Fairly frequent in level 1078; less frequent in level 1076.

Stratigraphic distribution — Upper Cambrian and Tremadocian (*Obolus* and *Dictyonema* strata), U.S.S.R., (Timofeev, 1959); Tremadocian and Arenigian, Montagne Noire, France (Rauscher, 1974); Arenigian, Belgium (Martin, 1968).

GONIOSPHAERIDIUM PUNGENS (Timofeev) Rauscher 1974
Pl. 6, figs. 14, 23

1959 *Archaeohystrichosphaeridium pungens* TIMOFEEV, Pl. 3, fig. 33.
1968 *Baltisphaeridium pungens* Timofeev n. comb. - MARTIN, Pl. 1, figs. 16, 23, 24, 34.

Description — Vesicle rounded polygonal bearing numerous long and tipped processes, 20 to 25 μ in average; they start from the central body with a large conical base and are as long as half of the diameter of the vesicle. Some processes seem to communicate with the body cavity, some others not (secondary filled ?). No preferential opening was found.

Dimensions — Vesicle diameter 18 to 22 μ; lenght of processes 8 to 10 μ.

Occurrence — Frequent in level 1078; rare in level 1076.

Stratigraphic distribution — Middle Cambrian and Early Tremadocian, U.S.S.R. (Timofeev, 1969; Jagielska, 1962); Tremadocian and Lower Arenigian, Belgium (Martin, 1968); Tremadocian and Arenigian, Montagne Noire, France (Rauscher, 1974).

GONIOSPHAERIDIUM SARDUM n s.p.
Pl. 8, fig. 15; Text-fig. 12

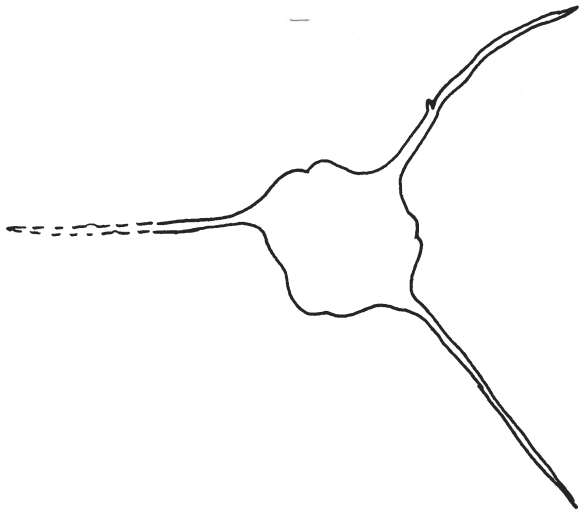
Derivatio nominis — Neuter adjective of Sardinia.

Holotype — Pl. 8, fig. 15.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Polygonal, subsphaerical vesicle, with three long and simple processes radially distributed at 120 degrees on it. The body wall is pimpled and little pimplies occur on the processes. The processes are long (1.5 to 2 times the body diameter), tipped at their ends and have a conical base which freely communicate with the interior cavity. Plicae due to compression are present at the periphery of the body. Nor median split neither excystment aperture were found.



Text-fig. 12 - *Goniosphaeridium sardum* n. sp. x 1000.

Dimensions — Diameter of vesicle 20 µ; length of processes 30 to 35 µ.

Remarks — The absence of the basal constriction in the processes differentiates this species from *Orthosphaeridium ternatum* (Burmann) Eisenack, Cramer & Diez 1976. The thickness of the processes differentiates it from any species of *Veryhachium*. Communication between processes and the body cavity excludes *Goniosphaeridium sardum* n. sp. from the genus *Baltisphaeridium*.

Occurrence — Rare in level 1076.

Genus HEMISPHAERIDIUM
Hemer & Nygreen 1967

Type-species — *Hemisphaeridium inominatum* Hemer & Nygreen 1967.

HEMISPHAERIDIUM sp.
Pl. 7, fig. 6

Description — Sphaerical vesicle equatorially opened into two halves which stay linked together by an istmo. Outer surface smooth or chagrenate.

Dimensions — Diameter of the vesicle 35 µ.

Remarks — The specimen illustrated by Cocchio (1981) as *Hemisphaeridium* sp. is quite similar to this species.

Occurrence — Levels 1076 and 1078.

Genus IMPLUVICULUS Loeblich & Tappan 1969
emend. Martin 1977

Type-species — *Impluviculus miloni* (Deunff) Loeblich & Tappan 1969.

IMPLUVICULUS CAMPIDANUS n. sp.
Pl. 4, figs. 2, 3, 6, 7, 10; Text-fig. 13

Derivatio nominis — Masculine adjective of proper noun; it is derived from « Campidano » the wide plain of Sardinia.

Holotype — Pl. 4, fig. 10.

EXPLANATION OF PLATE 9

Fig. 1 - *Veryhachium downiei*. 1076 C; O81. Gennamari.
Fig. 2 - *Veryhachium gibbosum* n. sp. 1076 C; 23CI85; Gennamari.
Fig. 3 - *Veryhachium trisulcum*. 1076 C; 18CI85; Gennamari.
Fig. 4 - ?*Micrhystridium stellatum*. 1076 C; Gennamari.
Fig. 5 - *Veryhachium gibbosum* n. sp. (Holotype); 1076 C; 35N81; Gennamari.
Fig. 6 - *Veryhachium gibbosum* n. sp. 1076 A; 36CL85; Gennamari.
Fig. 7 - *Leiofusa angulata* n. sp. (Holotype); 1076 C; O810. Gennamari.
Fig. 8 - *Leiofusa angulata* n. sp. 1076 C; 34N81; Gennamari.
Fig. 9 - *Leiofusa acuminata* n. sp. 1078 B1; 3L81; Gennamari.
Fig. 10 - *Leiofusa* cf. *angulata* n. sp. 1076 C; 37N81; Gennamari.
Fig. 11 - ?*Petaloferidium florigerum*. 1076 B; 2CM85; Gennamari.
Fig. 12 - *Leiofusa acuminata* n. sp. (Holotype); 1076 C; O81. Gennamari.
Fig. 13 - *Leiofusa somniculata* n. sp. (Holotype); 1078 B1; Gennamari.
Fig. 14 - *Leiofusa somniculata* n. sp. 1076 C; 11O81. Gennamari.
Magnification x 900.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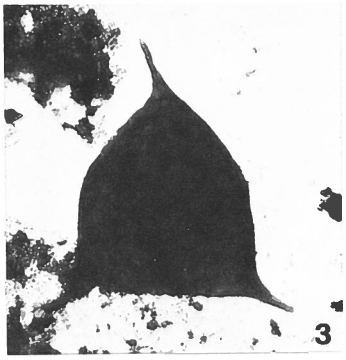
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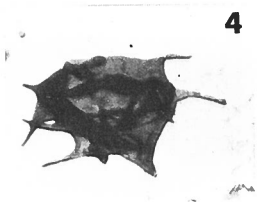
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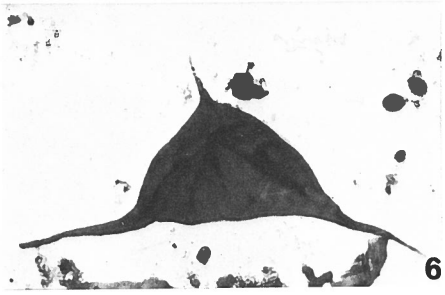
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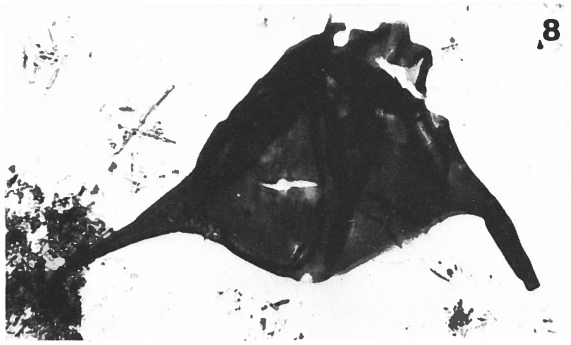
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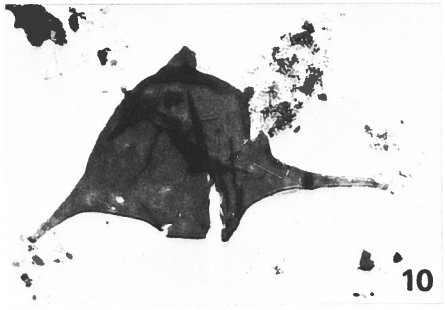
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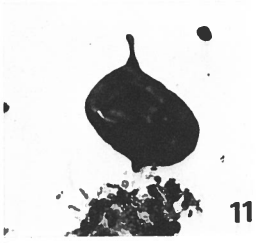
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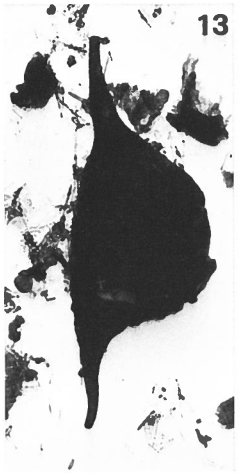
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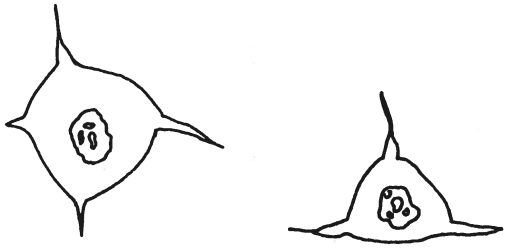
Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Statum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1079.



Text-fig. 13 - *Impluviculus campidanus* n. sp. x 1000.

Description — Quadrangular or triangular with convex sides vesicle, bearing four or three tapering and pointed processes distributed on the equatorial plane. The base of processes may be bulbous. The aperture, situated in the centre of the vesicle, is round or oval with undulate rim and, often, shows scattered fragments of the operculum. The vesicle surface is changrenate or smooth.

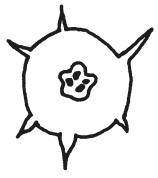
Dimensions — Diameter of vesicle 10 to 17 μ; length of processes 4 to 7 μ.

Remarks — *Impluviculus campidanus* n. sp. differs from *Impluviculus miloni* (Deunff) in having shorter processes and the tendency to be globular instead of rectangular. It differs also from *Impluviculus stellaris* Martin 1977 because of the absence of the horn-like process.

Occurrence — Common in level 1079.

Impluviculus cleae (Martin) Martin 1977
Pl. 6, figs. 8, 9; Text-fig. 14

1973 *Micrhystridium cleae* Martin, Pl. 1, figs. 5, 9; Pl. 5, figs. 10, 14, 27.
1977 *Impluviculus cleae* Martin n. comb. - Martin, p. 15.



Text-fig. 14 - *Impluviculus cleae* Martin. x 1000.

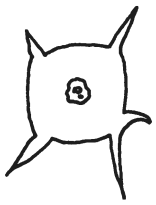
Description — See Martin 1973, pp. 10, 11.

Dimensions — Diameter of the vesicle 14 μ; spine-like processes 5 μ long.

Occurrence — Frequent in level 1079.

Stratigraphic distribution — Tremadocian, Montagne Noire, France (Martin, 1973) and Massif de Mouthoumet, France (Cocchio, 1981).

Impluviculus stellaris Martin 1977
Pl. 4, fig. 4; Text-fig. 15



Text-fig. 15 - *Impluviculus stellaris* Martin. x 1000.

Dimensions — Diameter of vesicle 14 to 16 μ; length of processes 3 to 7 μ.

Remarks — The presence of an horn-like process on the vesicle allows easily distinguish this species.

Occurrence — Frequent in level 1079.

Stratigraphic distribution — Tremadocian, Belgium (Martin, 1977) and Tremadocian, France (Cocchio, 1981).

Genus Leiofusa Eisenack 1938, restricted by Eisenack 1965, emend. and restricted by Combaz, Lange & Pensart 1967 and by Cramer 1967

Type-species — *Leiofusa fusiformis* (Eisenack) Eisenack 1938.

Leiofusa acuminata n. sp.
Pl. 9, figs. 9, 12; Text-fig. 16

Derivatio nominis — From latin *acuminatus* = with pointed termination; it is referred to the vesicle poles.

Holotype — Pl. 9, fig. 12.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Text-fig. 16 - *Leiofusa acuminata* n. sp. x 1000.

Diagnosis — Fusiform vesicle with two tipped apices. The outline of the central body is undulate and the vesicle is elongated to form two short pointed processes. Neither striate ornamentation structures are present on the ectoderm. The ectoderm is smooth or changrenate and is 1 micron thick.

Dimensions — Total length 40 to 47 μ.

Remarks — The closest species to *Leiofusa acuminata* n. sp., in the vesicle shape, is *Dactylofusa squama* Combaz, Lange & Pensart 1967 but the absence of striae in the Sardinia specimens justify the new species.

Occurrence — Frequent in level 1076; less frequent in level 1078.

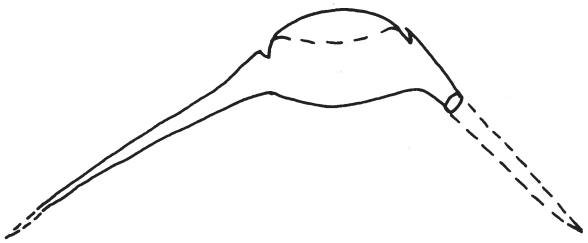
LEIOFUSA ANGULATA n. sp.
Pl. 9, fig. 7; Text-fig. 17

Derivatio nominis — From latin *angulatus* = which is angular.

Holotype — Pl. 9, fig. 7.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.



Text-fig. 17 - *Leiofusa angulata* n. sp. x 500.

Diagnosis — Angular vesicle; fusiform central body with one side more curved than the opposite one. The body extends into two long, cylindrical processes, the ideal axes of them form an obtuse angle. The processes are gradually connected with the central body and their termination is closed and tipped; they are as long as 1.5 to 2 times the height of the body. The excystment suture is S-shaped (sinusoidal). The ectoderm is smooth or chagrenate.

Dimensions — Heigth of the body 40 to 42 μ; width of the body 25 μ; length of processes 60 to 75 μ.

Remarks — The specimens belonging to this species always show their very long processes broken. *Leiofusa angulata* n. sp. resembles, for its general shape, *Leiofusa flagellaris* Burmann 1970, but in Burmann's species processes and body are more continuous and, moreover, dimensions of vesicle are larger.

Occurrence — Rare in level 1076.

LEIOFUSA GRAVIDA n. sp.
Pl. 10, figs. 3,4; Text-fig. 18

Derivatio nominis — From latin *gravidum* = full.

Holotype — Pl. 10, fig. 4.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Text-fig. 18 - *Leiofusa gravida* n. sp. x 1000.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit.

Diagnosis — Elongate vesicle with central body spheroidal. Two opposite cylindrical processes with conical base are laterally inserted in the central body; this position gives to the vesicle an asymmetry when it is seen in lateral view. The two processes freely communicate with the interior cavity. The excystment aperture is produced by a median split. The ectoderm is chagrenate. The processes are generally 1 or 1.5 times the body diameter.

Dimensions — Body diameter 21 to 25 μ; length of processes 25 to 35 μ.

Remarks — *Leiofusa gravida* n. sp. differs from *Leiofusa somniculata* n. sp. in having the body spheroidal instead of longitudinally elongate and long cylindrical processes.

Occurrence — Rare in level 1076.

LEIOFUSA ORBICULARIS n. sp.
Pl. 2, figs. 5-7; Text-fig. 19.

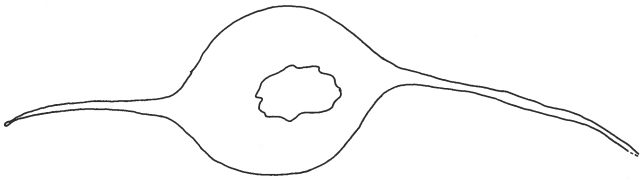
Derivatio nominis — From latin *orbicularis* = which has a spheroidal shape.

Holotype — Pl. 2, fig. 6.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Subspherical slightly elongate central body which rapidly passes to two simple and conical processes, one per pole. The processes may have bulbous terminations, as well some hair-like ornamental structures on their last portion. Vesicle wall double layered approximately 1 μ thick; the outer surface is chagrenate. Often a large aperture with undulate rim occurs on the central body.



Text-fig.19 - *Leiofusa orbicularis* n. sp. x 500.

Dimensions — Vesicle height 50 to 60 μ; vesicle width 38 to 46 μ; processes length 45 to 80 μ.

Remarks — *Leiofusa orbicularis* n. sp. differs from *Leiofusa flagellaris* Burmann in the dimensions, in the process termination and in the mode of dehiscence. It differs also from *Baltisphaeridium deunffi* (Henry & Thadeu) Elaouad-Debbaj 1981 in having free comunication between body cavity and processes.

Occurrence — Frequent in level 1076.

LEIOFUSA SOMNICULATA n. sp.
Pl. 9, figs. 13, 14; Pl. 10, fig. 2; Text-fig. 20

Derivatio nominis — From latin *somniculata* = to doze, as the vesicle shape remembers a pillow.

Holotype — Pl. 9, fig. 13.

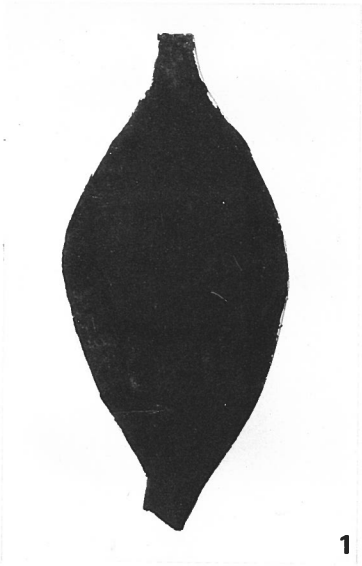
Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Asymmetric fusiform vesicle with two tapering processes on the opposite poles, which freely communicate with the interior cavity. Body elongate parallel to the longitudinal axis of the vesicle, one side being more or less flattened and the opposite one very inflated. Neither splitting pattern nor pylome structure have been found. Processes are generally 0.5

EXPLANATION OF PLATE 10

Fig. 1 - ?*Leiofusa stoumonensis*. 1076 C1; 32M81; Gennamari.
Fig. 2 - *Leiofusa somniculata* n. sp. 1076 C; 34N81; Gennamari.
Fig. 3 - *Leiofusa gravida* n. sp. 1076 A; Gennamari.
Fig. 4 - *Leiofusa gravida* n. sp. (Holotype); 1076 C; 22CL85; Gennamari.
Fig. 5 - Indetermined netromorph; new genus.
Fig. 6 - Indetermined genus; diacrodian?
Figs. 7-9 - Three acritarchs with one common feature which consists in having one process larger than the others. Those represented in Fig. 7 and 9 are related to leiofusids, the other one illustrated in fig. 8 is morphographically related to acantomorphs. Fig. 7 and 9: 1078 B: 35M81 and 1076 C; 4CN85; Gennamari. Fig. 8: 1076 C; 27CG85; Gennamari.
Figs. 10, 11 - ?*Metaleiofusa* sp.; fig. 10: 1076 B; 29CL85; fig. 11: 1075 C; 15CI85; Gennamari.
Magnification x 900.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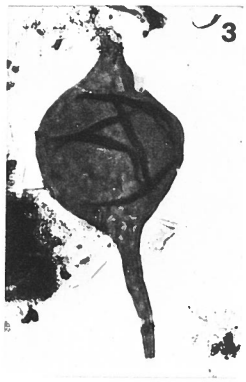
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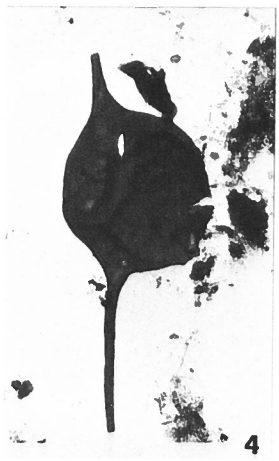
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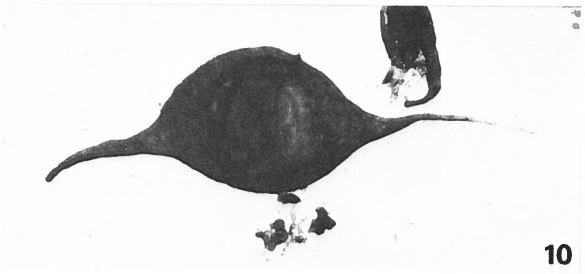
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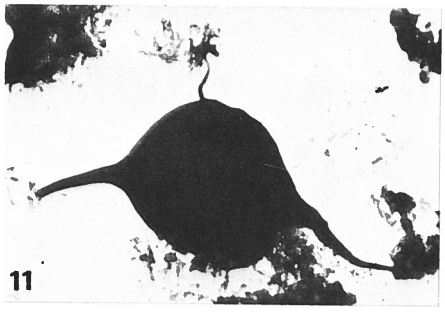
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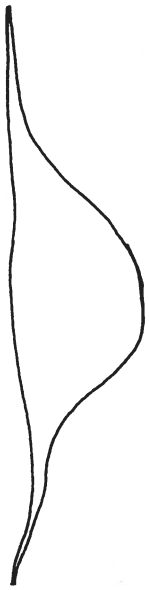


Text-fig. 20 - *Leiofusa somniculata* n. sp. x 1000.

or 1 times the height of the body. Ectoderm chagrenate.

Dimensions — Total length of vesicle 55 to 75 μ.

Remarks — *Leiofusa somniculata* n. sp. differs from *Leiofusa gravida* n. sp. because the body gradually passes to the processes. For its longitudinal asymmetry is different from any other species of *Leiofusa*. Only Potter (1984, Poster session of VI I.P.C. Conference, Calgary) reported asymmetric specimens of *Leiofusa* sp. very similar to the Sardinian species, from the Upper Cambrian, *Olenus* and *Parabolina spinulosa* Zones, of England.

Occurrence — Frequent in level 1078 and 1076.

?Leiofusa stoumonensis Vanguestaine 1973
Pl. 10, fig. 1

Remarks — Only one incomplete specimen comparable to *Leiofusa stoumonensis* have been observed. The body is spindle-like and the apical processes are broken. Granulations or similar ornamental structures occur on the outer vesicle wall.

Dimensions — Lenght of the body 55 μ; width 32 μ. Length processes, unknown.

Occurrence — Very rare; level 1076.

Stratigraphic distribution — Upper Cambrian (Vanguestaine, 1974); Upper Cambrian, eastern Newfoundland (Martin, 1981); Upper Cambrian, England (Potter, 1984).

Genus Lophodiacrodium Timofeev 1958 emend. Deflandre & Deflandre-Rigaud 1962

Type-species — *Lophodiacrodium bubnoffi* (Timofeev) designated by Deflandre & Deflandre-Rigaud 1962.

Lophodiacrodium gigino n. sp.
Pl. 5, fig. 1; Text-fig. 21

Derivatio nominis — Diminutive of the proper noun Luigi.

Holotype — Pl. 5, fig. 1.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

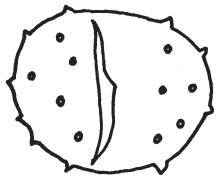
Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Prolate vesicle, the two poles of which are ornamented by ten to fifteen punctae; the equatorial zone is smooth (no striae are present) and sometimes folded; it is 10 μ high.

Dimensions — Height of vesicle 25 μ; width of vesicle 20 μ; punctae 1 μ high or less.

Remarks — *Lophodiacrodium gigino* n. sp. differs from Timofeev's species *Lophodiacrodium monomorphus* in the dimensions markedly smaller. It differs also from *Lophodiacrodium bilaterale* (Timofeev) because Russian species bears ornamentations over a limited zone of the pole. *Lophodiacrodium gigino* n. sp. differs also from *Lophodiacrodium tuber* (Deunff) Downie & Sarjeant 1964, besides in the smaller dimensions, in the absence of equatorial constriction.

Occurrence — Not common in levels 1076, 1078, 1077.



Text-fig. 21 - *Lophodiacrodium gigino* n. sp. x 1000.

Genus Micrhystridium Deflandre 1937 emend. Lister 1970

Type-species — *Micrhystridium inconspicuum* (Deflandre 1935).

MICRHYSTRIDIUM SHINETONENSIS Downie 1958

Dimensions — Diameter of body 10 to 15 μ; length of processes 5 to 7 μ.

Occurrence — Not common in levels 1078, 1076 and 1074.

Stratigraphic distribution — Tremadocian, Shropshire, England (Downie, 1958); Tremadocian and Lower Arenigian, Belgium (Martin, 1968); Tremadocian or Early Arenigian, Ireland (Gardiner & Vanguestaine, 1971); Tremadocian - Arenigian, Moesian Platform, Roumania (Béju, 1972); Tremadocian and Arenigian, Montagne Noire, France (Martin, 1973; Rauscher, 1974). It is also recorded in younger strata of Late Silurian (Ludlovian), England (Lister & Downie, 1967) and Early Devonian of Spain (Cramer, 1963).

Genus MONOCRODIUM n. gen.

Type-genus — *Monocrodium mediterraneum* n. sp.

Derivatio nominis — From greek *akros* = extremity, and *monos* = single; which has one different extremity.

Diagnosis — Vesicle symmetry axial or bilateral; poles heteromorphic. Subspherical central body, or slightly flask-shaped, bearing one long and conical main process freely communicating with the interior cavity. Adventive smaller processes, generally one, may be present in the apical zone. The process or processes are simple, with tipped terminations and without basal constriction. Excystment aperture occurs in the antiapex zone as linear slit-pylome.

Discussion — *Monocrodium* n. gen. differs from *Pirea* Vavrdovà 1972 in the central body clearly defined and in the tipped termination of the processes. It differs also from *Deunffia* Downie 1960 in not having the body elongated parallel to the long axis and because *Monocrodium* n. gen. possesses hollow processes.

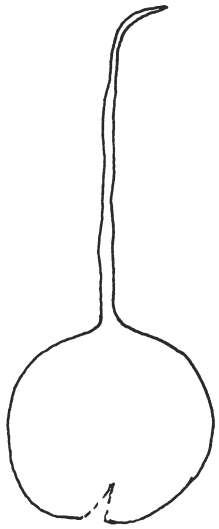
MONOCRODIUM MEDITERRANEUM n. sp.

Pl. 2, fig. 1-3; Text-fig. 22

Derivatio nominis — From the latin noun *mediterraneum* = located in between the lands. May also derived from the geographic noun of the « Mare Mediterraneo ».

Holotype — Pl. 2, fig. 1.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.



Text-fig. 22 - *Monocrodium mediterraneum* n. sp. x 500.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — The same of the genus plus: ectoderm smooth or chagrenate, double layered, and 1 μ thick. Presence of only one large process which rapidly connects to the body.

Dimensions — Diameter of body 35 to 40 μ; length of process 40 to 50 μ; width of the process 6 to 7 μ.

Occurrence — Not very frequent; it is confined to level 1076.

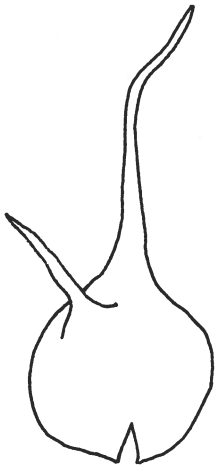
MONOCRODIUM sp. a

Pl. 2, fig. 4; Text-fig. 23

Diagnosis — The same of the genus plus: vesicle with one adventive process and body gradually passing to the main process. Ectoderm smooth, double layered, and 1 μ thick.

Dimensions — Diameter of body 35 to 45 μ; width of base process 12 μ; length of process approximately 200 percent of the body diameter.

Occurrence — Frequent; only present in level 1076.



Text-fig. 23 - *Monocrodium* sp. a. x 500.

Genus RETISPHAERIDIUM Staplin, Jansonius & Pocock 1965

Type-species — *Retisphaeridium dichamerum* Staplin, Jansonius & Pocock 1965.

RETISPHAERIDIUM DICHAMERUM Staplin, Jansonius & Pocock 1965
Pl. 7, fig. 5

1978 *Retisphaeridium dichamerum* S., J., & P. - FOMBELLA, Pl. 1, fig. 15.
1979 *Retisphaeridium dichamerum* S., J. & P. - FOMBELLA, Pl. 4, figs. 57, 58.

Description — See Staplin, Jansonius and Pocock, 1965.

Dimensions — Diameter of vesicle 34 μ.

Occurrence — Very rare; level 1078.

Stratigraphic distribution — Middle Cambrian, South Alberta, Canada (Staplin, Jansonius & Pocock, 1965); Middle Cambrian to Tremadocian, Spain (Fombella, 1979).

Genus STELLIFERIDIUM Deunff, Gorka & Rauscher 1974

Type-species — *Stelliferidium striatulum* (Vavrdovà).

STELLIFERIDIUM CORTINULUM (Deunff) Deunff, Gorka & Rauscher 1974
Pl. 7, figs. 9, 10, 17; Text-fig. 24

1961 *Priscogalea cortinula* DEUNFF, Pl. 1, fig. 8.
1964 *Baltisphaeridium cortinula* Deunff n. comb. - DEUNFF, p. 120.
1967 *Baltisphaeridium cortinula* Deunff - COMBAZ, Pl. 3, fig. 86.
1973 *Priscogalea cortinula* Deunff - MARTIN, Pl. 1, figs. 2-4, 12, 13; Pl. 4, figs. 13, 15.
1974 *Stelliferidium cortinulum* Deunff n. comb. - DEUNFF, GORKA & RAUSCHER, Pl. 3, figs. 3, 4, 6; Pl. 4, fig. 5; Pl. 6, figs. 1, 13; Pl. 7, figs. 9, 12.
1974 *Priscogolea cortinula* Deunff - RASUL, Pl. 4, fig. 2; Pl. 7, fig. 4.
1974 *Priscogalea cortinula* Deunff - RASUL & DOWNIE, Tab. 1.
1974 *Priscogalea cortinula* Deunff - JARDINÈ, COMBAZ, MAGLOIRE, PENIGUEL & VACHEY, p. 103.
1981 *Priscogalea cortinula* Deunff - MARTIN *in* MARTIN & DEAN, p. 13.

Description — Subspherical vesicle with large and circular polar opening. Numerous stout processes with ramified, bifurcate or palmate terminations radially emerge from the central body. Low starshaped ridges start from the base of processes. The operculum, possessing the characteristic lighter ring at its periphery, is often into the interior cavity or, still often, attached to the vesicle.

Dimensions — Diameter of vesicle 27 to 37 μ; length of processes 8 μ.

Occurrence — Abundant in level 1076; common in level 1078; less common in levels 1077, 1074, 1075 and 1079.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961); Tremadocian, England (Rasul, 1974); Tremadocian, Montagne Noire, France (Martin, 1973); Tremadocian, Western Iberian Chains, Spain (Wolf, 1980); Upper Cambrian and Tremadocian (*Peltura, Acerocare, Parabolina spinulosa* Zones), eastern Newfoundland (Martin *in* Martin & Dean, 1981).

STELLIFERIDIUM DISTINCTUM Rasul 1974 n. comb.
Pl. 8, fig. 7

1974 *Priscogalea distincta* RASUL, Pl. 4, fig. 1; Pl. 7, fig. 13.

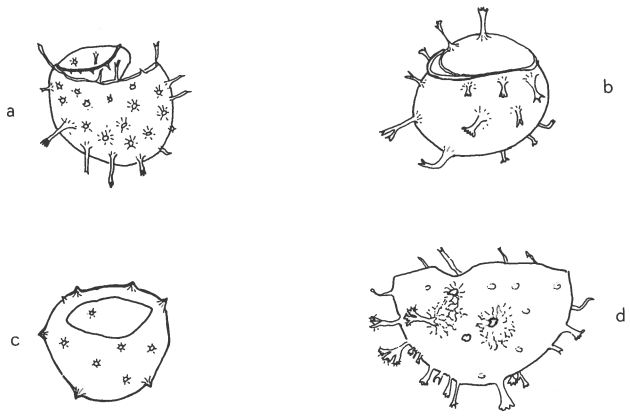
Description — Subspherical vesicle with large and circular polar opening. Numerous, tapering, thin, furcate or multifurcate processes are radially arranged over the central body. At processes base striations are present.

Dimensions — Vesicle diameter 28, 30 μ; processes length 6 μ.

Remarks — *S. distinctum* Rasul n. comb. can be distinguished from. *S. cortinulum* in having more numerous and thin processes.

Stratigraphic distribution — Tremadocian, Shropshire, England (Rasul, 1974).

Occurrence — Not very common; levels 1074, 1078 and 1076.



Text-fig. 24 - Morphological variation of the processes in the different species of *Stelliferidium*. a) *Stelliferidium simplex*; b) *Stelliferidium cortinulum;* c) *Stelliferidium pseudoornatum* n. sp.; d) *Stelliferidium* indet. new species; it could represent an extreme complication of process' morphology of the species *Stelliferidium cortinulum*.

STELLIFERIDIUM GAUTIERI Martin 1973 n. comb.
Pl. 7, fig. 14

1973 *Priscogalea gautieri* MARTIN, Pl. 6, fig. 3; Pl. 7, figs. 9, 10; Pl. 10, figs. 1-6; Pl. 11, fig. 1-6.
1981 *Priscogalea gautieri* Martin - MARTIN *in* MARTIN & DEAN, p. 13.

Description — Central body subspherical with large and circular polar opening the diameter of which is equal to 50 percent that of the vesicle. The aperture is bordered by a collar which in turn is ornamented by processes. The processes are tubular, with simple base and furcate at three, four branching terminations. The vesicle wall is delicately ornamented by thin striations which tend to become star-shaped at base of processes.

Dimensions — Vesicle diameter 24 μ; length of processes 4, 7 μ.

Remarks — The difference occurring between this species and the French holotype is in the number of processes, the Gennamari's specimens having twenty-twentyfive ones and the holotype thirthy to forty.

Occurrence — Not common in levels 1078 and 1076.

Stratigraphic distribution — Tremadocian, Montagne Noire, France (Martin, 1973); Uppermost Cambrian and Tremadocian, eastern Newfoundland (Martin *in* Martin & Dean, 1981).

STELLIFERIDIUM PHILIPPOTI (Henry) Deunff, Gorka & Rauscher 1974
Pl. 8, fig. 1

1966 *Cymatiogalea philippoti* HENRY, p. 265, fig. a, b.
1974 *Stelliferidium philippoti* Henry n. comb. - DEUNFF, GORKA & RAUSCHER, Pl. 6, fig. 16; Pl. 7, fig. 3.

Description — Subspherical vesicle with a large polar opening whose diameter is 20-25μ. Numerous tubular, hollow and radially oriented processes are connected to the central body through a star system of thin ridges. The processes are flared at their extremities and variably furcate; externally, they support a transparent velum that envelops entirely the vesicle. Processes are of variable length. The operculum is still found attached to the body.

Dimensions — Diameter of vesicle 30, 35 μ; length of processes 7 to 12 μ.

Occurrence — Rare in level 1078.

Stratigraphic distribution — Llanvirnian, France (Henry, 1966); Tremadocian, France (Cocchio, 1981; Rauscher, 1974).

STELLIFERIDIUM cf. PHILIPPOTI (Henry) Deunff *et al.* 1974
Pl. 8, fig. 2

Description — The same characters as shown in *Stelliferidium philippoti,* except for the smaller sizes.

Dimensions — Diameter of vesicle 20 μ; length of processes 6, 7 μ.

Occurrence — Rare in level 1078.

STELLIFERIDIUM PSEUDOORNATUM n. sp.
Pl. 8, figs. 11, 12; Text-fig. 24

Derivatio nominis — From greek « pseudos » = false, and from latin *ornatum* = ornamented. It is referred to the small processes which sometimes are not visible at all.

Holotype — Pl. 8, fig. 11.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1077.

Diagnosis — Dorso ventrally compressed vesicle with ovoidal outline. Elliptical or circular excystment aperture without collar. The processes consist of small coni widespread on the vesicle without any apparent

order. Very delicate striations radiate from the coni surface towards their base; the vesicle surface is chagrenate.

Dimensions — Diameter of the vesicle 22 to 25 μ; diameter of the aperture 8 to 12 μ; coni 1 μ high.

Remarks — It is distinct from any other species of *Stelliferidium* for the peculiar processes. *Priscogalea glabra* Martin 1973 could be the same species as *Stelliferidium pseudoornatum* but in the description given by Martin no mention has been made to the presence of coni.

Occurrence — Not common; level 1077 and 1076.

Stelliferidium simplex (Deunff) Deunff, Gorka & Rauscher 1974

Pl. 4, fig. 13; Pl. 7, fig. 19; Pl. 8, figs. 4, 5; Text-fig. 24

1961 *Priscogalea simplex* Deunff, Pl. 1, fig. 9.
1964 *Baltisphaeridium simplex* Deunff n. comb. - Deunff, p. 121.
1974 *Priscogalea simplex* Deunff emend. - Rasul, p. 47, Pl. 3, figs. 3, 4, 5, 6.
1974 *Stelliferidium simplex* Deunff n. comb. - Deunff, Gorka & Rauscher, p. 15, Pl. 5, figs. 5, 6; Pl. 6, figs. 3, 17.

Description — Body spherical to hemispherical in outline with simple acicular processes which may develop bifurcate terminations. The processes are distributed all over the vesicle and also over the operculum. The opening is generally without collar and processes are present along the rim. Low radiating striations at the base of processes are present.

Dimensions — Diameter of vesicle, 25 to 30 μ; aperture 27 μ; length of processes 5, 7 μ.

Remarks — In agreement to the diagnosis given by Rasul (1974, p. 50) also in the studied material of Sardinia *Stelliferidium simplex* and *Stelliferidium cortinulum* are separated on the basis of having processes of different thickness (thinner in *Stelliferidium simplex*) and with different terminations.

Occurrence — Common in levels 1076 and 1078.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961); Tremadocian of England (Rasul, 1974).

Genus Striatotheca Burmann 1970

Type-species — *Striatotheca principalis* Burmann 1970.

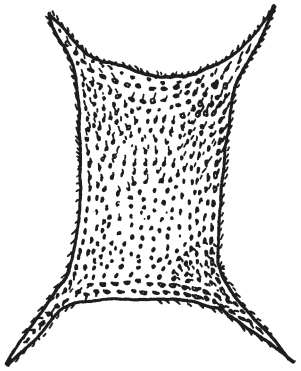
Striatotheca foraminifera n. sp.

Pl. 8, figs. 18-22; Text-fig. 25

Derivatio nominis — From latin *foramina* = little holes, and *fero* = to carry. It is referred to the structural character of the ectoderm body.

Holotype — Pl. 8, fig. 22.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.



Text-fig. 25 - *Striatotheca foraminifera* n. sp. x 1000.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1078.

Diagnosis — Quadrangular, frequently rectangular and rarely triangular vesicle with flattened or slightly inflated central body. At each corner the vesicle is prolonged to form one tapering process with tipped termination. The ectoderm is clearly microreticulate (positive reticulum ?) and the outer surface is covered by thin hair-like ornamental structures 0.5 microns high. Only at the base of processes faint striations due to the ornamentation can be distinguished, but regular ridges on the vesicle surface are never present. Neither pylome, nor prefential opening were found. Reticulum lumina less than 1 micron wide.

Dimensions — Heigth of vesicle 22 to 30 μ; width of vesicle 19 to 23 μ; length of processes 3 to 12 μ.

Remarks — I have taxonomically ranged this species under the genus *Striatotheca* even if it lacks the curved striations, characteristic of the genus. On the other hand, the characters shown by this species are not compatible with the diagnosis of the genus *Veryhachium*.

Occurrence — Frequent; levels 1077, 1078 and 1076.

Genus TARICCRODIUM n. gen.
Text-fig. 26

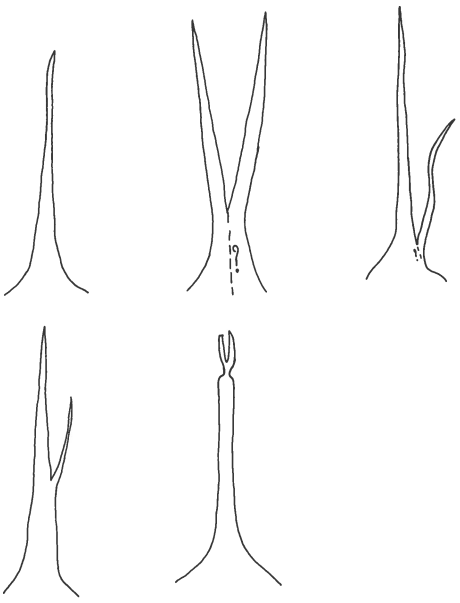
Type-species — *Tariccrodium elegantulum* n. sp.

Derivatio nominis — Dedicated to Dr. Ing. M. Taricco, a famous geologist who studied the Paleozoic of Sardinia at the beginning of this century.

Diagnosis — Vesicle with bilateral symmetry, heteromorphic poles and heteromorphic processes. Central body subspherical and circular to oval outline. The processes, emerging from the vesicle with a conic base, are long (at least 100-150 percent of the vesicle diameter), stout, hollow and then freely communicating with the interior cavity, conical and tipped ended or cylindrical with furcate termination, or bifid. Mode of dehiscence unknown.

Discussion — *Tariccrodium* n. gen. differs from *Baltisphaeridium* Eisenack 1958 emend. Eisenack 1969 in the number of processes and their tendency to have a bipolar disposition; also because processes communicate with the main cavity.

Tariccrodium n. gen. differs from *Dasydiacrodium* Timofeev 1959 emend. Deflandre & Deflandre-Rigaud 1962 in having a spherical body and not poligonally elongate.



Text-fig. 26 - Process morphology in *Tarriccrodium* n. gen.

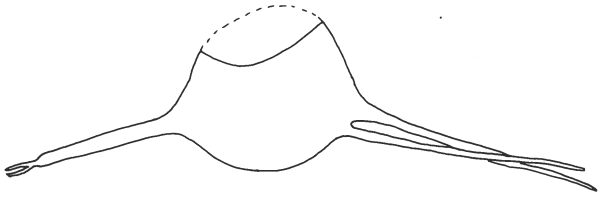
TARICCRODIUM ELEGANTULUM n. sp.
Pl. 1, figs. 1, 2, 3; Text-fig. 27

Derivatio nominis — Neuter diminutive of the latin noun *elegans* = elegant.

Holotype — Pl. 1, fig. 1.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.



Text-fig. 27 - *Tariccrodium elegantulum* n. sp. x 500.

Diagnosis — Subspherical central body, bearing one process at one pole and two, which may be of different width, at the opposite one. The processes are heteromorphic, simple or bifurcate at the end with a constriction, or they may be bifid.

Ectoderm smooth, double layered and 1 μ thick.

Dimensions — Vesicle diameter 40 to 50 μ; length of processes 45 to 65 μ.

Remarks — *Tariccrodium elegantulum* n. sp. seems for some aspects similar to *Baltisphaeridium macroceros* (Deunff) Martin 1973, but it differs in having a gradual attachment of the process to the vesicle, and internal communication between processes and main cavity.

Occurrence — Frequent in level 1076; less frequent in level 1078.

TARICCRODIUM BIFIDUM n. sp.
Pl. 1, figs. 4, 5, 6; Text-fig. 28

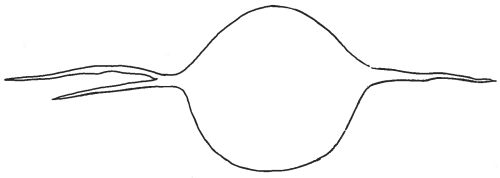
Derivatio nominis — From the latin adjective (neuter) *bifidum* = forked; it is referred to the process morphology.

Holotype — Pl. 1, fig. 5.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Spherical body with processes arranged on the two poles with conical base. Processes may be bifid, long and slender, conical and pimpled; they are hollow, or when they are thin, are closed. The ectoderm is smooth, double layered and it is at least 1 micron thick.



Text-fig. 28 - *Tariccrodium bifidum* n. sp. x 500.

Dimensions — Diameter of body 40, 45 µ; length of processes 20 to 60 µ.

Remarks — The difference between *Tariccrodium elegantulum* n. sp. and *Tariccrodium bifidum* n. sp. mainly consists on the process morphology.

Occurrence — Less frequent than *T. elegantulum* n. sp.; level 1076.

Genus TIMOFEEVIA Vanguestaine 1978

Type-species — *Timofeevia lancarae* (Cramer & Diez) Vanguestaine 1978.

TIMOFEEVIA PHOSPHORITICA Vanguestaine 1978
Pl. 4, fig. 17

1978 *Timofeevia phosphoritica* VANGUESTAINE, Pl. 3, figs. 1-12.
1981 *Timofeevia phosphoritica* Vanguestaine - MARTIN, Pl. 2, figs. 7, 15; Pl. 5, figs. 2, 10.

Description — Globular vesicle with slightly polygonal outline. Crests 1.5 µ high, delineate on the wall test polygonal campi, which have pentagonal or hexagonal shape. Only at the vertices of the campi emerge the columnar processes variably furcated, with ramifications of second and third order. Processes are hollow and seem communicate with the vesicle cavity. The ectoderm is smooth or chagrenate. About sixteen campi and forty processes are present. The aperture follow an irregular line.

Dimensions — Diameter of vesicle 25, 27 µ; width of campi 8 µ in average; length of processes 9, 10 µ.

Occurrence — Rare (only three specimens observed) in level 1079.

Stratigraphic distribution — Middle Cambrian, Belgium (Vanguestaine, 1978); Upper Middle and Upper Cambrian, eastern Newfoundland (Martin *in* Martin & Dean, 1981).

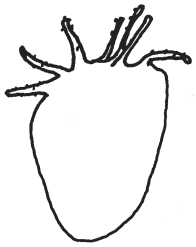
Genus TRUNCULUMARIUM Loeblich & Tappan 1976

Type-species — *Trunculumarium revinium* (Vanguestaine) Loeblich & Tappan 1976.

TRUNCULUMARIUM sp. a
Pl. 4, fig. 1; Text-fig. 29

Description — (Based on one specimen). Prolate vesicle bearing at least seven processes on one polar cap. The processes, roughly radially oriented, are conical and tapered; small ornamental structures are visible on some of them.

Dimensions — Height of vesicle, 24 µ; width 17 µ; length of processes 5 to 7 µ.



Text-fig. 29 - *Trunculumarium* sp. a x 1000.

Remarks — The preservation of the founded specimen prevents from observing any ornamentation in the form of grana or small hairs on the body surface.

Occurrence — Very rare; level 1079.

Genus VERYHACHIUM Deunff 1956

Type-species — *Hystrichosphaeridium trisulcum* Deunff 1951.

VERYHACHIUM DOWNIEI Stockmans & Williére 1962
Pl. 9, fig. 1

1960 *Veryhachium trispinosum* (Eisenack) - STOCKMANS, & WILLIÈRE, Pl. 1, figs. 1, 2.
1962 *Veryhachium downiei* n. sp. STOCKMANS & WILLIÈRE, Pl. 2, figs. 20-22.

Description — Triangular vesicle with convex sides elongate to form three simple processes. The central body is slightly inflated and the ectoderm is chagrenate. Processes are long 90-150 percent of the vesicle diameter.

Dimensions — Sides of the vesicle 25 µ; length of processes 20 to 30 µ.

Occurrence — Very rare, only found in level 1076.

Stratigraphic distribution — *Veryhachium downiei* is a characteristic species of European Silurian and Devonian palynofacies. Sporadic findings in the Lower Ordovician are also known: Arenigian, Montagne Noire, France (Rauscher, 1974); Arenigian, Belgium (Martin, 1968).

VERYHACHIUM GIBBOSUM n. sp.
Pl. 9, figs. 2, 5, 6; Text-fig. 30

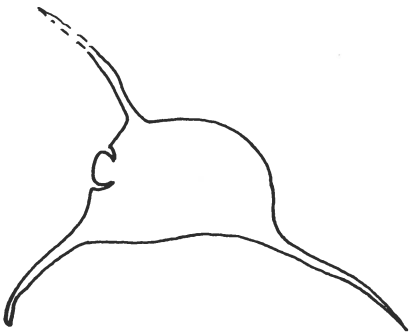
Derivatio nominis — From latin *gibbosum*=hump - backed. It is referred to the shape of the vesicle.

Holotype — Pl. 9, fig. 5.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Roundedly triangular and asymmetric vesicle of *Veryhachium* with a flattened side. The central body is inflated and the ectoderm is prolonged to form three veryachids processes one of them excentrically emerging. The processes are flexuous, slender with tipped terminations and communicate with the main cavity; their length is about 60-70 percent of the major axis of the body. The vesicle opens by an C-shaped slit-pylome. The ectoderm is smooth or slightly chagrenate.



Text-fig. 30 - *Veryhachium gibbosum* n. sp. x 1000.

Dimensions — Height of vesicle 25 x 18 μ; length of processes 15 to 18 μ.

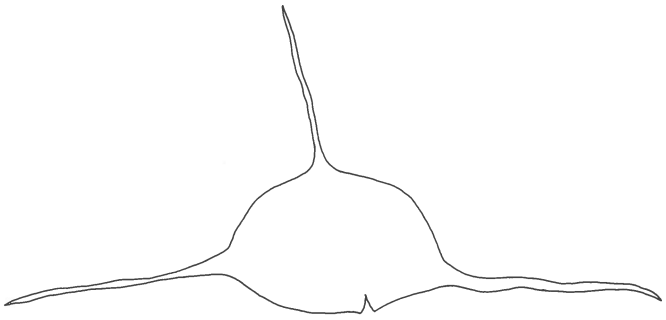
Remarks — Because of its outline is easy to distinguish it from any other species of *Veryhachium*.

Occurrence — Not common; it is found only in level 1076.

VERYHACHIUM MARTINUM n. sp.
Pl. 3, figs. 1-5; Text-fig. 31

Derivatio nominis — Dedicate to Mad.me Francine Martin palynologist, experienced interpreter of the oldest Paleozoic rocks.

Holotype — Pl. 3, fig. 1.



Text-fig. 31 - *Veryhachium martinum* n. sp. x 500.

Possible synonym: *Veryhachium* sp.a Martin 1981, Pl. 1, fig. 12; -Pl. 4, fig. 5.

Locus typicus — Gennamari, Provincial Road from Case Bidderdi to Punta S'Acqua Durci.

Stratum typicum — Grey metashales of the basal formation of the Arburese Unit. Level 1076.

Diagnosis — Central body roundedly triangular, which may be slightly elongate parallel to the longitudinal axis. On the vesicle and communicating with the internal cavity, three to five processes are arranged. They are gradually connected to the vesicle with a conical base; are proximally cylindrical and distally tapered. The excystment aperture is produced by a linear slit-pylome suture which is often present on one side of the vesicle. The ectoderm is smooth to slightly chagrenate, double layered, and 1 micron thick.

Dimensions — Diameter of vesicle 40 to 60 μ; length of processes 40 to 60 μ.

Occurrence — Frequent, in level 1076.

VERYHACHIUM MINUTUM Downie 1958
Pl. 8, fig. 16

1958 *Veryhachium minutum* DOWNIE, Pl. 17, fig. 4.

Dimensions — Total length from 15 to 20 μ.

Occurrence — Not common. It is found in levels 1076 and 1078.

Stratigraphic distribution — Tremadocian, Shropshire, England (Downie, 1958); Tremadocian and Llanvirnian, Belgium (Martin, 1968); Tremadocian and Lower Arenigian, Ireland (Gardiner & Vanguestaine, 1971); Tremadocian, Montagne Noire, France (Martin, 1973); Arenigian, Klabava Shales, Bohemia (Vavrdovà, 1972); Tremadocian and Arenigian, Mon-

tagne Noire, France (Rauscher, 1974); Lower Caradocian, Belgium (Martin, Michot & Vanguestaine, 1970), Llanvirnian/Llandeilian, Bulgaria (Kalvacheva & Chobanova, 1974).

VERYHACHIUM TRISULCUM (Deunff 1951) Deunff 1956
Pl. 9, fig. 3

1951 *Hystrichosphaeridium trisulcum* DEUNFF, p. 322-323, fig. 3.
1958 *Veryhachium trisulcum* (Deunff) var. *reductum* DEUNFF, Pl. 1, figs. 1, 3, 8, 10-12, 14, 16, 17, 22, 23.
1981 *Veryhachium trisulcum* (Deunff) - ELAOUAD-DEBBAJ, pp. 59, 60.

Dimensions — Height of the vesicle 27 µ; length of processes 7 µ.

Remarks — It is here accepted the Elaouad-Debbaj's concept on *Veryhachium trisulcum* and *Veryhachium reductum* and thus the rare specimens encountered with « *Veryhachium reductum* » aspect have been ranged under the species *trisulcum*.

Occurrence — Very rare; level 1076.

Stratigraphic distribution — The oldest record of the species is in the: Lower Arenigian, Montagne Noire, France (Rauscher, 1971); Arenigian, Belgium (Martin, 1968); Arenigian, Klabava Shales, Bohemia (Vavrdovà, 1965). The species is also distributed throughout the Middle and Upper Ordovician (Deunff, 1951, 1958; Henry, 1969; Paris & Deunff, 1970; Martin, 1966; Henry & Thadeu, 1971; Deunff & Massa, 1975; Kalvacheva, 1978; Colthurst & Smith, 1977) of the Europe and North Africa. It is a common component of Silurian and Devonian associations of Europe, North and South America (Cramer, 1964a, 1964b, 1968a, 1968b, 1970; Downie, 1959; Baldis, 1975; Stockmans & Williére, 1974). The uppermost record is in the Upper Cretaceous of North Europe (Eisenack, 1963).

Genus VULCANISPHAERA Deunff 1961
emend. Rasul 1976

Type-species — *Vulcanisphaera africana* Deunff 1961.

VULCANISPHAERA AFRICANA Deunff 1961
Pl. 6, fig. 20

Description — The description is based only on one large fragment, whose diameter is 40 µ. The hollow, conical primary processes are of the b type (Rasul, 1976) and are 3 microns high. Secondary processes are grouped in tufth of three or four on each protuberance; they are slender, tapered or curved with bifurcate tips. The ectoderm is weakly chagrenate.

Dimensions — Estimated diameter of the whole vesicle, 50 µ; length of primary processes 3µ; length of secondary processes 8 to 15 µ.

Occurrence — Very rare; level 1076.

Stratigraphic distribution — Tremadocian, Sahara (Deunff, 1961); Tremadocian, Shropshire, England (Rasul, 1976); Tremadocian, Belgium (Martin, 1968; 1977); Tremadocian/Lower Arenigian, England (Downie, Booth *et al.*, 1979); Uppermost Cambrian and Tremadocian, Newfoundland (Martin & Dean, 1981); Tremadocian, Montagne Noire, France (Martin, 1973; Rauscher, 1974).

VULCANISPHAERA BRITANNICA Rasul 1976
Pl. 6, fig. 17

Description — (Based only on one specimen). Body polygonal in outline bearing nine processes with very large base. Processes may be columnar and they divide into tufts of two or three secondary processes; or they may be slender and then simply tapered distally. The vesicle ectoderm is smooth.

Dimensions — Diameter of the body, 20 µ; length of processes 15 µ.

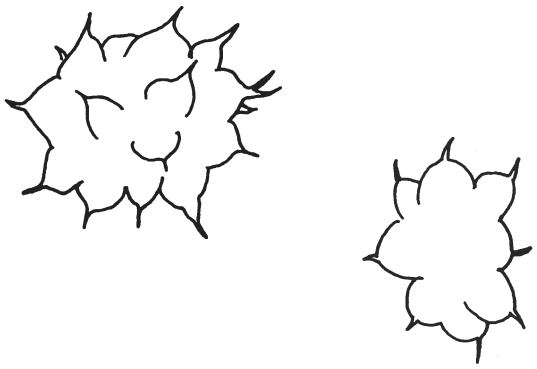
Occurrence — Very rare; level 1074.

Stratigraphic distribution — Tremadocian, from *Clonograptus tenellus* to *Shumardia pusilla* Zones, England (Rasul, 1976); Upper Cambrian/Tremadocian, Oville Formation, Spain (Fombella, 1979).

VULCANISPHAERA TUBERATA (Downie) Eisenack, Cramer & Diez, 1973
Pl. 6, figs. 21, 22; Text-fig. 32

1958 *Hystricosphaeridium tuberatum* DOWNIE, Pl. 17, fig. 3.
1963 *Baltisphaeridium tuberatum* Downie n. comb. - DOWNIE & SARJEANT, p. 91.
1967 *Baltisphaeridium tuberatum* Downie - COMBAZ, Pl. 3, fig. 55.
1973 *Acanthodiacrodium tuberatum* Downie - MARTIN, Pl. 3, fig. 6, not. 5.
1973 *Vulcanisphaera tuberata* Downie n. comb. - EISENACK, CRAMER & DIEZ, p. 1087.

Description — Globularly oval or irregular vesicle, the test of which bears 10 to 16 cupular protuberances randomly distributed wich may be regarded like processes of first order; one, rarely two, spine-like processes emerge from the top of each protuberance. No preferential opening have bee observed.



Text-fig. 32 - *Vulcanisphaera tuberata* (Downie). x 1000.

Dimensions — Diameter of vesicle 25 to 30 μ (without second order processes); medium height of cupulae, 5 μ; medium width of cupulae 7μ; length of second order processes, 3 to 5 μ.

Remarks — The studied assemblages contain acritarchs having features like those above exposed and thus included in the genus *Vulcanisphaera,* and acritarchs similar to them but with a bipolar disposition of processes. These last ones do not have so pronounced protuberances, but only small cones. For this reason I prefer to range the two types under different genera, which are: *Vulcanisphaera* and *Acanthodiacrodium* respectively. Martin (1973) did similar observations but lumped them under the same genus *Acanthodiacrodium.*

Occurrence — Common in level 1078; less common in level 1076.

Stratigraphic distribution — Upper Tremadocian, Shineton Shales England (Downie, 1958); Lower Tremadocian, Sahara (Combaz, 1976); Tremadocian, Montagne Noire, France (Martin, 1973).

Genus ZONOSPHAERIDIUM Timofeev 1956 ex Timofeev 1959

Type-species — Not indicated.

ZONOSPHAERIDIUM OVILLENSIS Cramer & Diez 1972
Pl. 7, figs. 1, 2, 4

1972 *Zonosphaeridium ovillensis* CRAMER & DIEZ, Pl. 2, figs. 5, 8, 11.
1979 *Zonosphaeridium ovillensis* Cramer & Diez - FOMBELLA, Pl. 2, fig. 25; Pl. 4, figs. 60, 61.
1981 *Cristallinium ovillensis* Cramer & Diez. n. comb. - MARTIN, Pl. 3, fig. 16.

Description — Globular vesicle with rounded or oval polyhedral outline. The ectoderm (unilayered ?) is externally divided into about 100 or more polygonal fields of 5 to 10 μ in diameter by low ridges, unornamented at their top, 1, 1.5 μ high. The ectoderm is smooth. Mode of opening unknown, other than random rupture of the vesicle wall.

Dimensions — Diameter of vesicle 30 to 40 μ.

Remarks — As defined by Timofeev 1956 and 1959, *Zonosphaeridium* includes a great variety of spheromophitic acritarchs from chagrenate to cellulo-reticulate surface. For this reason I do not totally disagree with Martin (1981, p. 17) when she transfers the species to the genus *Cristallinium.* Neverthless, for the time being I still prefer to use the original designation given by Cramer & Diez (1972): *Zonosphaeridium ovillensis*, because *Cristallinium* has crests bearing ornamentations at their top. *Zonosphaeridium ovillensis* does not show this character.

Occurrence — Not common; in levels 1077 and 1078.

Stratigraphic distribution — Upper Middle Cambrian, Oville Formation, Spain (Cramer & Diez de Cramer, 1972); Upper Cambrian and ?Tremadocian, Spain (Fombella, 1979); Upper Cambrian, eastern Newfoundland (Martin, 1981).

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REFERENCES

BALDIS, E.D.P., 1975, Microplancton del Wenlockiano de la precordillera Argentina: Rev. Españ. Micropal., v. 7, pp. 489-505, Madrid.

BARCA, S. & SALVADORI, I., 1974, Nuovo contributo alla geologia del Paleozoico a Nord di Monte Arcuentu (Sardegna sud-occidentale): Boll. Soc. sarda Sc. Nat., v. 8, pp. 77-78, Roma.

—, DEL RIO, M. & PITTAU DEMELIA, P., 1982, Acritarchs in the « Arenarie di San Vito » of South-East Sardinia: stratigraphical and geological implications: Boll. Soc. Geol. It., v. 100, pp. 369-375, Roma.

—, Cocozza, T., Del Rio, M. & Pittau Demelia, P., 1982, Discovery of Lower Ordovician acritarchs in the « Postgotlandiano » sequence of southwestern Sardinia (Italy): age and tectonic implications: Boll. Soc. Geol. It., v. 100, pp. 377-392, Roma.

—, —, —, Pillola, G.L. & Pittau, P., 1985, Découverte d'acritarches trémadociennes et de *Dictyonema flabelliforme* (Eichw.) dans les Schistes de Cabitza. Sardaigne sud-occidentale. C.R. Acad. Sci. Paris (in press).

Baudelot, S. & Gery, B., 1979, Découverte d'acritarches du Cambrien Supérieur et du Trémadoc dans le Massif ancienne de Grande Kabylie (Algérie): C. r. hébd. Séanc. Acad. Sci., Paris, v. 288, pp. 1513-1516.

Burmann, G., 1970, Weitere organische Mikrofossilien aus dem unteren Ordovizium: Paläont. Abh., B. Paläobot., v. 3, pp. 289-347, Stuttgart.

Cocchio, A.M., 1981, Microflores des Séries du Paléozoique inférieur du Massif de Mouthoumet (Corbières, Aude). Thèse et Trav. Géol. Medit., Univ. P. Sabatier, Toulose, pp. 132, pls. 4, Toulose.

Colthurst, J.R.J. & Smith, D.G., 1977, Paleontological evidence for the age of the Lower Palaeozoic Rocks of the Slievenamon Inlier, county Typperary: Proc. Roy. Irish Acad., v. 77, pp. 143-158.

Combaz, A., 1967, Un Microbios du Trémadoc dans un sondage de Hassi-Messaoud: Act. Soc. Linn. Bordeaux, v. 104, pp. 1-26.

Cramer, F.H., 1964a, Some Acritarchs from the San Pedro Formation (Gedinnian) of the Cantabric Mountains in Spain: Bull. Soc. belg. Géol., v. 73, pp. 33-38, Bruxelles.

—, 1964b, Microplankton from three Palaeozoic formations in the province of Leòn (N.W. Spain): Leidse Geol. Meded., v. 30, pp. 253-361.

—, 1968a, Considération paléogéographiques à propos d'une association de microplanctontes de la série gothlandienne de Birmingham (Alabama, U.S.A.): Bull. Soc. Géol. France, v. 10, pp. 126-131, Paris.

—, 1968b, Silurian palynologic microfossils and palaeolatitudes: N. Jb. Geol. Paläont. Mh., v. 10, pp. 591-597, Stuttgart.

—, 1970, Distribution of selected Silurian acritarchs. An account of the palynostratigraphy and palaeogeography of selected Silurian acritarchs taxa: Rev. Españ. Micropal., num. spéc., 203 p., Madrid.

—, & Diez, M.D.C.R., 1972, Acritarchs from the Upper Middle Cambrian Oville Formation of Leòn, Northwestern Spain: Rev. Españ. Micropal., num. extraord., pp. 39-50, Madrid.

Deflandre, G. & Deflandre-Rigaud, M., 1962, Nomenclature et Systematique des Hystrichosphéres (sens. lat.). Observations et rectifications: Rev. Micropal., v. 4, pp. 190-196, Paris.

Deunff, J., 1951, Sur la présence de microorganismes (Hystrichosphéres) dans les schistes Ordoviciens du Finistére: C.R. Acad. Sci. Paris, v. 233, pp. 321-323.

—, 1956, Progrés récents de nos connaissance sur les microplanctons fossiles à Hystrichosphaerés des mers primaires: Grana Palynologica, v. 1, pp. 79-84, Stockholm.

—, 1961, Un microplancton à Hystrichosphéres dans le Trémadoc du Sahara: Rev. Micropal. v. 4, pp. 37-50, Paris.

—, 1964, Systématique du microplancton fossile à Acritarches. Revision de deux genres de l'Ordovicien inférieur: Rev. Micropal., v. 7, pp. 119-124, Paris.

—, 1965, Acritarches du Dévonien du Tunisia: C.R. Somm. Soc. Géol. France, v. 1, pp. 22-24, Paris.

—, & Chauvel, J.J., 1970, Un microplancton à Chitinozoaire et Acritarches dans des niveaux schisteux du Grés Armoricain (Mayenne et sud de Rennes): C.R. Somm. Soc. Géol. France, v. 6, pp. 196-197, Paris.

—, Gorka, H. & Rauscher, R., 1974, Observations nouvelles et precisions sur les Acritarches à large ouverture polaire du Paléozoique inférieur: Geobios, v. 7, pp. 5-18, Lyon.

—, Massa, D., 1975, Palynologie et Stratigraphie du Cambro-Ordovicien (Libye nord-occidentale): C.R. Acad. Sci. Paris, v. 281, pp. 21-24.

Downie, C., 1958, An assemblage of Microplankton from the Shineton Shales (Tremadocian): Proc. Yorks. Geol. Soc., v. 31, pp. 331-349.

—, 1960. *Deunffia* and *Domasia,* new genera of hystrichospheres: Micropal., v. 6, pp. 56-71, New York.

—, & Sarjeant, W.A.S., 1963, Bibliography and index ot fossil dinoflagellates and acritarchs: Mem. Geol. Soc. Am., v. 94, pp. 1-156.

Eisenack, A., 1939, Chitinozoen und hystrichosphaerideen im Ordovicium des Rheinischen Schiefergebirges: Senckenbergiana, v. 21, pp. 135-152.

—, 1959, Neotypen baltischer Silur Hystrichosphären und neuen Arten: Palaeontographica, ABT. A, v. 112, pp. 193-211, Stuttgart.

—, 1963, Hystrichosphären: Biol. Rev., v. 38, pp. 107-139.

—, 1969, Zur sistematyk einiger paläozoischer hystrichosphären (Acritarcha) des baltischen Silurs: N. Jb. Geol. Paläont. Abh., v. 133, p. 245-266, Suttgart.

—, Cramer, F.H. & Diez, M.D.C.R., 1973, Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien: Band III, 1 Teil, pp. 1-1104. Ed. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.

—, — & —, 1976, Katalog der fossilen Dinoflagellaten, Hystrichosphären un verwandten Mikrofossilien Band IV, 2 Teil, pp. 1-873. Ed. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.

Elaouad-Debbaj, Z., 1981, Acritarches de l'Ordovicien supérieur de la synclinal de Buçaco (Portugal): Bull. Soc. géol., minéral. Bretagne, v. 10, 101 pp., Rennes.

Fombella, M.A., 1978, Acritarços de la Formacion Oville, edad Cambrico Medio-Tremadoc, Provincia de Leòn, España: Palinologia, Num. Extraord. v. 1, pp. 245-261, Leòn.

—, 1979, Palinologia de la Formacian Oville al Norte Y Sur de la Cordillera Cantabrica, España: Palinologia, v. 1, pp. 1-15, Leòn.

GARDINER, P. & VANGUESTAINE, M., 1971, Cambrian and Ordovician microfossils from south-east Ireland and their implications: Bull. Geol. Surv. Ireland, v. 1, pp. 163-210.

GIOVANNONI, M.G. & ZANFRÀ, S., 1978, Studio di brachiopodi ordoviciani della Sardegna meridionale con la revisione delle collezioni del Servizio Geologico d'Italia: Boll. Serv. Geol. d'It., v. 98, pp. 232, Roma.

GORKA, H., 1967, Quelques neouveaux Acritarches des silexites du Tremadocien supérieur de la région de Kielce (Montagne de Ste. Croix, Pologne): Cahiers de Micropal., v. 1, (1965-1969), pp. 1-8, Paris.

HEMER, D.O. & NYGREEN, P.W., 1967, Algae, acritarchs and other microfossils *incertae sedis* from the Lower Carboniferous of Saudi Arabia: Micropal., v. 13, pp. 183-194, New York.

HENRY, J.L., 1966, Quelques acritarches (microorganismes *incertae sedis*) de l'Ordovicien de Bretagne: C.R. Somm. Soc. Géol. France, v. 7, pp. 265-267, Paris.

—, & THADEU, D., 1971, Intérêt stratigraphique et paléogéographique d'un microplancton à Acritarches, découvert dans l'Ordovicien de la Serra del Buçaco (Portugal): C.R. Somm. Soc. Géol. France, v. 5, pp. 158-160, Paris.

JAGIELSKA, L., 1962, Preliminary note on microspores from the Ordovician of Brzeziny and Zbrza in the Swiety Krzyz Mts.: Inst. geol. Biul., v. 174, pp. 61-64,

JARDINÉ, S., COMBAZ, A., MAGLOIRE, L., PENIGUEL, G. & VACHEY, G., 1974, Distribution stratigraphic des Acritarches dans le Paléozoique du Sahara Algérien: Rev. Palaeob. Palynol., v. 18, pp. 99-130, Amsterdam.

KALVACHEVA, R., 1969, Acritarchs from the Tseretsel Formation (Ordovician): Rev. Bulg. Geol. Soc., v. 30, pp. 88-90, Sofia.

—, & CHOBANOVA, A., 1974, Biometrics of *Veryhachium minutum* Downie, 1958 (Acritarcha) from the Ordovician in the Iskur Gorge, Bulgaria: Rev. Palaeob. Palynol., v. 18, pp. 177-186, Amsterdam.

KJELLSTRÖM, G., 1971, Ordovician microplancton (Baltisphaerids) from the Grötlingbo borehole No. 1 in Gotland, Sweden: Sver. geol. Unders., v. 655, pp. 1-75,

KONZALOVA-MAZANKOVA,, M., 1969, Acritarcha Evitt. 1963 aus dem Unter-Ashgill Böhemens: Palaeontographica, Abt. B, v. 125, pp. 81-92, Stuttgart.

LISTER, T.R., 1970, A monograph of the acritarchs and chitizoa from the Wenlock and Ludlow series of Ludlow and Millichope areas, Shropshire: Palaeontogr. Soc. (Monogr.), v. 1, 100 pp., London.

—, & DOWNIE, C., 1974, New evidence for the age of the primitive echinoid *Myriastiches gigas*: Palaeontology, v. 10, pp. 171-174, London.

LOEBLICH, A.R., 1970, Morphology, ultrastructure and distribution of Palaeozoic acritarchs: Proc. North Amer. Paleont. Conv., Chicago, 1969, G, pp. 705-788.

—, & TAPPAN, H., 1969, Acritarchs excystment and surface ultrastructure with descriptions of some Ordovician taxa. Rev. Espan. Micropal., v. 1, pp. 45-57, Madrid.

—, & —, 1976, Some new and revised organic-walled phytoplankton microfossil genera: Journ. Paleontol., v. 50, pp. 301-308, Tulsa.

MARTIN, F., 1966, Les Acritarches de St. Bernard (Ordovicien belge): Bull. Soc. belg. Géol., v. 74, pp. 1-22, Bruxelles.

—, 1969, Les Acritarches de l'Ordovicién et du Silurien belges: Inst. Roy Sci. Nat. Belg., 1968, v. 160, pp. 1-175, Bruxelles.

—, 1973, Les Acritarches de l'Ordovicién inférieur de la Montagne Noire (Hérault, France). Bull. Inst. Roy. Sci. Nat. belg., v. 48, pp. 1-72, Bruxelles.

—, 1974, Ordovicién sùperieur et Silurien inférieur à Deerlijk (Belgique): Inst. Roy. Sci. Nat. belg. v. 174, 1973, pp. 1-71, Bruxelles.

—, 1977, Acritarches du Cambro-Ordovicién du Massif de Brabant Belgique: Bull. Inst. Roy. Sci. Nat. belg., v. 51, pp. 1-33, Bruxelles.

—, 1982, Some aspect of late Cambrian and early Ordovician acritarchs, pp. 29-40; in Bassett M.G. & Dean W.T. (eds.); The Cambrian Ordovician Boundary: sections, fossils distributions and correlations. National Museum of Wales, Geological Series N. 3, Cardiff.

—, MICHOT, P. & VANGUESTAINE, M., 1970, Le flysh Caradocien d'Ombret: Ann. Soc. Géol. bel., v. 93, pp. 337-362, Bruxelles.

—, & DEAN, W.T., 1981, Middle and Upper Cambrian and Lower Ordovician acritarchs from Random Island, eastern Newfoundland: Bull. Geol. Surv. Can., v. 343, pp. 1-43, Ottawa.

PARIS, F. & DEUNFF, J., 1970, Le paléoplancton Llanvirnien de la Roche - au - Merle (Commune de Vieux-Vy-Sur Couesnon Ille-et-Vilaine): Bull. Soc. géol. minéral. Bretagne, v. 2, pp. 25-43, Rennes.

POTTER, T.L., 1974, British Cambrian acritarchs - a preliminary account: Rev. Paleob. Palynol., v. 18, pp. 61-62, Amsterdam.

RASUL, S.M., 1974, The Lower Palaeozoic acritarchs *Priscogalea* and *Cymatiogalea*: Paleontology, v. 17, pp. 41-63, London.

—, 1976, New species of the genus *Vulcanisphaera* (Acritarcha) from the Tremadocian of England. Micropal., v. 22, pp. 479-484, New York.

—, & DOWNIE, C., 1974, The stratigraphic distribution of Tremadoc acritarchs in the Shineton Shales succession, Shropshire, England. Rev. Palaeob. Palynol., v. 18, pp. 1-9, Amsterdam.

RAUSCHER, R., 1971, Acritarches du Paléozoique inférieur de la Montagne Noire: Bull. Serv. géol. Alsace Lorraine, v. 24, pp. 291-296, Strasbourg.

—, 1974, Recherches micropaléontologiques et stratigraphiques dans l'Ordovicien et le Silurien en France: Bull. Serv. géol. Alsace Lorraine, v. 33, 224 pp., Strasbourg.

ROMANO, M., 1982, The Cambrian Ordovician boundary in Spain, Portugal and north-west France, pp. 71-75; in Bassett, M.G. & Dean, W.T. (eds.). The Cambrian-Ordovician Boundary: sections, fossil distributions and correlations. National Museum of Wales, Geological Series No. 3, Cardiff.

STAPLIN, F.L., JANSONIUS, J. & POCOCK, S.A.J., 1965, Evaluation of some acritarchous hystrichosphaere genera: N. Jb. Geol. Paläont. Abh., v. 123, pp. 167-201, Stuttgart.

STOCMANS, F. & WILLIÉRE, Y., 1962, Hystrichosphéres du Dévonien belge (sondage de l'Asile d'aliénés à Tournai): Bull. Soc. belg. Géol., v. 71, pp. 41-77, Bruxelles.

—, & —, 1963, Les Hystrichosphéres au mieux les Acritarches du Silurien belge. Sondage de la Brasserie Lust à Courtrai (Kortrijk): Bull. Soc. belg. Géol., v. 71, pp. 450-481, Bruxelles.

TARICCO, M., 1922. Sul Paleozoico del Fluminese: Boll. Com. Geol. It., v. 48 (1921-22), pp. 1-22, Roma.

TIMOFEEV, B.V., 1958, Uber das Alter sächsischer Grauwacken. Mikropaläophytologische Untersuchungen von Proben aus der Weesensteiner und Lausitzer Grauwacke: Geologie, v. 7, pp. 826-845,

—, 1959, La plus ancienne flore de la Baltique et sa signification stratigraphique: Trudy V.N.I.G.R.I. S.S.S.R., v. 129, pp. 1-350. Trad. Bur. Rech. géol. min., 4686, 142 pp.

VAVRDOVÀ, M., 1965, Ordovician Acritarchs from Central Bohemia, Vestnik, U.U.G., v. 40, pp. 351-357,

—, 1972, Acritarchs from Klabava Shales (Arenig), Czechoslovakia, Vestnik U.U.G., v. 47, pp. 79-86,

VANGUESTAINE, M., 1973, New acritarchs from the Upper Cambrian of Belgium; in Microfossils of the oldest deposits, Proceedings of Third International Palynological Conference, Academy of Sciences of the U.S.S.R., Siberian Branch, Institute of Geology and Geophysic, pp. 28-30,

—, 1974, Espéces zonales d'Acritarches du Cambro-Trémadocien de Belgique et de l'Ardenne française: Rev. Palaeob. Palynol., v. 18, pp. 63-82, Amsterdam.

—, 1978, Critéres palynostratigraphiques conduisant à la reconnaissance d'un pli couché revinien dans le sondage de Grand-Halleux: Rnn. Soc. Geol. belg., v. 100, p. 249-276, Bruxelles.

WOLF, R., 1980, The lower and upper boundary Ordovician system of some selected regions (Celtiberia, eastern Sierra Morena) in Spain: N. Jb. Geol. Paläont. Abh., v. 160, pp. 118-137, Stuttgard.

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