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A PALYNOLOGICAL SYSTEMATIC NOMENCLATURE

(with 12 plates)

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C O N T E N T S

A B S T R A C T

The present article deals with a new artificial palynological nomenclature. The genera and generic names of pollengrains are based on the pollen-types of IVERSEN & TROELS-SMITH (1950) and the subgenera and sub-generic names on the sculpture-types of the same authors. The main part of the theoretically possible genera and some of the sub-genera are described with their type-species.

For spores a similar system is proposed, but the genera are not described here with their type-species, as many spore-genera are established allready from the paleozoic.

A PALYNOLOGICAL SISTEMATIC NOMENCLATURE

INTRODUCCTION

Some time ago we published an article in Spanish, discussing the present statuus of palynological systematic nomenclature (VAN DER HAMMEN, 1954 b). We came to the conclusion that a consistent and generally acceptable system was very much needed, and made a proposal in this respect, without formally describing the genera and their type-species in order to learn the opinions of colleagues.

The whole problem of palynological systematic nomenclature is something apart, involving many problems different from those of established botanical nomenclature. This is an important point, and in our opinion special nomenclature rules will have to be proposed and established at the next International Botanical Congress.

One main point is the manner of forming generic names. Two different opinions exist, one for forming the names at the base of names of recent genera and families, using the ending -oidites,-idites,- etc., according to their resemblance to pollengrains of recent plants or according to their supposed natural relationship, and the other for forming the names on the basis of morphological characters only.

We discussed these two principles in the above mentioned publication, showing why in our opinion the second one is preferable. As a matter of fact nowadays a majority of prequarternary palynologists also favour this opinion, and even part of those who favour the other, admit that a pure artificial system is a desirable adjunct to theirs.

Various artificial nomenclature systems have been proposed for pollengrains and spores, but as the different authors used different ways of forming the generic names and many genera overlap others, there exists a considerable confusion in palynological systematical nomenclature.

Two means of resolving the confusion are in our opinion:

1) Having all pollen students form the names of their new genera in the same way.
2) Having all pollen students use the morphological terms, employed in the construction of generic names and in the description of genera, in exactly the same sense.

Therefore we proposed to use morphological terms and definitions according to IVERSEN & TROELS-SMITH (1950), as correspondence with many European and American colleagues showed that this system of morphological names, being very logical and with well defined terms, is accepted as one of the best by many pollen-students. Consequently we also proposed to use a part of these morphological terms for the construction of the generic names.

We received, after the above mentioned publication (VAN DER HAMMEN, 1954 b), many letters from colleagues expressing enthusiasm about the system proposed. Several of them also gave valuable detailed advice, and we would like to express our gratitude to them all at this time.

After realizing that many other workers agreed with our system, we resolved to publish it in English in a more definite form, describing the new genera with their geno-types. Although we have used this system in a former publication (VAN DER HAMMEN, 1954 a) in order to classify some 150 species from the Maestrichtian and Paleocene of Colombia, we did not formally describe the genera, not wishing to create a new system without knowing the opinion of other students.

In the following pages we will first describe the way in which our generic names are formed, and then establish the most important theoretically possible generic names.

Once again we would like to state since we think it to be a very important point, that a palynological nomenclature system will result only if all students construct generic names in the same manner, and use the morphological terms in exactly the same sense.

Since it is not our aim to describe all the genera known up till now, but rather to indicate the theoretical possibilities, we will give formal descriptions for only the more common genera and sub genera. Other students who use our sytem, and who propose another genus or subgenus not described here with its type-species, may take the corresponding theoretically possible name and genus mentioned in this article, and describe it as a new genus with a type-species.

Undoubtedly there will be cases in which new generic names must be created since they are not covered in the theoretical possibilities mentioned here. In such cases the names will have to be formed in the same way, on the base of the main morphological characters of the corresponding new genus.

Without doubt there are still many problems, in the case of Paleozoic spores, involving priority, which only can be solved by an International Congress, since many of these spore-genera are well established and valid. But one may ask if it should not be preferable to unify all the names according to one and the same artificial system. Nevertheless we give our spore-system here only as a proposal, not describing the genera on the base of type-species, and leaving acceptance or rejection of this system to specialists in this field.

One item is left to be treated in this introduction, As the system is purely artificial based on morphological characters alone, both fossil and recent pollengrains and spores belong to the same artificial genera. In this respect it is generally of little importance to give the recent pollengrains a specific name,

but as a matter of fact they belong to one of the artificial genera.

A significant advantage derives from this device, of using recent pollen-species as type-species for the more important genera, since type material can easily be had all over the world from any more extensive herbarium. For this reason we have used recent representatives of the artificial genera as geno-types for the genera described here, although fossil species may be used equally well as geno-types.

Summarizing, we can say that the following points are basic to our system:

1. The names of the artificial genera are based on morphological characters only, and constructed according to one uni form scheme.
2. The morphological terms used in the construction of the generic names are the well-defined terms of IVERSEN & TROELS-SMITH (1950).
3. Possible or supposed natural relationship is never used for the construction of generic nor sub-generic names.
4. Recent pollen-species can be used as geno-types for the arti ficial genera as well as fossil ones, as all logically belong to one of these artificial genera.

Point three does not imply that the natural relationship of fossil pollengrains and spores is thought to be of little importance. On the contrary we consider it to be of the greatest importance both for palynological-botanical as well a for palynological-stratigraphical investigations, and for that reason it will have to be indicated, if known or supposed, at the end of every species-description. It does not seems superfluous to mention this fact here, as it is sometimes neglected completely in stratigraphical studies, even though it may be of great importance for the correct interpretation of the data.

One problem is left, namely that of whether or not the shape of a pollengrain should be used in the main classification and in the construction of the generic names. Our opinion is that this should be prevented, as the study of recent pollen shows that, although various species are constant in shape, there are many other species which show a great variability in this respect. And the same study learns us that other morphological characteristics, like e.g. sculpture-type are amongst the most constant ones. So these most constant characteristics will have to be used for classification in the first place. The same is true in the case of spores. Nevertheless shape, in some cases, seems to be an important characteristic for classification of paleozoic spores-groups, and has been used frequently for this purpose.

Palynology is still a young science, and we may except that many hundreds of species will be described in the next few years. One can realize that if palynological nomenclature goes on in the same way as it did up till now, within the next few years we may be more or less in a position comparable to that of organic chemistry before the introduction of the new names. The number of genera and species described is still relatively small, but if we are to avoid a tremendous future confusion, a great majority of workers must accept one logically formed artificial system in which the possibility of overlapping genera is excluded almost completely, and in which full use has been made of all the advantages which an artificial system can give.

THE PRINCIPLES OF THE ARTIFICIAL SYSTEM AND ITS THEORETICAL POSSIBILITIES

a) Pollen

For the main systematical divisions the pollen-types, which can be destinguished on the base of the different nature, number and position of apertures ("typus pollinis"), are used, as ERDTMAN (1947)

proposed. The names and definitions of these pollen-types are taken from IVERSEN & TROELS-SMITH (1950), for reasons explained in the introduction. The names of genera are formed on the base of these terms, using the ending -ites. In this way all tricolpate pollengrains belong to the genus *Tricolpites*, all monoporate pollengrains to the genus *Monoporites*, etc. It was necessary to use names of some pollen-types not included in the definitions of IVERSEN & TROELS-SMITH. These names are the following: trichotomocolpatae (ERDTMAN, 1945), pluricellulatae, syncolporatae and dicolporatae. More names may be necessary in the future.

So we have the following theoretical possibilities for artificial genera:

Génus	Characteristic
Polyadites	More than four pollengrains united
Tetradites	Four pollengrains united
Dyadites	Two pollengrains united
Trichotomocolpites	With a three-slit opening
(Vesiculites) Saccites	With air-bladders
Inaperturites	Without preformated aperture (or only very faint indication)
Pluricellulites	With an internal division in cells
Monoporites	With one pore only
Monocolpites	With one colpe only
Syncolpites	Colpes united, forming rings, spirals etc. or colpes connected in the polar area. Pores absent.
Syncolporites	Colpes connected in the polar area, each provided with a pore.
Diporites	With two pores

G e n u s	Characteristic
Dicolpites	With two parallel and opposite colpes
Dicolporites	With two meridional colpes, each provided with a pore.
Triporites	With three pores
Tricolpites	With three colpes
Tricolporites	With three colpes, each provided with a pore.
Stephanoporites	With more than three pores, aequatorially arranged
Stephanocolpites	With more than three colpes, aequatorially arranged
Stephanocolporites	With more than three aequatorially arranged colpes, each provided with a pore.
Periporites	With pores, in general more than three, not aequatorially arranged
Pericolpites	With more than two colpes, not all meridional.
Pericolporites	With more than two colpes, not all meridional, each provided with a pore.
Fenestrites	With pseudopores (lakunas)
Heterocolpites	Some colpes have pores, others (pseudocolpes) have not. Free pores absent.
Extraporites	With pseudocolpes. Free pores present.

Schematic drawings of all these possible genera are given in fig. 1.

As it is necessary to split up several of the larger genera such as *Tricolpites*, we use the sculpture-types according to IVERSEN & TROELS-SMITH (1950), both for the characterization as for the names. In this way e.g. those species of the genus *Tricolpites* which have a reticulate sculpture, belong to the sub-genus *Retitricolpites*. If we call the genus XXX, we have for each genus the following theoretically possible sub-genera.

Sub-genus	Characteristics (sculpture-type according to the definitions of IVERSEN & TROELS-SMITH (1950)
Psila XXX	psilatus
Foveo XXX	foveolatus
Fossu XXX	fossulatus
Scabra XXX	scabratus
Echi XXX	echinatus
Verru XXX	verrucatus
Gemma XXX	gemmatus
Bacu XXX	baculatus
Clava XXX	clavatus
Reti XXX	reticulatus
Rugu XXX	rugulatus
Stria XXX	striatus

Schematic drawings of the sub-genera of *Tricolpites* are given as an example in fig. 2. To prevent possible doubts in more or less transitional types, we add at the end of the article determination-tables for the form genera (Table A) and their sub-genera (Table C). For these tables we utilised the determination -tables for the pollen-types and pollen sculpture-types according to IVERSEN & TROELS SMITH (1950), with some additions and minor changes.

The assignment of either a genus or a sub-genus rank to these subdivisions is a matter of taste, and will have to be established by general agreement. We gave them a sub-genus rank as it seemed to be more practical.

The type-descriptions for the most important of the theoretically possible genera and sub-genera will be given in the paragraph 3 of the present paper.

In case a pollengrain has a combination of several sculpture-types, it must be classified according to the following rules:

1º. The real (positive) sculpture-elements have priority (e.g. echinae have priority on foveolae).

2º. Among several types of real sculpture-elements the predominant elements have priority.

b) Spores

Pteridophytae-spores should be divided, into three principal form-groups, which follow here, with their descriptions.

Form-group	Characteristics
Aletes	Without preformed aperture
Monoletes	With one elongated aperture
Triletes	With a three-slit aperture (tetrade-mark)

As it is necessary to subdivide these form-groups, we propose to form the genera mainly on the base of the sculptural characteristics. IBRAHIM (1933) already proposed such a division of Aletes, Monoletes and Triletes, using for the subdivisions of these three groups the ending "-sporites". But other authors used different systems, and the resulting described genera partly overlap.

It seems to us preferable to use the ending "-triletes" for all the genera of the Triletes- group, etc. Moreover we propose to use, where possible in the case of spores, the well-defined sculpture-terminology of IVERSEN & TROELS-SMITH (1950).

So the theoretically possible genera of Triletes, with their characteristics are:

Genus	Characteristics (sculpture-types according to the definitions of IVERSEN & TROELS-SMITH)
Psilatriletes	psilatus
Foveotriletes	foveolatus
Fossutriletes	fossulatus
Scabratriletes	scabratus
Echitriletes	echinatus
Verrutriletes	verrucatus
Gemmatriletes	gemmatus
Bacutriletes	baculatus
Clavatriletes	clavatus
Retitriletes	reticulatus
Rugutriletes	rugulatus
Striatriletes	striatus

Fig. 3 gives schematical drawings of these theoretically possible genera of the Triletes-group.

The same type of division in genera may be used for the other two form-groups, in this way:

Psilamonoletes	*Psilaletes*
Foveomonoletes	*Foveoaletes*
etc.	*etc.*

At the end of this article (paragraph 4) are added the determination tables for the form-groups (table B) and their theoretically possible genera (table C).

We do not describe formally these artificial spore-genera on the basis of type-species, for the reazon that many spore-genera are already described from the Paleozoic, and the whole question as it stands now has to be resolved by an International Congress. Never theles we prefer to classify. Mesozoic and Cenozoic spores provisionally at present in the system described above.

TYPE-DESCRIPTIONS

The following section includes the type-descriptions of the artificial genera, and sub-genera of pollengrains and the description of their type-species. Of the theoretically possible "sub-genera" only those have been described with their type-species, where we felt the need to establish them at this time. When other students feel the necessity splitting up other genera, they might describe the corresponding sub-genera themselves on the basis of a type-species.

According to the international botanical rules one of the sub-genera of a genus must have the same name as the genus. This rule is inconvenient for the artificial pollen-system. If nevertheless an International Congress will accept this rule too for the artificial pollen-system, we establish the genus-name XXX as sub-generic name instead of *Psila XXX*. We have followed the international rules in <u>pu</u> tting the sub-generic name in parenthesis behind the genus-name; this is for the present artificial system unnecesary, and this rule should be made non-obligatorial by a Congress, for artificial pollen-nomenclature, as the sub-genus-name includes the genus-name.

In the following descriptions Col.I.G,N.C. is the abbreviation for:

Collection of the Paleobotanical Department of the Instituto Geológico Nacional of Colombia, Bogotá.

The morphological terms used are those of IVERSEN & TROELS-SMITH (1950), and have the sense these authors gave to them. Measurements were allways carried out on the type-specimen.

As we are not dealing with natural genera and species, but with artificial ones, we describe them as "form-genera" and "form-species" (resp. nov. fgen and nov. fsp.).

POLYADITES nov. fgen.

Pollengrains compound, more than four grains united.
Genotype: *Polyadites multicompositus* nov. fsp.

Polyadites multicompositus nov. fsp.
Grains united in polyads. Number of grains in a polyad 16.
Sculpture type: psilate; some small foveolae and ondulations may be present. Size of polyad 50 x 45 x 20 micron. Greatest length of separate grains 18 micron.
Thickness of exine 1-1,5 micron.
Type: Slide R III 54, Col. I.G.N.C.; Fig. 4.
Natural relationship: The type-specimen is a recent pollengrain of *Acacia retinodes* SCHLECHT (Mimosaceae).
Age and locality: recent; Colombia.

TETRADITES VAN DER HAMMEN 1954

Pollengrains compound, four grains united.
Lectogenotype (herewith established): *Tetradites tetradymos* nov. fsp.

Tetradites tetradymos nov. fsp.
Grains united in tetrads. Tectate.
Sculpture-type: irregular verrucate. Size of tetrad 43 micron. Separate grains 28 micron.
Thickness of exine 2-2.5 micron. Greatest diameter of largest verrucae 2.5 micron. Separate grains are tricolpate, but the furrows are short and poorly defined.
Type: Slide H I 48, Col. I.G.N.C.; Fig. 5.
Natural relationship: The type-specimen is a recent pollengrain of *Calluna vulgaris* SALISB. (Ericaceae).
Age and locality: Recent; Holland.

DYADITES nov. fgen.

Pollengrains compound, two grains united.
Genotype: *Dyadites adelphos* nov. fsp.

Dyadites adelphos nov. fsp.
Two grains united in a dyad. Separate grains inaperturate.
Sculpture-type: reticulate. Reticulum continuous from grain to grain, uninfluenced by the suture between them. The transverse wall separating the two grains apparently consists of endexine only. Size of dyads 42 x 30 micron.
Type: Slide H II 45, Col. I.G.N.C.; Fig. 6.
Natural relationship: The type-specimen is a recent pollengrain of *Scheuchzeria palustris* (Scheuchzeriaceae).
Age and locality: Recent; Holland.

TRICHOTOMOCOLPITES nov. fgen.

Pollengrains with only a three-slit apperture (trichotomocolpate).
Genotype: *Trichotomocolpites normalis* nov. fsp.

Trichotomocolpites normalis nov. fsp.
Pollengrains trichotomocolpate.
Sculture-type: foveolate. Size of grain 44 micron.
Thickness of exine 2-2.5 micron. Intrabaculate. Shape of grains trian gular. Three-slit apperture often wide opened. Distance of foveolae about 3 micron, sometimes connected by fossulae.
Type: Slide R VII 63, Col. I.G.N.C.; Fig. 7.
Natural relationship: The type-specimen is a recent pollengrain of *Pyrenoglyphis major* (JACQ) KARST. (Palmae).
Age and locality: Recent; Colombia.

SACCITES ERDTMAN 1947

Pollengrains provided with air-bladders.
(This genus was proposed by ERDTMAN (1947), and we don't use in this case the term vesiculatae of IVERSEN & TROELS-SMITH, as ERDTMAN name is already in general use. It seems however that also spores have been included and the genus was elevated to a "division". So we establish now a lectogenotype for this form-genus of pollen. Saccites is one of the few genera in which subdivision has to be carried out on other characters than sculpture-type).
Lectogenotype (herewith established): *Saccites formalis* nov. fsp.

Saccites formalis nov. fsp.
Pollengrains with two air-bladders relatively big, with irregular re ticulate thickenings at the innerside of the exine. Lumina of this reticulum very big. Pollengrain (body) clearly micro-foveolate micro reticulate.
Exine relatively thick, 2-3 micron. Size of grain (without bladders): 40 micron.
Type: Slide R II 16, Col. I.G.N.C.; Fig. 8.
Natural relationship: The type-specimen is a recent pollengrain of *Podocarpus montanus* (Podocarpaceae).
Age and locality: Recent; Colombia.

INAPERTURITES VAN DER HAMMEN 1954

Pollengrains without preformated aperture (or only with a very faint indication).

Lectogenotype (herewith established): *Inaperturites clausus* nov.fsp.

Inaperturites clausus nov. fsp.

Grains inaperturate.

Sculpture-type: scabrate-microgemmate, projections uniform. Intectate. Size of grain 30 micron.

Exine thin. Shape globular.

Type: Slide H I 1, Col. I.G.N.C.; Fig. 9.

Natural relationship: The type-specimen is a recent pollengrain of *Populus tremula* L. (Salicaceae).

Age and locality: Recent; Holland.

PLURICELLULITES VAN DER HAMMEN 1954

The interior of the pollengrains is divided in cells.

Lectogenotype (herewith established): *Pluricellulites curiosus* nov. fsp.

Pluricellulites curiosus nov. fsp.

The interior of the grains is divide by partitions which form cells more or less regularly arranged and completely filling the cavity.

Sculpture-type: echinate, spines short, irregularly arranged. Size of pollengrain 170 x 100 micron.

Type: RENAULT (1879), Fig. also in WODEHOUSE (1935), fig. 63

Natural relationship: The type-specimen is a fossil pollengrain of *Stephanospermum akenioides* BROGN. (Pteridospermae).

Age and locality: Carboniferous; see RENAULT (1879).

MONOPORITES VAN DER HAMMEN 1954

Pollengrains provided with one pore only.
Lectogenotype (herewith established): *Monoporites unipertusus* nov. fsp.

Monoporites unipertusus nov. fsp.
Pollengrains with one pore.
Sculpture-type: psilate. Size of pollengrain 50 micron. Shape globular. Pore with protruding annulus. Diameter of pore 4.5 micron, and diameter of pore with annulus 10 micron.
Exine relatively thin.
Type: Slide R VII 66, Col. I.G.N.C.; Fig. 10.
Natural relationship: The type-specimen is a recent pollengrain of *Chusquea lehmanni* PILG. (Gramineae).
Age and locality: Recent; Colombia.

MONOCOLPITES VAN DER HAMMEN 1954

Pollengrains provided with one colpe (furrow) only (monocolpate).
Lectogenotype (herewith established): *Monocolpites longicolpatus* nov. fsp.

Monocolpites longicolpatus nov. fsp.
Pollengrains monocolpate.
Sculpture-type: reticulate. Furrow long, with somewhat irregular margin. Magnitude luminum 0.3-1.5 micron, somewhat smaller towards the furrow. Size of pollengrain 52 x 39 micron.
Thickness of exine (incl. reticulum): 1-1.5 micron. At lower adjustment of the microscope the reticulum becomes somewhat less clear and separate granules are visible in part.
Type: Slide R I 19, Col. I.G.N.C.; Fig. 11
Natural relationship: The type-specimen is a recent pollengrain of *Orthrosanthus chimboracensis* (HBK) BAKER (Iridaceae).
Age and locality: Recent; Colombia.

SYNCOLPITES VAN DER HAMMEN 1954

Pollengrains with colpes united, forming rings, spirals etc.,or with colpes united in the polar area.
Lectogenotype (herewith established): *Syncolpites normalis* nov.fsp.

Syncolpites normalis nov. fsp.
Pollengrains with colpes united to a spiral-like form.
Sculpture-type: echinate. Size of grain 38 microns. There are two types of echinae, one very small, and the other larger, up to 2.5 micron. Shape of grain more or less globular.
Thickness of exine 1-1.3 micron.
Type: Slide R II 30, Col. I.G.N.C.; Fig. 12.
Natural relationship: The type-specimen is a recent pollengrain of *Paepalanthus crassicaulis* KOERN. (Eriocaulaceae).
Age and locality: Recent; Colombia.

SYNCOLPORITES VAN DER HAMMEN 1954

Pollengrains provided with colpes connected in the polar area. Each colpe provided with a pore.
Lectogenotype (herewith established): *Syncolporites triangulatus* nov. fsp.

Syncolporites triangulatus nov. fsp.
Pollengrains provided with three colpes connected in the polar areas, each colpe provided with a pore.
Sculpture-type: psilate to finely micro-reticulate. Shape of pollengrain in polar view triangular with almost flat sides. Polar axis 20 micron. Greatest size of pollengrain (equatorial) 33 micron. Tectate. Greatest thickness of exine 1.5 micron.
Type: Slide R IV 45, Col. I.G.N.C.; Fig. 13.
Natural relationship: The type-specimen is a recent pollengrain of *Cupania cineraea* (Sapindaceae).
Age and locality: Recent; Colombia.

DIPORITES VAN DER HAMMEN 1954

Pollengrains provided with two pores only.
Lectogenotype (herewith established): *Diporites amplissimus* nov.fsp.

Diporites amplissimus nov. fsp.
Pollengrains provided with two opposite pores.
Sculpture-type: psilate. The inmerside of the endexine has an irregular sculpture near the pores. Pores very big, diameter 15 micron, with vestibulum. Size of pollengrain 78 micron (axis from pore to pore).
Thickness of exine: 3.5-4.5 micron.
Type: Slide R V 73, Col. I.G.N.C.; Fig. 14.
Natural relationship: The type-specimen is a recent pollengrain of *Fuchsia hartwegii* BENTH. (Oenotheraceae).
Age and locality: Recent; Colombia.

DICOLPITES VAN DER HAMMEN 1954

Pollengrains provided with two parallel and opposite colpes only.
Lectogenotype (herewith established): *Dicolpites simplex* nov. fsp.

Dicolpites simplex nov. fsp.
Pollengrains provided with two parallel and opposite colpes.
Sculpture-type: faintly micro-reticulate. Size of pollengrain 37 x 25 micron.
Thickness of exine 1.2-1.5 micron. Colpes well defined, 29 micron long.
Type: Slide R II 49, Col. I.G.N.C.; Fig. 15.
Natural relationship: The type-specimen is a recent pollengrain of *Tofieldia falcata* (Liliaceae).
Age and locality: Recent; Colombia.

DICOLPORITES nov. fgen.

Pollengrains with two meridional colpes, each one provided with a pore (dicolporate).

Genotype: *Dicolporites formosus* nov. fsp.

Dicolporites formosus nov. fsp.

Pollengrains provided with two meridional colpes, each one provided with a pore. Tectate-perforate. Columellae big. There is a very broad margin, where a part of the ectexine is lacking, and only present in round patches. Size of Pollengrain 63 x 38 micron. Pores big. 7 micron, somewhat equatorially elongated. Colpes 31 micron long. Thickness of exine at the equator 4.5 micron, and at the poles 2.3 micron.

Type: Slide R VI 95, Col. I.G.N.C.; Fig. 16.

Natural relationship: The type-specimen is a recent pollengrain of *Beloperone bracteosa* (Acanthaceae).

Age and locality: Recent; Colombia.

TRIPORITES VAN DER HAMMEN 1954

Pollengrain provided with three equatorial pores (triporate)

Lectogenotype (herewith established): *Triporites inornatus* nov.fsp.

Triporites inornatus nov. fsp.

Pollengrains triporate.

Sculpture - type: psilate. Tectate. Pores with vestibulum. Columellae small, but visible at high magnification. Size of pollengrain 30 micron.

Thickness of exine 1.2-1.5 micron. Ectexine somewhat thicker near the pores.

Type: Slide H I 84, Col. I.G.N.C.; Fig. 17.

Natural relationship: The type-specimen is a recent pollengrain of *Betula nana* L. (Betulaceae).

Age and locality: Recent; Germany.

PSILATRIPORITES nov. fsubgen.

Pollengrains triporate, exine psilate.
Subgenotype: *Triporites (Psilatriporites) inornatus* nov. fsp. (description see above).

SCABRATRIPORITES nov. fsubgen.

Pollengrains triporate, exine scabrate.
Subgenotype: *Triporites (Scabratriporites) asper* nov. fsp.

Triporites (Scabratriporites) asper nov. fsp.
Pollengrains triporate.
Sculpture-type: scabrate. Tectate. Shape triangular somewhat rounded. Size of pollengrain 34.5 micron. Diameter of pores about 4.5 micron. Thickness of exine 1.5 micron, but much thicker (3-3.5 micron) near the pores. Columellae big and clear near the pores.
Type: Slide R IV 85, Col. I.G.N.C.; Fig. 18.
Natural relationship: The types-specimen is a recent pollengrain of *Helicteres carthagenensis* JACQ. (Sterculiaceae).
Age and locality: Recent; Colombia.

GEMMATRIPORITES nov. fsubgen.

Pollengrains triporate, exine gemmate.
Subgenotype: *Triporites (Gemmatriporites) distinctus* nov. fsp.

Triporites (Gemmatriporites) distinctus nov. fsp.
Pollengrains triporate.
Sculpture-type: gemmate. The gemmae are of two sizes, small ones regularly distributed over all the surface, and big ones (up to about 6 micron), irregularly distributed. There are some big gemmae surrounding the pores. Pores big, with more or less irregular annulus. Diameter of

pores about 15 micron. Size of pollengrain 100 micron. Shape globular. Thickness of exine about 3.5 micron.
Type: Slide R IV 79, Col. I.G.N.C.; Fig. 19.
Natural relationship: The type-specimen is a recent pollengrain of *Matisia cruceto* CUATR. (Bombacaceae).
Age and locality: Recent; Colombia.

ECHITRIPORITES nov. fsubgen.

Pollengrains triporate, exine echinate.
Subgenotype: *Triporites (Echitriporites) argutus* nov. fsp.

Triporites (Echitriporites) argutus nov. fsp.
Pollengrains triporate.
Sculpture-type: echinate. Echinae up to 1.5 (-2) micron long. Pores with annulus. Diameter of pore about 5.5 micron. Size of grain 38 micron. Shape globular.
Thickness of exine 1.5-2.3 micron.
Type: Slide H I 25, Col. I.G.N.C.; Fig. 20.
Natural relationship: The type-specimen is a recent pollengrain of *Campanula rotundifolia* L. (Campanulaceae).
Age and locality: Recent; Denmark.

RETITRIPORITES nov. fsubgen.

Pollengrains triporate, exine reticulate.
Subgenotype: *Triporites (Retitriporites) formalis* nov. fsp.

Triporites (Retitriporites) formalis nov. fsp.
Pollengrains triporate.
Sculpture-type: reticulate. Lumina of reticulum up till 3.5 micron. Muri solid, loose granules only visible in some parts. Muri about 1-1.5 micron broad, and 2-2.5 micron high. Diameter of pores 2.3 micron.

Size of pollengrain 38 micron.
Type: Slide R VII 12, Col. I.G.N.C.; Fig. 21.
Natural relationship: The type-specimen is a recent pollengrain of *Guettarda parviflora* VAHL. (Rubiaceae).
Age and locality: Recent; Colombia.

TRICOLPITES ERDTMAN 1947

Pollengrains provided with three meridional colpes (tricolpate). (Fenestrate types excluded).
ERDTMAN (1947) proposed this genus, but we do not know whether he mentioned a geno-type or not. If not, than the type-species of *Psilatricolpites* nov. fsubgen. will be the lectogenotype for *Tricolpites* too.

PSILATRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine psilate.
Subgenotype: *Tricolpites (Psilatricolpites) incomptus* nov. fsp.

Tricolpites (Psilatricolpites) incomptus nov. fsp.
Pollengrains tricolpate.
Sculpture-type: psilate. Tectate (somewhat perforate?). Colpes narrow with somewhat irregular limits. Colpes about 21 micron long, polar area large. Columellae small but clear.
Thickness of exine about 1.5 micron at the equator and 2.3 micron in the polar areas. Shape of pollengrains subsphaeroidal, size 40 micron.
Type: Slide R I 17, Col. I.G.N.C.; Fig. 22.
Natural relationship: The type-specimen is a recent pollengrain of *Bartsia santalinaefolia* (HBK) BENTH. (Scrophulariaceae).
Age and locality: Recent: Colombia.

SCABRATRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine scabrate.
Subgenotype: *Tricolpites (Scabratricolpites) asperatus* nov. fsp.

Tricolpites (Scabratricolpites) asperatus nov. fsp.
Pollengrains tricolpate.
Sculpture-type: scabrate. Colpes about 23 micron long, limits somewhat irregular. Polar area rather large.
Thickness of exine about 1.5 micron. Tectate. Size of pollengrain 35x 32 micron, shape subsphaeroidal.
Type: Slide H I 49, Col. I.G.N.C.; Fig. 23.
Natural relationship: The type-specimen is a recent pollengrain of *Batrachium aquatile* L. (Ranunculaceae).
Age and locality: Recent; Holland.

ECHITRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine echinate.
Subgenotype: *Tricolpites (Echitricolpites) giganteus* nov. fsp.

Tricolpites (Echitricolpites) giganteus nov. fsp.
Pollengrains tricolpate.
Sculpture-type: echinate. Limits of the colpes irregular. Polar area 38 micron.
Thickness of exine about 3.8 micron. Tectate-perforate. Columellae big and clear. Echinae about 2.5 micron. Size of pollengrain (equatorial) 105 micron. Shape subsphaeroidal.
Type: Slide R V 37, Col. I.G.N.C.; Fig. 24.
Natural relationship: The type-specimen is a recent pollengrain of *Phyllocactus phyllanthus* (L.) LINK. (Cactaceae).
Age and locality: Recent; Colombia.

BACUTRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine baculate.
Subgenotype: *Tricolpites (Bacutricolpites) magnus* nov. fsp.

Tricolpites (Bacutricolpites) magnus nov. fsp.
Pollengrains tricolpate.
Sculpture-type: baculate (a few of the sculpture-elements are like clavae, but the baculae dominate completely). Colpes rather long. Polar area 17 micron. Length of the baculae about 2.3 micron.
Thickness of exine about 5.8 micron (baculae included). Tectate. Columellae very long. Size of pollengrain 71 micron; shape subsphaeroidal.
Type: Slide R V 99, Col. I.G.N.C.; Fig. 25.
Natural relationship: The type-specimen is a recent pollengrain of *Plumbago scandens* L. (Plumbaginaceae).
Age and locality: Recent; Colombia.

RETITRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine reticulate.
Subgenotype: *Tricolpites (Retitricolpites) ornatus* nov. fsp.

Tricolpites (Retitricolpites) ornatus nov. fsp.
Pollengrains tricolpate.
Sculpture-type: reticulate. Lumina 1-2 micron. Muri formed by partly loose granulae. Colpes relatively short, 17 micron. Polar area 15 micron.
Thickness of exine about 2 micron (reticulum included). Height of reticulum about 1 micron. Size of pollengrain 33 micron (equatorial), shape subsphaeroidal.
Type: Slide R III 11, Col. I.G.N.C.; Fig. 26.
Natural relationship: The type-specimen is a recent pollengrain of *Neea macrophylla* POEPP. & ENDL. (Nyctaginaceae).
Age and locality: Recent; Colombia.

STRIATRICOLPITES nov. fsubgen.

Pollengrains tricolpate, exine striate.

Subgenotype: *Tricolpites (Striatricolpites) virgulatus* nov. fsp.

Tricolpites (Striatricolpites) virgulatus nov. fsp.

Pollengrains tricolpate.

Sculpture-type: striate. Striae fine, predominantly meridional. Colpes long. Polar area small, 5.5 micron.

Exine about 2.5 micron, thinner towards the colpes. Size of pollengrain 41 micron, shape subsphaeroidal.

Type: Slide H I 11, Col. I.G.N.C.; Fig. 27.

Natural relationship: The type-specimen is a recent pollengrain of *Acer platanoides* L. (Aceraceae).

Age and locality: Recent; Denmark.

TRICOLPORITES ERDTMAN 1947

Pollengrains with three meridional colpes, each one provided with a pore (tricolporate) (Fenestrate types excluded).

ERDTMAN (1947) proposed this genus with a slightly different definition ("ora" instead of pores), but we don't know whether he mentioned a genotype or not. If not, than the type-species of *Psilatricolporites* nov. fsubgen. will be the lectogenotype for Tricolporites too.

PSILATRICOLPORITES nov. fsubgen.

Pollengrains tricolporate, exine psilate.

Subgenotype: *Tricolporites (Psilatricolporites) inornatus* nov. fsp.

Tricolporites (Psilatricolporites) inornatus nov. fsp.

Pollengrains tricolporate.

Sculpture-type: psilate. Pores big, up to 3.5 x 2 micron, somewhat protruding. Pores have the character P of IVERSEN & TROELS-SMITH. Exine relatively thick, about 1.5 micron. Tectate. Polar area about 4 micron. Size of pollengrain 19 (equat.) x 17 (polar axis) micron. Shape subsphaeroidal.

Type: Slide R V 84, Col. I.G.N.C.; Fig. 28.

Natural relationship: The type-specimen is a recent pollengrain of *Clethra bicolor* HBK (Clethraceae).

Age and locality: Recent; Colombia.

SCABRATRICOLPORITES nov. fsubgen.

Pollengrains tricolporate, exine scabrate.

Subgenotype: *Tricolporites (Scabratricolporites) impolitus* nov.fsp.

Tricolporites (Scabratricolporites) impolitus nov. fsp.

Pollengrains tricolporate.

Sculpture-type: scabrate. Tectate (-perforate). Perforations of tectum very small. Colpae transversalis rather wide (indications of costae aequatorialis).

Exine about 2.5 micron thick. Polar area about 5 micron. Size of pollengrain 31 x 26.5 micron. Shape subsphaeroidal.

Type: Slide R VII 6, Col. I.G.N.C.; Fig. 29.

Natural relationship: The type-specimen is a recent pollengrain of *Chiococca alba* (L.) HITCHE. (Rubiaceae).

Age and locality: Recent; Colombia.

ECHITRICOLPORITES nov. fsubgen.

Pollengrains tricolporate, exine echinate.

Subgenotype: *Tricolporites (Echitricolporites) spinosus* nov. fsp.

Tricolporites (Echitricolporites) spinosus nov. fsp.
Pollengrains tricolporate.
Sculpture-type: echinate. Small colpae transversalis are present. Tectate. Polar-area about 4.5 micron.
Thickness of exine 2 micron. Echinae 2.5 micron long, with monogranulate apex. Size of pollengrain 22 micron. Shape subsphaeroidal.
Type: Slide R VII 45, Col. I.G.N.C.; Fig. 30.
Natural relationship: The type-specimen is a recent pollengrain of *Baccharis tricuneata* (L.f.) PERS. (Compositae).
Age and locality: Recent; Colombia.

RETITRICOLPORITES nov. fsubgen.

Pollengrains tricolporate, exine reticulate.
Subgenotype: *Tricolporites (Retitricolporites) normalis* nov. fsp.

Tricolporites (Retitricolporites) normalis nov. fsp.
Pollengrains triporate.
Sculpture-type: reticulate. Small colpae transversalis are present. The muri consist of a single row of rather big granules, isolated in the lower part. Greatest size of lumina about 2.3 micron. Reticulum somewhat finer near the colpes. Polar area small. Exine (incl. reticulum) about 4 micron thick. Endexine relatively thick. Size of pollengrain 31 x 28 micron, shape subsphaeroidal.
Type: Slide R VII 28, Col. I.G.N.C.; Fig. 31.
Natural relationship: The type-specimen is a recent pollengrain of *Viburnum triphyllum* BENTH. (Caprifoliaceae).
Age and locality: Recent; Colombia.

STRIATRICOLPORITES nov. fsubgen.

Pollengrains tricolporate, exine striate.
Subgenotype: *Tricolporites (Striatricolporites) formalis* nov.fsp.

Tricolporites (Striatricolporites) formalis nov. fsp.
Pollengrains tricolporate.
Sculpture-type: striate. Colpae transversalis present, about 10 micron long. Polar-area small. Striae fine, predominently meridional.
Thickness of exine 1.5-2.3 micron. Tectate. Size of pollengrain 26.5x 24 micron, shape subsphaeroidal.
Type: Slide R IV 30, Col. I.G.N.C.; Fig. 32.
Natural relationship: The type-specimen is a recent pollengrain of *Tapirira guianensis* AUBL. (Anacardiaceae).
Age and locality: Recent; Colombia.

STEPHANOPORITES VAN DER HAMMEN 1954

Pollengrains provided with more than three equatorial pores (stephanoporate).
Lectogenotype (herewith established): *Stephanoporites fornicatus* nov. fsp.

Stephanoporites fornicatus nov. fsp.
Pollengrains stephanoporate.
Sculpture-type: psilate. Shape more or less polygonal. Pores with annulus. Diameter of pore about 2.5 micron. Arci (streaks of thickemed ectexine) swing from pore to pore. Size of pollengrain (equatorial) 45 micron.
Type: Slide H II 26, Col. I.G.N.C.; Fig. 33.
Natural relationship: The type-specimen is a recent pollengrain of *Alnus glutinosa* (Betulaceae).
Age and locality: Recent; Holland.

STEPHANOCOLPITES VAN DER HAMMEN 1954

Pollengrains provided with more than three meridional colpes (stephanocolpate).
Lectogenotype (herewith established): *Stephanocolpites communis* nov. fsp.

Stephanocolpites communis nov. fsp.
Pollengrains stephanocolpate.
Sculpture-type: reticulate. (-micro-reticulate), Number of colpes 6. Granulae become loose and reticulum unclear at lower adjustment of the microscope. Colpes long. Polar area relatively small, about 11 micron.
Thickness of exine 1.2-1.8 micron. Size of pollengrain (equatorial) 40 micron.
Type: Slide H I 32, Col. I.G.N.C.; Fig. 34.
Natural relationship: The type-specimen is a recent pollengrain of *Lycopus europaeus* (Labiatae).
Age and locality: Recent; Denmark.

PERIPORITES nov. fgen.

Pollengrains provided with pores (in general more than three), which are not equatorially arranged (periporate).
Genotype: *Periporites splendens* nov. fsp.

Periporites splendens nov. fsp.
Pollengrains periporate.
Sculpture-type: reticulate. Number of pores 6. Reticulum very clear, muri solid. The lumina of the reticulum are of different sizes, the largest ones 2.5 micron. Pores with annulus. Diameter of pores about 2.5 micron. Size of pollengrain 32 micron, shape globular.
Type: Slide R I 55, Col. I.G.N.C.; Fig. 35.
Natural relationship: The type-specimen is a recent pollengrain of *Bocconia frutescens* L. (Papaveraceae).
Age and locality: Recent; Colombia.

PERICOLPITES nov. fgen.

Pollengrains provided with more than two not meridional, or not all meridional, colpes (pericolpate).
Genotype: *Pericolpites curiosus* nov. fsp.

Pericolpites curiosus nov. fsp.
Pollengrains pericolpate.
Sculpture-type: scabrate. Number of colpes about 10, partly parallel and partly at right angles to the meridians. The scabrae are very small echinae. Tectate-perforate. Length of colpes 20-25 micron. Size of pollengrain 74 micron, shape globular. Columellae very clear.
Type: Slide R V 36, Col. I.G.N.C.; Fig. 36.
Natural relationship: The type-specimen is a recent pollengrain of *Peireskia colombiana* BRIT. & ROSE (Cactaceae).
Age and locality: Recent; Colombia.

PERICOLPORITES nov. fgen.

Pollengrains provided with more than two, not all meridional, or not meridional, colpes each one provided with a pore (pericolporate).
Genotype: *Pericolporites communis* nov. fsp.

Pericolporites communis nov. fsp.
Pollengrains pericolporate.
Sculpture-type: micro-reticulate. Number of colpes 4. The colpes form different angles with the equator. Polar area great. Colpes very narrow. Pores clear.
Thickness of exine about 1.5 micron. Size of pollengrain 27 micron, shape subsphaeroidal.
Type: Slide H I 59, Col. I.G.N.C.; Fig. 37.
Natural relationship: The type-specimen is a pollengrain of *Rumex acetosa* L. (Polygonaceae).
Age and locality: Recent; Holland.

FENESTRITES nov. fgen.

Pollengrains provided with "pseudo-pores" (lacunas) (fenestrate).
Genotype: *Fenestrites spinosus* nov. fsp.

Fenestrites spinosus nov. fsp.
Pollengrain fenestrate (and probably tricol(po)rate). Sculpture-type: echinate. The exine forms high bridges, which form a pattern of polygonals, enclosing the lacunae. The lacunae have only a very thin layer of smooth exine. The high bridges bear the echinae. Thickness of exine in the bridges about 5.5 micron (echinae not included). Length of the echinae about 3-3.7 micron. Size of pollengrain 32 micron, shape subsphaeroidal.
Type: Slide H II 46, Col. I.G.N.C.; Fig. 38.
Natural relationship: The type-specimen is a recent pollengrain of *Crepis paludosa* MOENCH (Compositae).
Age and locality: Recent; Holland.

HETEROCOLPITES nov. fgen.

Pollengrains provided with colpes, some of which have pores and others ("pseuso-colpes") not (heterocolpate).
Genotype: *Heterocolpites incomptus* nov. fsp.

Heterocolpites incomptus nov. fsp.
Pollengrains heterocolpate. Sculpture-type: psilate. Number of colpes 6; three colpes with pores alternate with (three) "pseudo-colpes" without pores. Tectate. Size of pollengrain 21 x 19.5 micron (polar axis is the longest). Colpes very narrow. Pores somewhat irregular. Thickness of exine 1.3 micron. Columellae very faint.
Type: Slide R V 63, Col. I.G.N.C.; Fig. 39.
Natural relationship: The type-specimen is a recent pollengrain of *Bucquetia glutinosa* (Melastomataceae).
Age and locality: Recent; Colombia.

DETERMINATION TABLES FOR ARTIFICIAL GROUPS, GENERA AND SUBGENERA OF POLLEN AND SPORES

A. Artificial genera of pollen

(For the determination of subgenera see table C.)

1.	Types pollinis uncertain	*Pollenites*
	Typus pollinis clearly identificable	2
2.	With an internal division in cells	*Pluricellulites*
	Lacking internal divisions in cells	3
3.	With a three-slit opening	*Trichotomocolpites*
	Lacking three-slit opening	4
4.	Pollengrains compound (united in groups)	5
	Pollengrains simple (free from each other) ...	7
5.	More than four pollengrains united	*Polyadites*
	Four or less than four pollengrains united ...	6
6.	Four pollengrains united	*Tetradites*
	Two pollengrains united	*Dyadites*
7.	With one aperture or without apertures	8
	Two or more clear apertures are present	11
8.	With air-sacs	*Saccites*
	Without air-sacs	9
9.	With one furrow	*Monocolpites*
	Not so	10
10.	With one clear pore	*Monoporites*
	Pore rudimentary or absent	*Inaperturites*
11.	With pseudo-pores (lacunas)	*Fenestrites*
	Pseudo-pores lacking	12
12.	Furrows present, free pores absent.....	13
	Free pores present	23
13.	Colpes united forming rings, spirals etc. or colpes connected in the polar-area	14
	Colpes not united or connected	15
14.	Furrows not provided with pores	*Syncolpites*
	Furrows provided with pores	*Syncolporites*

15.	Two furrows (colpi or pseudocolpi)	16
	More than two furrows	17
	Furrows without pores or transverse furrows .	*Dicolpites*
	Furrows provided with pores or transverse furrows	*Dicolporites*
17.	Furrows without clear pores or transverse furrows	18
	Some or all furrows provided with pores or transverse furrows	20
	All furrows are meridional	19
	Not all furrows are meridional	*Pericolpites*
19.	Three furrows	*Tricolpites*
	More than three furrows	*Stephanocolpites*
20.	All furrows meridional	21
	Not all furrows are meridional	*Pericolporites*
21.	Half or more of the furrows (pseudo-colpes) without pores	*Heterocolpites*
	All furrows with pores	22
22.	Three furrows	*Tricolporites*
	More than three furrows	*Stephanocolporites*
23.	Furrows present (pseudo-colpes)	*Extraporites*
	Furrows absent	24
24.	Pores equatorial	25
	Pores not equatorial	*Periporites*
25.	Two or three pores	26
	More than three pores	*Stephanoporites*
26.	Two pores	*Diporites*
	Three pores	*Triporites*

B. Artificial groups spores

(for the determination of genera see table C.)

1.	Without preformed aperture	*Aletes*
	With preformed aperture	2

2.	One elongated slit-like aperture	*Monoletes*
	With tri-radiate tetrade-mark	*Triletes*

C. Artificial subgenera of pollen and artificial genera of spores.
(Artificial genus of groups: XXX)

1.	Real (positive) sculpture elements are absent	2
	Real sculpture elements present	4
2.	Deepenings absent (or all 0.5 micron)	*Psila XXX*
	Deepenings present (at least some 0.5 micron) ..	3
3.	With holes (or grooves) diameter of holes must be smaller then the shortest distance between two of them)	*Foveo XXX*
	With disperse elongate deepenings	*Fossu XXX*
4.	Sculpture-elements all dot-shaped projections	5
	Sculpture-elements all or at least some elongated.	10
5.	All dimensions of the sculpture-elements 0.5 micron	*Scabra XXX*
	At least one of the dimensions 0.5 micron	6
6.	Sculpture-elements pointed	*Echi XXX*
	Sculpture-elements not pointed	7
7.	Largest diameter of the sculpture-elements as the height	8
	Largest diameter of the sculpture-elements as the height	9
8.	Sculpture-elements without proximal constriction .	*Verru XXX*
	Sculpture-elements with proximal constriction.....	*Gemma XXX*
9.	Sculpture-elements without distal thickening	*Baculu XXX*
	Sculpture-elements with distal thickening	*Clava XXX*
10.	Sculpture-elements arranged in a net-work	*Reti XXX*
	Not so	11
11.	Sculpture-elements without arrangement or without dominant arrangement	*Rugu XXX*
	Sculpture-elements arranged dominantly paralell ..	*Stria XXX*

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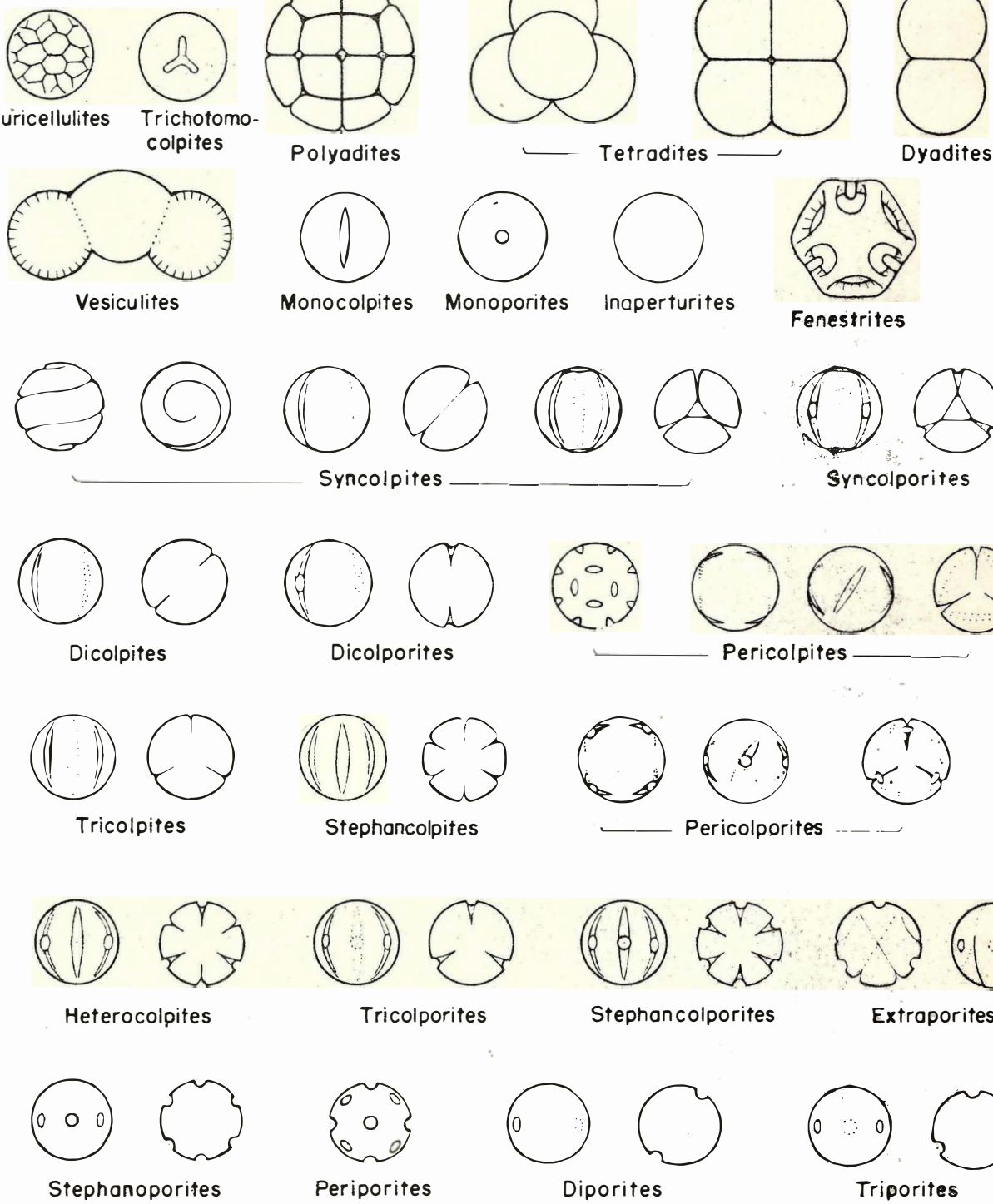
Fig I

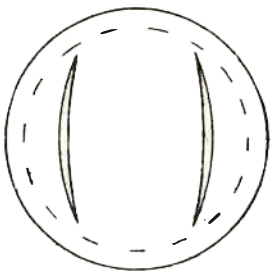
POSSIBLE ARTIFICIAL GENERA OF POLLENGRAINS



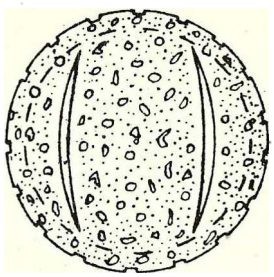
Dib: Irma Cortés Cediel

Fig 2

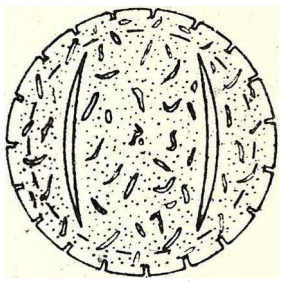
POSSIBLE ARTIFICIAL SUB-GENERA OF TRICOLPITES



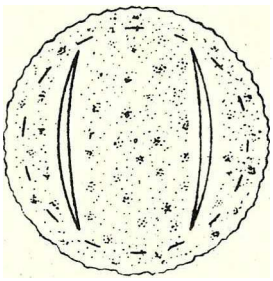
Psilatricolpites



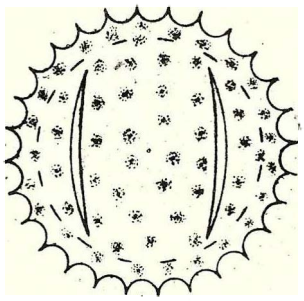
Foveotricolpites



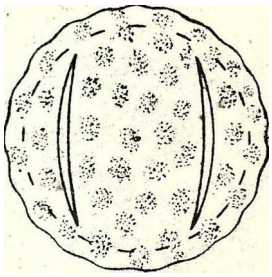
Fossutricolpites



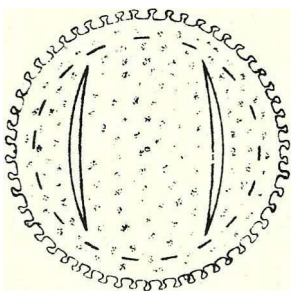
Scobratricolpites



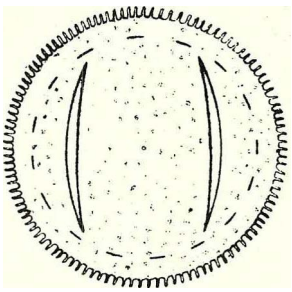
Echitricolpites



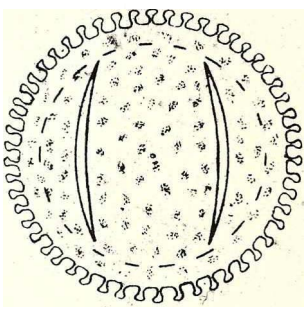
Verrutricolpites



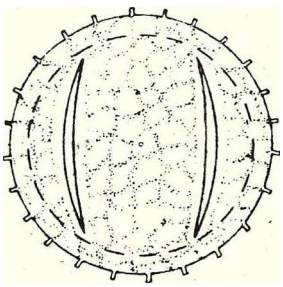
Gemmotricolpites



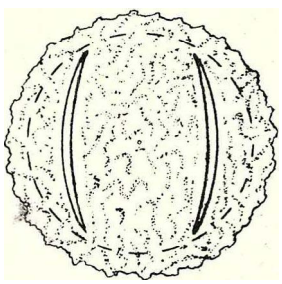
Bocutricolpites



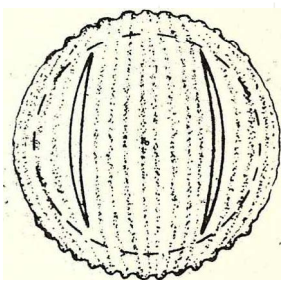
Clovatricolpites



Retitricolpites



Rugutricolpites

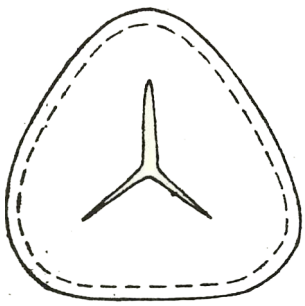


Striatricolpites

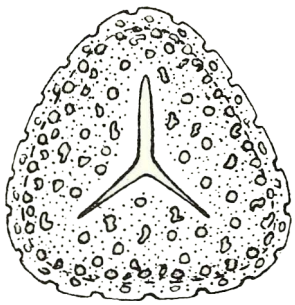
Dib: Irma Cortés Cediel.

Fig 3

POSSIBLE ARTIFICIAL GENERA OF THE TRILETES-GROUP

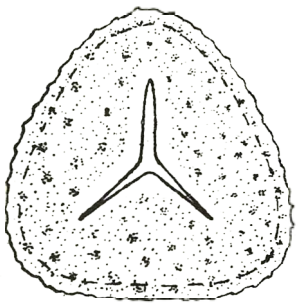


Psilatriletes

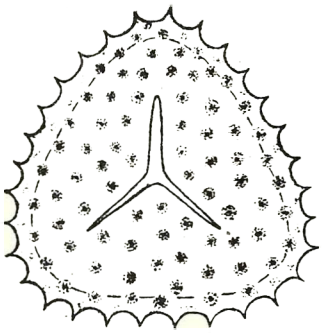


Foveotriletes

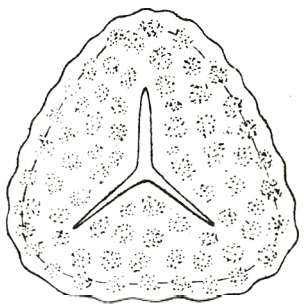
Fossutriletes



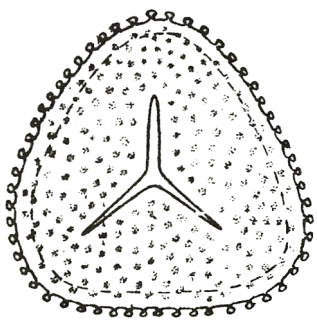
Scabratiletes



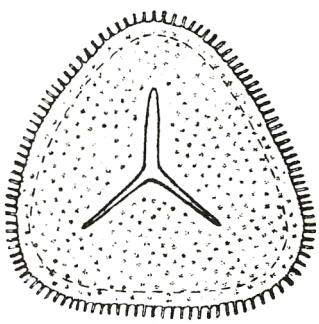
Echitriletes



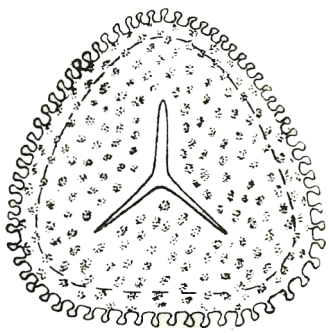
Verrutriletes



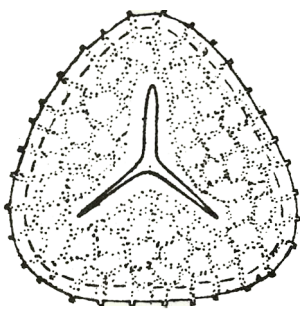
Gemmatriletes



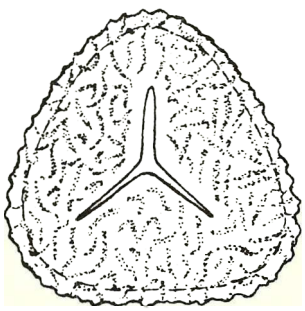
Bacutriletes



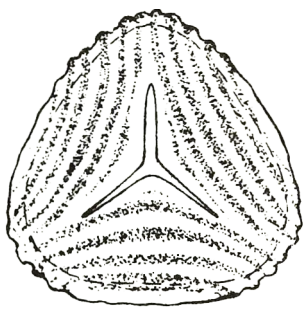
Clavatriletes



Retitriletes



Rugutriletes



Striatriletes

Dib: Irma Cortés Cediel.

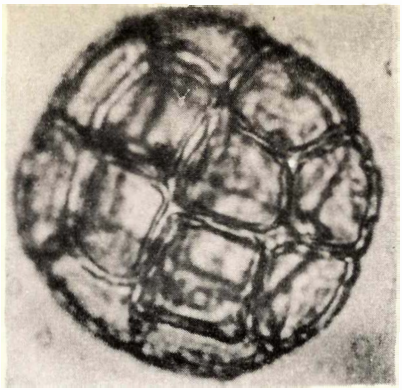
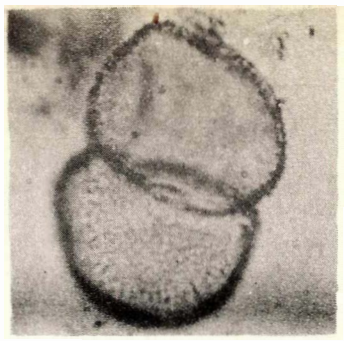


Fig: 4 Polyadites multicompositus nov. fsp.



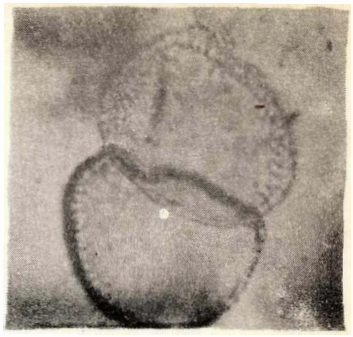


Fig:6 Dyadites adelphos

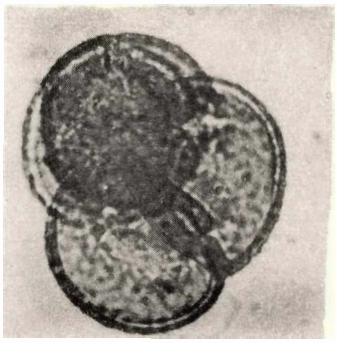


Fig:5 Tetradites tetradymos nov. fsp.

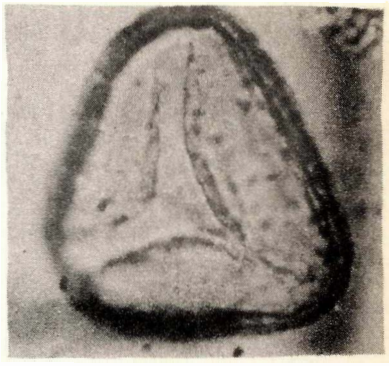
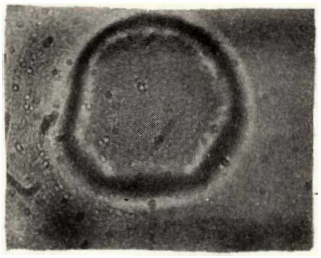
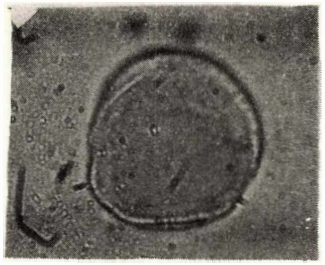


Fig:7 Trichotomocolpites normalis





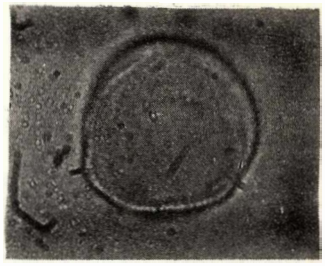


Fig:9 Inaperturites clausus

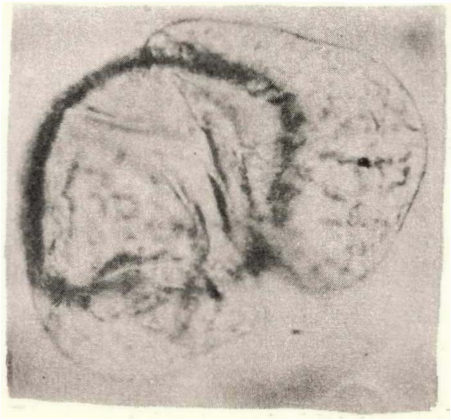
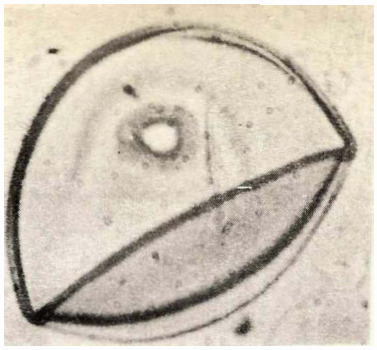


Fig:8 Saccites formalis

1.000 x



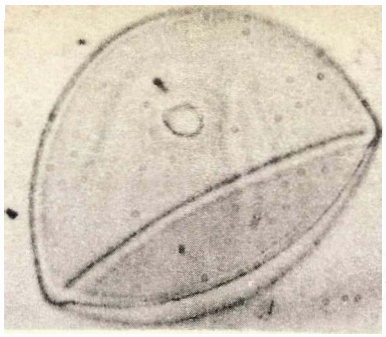


Fig: 10 Monoporites unipertusus

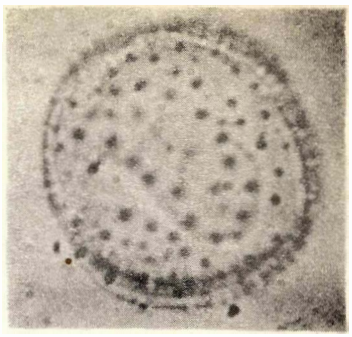


Fig: 12 Syncolpites normalis

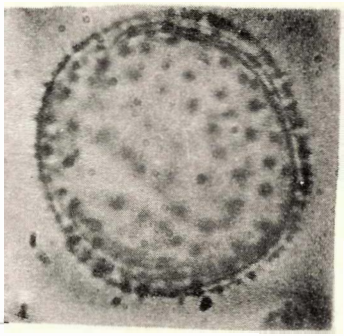
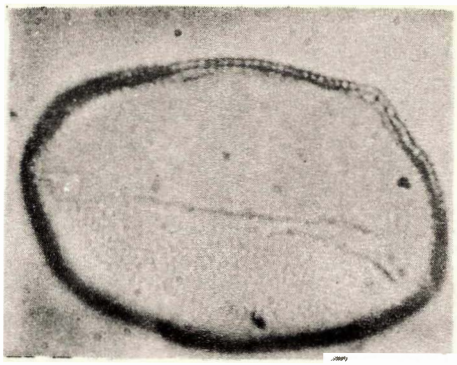


Fig: 12 Syncolpites normalis



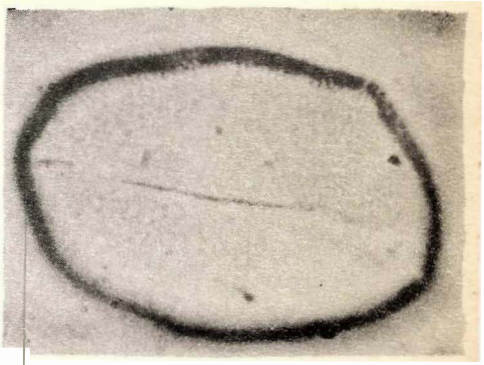


Fig: 11 Monocolpites longicolpatus

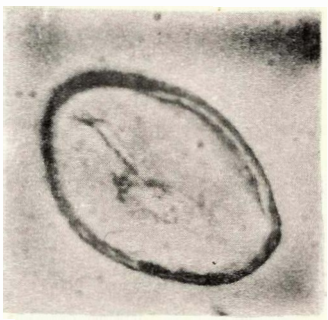
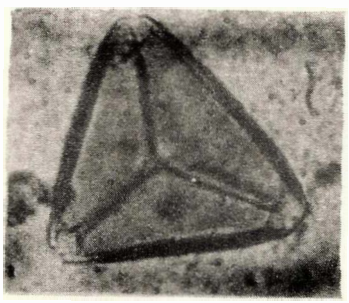


Fig: 15 Dicolpites simplex



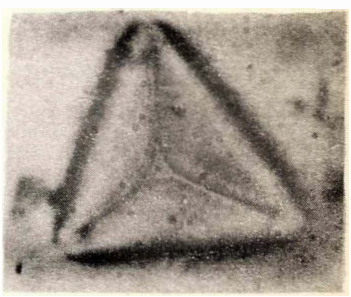


Fig: 13 Syncolporites triangulatus

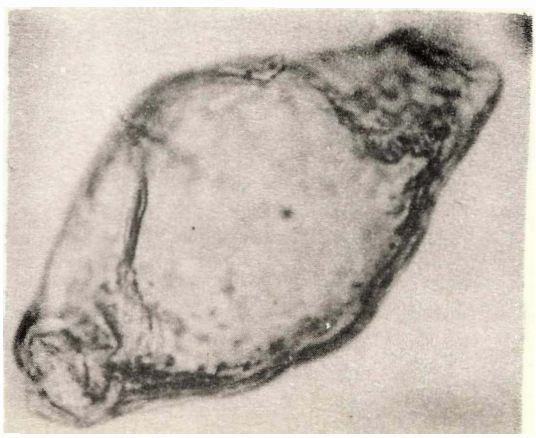


Fig: 14 Diporites amplissimus

1.000 x

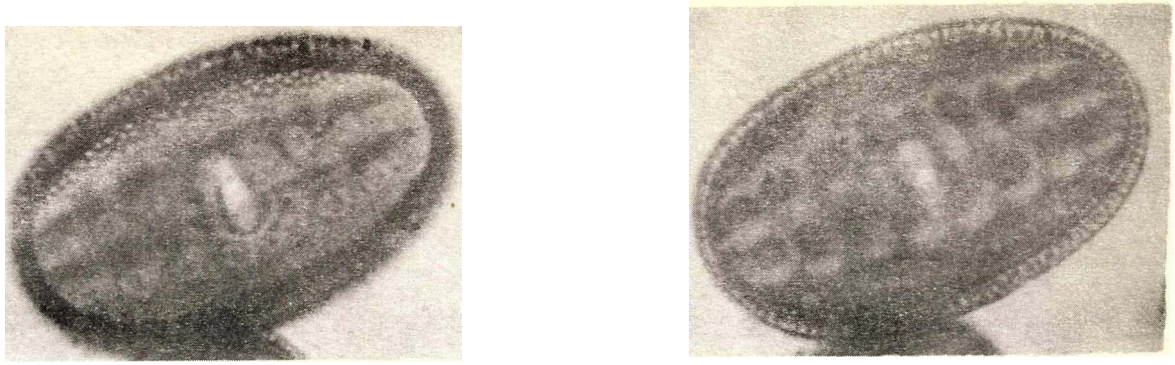


Fig: 16 Dicolporites formosus

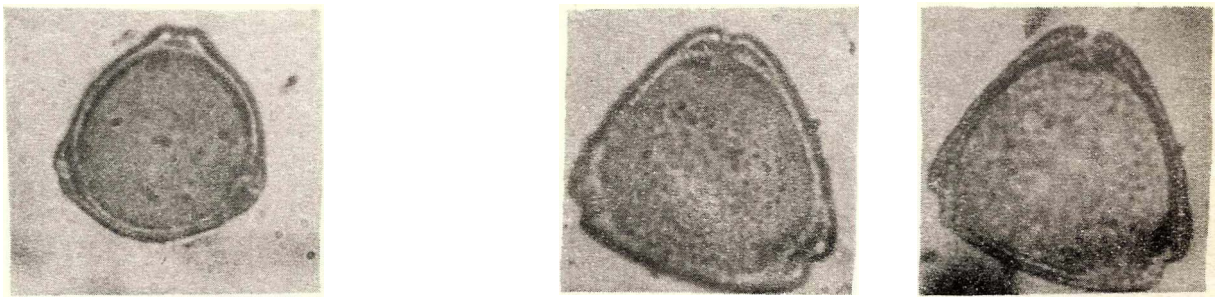


Fig: 17 Psilatriporites inornatus

Fig: 18 Scabratriporites asper

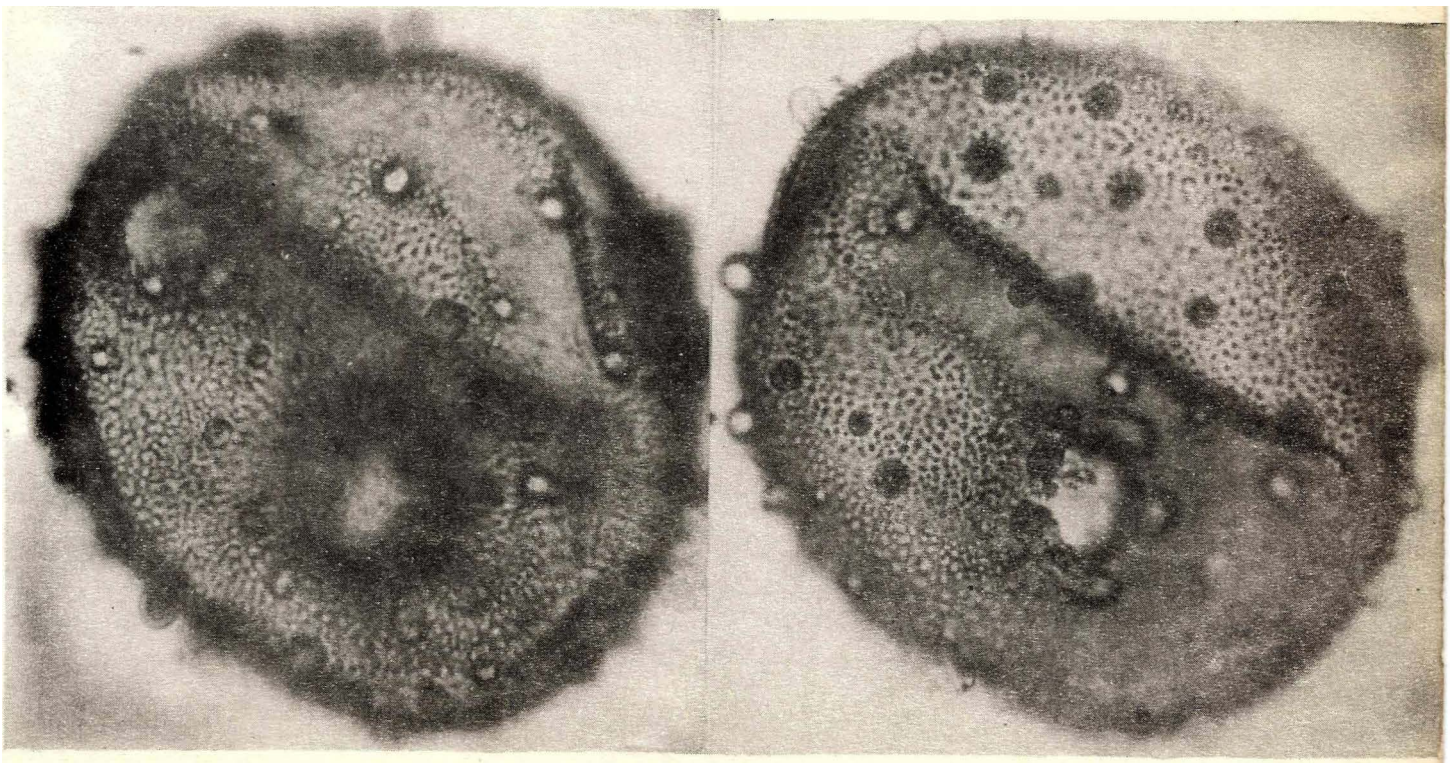


Fig: 19 Gemmatriporites distinctus

1.000 x

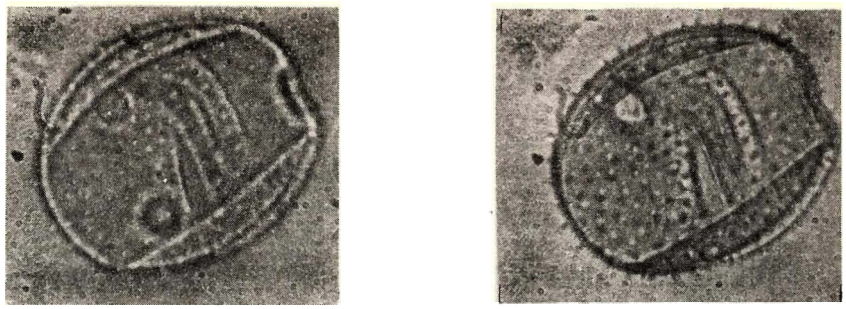


Fig: 20 Echitriporites argutus

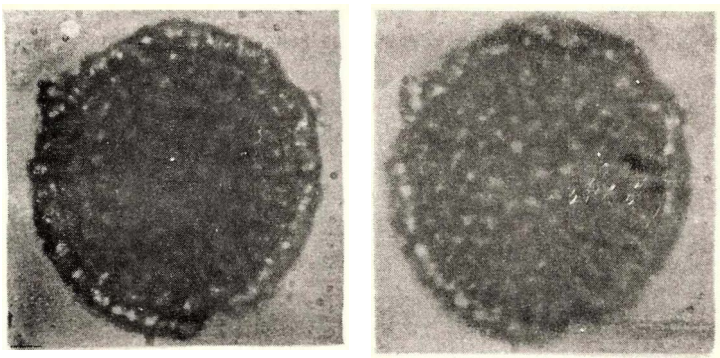


Fig: 21 Retitriporites formalis

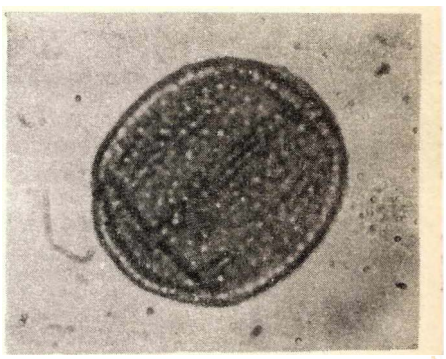


Fig:23 Scabratricolpites asperatus

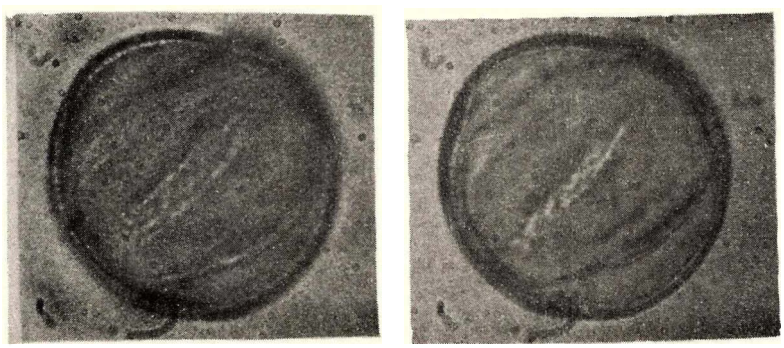
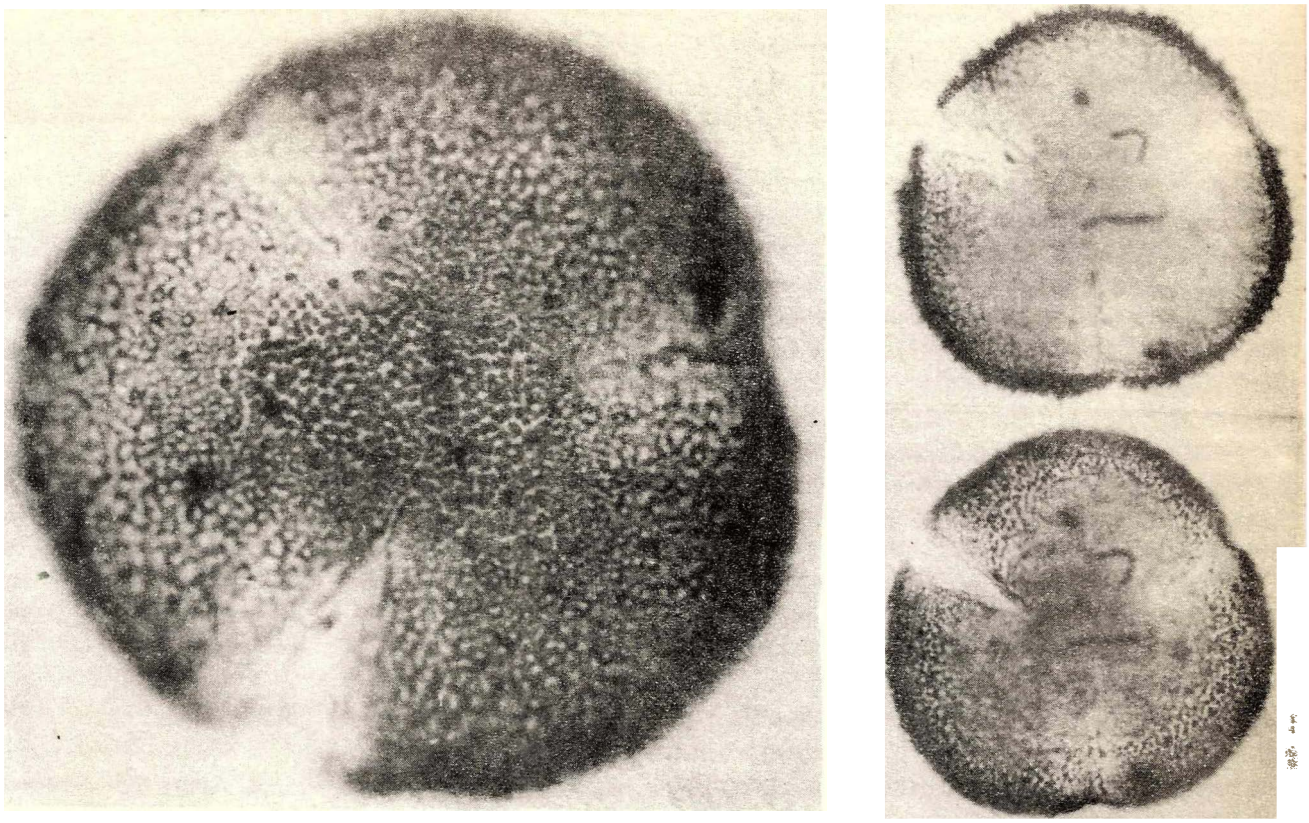


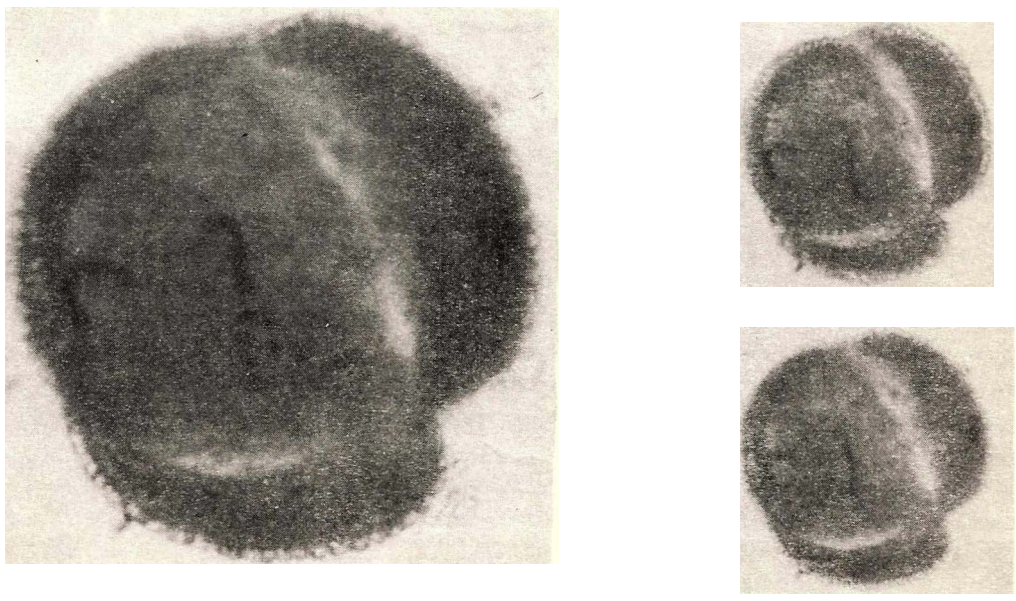
Fig: 22 Psilatricolpites incomptus

1.000 x



(500)

Fig: 24 Echitricolpites giganteus



(500)

1.000x

Fig: 25 Bacutricolpites magnus

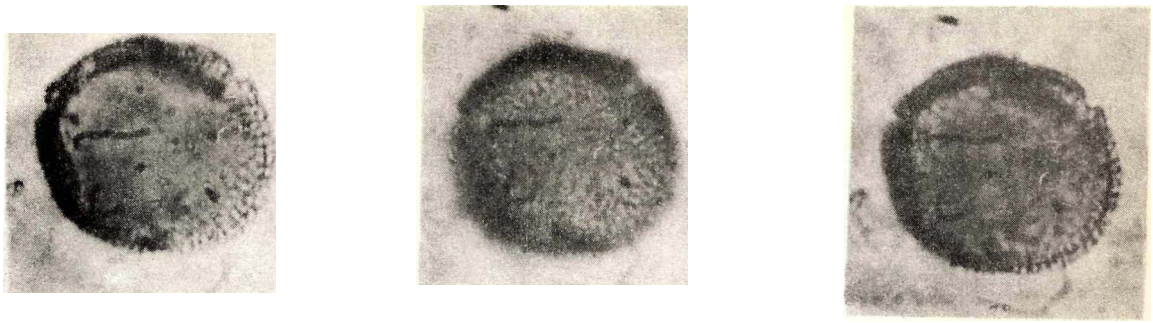


Fig: 26 Retitricolpites ornatus

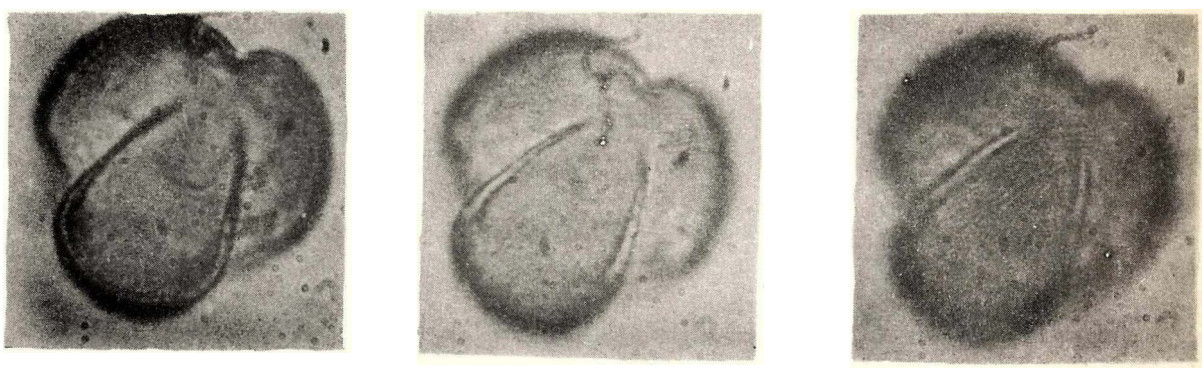


Fig: 27 Striatricolpites virgulatus

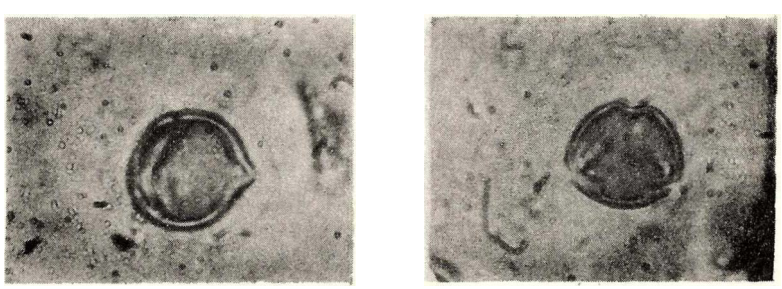


Fig: 28 Psilatricolporites inornatus

1.000 x

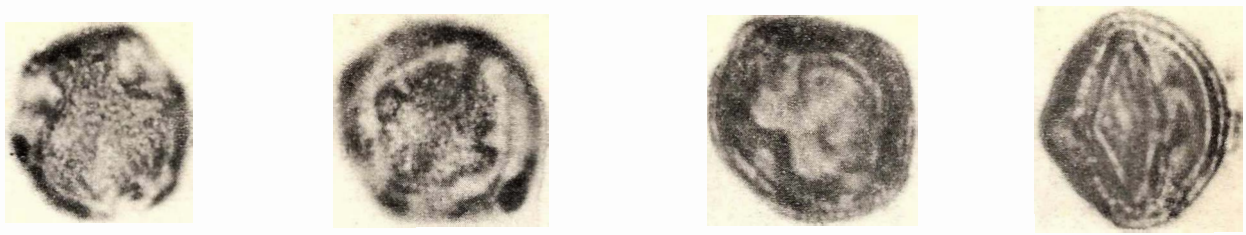


Fig: 29 Scabratricolparites impolitus

Fig: 30 Echitricolporites spinosus

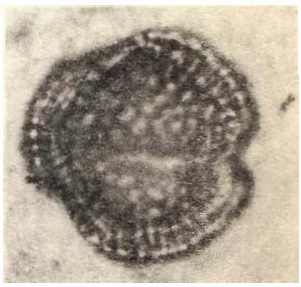


Fig: 31 Retitricolporites normalis.-

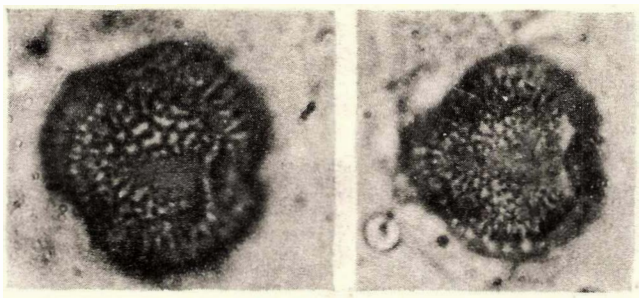


Fig: 31 Retitricolporites normalis

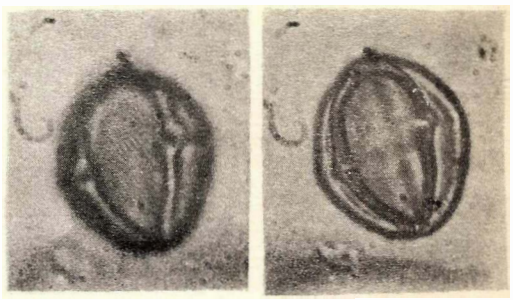


Fig: 32 Striatricolporites formalis.

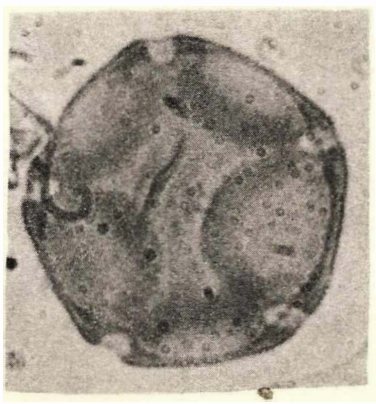


Fig: 33 Stephanoporites fornicatus

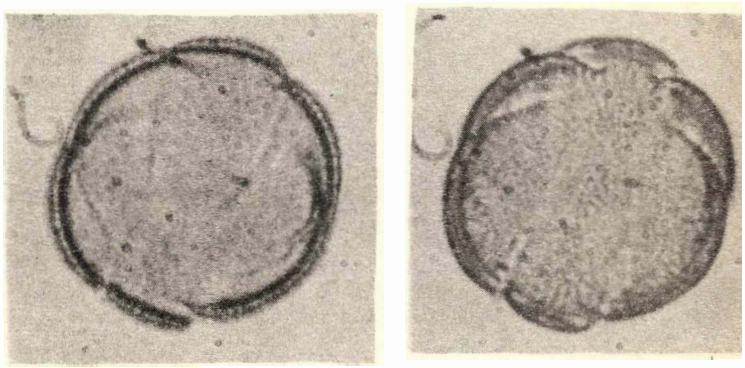


Fig: 34 Stephanocolpites communis

1.000x

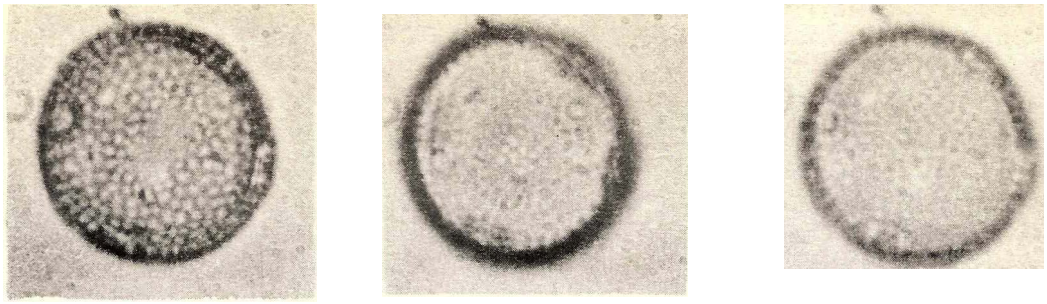


Fig:35 Periporites splendens

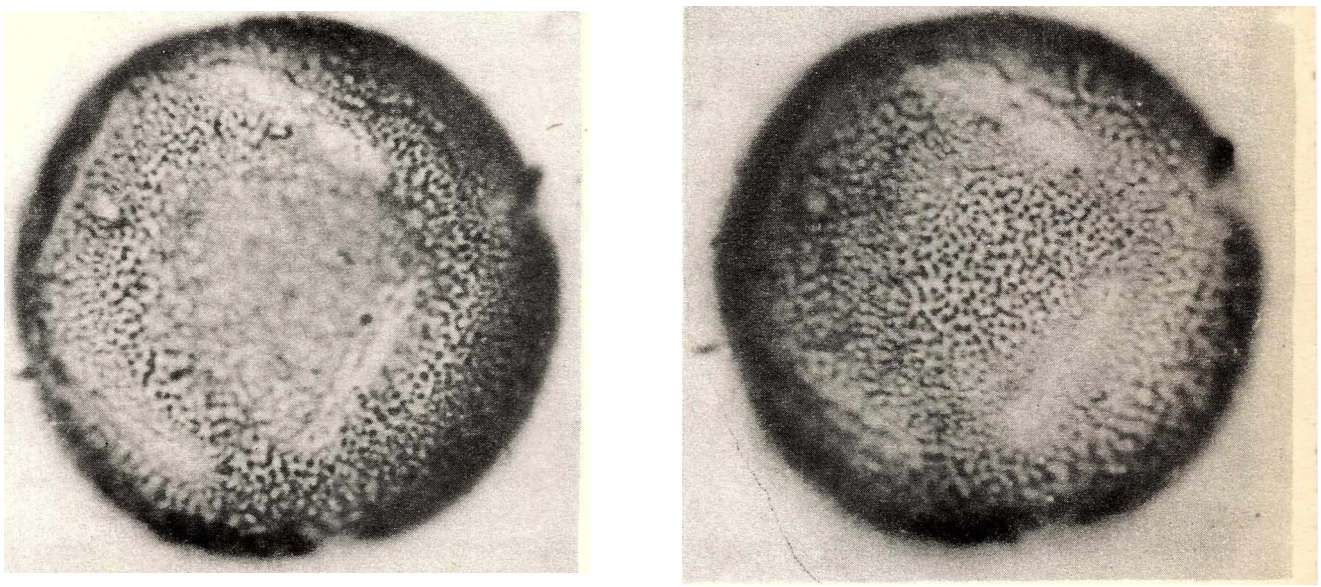


Fig: 36 Pericolpites curiosus

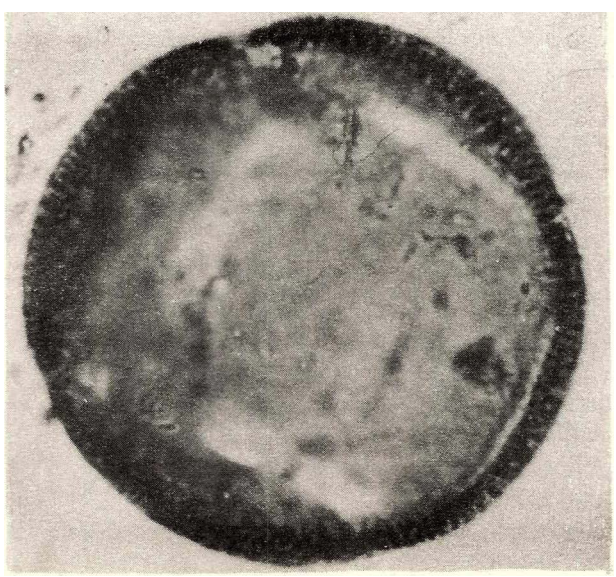


Fig:36 Pericolpites curiosus

1.000x

Fig: 38 Fenestrites spinosus

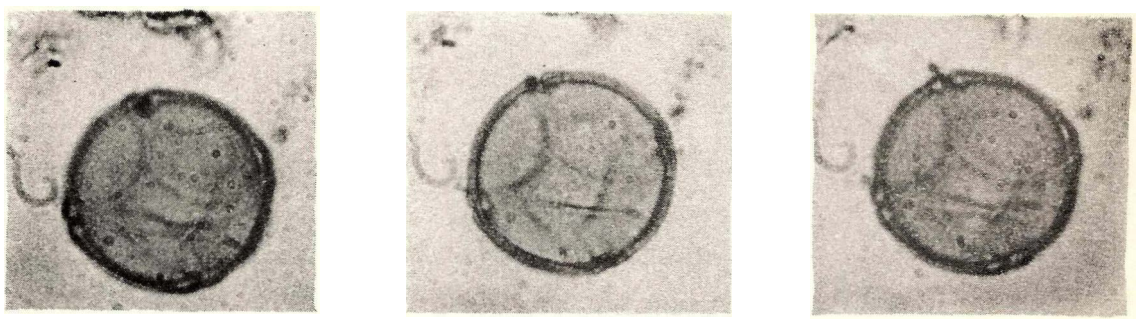


Fig: 37 Pericolporites communis

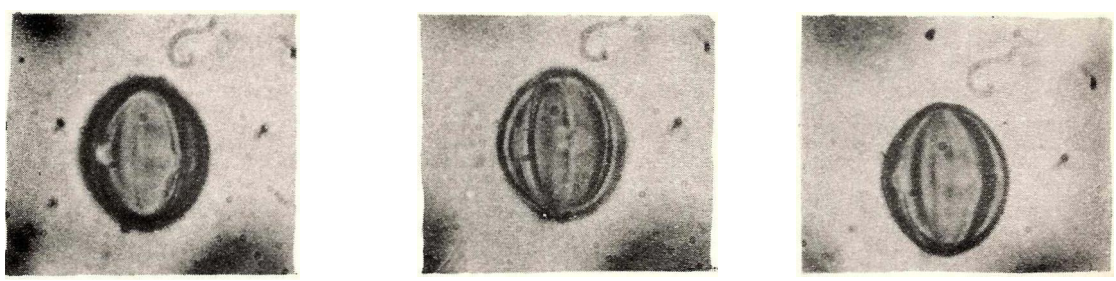


Fig: 39 Heterocolpites incomptus

1.000x