# PALYNOLOGY OF THE CRETACEOUS SEDIMENTS FROM THE SUBSURFACE OF VRIDHACHALAM AREA, CAUVERY BASIN

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## ABSTRACT

Palynological assemblages from the subsurface sediments of Vridhachalam area are studied. 58 genera and 85 species are recognised; 43 species are newly proposed and described.

Neocomian assemblage is recorded from the Periyavadavadi shallow well. This zone is homotaxial with the *Microcachryidites antarcticus* zone recognised in the Tirruturaipundi , Nagapattinam aud Karaikal B and D wells. Aptian-Lower Albian assemblage is recorded in Periyavadavadi, Rupnarayanaliur and Puvanur wells. This assemblage is homotaxial with the *Coptospora cauveriana* zone designated in the subsurface of Karaikudi, Gandharvakottai wells and Dalmiapuram Formation exposed in Dalmiapuram quarries. Lower Senonian age is assigned to assemblage 2 in the Puvanur well on the basis of a rich angiospermic palynoflora . This zone is designated as *Constantinisporis jacquei* zone. Maestrichtian assemblage is recorded in the Kallamedu well which is designated as *Scollardia conferta* zone.

## INTRODUCTION

Lower Cretaceous sediments occurring in the subsurface of the Cauvery basin are studied in detail for palynofossils by VENKATACHALA *et al.* (1972). They designated three palynological zones ranging in age from Upper Jurassic—Lower Albian. The purpose of this study is to catalogue palynofossils occurring in the subsurface sediments of Vridhachalam area and propose a zonation of the Cretaceous sediments uncovered by shallow drilling in this area.

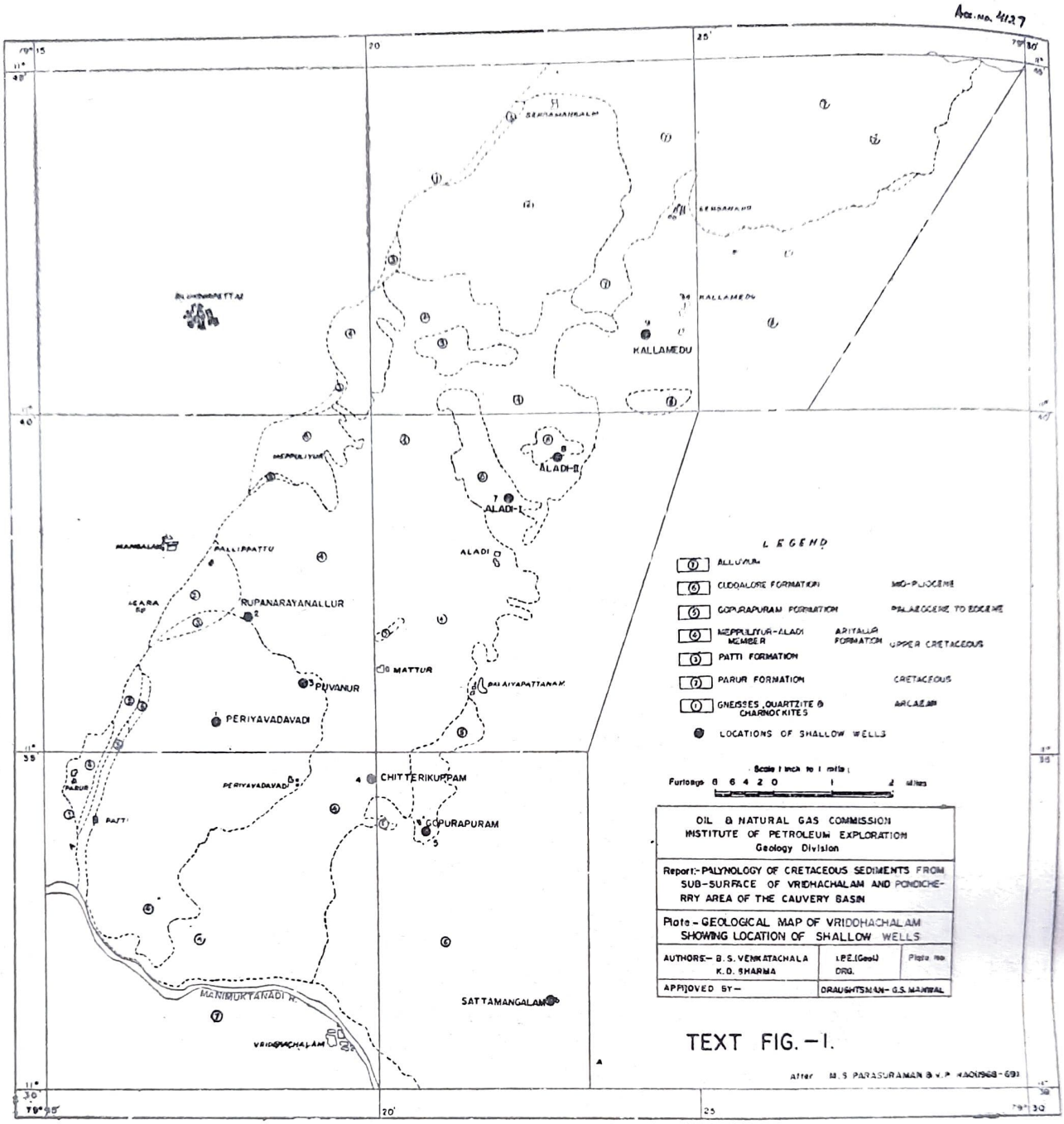
*Microcachryidites antarcticus* and *Coptospora cauveriana* zones earlier proposed by VENKATACHALA *et al.* (1972) are recognised in this area.

The material for this study is based on fossiliferous core and cutting samples from four wells drilled up to a depth of 200 m. in the area by the Oil and Natural Gas Commission (Text-fig. 1).

The method for the recovery of fossils are the same as that employed by the Palynology Laboratory of the I. P. E. (see VENKATACHALA *et al.*, 1972). Two slides are studied for each sample to obtain the assemblage, however in several instances more than 6 slides were scanned and studied to mark and classify rare fossils. 200 palynofossils are counted in each sample to obtain distribution pattern in the wells. The quantitative data thus obtained is graphically represented in Text-figures 2-5.

## SYSTEMATIC PALYNOLOGY

The taxonomic assignments are based on a study of ten well preserved specimens. New taxa that are proposed, are described in detail and a comparative diagnosis is provid-




TEXT FIG. – 1.

ed. The type slides as well as other preparations are lodged at the Palynology laboratory of the Institute of Petroleum Exploration, Dehra-Dun.

**Deltoidospora** (Miner) Potonié, 1956

Type species—*Deltoidospora hallii* Miner, 1935

**Deltoidospora** sp. (Pl. 2, Fig. 44)

*Description*—Triangular miospore, 32 μ, margins straight and apical areas rounded. Trilete mark distinct, almost reaching the margins. Exine up to 2 μ thick, laevigate.

**Dictyophyllidites** Couper emend. Dettmann, 1963

*Type species—Dictyophyllidites harrisii* Couper, 1958

**Dictyophyllidites pectinataeformis** (Bolkhovitina) Dettmann 1963. (Pl. 1, Fig. 9)

*Remarks*—This species distinguishes from the others in possessing sculptured exine, and is recorded from Lower Cretaceous sediments of Otway Basin, Australia and Cenomanian-Turonian sediments of Urals, U.S.S.R.

**Neoraistrickia** Potonié, 1956

*Type species*—*Neoraistrickia truncata* (Cookson) Potonié, 1956

**Neoraistrickia limbata** sp. nov. (Pl. 2, Fig. 43)

*Holotype*—Pl. 2, Fig. 43; Puvanur shallow well, sample no. 2, slide no. 2.

*Diagnosis*—Microspore roundly triangular with slightly concave sides and rounded angles, 25 μ, trilete mark distinct, almost reaching the margins, tapering at the apices. Proximal exine baculate with a broad kyrtomic thickening bordering the trilete mark. Distal exine ornamented with bacula which are short, as broad as long. Equatorial margin bedecked with bacula.

*Comparison*—*N. truncata* is distinguished by more pronounced ornamentation.

**Stereisporites** Pflug, 1953

*Types species*—*Stereisporites stereoides* (Potonié & Venitz) Pflug, 1953

**Stereisporites** sp. cf. **Sphagnumsporites bimmatus** (Naumova Ex. Bolkhovitina 1953) Elsik. (Pl. 2, Fig. 36)

*Diagnosis*—Microspore roundly triangular with convex sides and rounded angles, 32 μ, trilete mark distinct, bordered by prominent up to 2 μ wide raised labra. Proximally laevigate, distally verrucate. Verrucae low, flat, anastomosing to form vermiculate ridges. Exine up to 2 μ thick, margin smooth.

*Comparison*—Spores referred to *Sphagnum* and *Stereisporites* are various. Cingulate spores with a distal thickening, verrucose ornamented acingulate spores and smooth acingulate spores are encountered in the modern genus *Sphagnum*.

Taxonomically they are either referred to *Stereisporites* or *Cingulatisporites*. The specimen encountered here is verrucose distally with a thick spore wall and is closely comparable to *S. bimmatus* described by Elsik (1966).

**Klukisporites** Couper, 1958

Type species—*Klukisporites variegatus* Couper, 1958

**Klukisporites kallameduensis** sp. nov. (Pl. 1, Figs. 20 & 11)

*Holotype*—Pl. 1, Fig. 11. Kallamedu shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Microspore trilete, biconvex, roundly triangular, 60 μ. Trilete rays raised, reaching up to 2/3 the radius. Exine up to 4 μ thick, broadly reticulate. Muri 2 μ high and up to 2 μ broad anastomosing to form polygonal to irregular lumina on the distal side, proximally laevigate.

*Comparison*—*K. scaberis* (Cookson & Dettmann) Dettmann (1963), distinguishes in possessing a granulose proximal exine. *K. punctatus* Venkatachala (1969) has regular muri with polygonal meshes.

**Klukisporites supinicus** sp. nov. (Pl. 2, Figs. 33 & 34)

*Holotype*—Pl. 2, Fig. 33; Kallamedu shallow well; sample no. 2; slide no. 2.

*Diagnosis*—Microspore, trilete, biconvex, roundly triangular in equatorial flattening, trilete mark distinct, rays almost reaching the equatorial margins, broad, accompanied by up to 2 μ thick lips on either side of the suture. Proximally laevigate to verrucose, distally reticulate, muri flat forming circular to irregular lumina. Exine up to 2 μ thick.

*Comparison*—*K. scaberis*, *K. punctatus* and *K. kallameduensis* have raised high muri. *K. supinicus* distinguishes in possessing flat muri that do not form many meshes.

**Impardecispora** Venkatachala, Kar & Raza, 1968

*Type species*—*Impardecispora apiverrucata* (Couper) Venkatachala, Kar & Raza, 1968

**Impardecispora decora** sp. nov. (Pl. 1, Figs. 16 & 17)

*Holotype*—Pl. 1, Fig. 16; Puvanur shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Microspore trilete, triangular with straight to concave sides with rounded angles, 50-55 μ. Y mark distinct, 3/4 radius, bordered by well pronounced arcuate ridges that broaden at the apices and form a valvate thickening. Exine 2-3 μ thick, punctate, not ornamented at interradial areas.

*Comparison*—*T. tribotrys* Dettmann (1963) originally described as *Lygodium* sp. by Samoilovitch (1961) was transferred to *Impardecispora* by Venkatachala *et al.* (1968) on the basis of the well pronounced ornamentation. The new species is comparable to *T. tribotrys* in the overall organisation. *I. tribotrys* differs in possessing well pronounced verrucae all over while *I. decora* is laevigate in interradial regions.

**Cingulatisporites** Thomson, 1953

*Type species*—*Cingulatisporites caminus* Balme, 1957

**Cingulatisporites formosus** sp. nov. (Pl. 1, Fig. 8)

*Holotype*—Pl. 1, Fig. 8; Puvanur shallow well; sample no. 3; slide no. 3.

*Diagnosis*—Microspore roundly triangular, 25-30 μ, sides concave with rounded angles. Trilete mark prominent, reaching the margins, labra 2 μ wide, raised. Body 12-17 μ, exine infragranulose. Cingulum up to 6 μ wide, closely punctate, almost appearing pitted.

*Comparison*—*C. ornatus* Hoeken Klinkenberg, (1966) from the Maestrichtian sediments of Nigeria is closely comparable but differs in not possessing a well pronounced trilete mark.

**Boseisporites** Dev emend. Singh *et al.*, 1964.

*Type species*—*Boseisporites praeclarus* Dev emend. Singh *et al.*, 1964

**Boseisporites paucipunctatus** sp. nov. (Pl. 1, Fig. 27)

*Holotype*—Pl. 1, Fig. 27. Puvanur shallow well; sample no. 3; slide no. 1.

*Diagnosis*—Microspore trilete, triangular with rounded angles and distinct concave sides, 50-60 μ. Trilete mark distinct, rays almost reaching up to the inner part of the cingulum. Exine punctate, puncta less than 1 μ wide and sparsely placed. Equatorial cingulum up to 4 μ broad at the sides and up to 8 μ at the angles forming broad valvae.

*Comparison*—*B. praeclarus* (Dev) Singh *et al.* and *B. insignatus* and *B. punctatus* described by Venkatachala (1969) are larger in size. *B. punctatus* though coming closer to the size range distinguishes in possessing well defined puncta which are very closely spaced.

**Plicifera** Bolkhovitina, 1965

*Type species—Plicifera delicata* Bolkhovitina, 1965

**Plicifera minutus** sp. nov. (Pl 2, Fig. 37)

*Holotype*—Pl. 2, Fig. 37. Kallamedu shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Microspore trilete, 22 μ, triangular in outline with concave sides, trilete mark thin, straight, almost going up to the margin, arcuate ridges distinct, running along the margins and covering apices. Exine laevigate.

*Comparison*—The species described here is the smallest recorded so far and distinguishes in possessing laevigate exine and prominent arcuate ridges.

**Plicifera** sp. (Pl. 1, Fig. 18)

*Description*—Microspore triangular with rounded angles and straight to convex sides. Trilete mark distinct, almost reaching the margins. Exine smooth proximally, distally three arcuate folds cover the trilete area and reach the angular apices.

*Remarks—Plicifera* is separated from *Gleicheniidites* by Bolkhovitina (1965) on the basis of the presence of the arcuate folds.

**Polypodiisporites** Potonié, 1934

*Type species—Polypodiisporites favus* Potonié, 1934

**Polypodiisporites** sp. (Pl. 1, Fig. 11)

*Description*—Microspores bilateral, broadly oval, 60-65 μ. Monolete distinct, bordered by distinct sculpture. Exine up to 4 μ thick, ornamented with up to 6 μ broad and high, irregular verrucae coalescing to form vermiculate pattern.

**Humulatisporites** Krutzsch, 1959

*Type species—Humulatisporites humulatus* Krutzsch, 1959

**Humulatisporites** sp. (Pl. 1, Figs. 24 & 25)

*Description*—Microspore circular, trilete, Y rays up to half the radius. Exine up to 2 μ thick, proximally granulose, with less than 2 μ wide grana, distributed throughout the surface, distally vermiculate, muri not anastomosing regularly to form meshes, however a distinct vermiculate pattern is obtained by coalescence of the muri.

*Comparison*—The not too distinct trilete mark differentiates this species from *H. humulatus*.

**Rouseisporites** Pocock, 1962

*Type species—Rouseisporites reticulatus* Pocock, 1962

**Rouseisporites dakshinii** sp. nov. (Pl. 1, Figs. 2 & 3)

*Holotype*—Pl. 1, Fig. 3. Kallamedu shallow well, sample no. 4; slide no. 2.

*Diagnosis*—Microspore subcircular, or roundly triangular in equatorial view, 80-100 μ, trilete mark distinct, almost reaching the equator. Exine two layered, the inner infrapunctate, 1-5 μ thick and the outer membranous, loosely enveloping, proximally and

distally reticulate, proximally as well as distally ornamented with low muri with complete meshes. Muri low, forming complete meshes, the proximal meshes are small and few in number while the distal ones are broad with circular lumina and large in number, membranous layer projects at the equator in the form of a zona forming funnel like invagination in each radial region of the equator, seen in the form of a pore at the terminating end of the tetrad mark.

*Comparison*—*R. reticulatus* has lesser number of meshes on the distal side. *R. simplex* and *R. radiatus* have muri not forming meshes. *Zilvisporis* described from the Upper Cretaceous of Czechoslovakia is closely comparable to *Rouseisporites* but no pore like structure has been observed by PACLTOVA (1961). A restudy of the type of *Zilvisporis* would bring out the differences.

*Remarks*—The outer membranous layer which projects in the form of zona in the equatorial view is a loosely fitting cover which holds the three porate apertures in the form of a funnel shaped invagination at the three apices of the trilete aperture. DETTMANN (1963) has studied sections of *Rouseisporites* and confirmed the nature of the sclerine and hollow muroid ridges. The membranous nature allows us to suggest that this may be perinous. Dettmann suggests an affinity with the Hepatics.

**Rouseisporites muricatus** sp. nov. (Pl. 2, Figs. 30-32)

*Holotype*—Pl. 2, Fig. 30; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Microspore roundly triangular, 55-70 μ. Exine two layered, inner up to 2 μ thick, scabrate, outer closely enveloping with muroid ridges on distal side, which are irregular, rarely forming meshes of any regular shape and size, proximally three prominent ridges present along the trilete aperture. The three angular areas of the outer exine invaginate in the form of funnels at the tips of the trilete mark.

*Comparison*—*R. reticulatus* and *R. dakshinii* possess regularly arranged meshes on proximal and distal areas. *R. simplex* and *R. radiatus* (Dettmann) have only few ridges, which do not anastomose. *R. laevigatus* is almost smooth but form few low set distal ridges. *R. triangularis* (Pocock) has well pronounced broad funnel shaped invagination at angular areas.

## **Distaverrusporites** Muller, 1968

*Type species*—*Distaverrusporites simplex* Muller, 1968

**Distaverrusporites margaritatus** Muller, 1968. (Pl. 1, Fig. 14)

*Remarks*—Prominent distal and equatorial ornamentation composed of rounded verrucae with a granulose proximal face bearing distinct, raised trilete mark characterises this species.

## **Dictyotosporites** Cookson & Dettmann, 1958

*Type species*—*Dictyotosporites speciosus* Cookson & Dettmann, 1958.

**Dictyotosporites** cf. **D. speciosus** Cookson & Dettmann, 1958. (Pl. 1, Fig. 23)

*Description*—Microspores trilete, roundly triangular, 40 μ. Exine covered by close irregular flabelliform meshes. Muri vermiculate, not forming perfect reticulum in most of the cases.

*Comparison*—*D. speciosus* is closely comparable but form lesser number of reticulum on the body.

**Corrugatisporites** (Thomson & Pflug, 1953), Weyland & Greifeld, 1953

*Lectogenotype*—*Corrugatisporites toratus* Weyland & Greifeld, 1953

**Corrugatisporites** sp. 1 (Pl. 1, Fig. 6)

*Description*—Microspores triangular with convex sides and rounded angles, 60-65 μ, trilete mark hardly perceptible, covered by the ornamentation. Exine up to 3 μ thick, verrucose, verrucae anastomosing at the margins to form a vermiculate, rugulate appearance, broad irregular verrucae and grana found in the contact area.

*Comparison*—The anastomosing verrucae distinguish this species. The other known species have muri for their ornamentation.

**Corrugatisporites** sp. 2 (Pl. 1, Fig. 7)

*Description*—Microspores circular, 42 μ, trilete mark distinct in the form of a triradial opening, verrucate to vermiculate, distally a central ring like area bordered by verrucae present.

**Bullasporis** Krutzsch, 1959

*Type species*—*Bullasporis bullis.* Krutzsch, 1959

**Bullasporis triangularis** sp. nov. (Pl. 1, Figs. 4 & 5)

*Holotype*—Pl. 1, Fig. 4; Kallamedu shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Microspore triangular with concave sides and rounded angles, 75-80 μ large, trilete mark distinct. Exine covered with bacula with a short up to 3μ wide stalk and up to 8 μ broad heads, almost appearing like pin-heads. Pl. 1, fig. 5 illustrates a portion of the spore.

*Comparison*—The distinct stalked, pin-head like bacula distinguishes this species from the others.

**Bullasporis minutus** sp. nov. (Pl. 2, Fig. 38)

*Holotype*—Pl. 2, Fig. 38; Kallamedu shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Microspore roundly triangular, 45 μ, trilete mark distinct, generally masked by the ornamentation. Exine covered by pin-head like baculae with a short stalk.

*Comparison*—*B. triangularis* is larger in size with larger bacula for ornamentation.

**Spore type-1.** (Pl. 1, Fig. 10)

*Description*—Microspore roundly triangular, 50 μ, trilete mark distinct, rays up to half the radius, proximally a hollow unornamented area present around the mark, rest of the exine ornamented with verrucae.

**Cyclusphaera** Elsik, 1966

*Type species*—*Cyclusphaera euribea* Elsik, 1966

**Cyclusphaera intacta** sp. nov. (Pl. 2, Figs. 40-42)

*Holotype*—Pl. 2, Fig. 42; Kallamedu shallow well; sample no. 4; slide no. 1.

*Diagnosis*—Circular to oblong, 45-85 μ. Exine smooth, about 4 μ thick. Central areas both proximally and distally marked, conforming to the shape of the fossil, perhaps to be detached in the form of an operculum.

*Comparison*—*C. euribea* described from the Campanian (Vivian Formation) of Peru does not show the central operculate areas intact.

**Granuloperculatipollis** Venkatachala & Goczan, 1964

*Types species*—*Granuloperculatipollis rudis* Venkatachala & Goczan, 1964

**Granuloperculatipollis mundus** sp. nov. (Pl. 2, Figs. 50 & 51)

*Holotype*—Pl. 2, Fig. 5; Puvanur shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Circular, 25-30 μ, operculate, operculum circular, 20-25 μ, wide, bearing a distinct pore, pore 5-8 μ wide, irregularly defined. Proximal tetragonal compression mark (Y mark) hardly perceptible. Exine granulose with closely set less than 2 μ wide grana.

*Comparison*—*G. rudis* is distinguished by the larger size and bold ornamentation, and is from the Triassic sediments of Hungary.

**Classopollis** Pflug emend. Pocock & Jansonius, 1951

*Type species*—*Classopollis classoides* Pflug emend. Pocock & Jansonius, 1951

**Classopollis meditriangulus** sp. nov. (Pl. 2. Fig. 52)

*Holotype*—Pl. 2, Fig. 52; Rupanarayanaliur shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Grain circular, 22 μ, roundly triangular. Operculum defined by the limits of faint equatorial striations, distally porate, proximally with a distinct triangular interradial fold, almost going up to the rimulae.

*Comparison*—*C. obidosensis* is closely comparable but for the interradial proximal folds which appear to be the characteristic feature of this species. The consistency of the folds in most of the specimens studied by us may prove significant.

**Cycadopites** (Wodehouse, 1933) Wilson & Webster, 1946

*Type species*—*Cycadopites follicularis* Wilson & Webster, 1946

**Cycadopites** sp. (Pl. 2, Fig. 53)

*Description*—Grains oblong, 40 ×20 μ, sulcus as long as the pollen and up to 4 μ wide. Exine laevigate.

**Inaperturopollenites** Pflug (Ex. Thomson & Pflug, 1953) Potonié, 1958

*Type species*—*Inaperturopollenites dubius* (Potonié & Venitz, 1934) Thomson & Pflug, 1953

**Inaperturopollenites** sp. (Pl. 2, Fig. 55)

*Description*—Pollen grain spherical, 30 μ. Exine up to 2 μ thick, folded, no aperture.

**Clavainaperturites** V. d. Hammen & Wijmstra, 1964

*Type species—Clavainaperturites clavatus* V. d. Hammen & Wijmstra, 1964

**Clavainaperturites ornatus** sp. nov. (Pl. 2, Figs. 70-72)

*Holotype*—Pl. 2, Fig. 71; Puvanur shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Pollen grain spheroidal, amb circular, 40-50 μ, apparently non-aperturate. Sexine thicker than nexine, ornamented with pin head shaped bacula; bacula up to 2 μ long and globular with a 2 μ wide head and a narrow base. Extrema lineamenta closely beset with rounded head of the bacula. Nexine fragile with polygonal muri perhaps representing the roots of the bacula or the foot layer.

*Comparison—C. clavatus* described by Hammen and Wijmstra (*l. c.*) is distinguished by smaller sculptural elements.

**Monosulcites** Cookson ex Couper, 1953

*Type species—Monosulcites minimus* Cookson, 1947

**Monosulcites foveolatus** sp. nov. (Pl. 2, Fig. 67)

*Holotype*—Pl. 2, Fig. 67; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grain broadly oval, 36 ×20 μ. Monosulcate, sulcus running throughout the length of the pollen, 10 μ wide at the centre and tapering. Exine finely foveolate, foveola less than 1 μ.

*Comparison—M. minimus* (Cooks.) described by Couper (*l. c.*) is smooth with a spindle-oval shape, *M, palisadus* Couper (*l. c.*) has a tectate exine with clavate—baculate sculpture, *M. perispinosus* (Couper) need be transferred to *Couperipollis* Venkatachala & Kar (1968).

**Monulcipollenites** Fairchild, 1968

*Type species—Monulcipollenites confosus* Fairchild, 1968

**Monulcipollenites foveolatus** sp. nov. (Pl. 2, Fig. 48)

*Holotype*—Pl. 2, Fig. 48; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grains monoporate, spheroidal, 32 μ. Pore circular, 5 μ wide. Exine foveolate, foveola less than 1 μ, circular 2-4 μ apart.

*Comparison—M. confosus* has closely spaced foveola for ornamentation.

**Tricolpites** Cookson, 1947, Ex. Couper, 1953 emend. Belsky, Boltenhagen & Potonié, 1965

*Type species—Tricolpites reticulatus* Cookson, 1947

**Tricolpites crassimarginatus** sp. nov. (Pl. 3, Figs. 90 & 112)

*Holotype*—Pl. 3, Fig. 90; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Tricolpate, circular, 25 μ, colpi almost reaching the pole, broad, wedge shaped. Nexine thicker than sexine, reticulate.

*Comparison—T. microreticulatus* is smaller in size and has very fine meshes for ornamentation. *T. reticulatus* also differs in having a thinner sexine. *T. americana* has broader meshs for its ornamentation. *T. pannosus* is larger in size possessing ragged colpi and has a thinner nexine.

**Tricolpites pilosus** sp. nov. (Pl. 3, Fig. 108)

*Holotype*—Pl. 3, Fig. 108; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grains circular, tricolpate, 25 μ, colpi almost meeting at the poles, narrow. Exine pilose, pila less than 1 μ long with rounded tips.

*Comparison*—*T. microreticulatus*, *T. reticulatus* and *T. americana* are devoid of any surface ornamentation, which characterises this species.

**Tricolpites triangulatus** sp. nov. (Pl. 3, Fig. 115)

*Holotype*—Pl. 3, Fig. 36; Kallamedu shallow well, sample no. 6, slide no. 2.

*Diagnosis*—Amb triangular, 18-20 μ, angulaperturate, tricolpate, Colpi up to 10 μ long, almost reaching the pole, wedge shaped. Sexine thicker than nexine, 1.5 μ thick, laevigate.

*Comparison*—*T. reticulatus* is distinctly ornate and represents pollen of *Gunnera* Linn.

**Tricolpites pasifoveatus** sp. nov. (Pl. 3, Figs. 85 & 92)

*Holotype*—Pl. 3, Fig. 92; Kallamedu shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Amb roundly triangular, 30-40 μ, angulaperturate, tricolpate, colpi up to 10 μ long, narrow. Sexine thicker than nexine, sparsely foveolate.

*Comparison*—*T. microreticulatus* and *T. reticulatus* have reticulate exine. *T. americana* has a closely reticulate exine which distinguishes this species. *T. pannosus* is a characteristic pollen with diffused, not well marked colpi.

**Tricolpites gillii** Cookson, 1957 (Pl. 2, Fig. 69)

*Remarks*—The species has also been recorded from the Upper Cretaceous sediments of Eastern Australia (Dettmann & Playford, 1968), Upper Cretaceous and Lower Tertiary sediments of Victoria (Cookson, 1957; Harris, 1965).

**Striatopollis** Krutzsch, 1959

*Type species*—*Striatopollis sarstedtensis* Krutzsch, 1959

**Striatopollis simplus** sp. nov. (Pl. 2, Fig. 56)

*Holotype*—Pl. 2, Fig. 56; Kallamedu shallow well; sample no. 3; slide no. 1.

*Diagnosis*—Pollen grain tricolpate, subspheroidal, 41 ×25 μ in equatorial view, circular in polar view. Sexine thicker than nexine, striate, striations very fine, even, closely spaced.

*Comparison*—*S. sarstedtensis* described by Krutzsch (1959) from the Lower Palaeocene of Germany and the Upper Cretaceous of Portugal by Groot and Groot (1962) has coarser ornamentation.

**Scollardia** Srivastava, 1966

*Type species*—*Scollardia trapaformis* Srivastava, 1966

**Scollardia conferta** sp. nov. (Pl. 3, Fig. 129)

*Holotype*—Pl. 3, Fig. 129; Kallamedu shallow well; sample no. 6; slide no. 1.

*Diagnosis*—Pollen grain isopolar, tridemicolpate, 60 μ, colpi short. Equatorial contour triangular, sides straight to convex, equatorial protrusion present lodging the colpi. Sexinous striations in the form of finger prints, muri less than 1 μ, parallel.

*Comparison*—*S. trapaformis* is smaller in size and possesses thicker striations and prominent equatorial protrusions.

**Kurtzipites** (Anderson, 1960) Leffingwell, 1971

*Type species*—*Kurtzipites trispissatus* Anderson, 1960

*Remarks*—The genus is emended by Leffingwell (1971) after a reinterpretation of the aperture as tricolpate or colporate. It was earlier interpreted as triporate by Anderson (1960). The opening is slit like, striate and wedge shaped in equatorial view. The authors agree with this interpretation and thus *K. annulatus* is here included under colpate pollen. The aperture is considered as brevicolpate.

**Kurtzipites annulatus** Norton, 1969 (Pl. 3, Fig. 123)

**Psilatricolporites** V. d. Hammen ex V. d. Hammen & Wijmstra, 1964

**Psilatricolporites virdhachalamensis** sp. nov. (Pl. 3, Fig. 100)

*Holotype*—Pl. 3, Fig. 100; Kallamedu shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Amb triangular, 28 μ, angulaperturate, tricolporate, pores sunken, forming slight depression at the angles. Colpi almost reaching the pole, narrow. Exine up to 2 μ thick, psilate.

*Comparison*—The sunken pores differentiate this species. Similar syncolporate pollen belonging to *Myrtaceidites* possess distinct, aspidate aperture. *Cupanieidites* has a distinct ornate exine and is also trisyncolporate, with a distinct polar triangle. *Psilatricolporites operculatus* van der Hammen and Wijmstra, 1964 is brevicolpate and possesses an operculum. *P. crassus* described by the same authors is comparable in the shape and general nature of the pore opening but also has shorter colpi. *P. triangularis* described by Van der Hammen & Wijmstra has oculate pore openings. *P. optimus*, *P. normalis*, *P. vanus* and *P. obscurus* described by Guzman (1967) though possessing long colpi are not syncolporate as in *P. vridhachalamensis* described here.

**Psilatricolporites pseudolaevigatus** sp. nov. (Pl. 3, Figs. 84 & 96)

*Holotype*—Pl. 3, Fig. 96; Kallamedu shallow well; sample no. 4; slide no. 2.

*Diagnosis*—Amb circular, 35-42 μ, angulaperturate, tricolporate. Colpi 12-15 μ, narrow, reaching up to half radius, pores sunken up to 6 μ, wide, lolongate. Exine laevigate to scabrate, up to 2 μ thick.

*Comparison*—*P. operculatus* is distinguished by smaller colpi possessing an operculum. *P. optimus* has longer colpi and a large pore as well as *P. normalis*, *P. obscurus* and *P. vanus* have distinct lolongate pores and a colpi traversing up to 3/4 radius. *P. vridhachalamensis* is syncolporate and thus is distinguished.

**Retisyncolporites** Guzman, 1967

*Types species*—*Retisyncolporites aureus* Guzman, 1967

**Retisyncolporites cauveriensis** sp. nov. (Pl. 3, Fig. 99)

*Holotype*—Pl. 3, Fig. 99; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grains syncolporate, sub-angular, 25 μ. Pore 2 μ wide, sunken, colpi reaching the pole. Exine tectate. Sexine thicker than nexine, finely reticulate.

*Comparison*—*R. aureus*, the type species has polar islands and wide pores. *R. angularis* described by GUZMAN (1967) is distinctly reticulate and thus not comparable.

**Verrutricolporites** V. d. Hammen & Wijmstra, 1964

*Type species*—*Verrutricolporites rotundiporus* V. d. Hammen & Wijmstra, 1964

**Verrutricolporites distinctus** sp. nov. (Pl. 3, Fig. 102)

*Holotype*—Pl. 3, Fig. 102; Kallamedu, shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Pollen grain triangular, 25 μ, angulaperturate, tricolporate. Colpi very small, demicolpate; pore up to 4 μ wide. Sexine thicker than nexine. Verrucate, verrucae up to 6 μ wide and 2 μ high.

*Comparison*—*V. rotundiporus* has large circular pores and long colpi while the species described here distinguishes in possessing small colpi and small pores. The sexine has wart like verrucae for the ornamentation.

**Foveotricolporites** Pierce, 1961

*Type species*—*Foveotricolporites rhombohedralis* Pierce, 1961

*Remarks*—Pollen included here under this generic circumscription are with a roundly triangular amb, angulaperturate, tricolporate, colpi up to half the radius of the pollen and circular pores possessing a foveolate exine.

*Tiliaepollenites* Potonié ex. Potonié & Van der Hammen, is porate with distinct vestibula and the pore situated in the interradial areas. *Retitricolporites* Van der Hammen & Wijmstra is differentiated by a long colpi and reticulate exine.

**Foveotricolporites brevicolpatus** sp. nov. (Pl. 3, Fig. 124)

*Holotype*—Pl. 3, Fig. 124; Puvanur shallow well; sample no. 3; slide no. 1.

*Diagnosis*—Amb roundly triangular, 30-35 μ, angulaperturate, brevicolporate, pore up to 4 μ wide, circular. Colpi wedge shaped, up to 8 μ long. Sexine thicker than nexine, foveolate, foveola less than 2 μ wide, up to 3 μ apart and equally distributed.

*Comparison*—*F. crassisexinus* Hoeken Klinkenberg, 1966 has a very thick exine as compared to the species described here. *F. florschultzi* (V. d. Hamm.) V. d. Hammen & Wijmstra, 1964 has longer colpi almost extending to the whole radius of the pollen.

**Cupanieidites** Cookson & Pike, 1954

*Type species*—*Cupanieidites orthoteichus* Cookson & Pike, 1954

**Cupaniedites reticularis** Cookson, 1954. (Pl. 3, Fig. 103)

*Remarks*—Pollen grain triangular with slightly convex sides, 35 μ, angulaperturate, trisyncolporte, colpi on one side not reaching the pole. Nexine as thick as sexine, sexine finely reticulate.

Similar pollen are also recorded from the Maestrichtian-Danian sediments of Escarpado Canyon, California by DRUGG (1967). The reticulation in the holotype is more prominent than those found in this specimen, as well as the one figured by DRUGG (1967).

**Cranwellia** Srivastava, 1966 emend. Srivastava, 1969

*Type species*—*Cranwellia striata* (Couper) Srivastava, 1969

**Cranwellia cauveriensis** sp. nov. (Pl. 2, Fig. 79)

*Holotype*—Pl. 2, Fig. 79; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grain isopolar, 42 μ, angulaperturate, roundly triangular with rounded corners and convex sides, tricolporate, colpi short. Sexine thick, striate, muri up to 2 μ wide, colpi up to 6 μ long, pore chamber inconspicuous, obscured by the ornamentation.

*Comparison*—*C. striata* Srivastava, 1969 has longer equatorial protrusions. *C. rumseyensis* Srivastava, 1969 is closely comparable but differs in possessing broader colpi and is smaller in size. *C. edmontonensis* and *C. fida* are tetracolporate. *C. bacata* has long pronounced colpi.

**Victorisporis** Belsky, Boltenhagen & Potonié, 1965

*Type species*—*Victorisporis roberti* Belsky, Boltenhagen & Potonié, 1965

**Victorisporis ornatus** sp. nov. (Pl. 2, Figs. 63, 64, 73 & 74)

*Holotype*—Pl. 2, Fig. 73; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grains heteropolar, roundly triangular in polar view. Triporate, 30-40 μ, pores submarginal at the angles, circular, bordered with a collar. Exine about 2 μ thick. Sexine reticulate, with fine meshes.

*Comparison*—*V. roberti* differentiates in possessing a slightly thinner exine.

**Victorisporis tetraporoides** sp. nov. (Pl. 3, Fig. 107)

*Holotype*—Pl. 3, Fig. 107; Kallamedu shallow well; sample no. 6; slide no. 2.

*Diagnosis*—Pollen grains circular, 32 μ. Tetraporate, pores subpolar, surrounded by a thickened annulus, tetrachotomosulcate. Sexine thicker than nexine, scabrate to finely reticulate.

*Remarks*—The pores though four in number are characteristically comparable to those found in *Victorisporis* described here as well as by Belsky, Boltenhagen and Potonié (1965). The connection forming a thinner area confirms the tetrachotomosulcate nature which is not very clear in triporate specimens studied by us.

**Constantinisporis** Belsky, Boltenhagen & Potonié, 1965

*Type species*—*Constantinisporis jacquei* Belsky, Boltenhagen & Potonié, 1965

**Constantinisporis sulcatus** sp. nov. (Pl. 3, Fig. 82)

*Holotype*—Pl. 3, Fig. 82; Puvanur shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Pollen heteropolar, circular, 56 μ. Trichotomosulcate, sulcus up to 8 μ long, narrow, submarginal. Sulcus ends broadening into a triangular area. Exine up to 1 μ thick, tectate.

*Comparison*—*C. jacquei* illustrated here in Pl. 3, figs. 1 & 2 has abroadened and angular sulcus.

**Striatriporites** Hoeken Klinkenberg, 1966

*Type species*—*Striatriporites nigeriensis* Hoeken Klinkenberg, 1966

**Striatriporites caurveriana** sp. nov. (Pl. 3, Figs. 110 & 111)

*Holotype*—Pl. 3, Fig. 32, Kallamedu shallow well, sample no. 6, slide no. 2.

*Diagnosis*—Specimen folded laterally and hence the exact position and natuer of the pores can not be clearly seen. Striate, triporate, 40 μ. Pores simple, obscured by the ornamentation.

*Comparison*—The ornamentation is heavier as compared to *S. nigeriensis* described from the Maestrichtian sediments of Nigeria by Hoeken Klinkenberg (1966).

**Triorites** Erdtman ex. Cookson emend. Couper, 1953

*Type species*—*Triorites magnificus* Cookson, 1950

**Triorites** sp. (Pl. 3, Fig. 137)

*Diagnosis*—Pollen grain 45 μ, triorate, angulaperturate. Sides slightly convex with protruding pores, protrusion up to 10 μ wide, conical, rounded. Nexine up to 2 μ thick, sexine reticulate, with irregular meshes. Muri up to 1 μ wide with irregular vermiculate lumina.

*Remarks*—*T. anularis* has also a collar as seen in this species. The pollen appears to be of Onagraceous affinity.

**Triporopollenites** Pflug & Thomson in Thomson & Pflug. 1953

*Type species*—*Triporopollenites andersoni* Drugg, 1967

**Triporopollenites minimus** sp. nov. (Pl. 3, Fig. 121)

*Holotype*—Pl. 3, Fig. 121. Periyavadavadi shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Pollen grains roundly triangular, triporate, angulaperturate, nexine thicker than sexine, thicker at the aperture, scabrate.

*Comparison*—*Triporopollenites* sp. B. described by Drugg (1967) is closely comparable.

**Triatriopollenites** (Pflug) Thomson & Pflug, 1953

*Type species*—*Triatriopollenites rurensis* Thomson & Pflug, 1953

**Triatripollenites minutus** sp. nov. (Pl. 3, Fig. 94)

*Holotype*—Pl. 3, Fig. 94; Periyavadavadi shallow well; sample no. 3; slide no. 2.

*Diagnosis*—Triporate, roundly triangular, 16 μ, sides concave. Pores striate, 2 μ wide, circular to oblong, atrium 2-3 μ thick. Exine up to 1 μ thick, laevigate-scabrate.

*Comparison*—*Triatriopollenites* described from other Upper Cretaceous sediments are distinctly larger. *Triporites iverseni* V. d. Ham. described by Hoeken-Klinkenberg (1964) from the Upper Cretaceous of Nigeria is 22 μ in size and possesses larger atrium surrounding the pores.

**Engelhardtiapollenites** Potonié, 1951

*Type species*—*Engelhardtapollenites punctatus* Potonié, 1951

**Engelhardtioipollenites** sp. (Pl. 3, Fig. 93)

*Description*—Pollen grain roundly triangular, triporate, pore simple, 2 μ broad. Exine scabrate.

**Intratriporopollenites** (Pflug.) Thomson & Pflug, 1953

*Type species—Intratriporopollenites indubitabilis* Potonié in Thomson & Pflug, 1953

**Intratriporopollenites** sp. (Pl. 2, Fig. 66)

*Description*—Pollen grain roundly triangular, triporate, pores situated in the interradial regions, up to 2 μ wide, circular, with a thickening around the pore area. Exine up to 2 μ thick, scabrate.

**Gothanipollis** Krutzsch, 1959.

*Type species—Gothaniopollis gothani* Krutzsch, 1959

**Gothanipollis descretus** sp. nov. (Pl. 2, Figs. 58 & 59)

*Holotype*—Pl. 2, Fig. 58; Chitterikuppam shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Amb triangular, lateral areas infolded forming a prominent thickening all along the amb except for the pore areas. Angulaperturate, triporate, pore up to 2 μ wide, bordered by a vestibulum with a projecting tip; the exinous thickening of the wall almost in the form of a kyrtome connecting the vestibula. Sexine thicker than nexine, scabrate.

*Comparison—G. thorneia* Drugg (1961) is closely comparable but is larger in size. *G. gothani* Krutzsch (1959) is also closely comparable but has more prominent triangular protrusions. *G. aleganee* Zaklinjskaya, is also closely comparable but for its smaller size.

**Proteacidites** Cookson Ex. Couper, 1953.

*Type species—Proteacidites adenathoides* Cookson, 1950

**Proteacidites amolosexinous** Dettmann & Playford, 1968 (Pl. 3, Figs. 105 & 106)

*Remarks*—Pollen grains here assigned to this species are triporate, angulaperturate with a triangular equatorial out line, and a thick nexine measuring up to 3 μ and a tectate sexine forming a rugulate pattern. The pores poroject and are up to 7 μ wide.

**Proteacidites cauverii** sp. nov. (Pl 3, Fig. 97)

*Holotype*—Pl. 3, Fig. 97; Kallamedu shallow well; sample no. 6; slide no. 1.

*Diagnosis*—Amb triangular, straight to slightly concave sides, 56 μ. Angulaperturate, triorate, pore up to 8 μ wide. Exine up to 2 μ thick, not thinning towards the aperture. Sexine baculate-pilate, pila-bacula arranged irregularly.

*Comparison—P. rectomargines* Cookson is closely comparable but differs in forming a more prominent ornamentation and distinctly differentiated sexine, which in the present species is not very distinct. *P. subscabratus* Couper is smaller in size and has a thickened ora and scabrate exine. The other species are prominently ornamented and hence not comparable. *P. cauverii* distinguishes in possessing a not well defined ora which does not possess a collar or annulus and baculate ornamentation. The low set baculae coalesce to appear vermiculate.

**Proteacidites decorus** sp. nov. (Pl. 3, Fig. 91)

*Holotype*—Pl. 3, Fig. 91; Kallamedu shallow well; sample no. 6; slide no. 1.

*Diagnosis*—Pollen grains triorate, angulaperturate, roundly triangular with straight to convex sides. Pore circular, up to 8 μ in diameter. Nexine up to 2 μ thick, sexine less than 1 μ, reticulate, reticulum less than 1 μ wide.

*Comparison*—*P. cauverii* lacks the projecting pores. *P. amolosexinus* has more prominent pores.

**Ulmipollenites** Wolff, 1934 emend. Srivastava, 1969

*Type species*—*Ulmipollenites undulosus* (Wolff, 1934) Anderson, 1960

**Ulmipollenites tetraporites** sp. nov. (Pl. 2, Fig. 75)

*Holotype*—Pl. 2, Fig. 75. Chitterikuppam shallow well; sample no. 2; slide no. 1.

*Description*—Amb circular, 20-40 μ, tetraporate, pores subequatorial, simple, up to 5 μ wide. Exine 1.5 μ thick, ornamented with low set verrucae of 2-4 μ wide giving a pseudoreticulate ulmoid appearance.

*Comparison*—*U. krempii* (Anderson) Elsik has a prominent ornamentation and a distinct arcus.

**Ulmipollenites rugulatus** sp. nov. (Pl. 2, Fig. 65 & Pl. 3, Fig. 120)

*Holotype*—Pl. 2, Fig. 65; Chitterikuppam shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Amb circular, isopolar, pentaporate, pores subequatorial. Sexine 1 μ thick, tectate, verrucate, verrucae low, unevenly distributed giving a mottled appearance to the surface.

*Comparison*—*U. tetraporites* is smaller in size and angulaperturate.

**Ulmipollenites arcuatus** sp. nov. (Pl. 2, Fig. 76)

*Holotype*—Pl. 2, Fig. 76; Chitterikuppam shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Amb tetragonal 2.5 μ. Angulaperturate, tetraporate, pore surrounded with a slightly thickened annulus connected with an arcuate ridge. Sexine up to 1 μ thick, thicker than nexine, ornamented with sparsely placed low set verrucae.

*Comparison*—*U. tetraporites*, *U. rugulatus* do not possess arcuate ridges. *U. krempii* though possessing an arcuate ridge has distinct ornamentation which distinguishes from *U. arcuatus*.

**Scabrastephanocolpites** Van d. Hammen & de Mutis, 1966

*Type species*—*Scabrastephanocolpites scabratus* Van d. Hammen & de Mutis, 1966

*Remares*—Polycolpate pollen with more than four small colpi reaching up to half or less than half the polar radius with laevigate to scabrate exine are included under this genus.

**Scabrastephanocolpites pentaaperturites** sp. nov. (Pl. 3, Fig. 122)

*Holotype*—Pl. 3, Fig. 122; Kallamedu shallow well; sample no. 6; slide no. 1.

*Diagnosis*—Amb pentagonal, angulaperturate, 40 μ. Pentabrevicolpate, colpi ill defined, up to 10 μ long, distinct. Exine up to 2 μ thick, psilate to scabrate.

*Comparison*—*S. scabratus* is also pentacolpate with fine narrow colpi, this species is distinguished from *S. pentaaperturites* which has large wedge shaped colpi and is pentagonal in shape. *S. vanegensis* has only four colpi. *S. lisamae* is costaecolpate with distinct granulose ornamentation.

**Pollen type-1.** (Pl. 3, Fig. 125)

*Description*—Amb circular, spheroidal, aperture not seen. Sexine tectate, beset with hyaline spines. Spines sparsely distributed.

*Comparison*—*Malvacearumpollenites* is closely comparable to the specimen described here. However, lack of recognizable apertural openings makes it difficult for these pollen to be placed in *Malvacearumpollenites*.

**Pollen Type-2.** (Pl. 3, Figs. 117 & 128)

*Description*—Amb circular, spheroidal. Aperture not visible, echinate with broad based spines and sharp tips. Sexine thick. Tectate.

*Comparison*—As no apertures are traced it is difficult to place these specimens in any of the known genera. However, *Compositoipollenites* shows a close resemblance. *Malvacearumpollenites*, which is polyporate, is also superficially comparable.

**Schizosporis** Cookson & Dettmann, 1959

*Type species*—*Schizosporis reticulatus* Cookson & Dettmann, 1959

**Schizosporis coromandelensis** sp. nov. (Pl. 2, Fig. 35)

*Holotype*—Pl. 2, Fig. 35; Puvanur shallow well; sample no. 4; slide no. 1.

*Diagnosis*—Ovoid, 80 μ long and 40 μ broad. Exine up to 2 μ thick, ornamented with uniformly broad polygonal meshes. Muri up to 2 μ high, enclosing up to 4 μ wide lumina. Aperture not perceptible.

*Comparison*—*S. reticulatus* is larger in size and possesses an equatorial aperture. *S. rugulatus* Cookson & Dettmann has fine rugulae not anastomosing to form meshes. *S. parvus* and other smooth forms with an equatorial aperture were separated into a new genus *Psilospora* by Venkatachala and Kar (1968).

**Proxapertites** V. d. Hammen, 1956

*Type species*—*Proxapertites operculatus* V. d. Hammen, 1956

**Proxapertites kallameduensis** sp. nov. (Pl. 2, Fig. 46)

*Holotype*—Pl. 2, Fig. 46; Kallamedu shallow well; sample no. 2; slide no. 1.

*Diagnosis*—Pollen grain circular, zonisulcate, sulcus along the equatorial margin, 70-80 μ. Exine tectate, finely reticulate, with lumina less than 1 μ wide and equally fine muri. Sulcus appearing as groove along the equator sometimes hardly perceptible.

*Comparison*—Pollen grains described as *Nymphea rufescens* and equatorial monocolpate pollen by Boltenhagen (1963) from the Lower Tertiary of Cameron are closely comparable. *P. operculatus* is distinguished by broad meshes and has a closer ornamentation.

*Remarks*—*P. cursus* is recorded by Hoeken-Klinkenberg from Upper Cretaceous of Nigeria and from Palaeocene of Sarawak, Malaysia by Muller (1968).

*P. operculatus* type of pollen is compared to the tropical palm *Nipa* by Muller (1968) who considers this group of pollen to represent an extinct group of palms possibly related to *Nipa*. Venkatachala and Kar (1969) described comparable pollen under *Nymphaeoipollis* and compared their specimen with the pollen of *Nymphaea*. Their specimen are from the Palaeogene of Kutch. There is a close resemblance between the two genera *Nymphaeopollis* and *Proxapertites* and both are distributed in Upper Cretaceous—Lower Tertiary sediments.

The diad like nature of *Proxapertites* specimen described by V. d. HAMMEN (1956) led VENKATACHALA AND KAR (1969) to separate their genus. However, these two genera seem to be very closely comparable.

**Pterospermopsis** Wetzel, 1952

*Type species—Pterospermopsis danica* Wetzel, 1952

**Pterospermopsis** sp. (Pl. 3, Fig. 47)

*Description*—Body circular in polar view, thick walled, smooth with a firm 12-15 μ broad equatorial envelop. Overall diameter 40-50 μ.

*Comparison—P. danica* is larger in size.

The following taxa are also recorded:—

*Microfoveolatosporis albertonensis* (Cookson, 1956) Comb nov.; (Pl. 1, fig. 12)
*M. punctata* Cookson, 1956, (Pl. 1, fig. 26)
*Polypodiaceoisporites retirugatus* Muller, 1968 (Pl. 1, fig. 15)
*Rouseisporites reticulatus* Pocock, 1962, (Pl. 1, fig. 1).
*Cicatricosisporites pseudotripartitus* (Bolkhovitina) Comb. nov.; (Pl. 1, fig. 28),
*Cicatricosisporites brevilaesuratus* Couper, 1958; (Pl. 1, fig. 29)
*Trilites verrucosus* Venkatachala & SHARMA, 1974; (Pl. 1, fig. 19).
*Dictyotosporites complex* Cookson & Dettmann, 1958; (Pl. 1, fig. 22).
*Taurocusporites segmentatus* Stover, 1962; (Pl. 2, fig. 39)
*Psilospora parva* (Cookson & Dettmann, 1959) Venkatachala & Kar, 1968; (Pl. 2, fig. 54)
*Schizaeoisporites eocaenicus* (Selling, 1945) Potonié, 1956; (Pl. 1, fig. 13)
*Classopollis obidosensis* Groot & Groot, 1962; (Pl. 2, fig. 49)
*Microcachryidites antarcticus* Cookson, 1947; (Pl. 2, fig. 47)
*Ephedripites multicostatus* Brenner, 1963; (Pl. 2, fig. 45)
*Myrtaceidites eugeniioides* Cookson & Pike, 1954; (Pl. 2, fig. 68)
*M. mesonesus* Cookson & Pike, 1954; (Pl. 3, fig. 118)
*M. parvus* Cookson & Pike, 1954;( Pl. 3, fig. 95)
*Striatricolporites conspicuus*, Muller, 1968; (Pl. 3, fig. 86)
*Proteacidites tuberculatus* Cookson, 1950; (Pl. 2, fig. 77)
*Tricolpopollenites globularis* Groot *et al.* 1961; (Pl. 3, fig. 89)
*Tricolpites microreticulatus* Belsky, Boltenhagen & Potonié, 1965; (Pl. 3, figs. 109 & 116)
*T. reticulatus* Cookson, 1947; (Pl. 3, figs. 87 & 88)
*T. americana* Wijmstra, 1966; (Pl. 3, figs. 113 & 114).
*T. pannosus* Dettmann & Playford, 1968; (Pl. 3, fig. 83)
*Vacuopollis pyramis* Pflug, 1953; (Pl. 2, fig. 62).
*Turonipollis helmigii* Van Ameron, 1965; (Pl. 2, figs. 60 & 61)
*Andreisporis mariae* Belsky, Boltenhagen & Potonié, 1965; (Pl. 2, fig. 57)
*Constantinisporis jacquei* Belsky, Bottenhagne & Potonié, 1965; (Pl. 3, figs. 80 & 81)
*Triporopollenites rugatus* Newman, 1965; (Pl. 2, figs. 78 & Pl. 3, fig. 119)
*Scabratriporites simpliformis* V. Hoeken Klinkenberg, 1966; (Pl. 3, fig. 98)
*Psilatricolporites operculatus* V. d. Hammen & Wijmstra, 1964; (Pl. 3, fig. 104)

The following taxa occurring in only the Lower Cretaceous sediments are not described and illustrated :

*Baculatisporites* sp.; *Gleicheniidites senonicus* Ross, 1949; *Undulatisporites* sp.; *Contignisporites*

*Gebulentus* Dettmann, 1963; *Microreticulatisporites* sp.; *Klukisporites scaberis* (Cookson & Dettmann) Dettmann; 1963; *Densoisporites velatus* Weyland & Krieger emend. Krasnova, 1961; *Concavissimisporites* sp.; *Ornamentifera* sp.; *Ceratosporites equalis* Cookson & Dettmann, 1958; *C. acutus* Venkatachala *et al.* 1969; *Biretisporites spectabilis* Dettmann, 1963; *Laevigatosporites* sp.; *Crybelosporites stylosus* Dettmann, 1963; *Trilites tuberculiformis* Cookson, 1947; *Foveotriletes* sp.; *Cerebropollenites* sp.; *Phyllocladidites* sp.; *Osmundacidites wellmanii* Couper, 1953; *Spheripollenites scabratus* Couper, 1953; *Callialasporites monoalasporites* (Balme) Dev, 1961; *C. triletes* Singh *et al.*, 1964; *C. segmentatus* (Balme) Srivastava, 1963; *C. dampieri* (Balme) Dev, 1961.

## PALYNOLOGICAL ASSEMBLAGES AND DISCUSSION ON AGE

Well No. 1—Periyavadavadi;

16 Core samples are studied.

Three distinct palynological assemblages are recorded in this well. (Text-fig. 2).

Assemblage-1

The oldest assemblage at 130-155 m. (Sample Nos. 12-16) is characterised by the following taxa :

*Cyathidites* spp., *Lycopodiumsporites reticulumsporites*, *Classopollis* spp., *Araucariacites* sp. *Callialasporites monoalasporus*, *Alisporites grandis*, *Podocarpidites ellipticus*, *Callialasporites trilobatus*, *C. dampieri*, *Lycopodiumsporites eminulus*, *Spheripollenites scabratus*, *S. psilatus*, *Osmundacidites wellmanii*, *Baculatisporites* sp., *Gleicheniiditess enonicus*, *Callialasporites segmentartus*, *Microcachryidites antarcticus*, *Callialasporites triletus*, *Vitreisporites pallidus*, *Contignisporites glebulentus*, *Klukisporites scaberis*, *Podosporites tripakshii*, *Clavifera* sp., *Densoisporites velatus*, *Concavissimisporites* sp., *Ornamentifera* sp., *Stereisporites antiquasporites*, *Ceratosporites equalis*, and *Contignisporites multimuratus*.

The presence of *Microcachryidites*, *Callialasporites*, *Klukisporites*, *Densoisporites*, *Contignisporites*, *Podosporites* and the absence of *Polypodiaceoisporites*, *Coptospora*, *polypodiisporites* distinguish this assemblage. This assemblage is assigned to *Microcachryidites antarcticus* zone dated as Neocomian from the Tiruturaipundi, Nagapattinam and Karaikal wells (Venkatachala *et al.*, 1972).

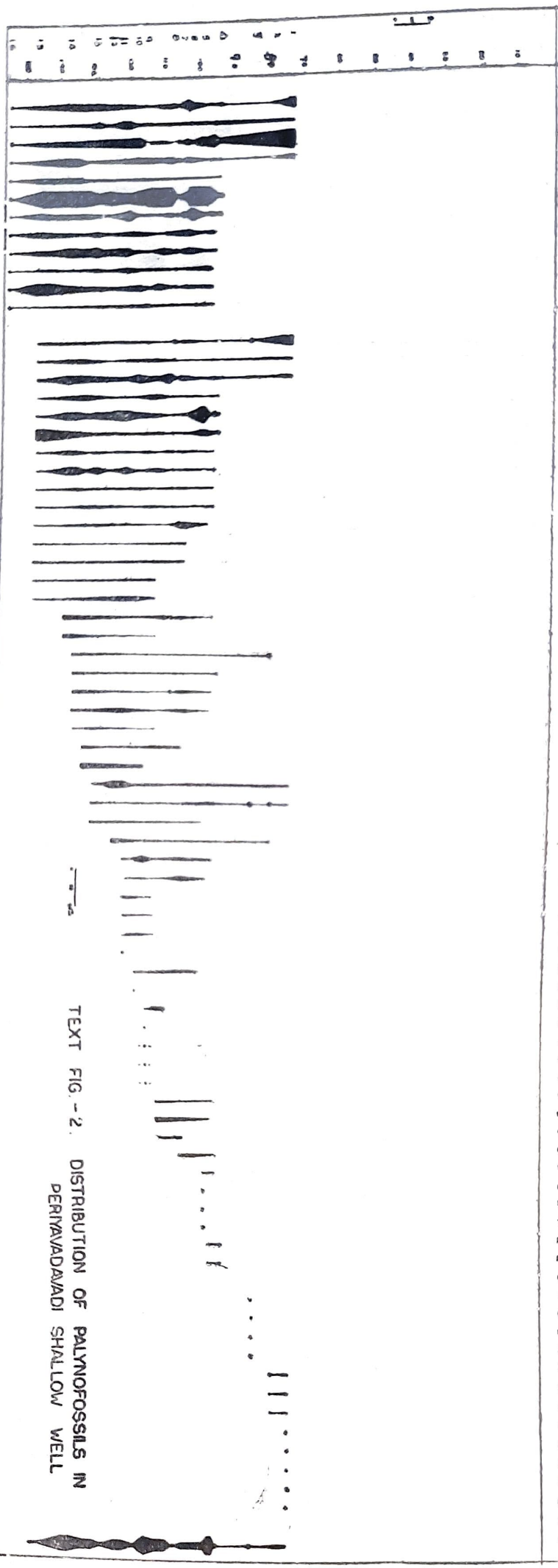
Assemblage-2

The overlying assemblage occurring at 95-130 m. (Sample nos. 4-11) contains the following taxa :

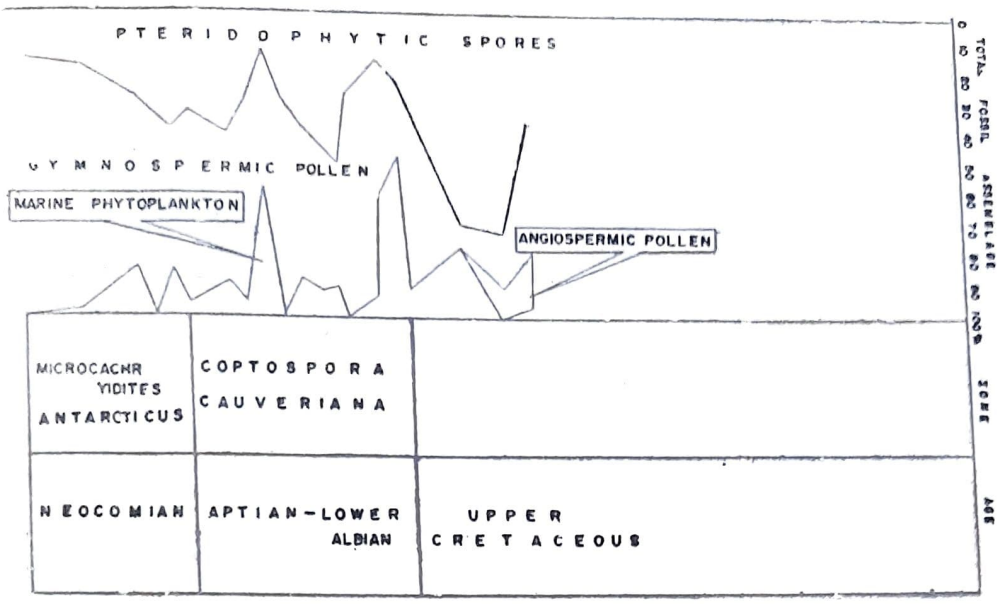
*Cyathidites* spp., *Araucariacites australis*, *Callialasporites monoalasporus*, *Lycopodiumsporites reticulumsporites*, *Alisporites grandis*, *Podocarpidites ellipticus*, *Osmundacidites wellmanii*, *Gleicheniidites senonicus*, *Callialasporites segmentatus*, *Microcachryidites antarcticus*, *Inaperturopollenites*, sp. *Classopollis obidosensis*, *Callialasporites trilobatus*, *Callialasporites dampieri*, *Spheripollenites scrabratus*, *Callialasporites triletus*, *Cycadopites* sp., *Vitreisporites pallidus*, *Clavifera* sp., *Concavissimisporites* sp., *Ornamentifera* sp., *Ceratosporites equalis*, *Polypodiisporites* sp., *Coptospora cauveriana*, *Trilites tuberculiformis* and *Polypodiaceoisporites retirugatus*.

This assemblage is devoid of angiospermic pollen which forms an important part of the younger Upper Cretaceous sediments. *Coptospora cauveriana*, *Polypodiaceoisporites* sp. and *Crybelosporites stylosus* are significant in this assemblage which is assigned to *Coptospora cauveriana* zone and dated as Aptian-Lower Albian in age on comparison with homotaxial assemblage in Nagapattinam, Karaikudi wells (Venkatachala *et al.*, 1972) and Dalmiapuram Formation—assemblage (Venkatachala & Sharma, 1969).

Assemblage-3




TEXT FIG. - 2. DISTRIBUTION OF PALYNOFOSSILS IN PERIYAVADAVADI SHALLOW WELL




Text-fig. 2 (*contd.*)

A scanty assemblage consisting of angiospermic pollen in association with other Cretaceous taxa is recorded at 75-95 m. (Sample nos. 1-3) in the cored sections of this well. The following taxa are recorded:

*Cyathidites* spp., *Lycopodiumsporites reticulumsporites*, *Classopollis classoides*, *Araucariacites australis*, *Osmundacidites wellmanii*, *Baculatisporites* sp., *Gleicheniidites senonicus*, *Callialasporites segmentatus*, *Densoisporites vlatus*, *Pterospermopsis* sp., *Polypodiisporites* spp., *Biretisporites spectabilis*, *Rouseisporites* spp., *Psilospora parva*, *Cicatricosisporites* sp., *Ephedripites multicostatus*, *Tricolpites reticulatus*, *Tricolpites* sp., *Intratriporopollenites triangularis*, *Foveotricolporites brevicolpatus*-*Tricolporopollenites* sp., *Liliacidites kaitangataensis* and Hystrichosphaerids.

*Rouseisporites* in association with angiospermic pollen listed above are common fossils of Upper Cretaceous age. *Classopollis obidosensis* which dominates the assemblage is also a fossil commonly encountered in the Upper Cretaceous sediments. The data recovered from these sediments is too meagre for a more precise dating. The sediments were deposited under a marine influence.

Well No. 2—Rupanarayanaliyur:

The only samples to yield palynofossil assemblage are those located at 160 and 180 m. (Text-fig. 3). The following taxa are recorded:

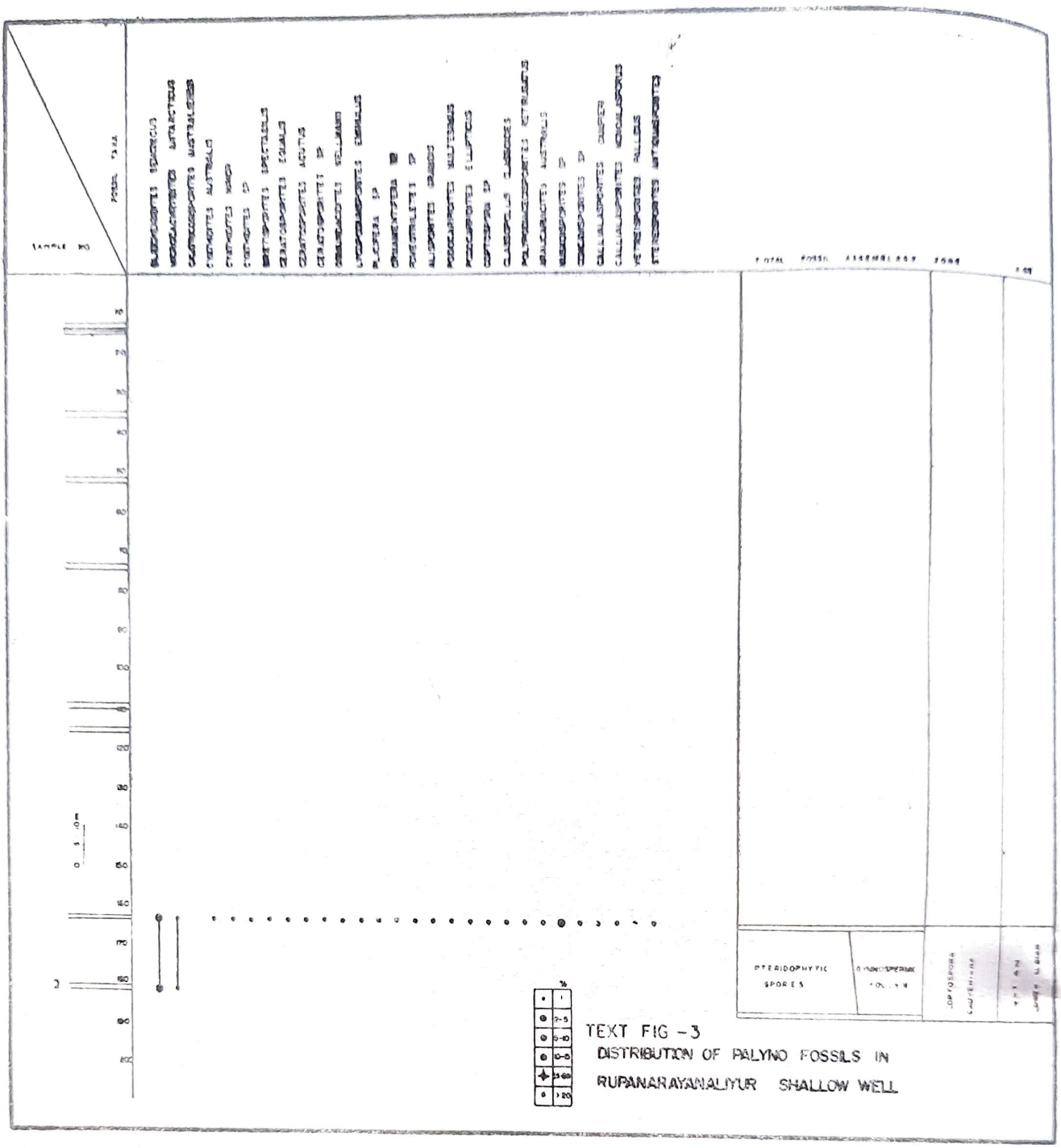
*Gleicheniidites senonicus*, *Microcachryidites antarcticus*, *Cicatricosisporites australiensis*, *Cyathidites australis*, *Cyathidites minor*, *Biretisporites spectabilis*, *Ceratosporites equalis*, *Ceratosporites acutus*, *Osmundacidites wellmanii*, *Lycopodiumsporites eminulus*, *Plicifera* sp., *Ornamentifera* sp., *Foveotriletes* sp., *Alisporites grandis*, *Podocarpidites multisimus*, *P. ellipticus*, *Coptospora* spp., *Classopollis* spp., *Polypodiaceoisporites retirugatus*, *Araucariacites australis*, *Concavisporites* sp., *Callialasporites dampieri*, *C. monoalasporus*, *Vitreisporites pallidus* and *Stereisporites antiquasporites*.

*Coptospora*, *Polypodiaceoisporites* in association with *Microcachryidites*, *Callialasporites* and *Classopollis* are important zone fossils of *Coptospora cauveriana* zone (Aptian-L. Albian). This zone is also recognised in the Periyavadavadi shallow well.

Reworked *Virkkipollenites*, a characteristic Permian pollen, is also encountered.

Well No. 3—Puvanur:

6 core samples and several cuttings were studied. Two distinct assemblages are recognised (Text-fig. 4).



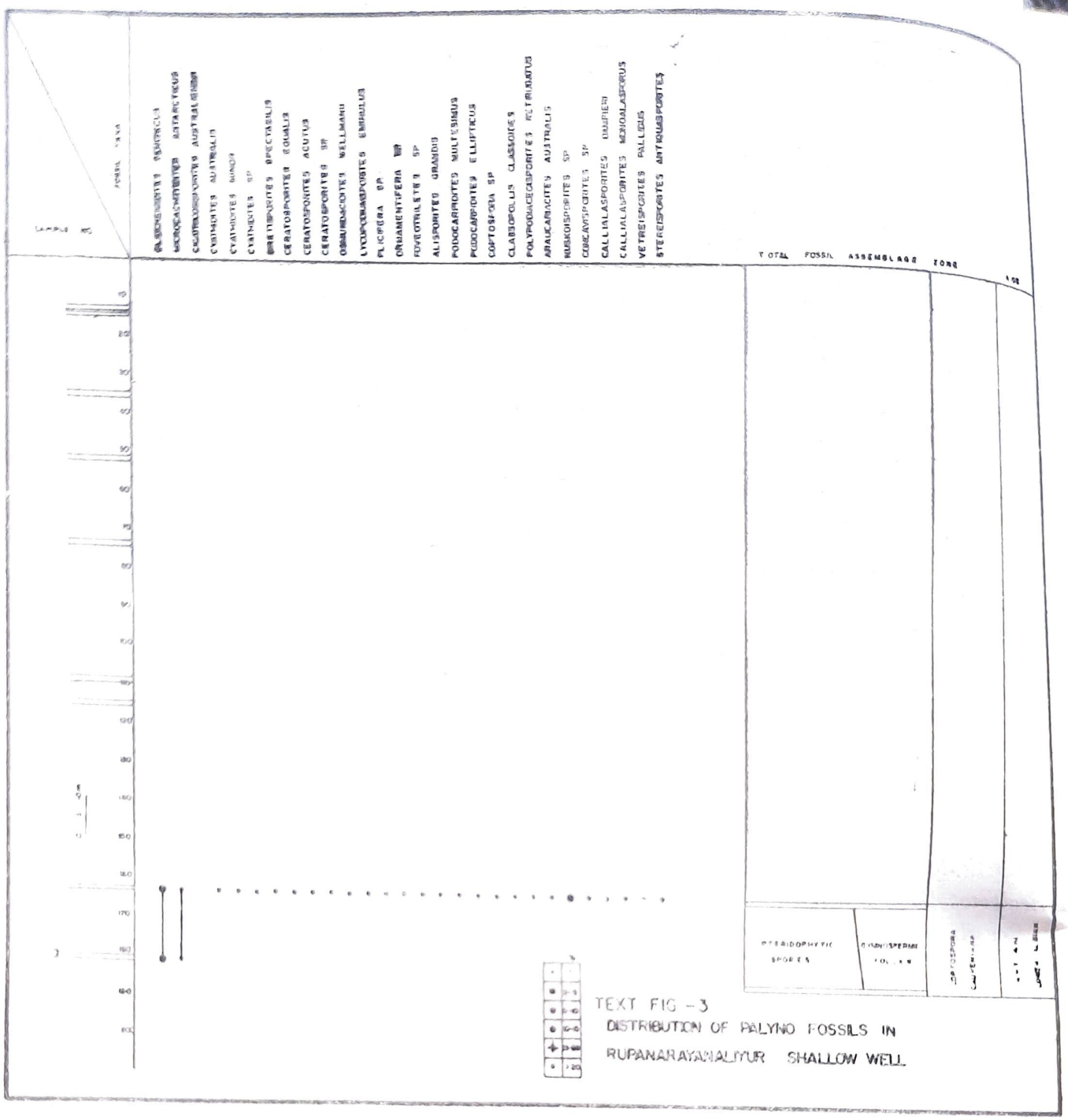

Test Fig. 4

Assemblage-1

Samples taken at 150 m. and below (sample nos. 4, 5 & 6) yielded a rich assemblage composed of the following taxa :

*Cicatricosisporites australiensis*, *Cyathidites australis*, *Lycopodiumsporites eminulus*, *Classopollis classoides*, *Araucariacites australis*, *Neoraistrickia limbata*, *Microcachryidites antarcticus*, *Densoisporites velatus*, *Gleicheniidites* sp., *Osmundacidites wellmanii*, *Stereisporites antiquasporites*, *Baculatisporites comaumensis*, *Contignisporites multimuratus*, *C. glebulentus*, *Callialasporites segmentatus*, *C. trilobatus*, *Alisporites grandis*, *Podocarpidites ellipticus*, *Ceratosporites equalis*, *Coptospora cauveriana*, *Polypodiaceoisporites retirugatus*, *Trilites verrucosus*, *Cooksonites variabilis*, *Schizosporis reticulatus*, *Leptolepidites* sp., *Ephedripites multicostatus* and *Pilosisporites* sp.

*Copotospora*, *Ceratosporites*, *Podocarpidites*, *Callialasporites*, *Microcachryidites* and *Polypodiaceoisporites* are marker taxa of *Coptospora cauveriana* zone recognised also in wells 1 & 2.



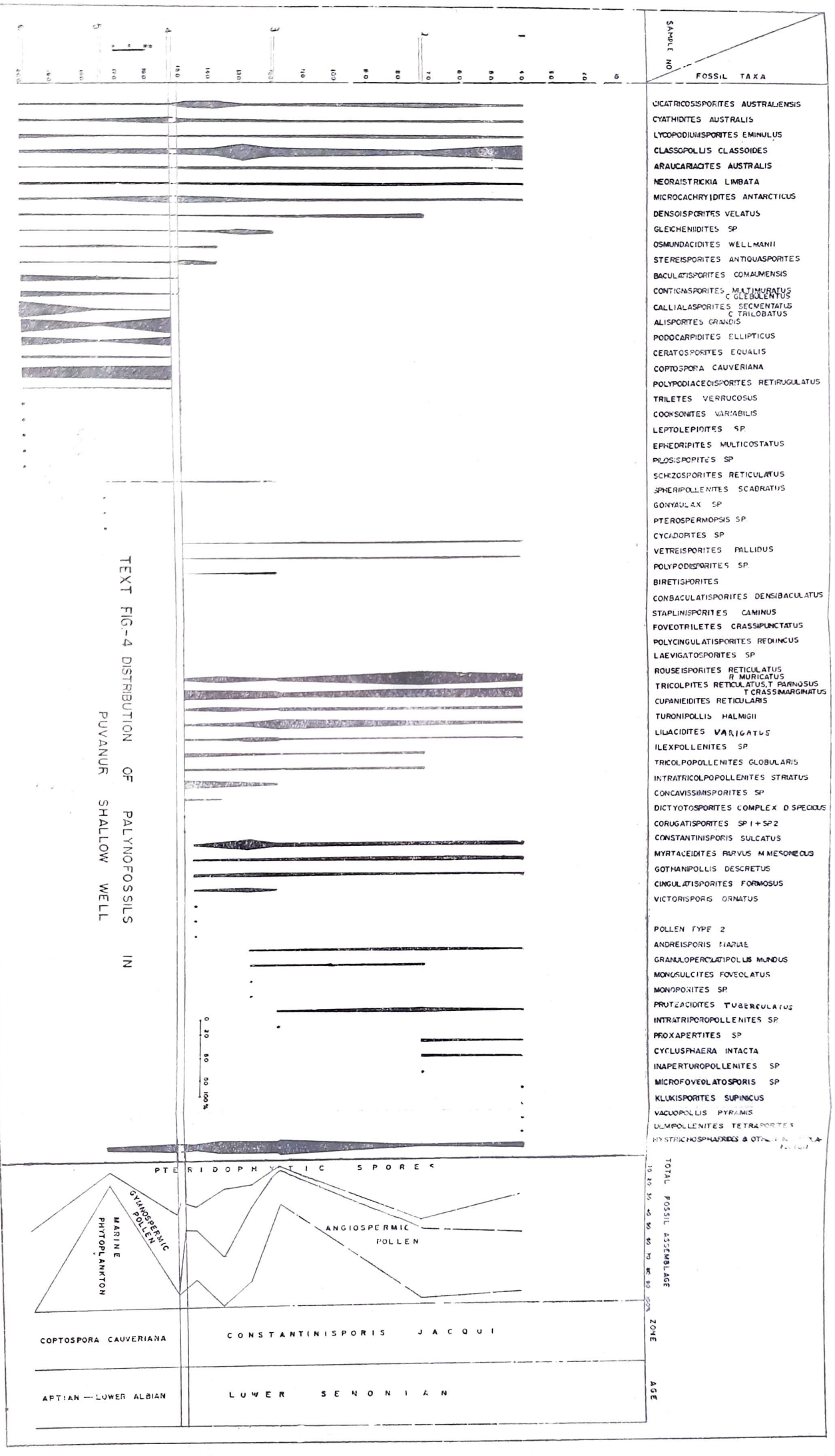

Test Fig. 4

Assemblage-1

Samples taken at 150 m. and below (sample nos. 4, 5 & 6) yielded a rich assemblage composed of the following taxa :

*Cicatricosisporites australiensis*, *Cyathidites australis*, *Lycopodiumsporites eminulus*, *Classopollis classoides*, *Araucariacites australis*, *Neoraistrickia limbata*, *Microcachryidites antarcticus*, *Densoisporites velatus*, *Gleicheniidites* sp., *Osmundacidites wellmanii*, *Stereisporites antiquasporites*, *Baculatisporites comaumensis*, *Contignisporites multimuratus*, *C. glebulentus*, *Callialasporites segmentatus*, *C. trilobatus*, *Alisporites grandis*, *Podocarpidites ellipticus*, *Ceratosporites equalis*, *Coptospora cauveriana*, *Polypodiaceoisporites retirugatus*, *Trilites verrucosus*, *Cooksonites variabilis*, *Schizosporis reticulatus*, *Leptolepidites* sp., *Ephedripites multicostatus* and *Pilosisporites* sp.

*Copotospora*, *Ceratosporites*, *Podocarpidites*, *Callialasporites*, *Microcachryidites* and *Polypodiaceoisporites* are marker taxa of *Coptospora cauveriana* zone recognised also in wells 1 & 2.




TEXT FIG-4 DISTRIBUTION OF PALYNOFOSSILS IN PUVANUR SHALLOW WELL

Assemblage-2

This assemblage is recorded in samples 1-3 taken between 40-150 m. and is dominated by angiospermic pollen.

*Cicatricosisporites* spp., *Cyathidites* spp. *Lycopodiumsporites* spp., *Classopollis* spp., *Araucariacites* spp., *Neoraistrickia limbata, Microcachryidites antarcticus, Pilosisporites* sp., *Cycadopites* sp., *Vitreisporites pallidus, Polypodiisporites* sp., *Vitreisporites* sp., *Rouseisporites* spp., *Tricolpites* spp., *Cupanieidites* spp., *Turonipollis helmigii, Liliacidites variegatus, Ilexpollenites* sp., *Tricolpopollenites globularis, Intratricolpopollenites striatus, Constantinisporis* spp., *Myrtaceidites* spp., *Victorisporis ornatus, Clavainaperturites ornatus, Andreisporis mariae, Granuloperculatipollis mundus, Monosulcites foveolatus, Monoporites* sp., *Proteacidites tuberculatus, Intratriporopollenites* sp., *Microfovolatosporis* sp., *Proxapertites* sp., *Cyclusphaera intacta, Vacuopollis pyramis, Ulmoidipites tetraporites.*

The occurrence and dominance of *Rouseisporites* spp. *Tricolpites* spp., *Cupanieidites* spp., *Turonipollis* spp. *Liliacidites* spp., *Constantinisporis* spp., *Myrtaceidites* spp. *Gothanipollis* sp., *Andreisporis* spp. and *Proteacidites* spp. is significant. This assemblage is also distinguished by the dominance of a large number of angiospermic pollen which are post Albian in age. *Callialasporites* spp., *Coptospora* sp., *Contignisporites* spp., and *Polypodiaceoisporites* spp. which are dominant Lower Cretaceous fossils do not continue into this assemblage. Thus this assemblage is assigned a Lower Senonian age and designated as *Constantinisporis jacqui* zone (VENKATACHALA, 1972).

Well No. 4—Kallamedu

Six core samples were analysed for palynofossils from this well, which is drilled on the Cuddalore sandstone outcrops. The first core sample representing the Cuddalore Sandstone proved unfossiliferous.

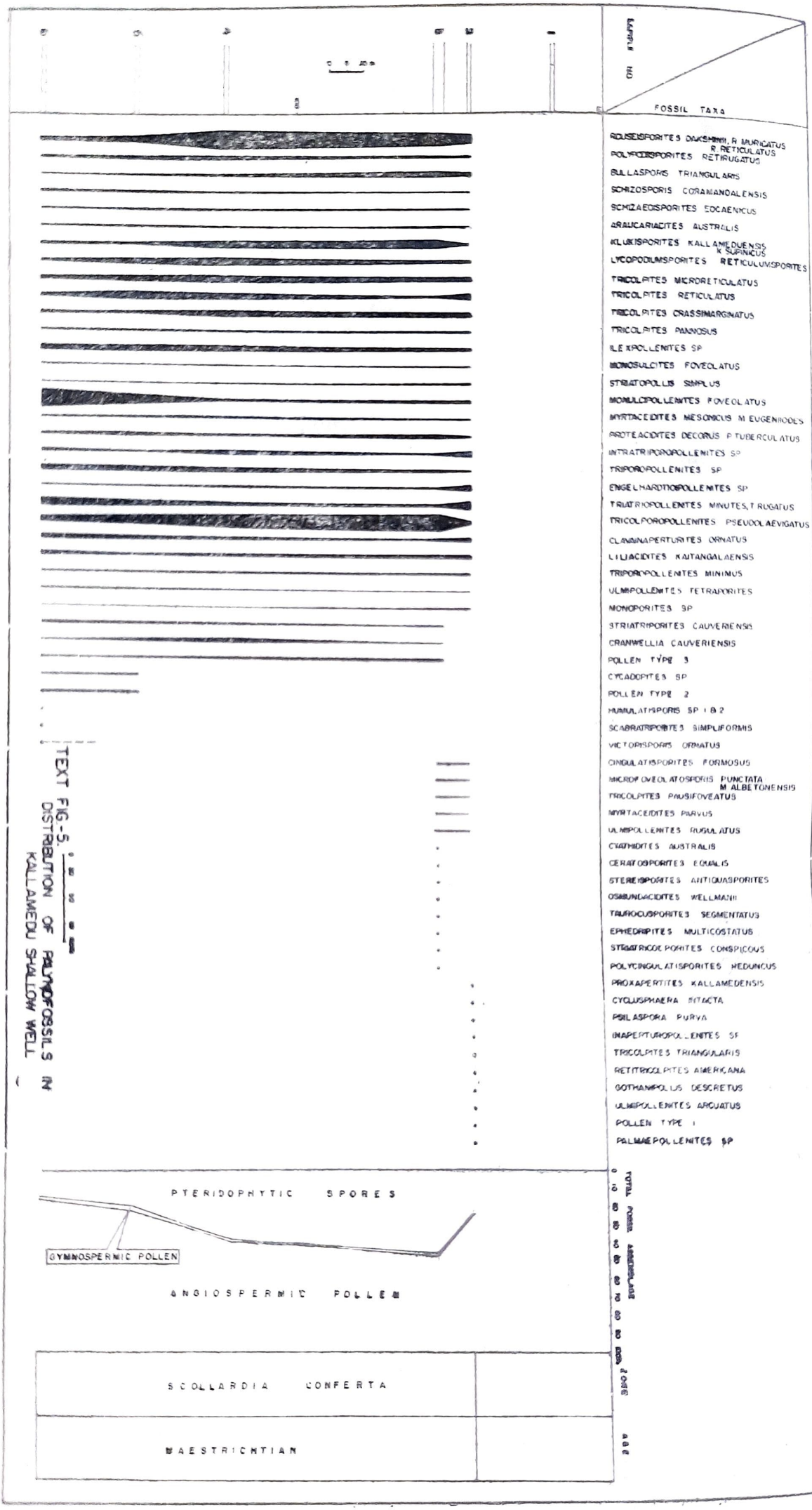
A uniformly rich palynofossil assemblage is recorded in sediments cored from 48-175 m. (Text fig. 5). The assemblages in all the core samples studied (samples 2—6) are highly fossiliferous and homotaxial. The following important-dominant taxa are recorded:

*Rouseisporites* spp., *Bullasporis triangularis, Polypodiisporites* spp., *Schizosporis* spp., *Schizaeoisporites eocaenicus, Araucariacites australis, Klukisporites* sp., *Lycopodiumsporites* spp., *Tricolpites microreticulatus, T. reticulatus, T. crassimarginatus, T. pannosus, Ilexpollenites* sp., *Monosulcites foveolatus, Striatricolporites conspicuus, Monulcipollenites foveolatus, Myricaceoipollenites* sp. *Proteacidites* spp., *Intratriporopollenites* sp., *Caryapollenites* sp., *Engelhardtioipollenites* sp., *Triatriopollenites* sp., *Clavainaperturites ornatus, Liliacidites kaitangataensis, Triporopollenites minimus. Ulmoidipites tetraporites, Monoporites* sp., *Striatriporites cauveriana, Cranwellia cauveriensis.*

A number of other taxa are present but are only represented by few specimens (See text fig. 5). *Rouseisporites, Tricolporopollenites, Monulcipollenites, Triatriopollenites, Ilexpollenites* and *Tricolpites* are dominant in this assemblage. *Victorisporis,* which was an important component in the Lower Senonian assemblage in the Puvanur shallow well, is rare and is represented by a single specimen in sample No. 6. The assemblage is assigned a Maestrichtian age and designated as *Scollardia conferta* zone (VENKATACHALA, 1972).

## PALAEOECOLOGY AND DEPOSITIONAL ENVIRONMENT

*Neocomian* assemblage is recorded only in the Periyavadavadi shallow well. Marine phytoplankton are represented in varying abundance from 2-16% in this zone (See Text fig. 2). Pteridophytic as well as gymnospermous pollen are abundant. *Classopollis*, a swamp representative of the Cheirolepidaceae, is the most abundant non saccate gymnospermous pollen. *Callialasporites* is also abundant and is represented by various species. *Microcachryidites* and *Alisporites* are the most dominant saccate pollen.




TEXT FIG-5. DISTRIBUTION OF PALYNOFOSSILS IN KALLAMEDU SHALLOW WELL

Schizeaceous pollen represented by *Klukisporites*, *Cicatricosisporites*, *Contignisporites*, *Trilites* are also well represented. These also represent a swampy environment.

A near shore swamp provided the plant material for deposition, the swamp appears to be subjected to fluctuating influence of sea during deposition.

*Aptian—Lower Albian* sediments are recognised in Periyavadavadi, Puvanur and Rupanarayanaliur shallow wells.

Phytoplankton are abundant in Periyavadavadi and Puvanur shallow wells. Their abundance varies from 10 to 50% in the Periyavadavadi well and 2 to 30% in the Puvanur well.

Swampy representatives such as Schizeaceous spores and *Classopollis* pollen in association with saccate gymnospermous pollen of *Microcachryidites*, *Alisporites*, *Podocarpidites* are abundant throughout the section in both the wells. A paralic environment of deposition under predominant marine influence is envisaged.

*Lower Senonian* assemblage is recorded only in the Puvanur shallow well. Phytoplankton of marine origin are common to abundant in this assemblage ranging in their percentage from 4 to 69% of the total assemblage. Marine influence is more pronounced in the sediments cored at 119-120 m. Phytoplankton amount to 69%, while they are 4-15% in the other sediments studied. Angiospermic pollen increase in abundance from the older to younger sediments, while pteridophytic spores are uniformly present throughout the sequence. Gymnospermous pollen are abundant in the upper part of the section (see composite diagram at Text fig. 4). A shallow marine depositional environment is postulated for this unit.

*Maestrichtian* assemblage recorded in the Kallamedu shallow well is richly fossiliferous and has a uniform abundance of angiospermic pollen and pteridophytic spores Gymnospermous pollen are rare (See composite diagram in Text fig. 5). No phytoplankton have been recovered. Palaeoecological interpretation is not possible from present evidences.

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## EXPLANATION OP PLATES

(All photomicrographs are magnified × 500 except otherwise mentioned)

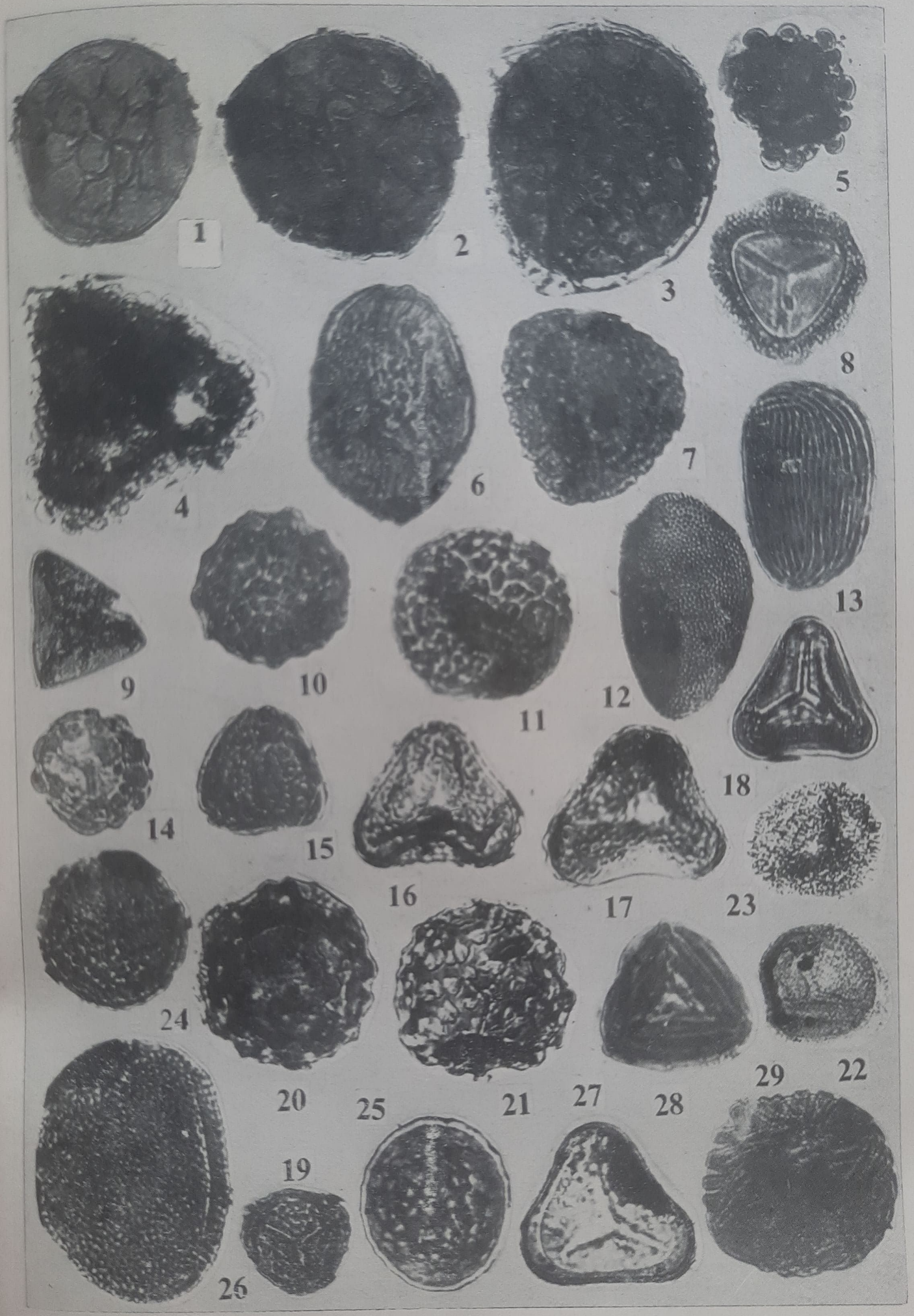
Plate 1

1. *Rouseisporites reticulatus* Pocock, 1962
2-3. *Rouseisporites dakshinii* sp. nov.

4-5. *Bullasporis triangularis* sp. nov.
6. *Corrugatisporites* sp. 1
7. *Corrugatisporites* sp. 2
8. *Cingulatisporites formosus* sp. nov.
9. *Dictyophyllidites pectinataeformis* (Bolkhovitina) Dettmann, 1963
10. Spore type 1
11. *Polypodiisporites* sp.
12. *Microfoveolatosporis atbertonensis* Cookson, 1956
13. *Schizaeoisporites eocaenicus* (Selling, 1945) Potonié, 1956
14. *Distaverrusporites margaritatus* Muller, 1968
15. *Polypodiaceoisporites retirugatus* Muller, 1968
16-17. *Impardecispora decora* sp. nov.
18. *Plicifera* sp.
19. *Trilites verrucosus* Venkatachala & Sharma, 1970
20-21. *Klukisporites kallameduensis* sp. nov.
22. *Dictyotosporites complex* Cookson & Dettmann, 1958
23. *Dictyotosporites* cf. *D. speciosus* Cookson & Dettmann, 1958
24. *Humulatisporites* sp. 1
25. *Humulatisporites* sp. 2
26. *Microfoveolatosporis punctata* Cookson, 1956
27. *Boseisporites paucipunctatus* sp. nov.
28. *Cicatricosisporites pseudotripartitus* Bolkhovitina, 1953
29. *Cicatricosisporites brevilaesuratus* Couper, 1958

PLATE 2

30-32. *Rouseisporites muricatus* sp. nov.
33-34. *Klukisporites supinicus* sp. nov.
35. *Schizosporis coromandelensis* sp. nov.
36. *Stereisporites* sp. cf. *Sphagnumsporites bimmatus* (Naumova Ex. Bolkht. 1953) Elsik.
37 *Plicifera minutus* sp. nov.
38 *Bullasporis minutus* sp. nov.
39 *Taurocusporites segmentatus* Stover, 1962
40-42 *Cyclusphaera intacta* sp. nov.
43. *Neoraisticka limbata* sp. nov.
44. *Deltoidospora* sp.
45. *Ephedripites multicostatus* Brenner, 1963
46. *Proxapertites kallameduensis* sp. nov.
47. *Microcachryidites antarcticus* Cookson, 1947
48. *Monulcipollenites foveolatus* sp. nov.
49. *Classopollis obidosensis* Groot & Groot, 1962
50-51. *Granuloperculatipollis mundus* sp. nov.
52. *Classopollis meditriangulus* sp. nov.
53. *Cycadopites* sp.
54. *Psilospora parva* (Cookson & Dettmann) Venkatachala & Kar, 1968.
55. *Inaperturopollenites* sp.
56. *Striatopollis simplus* sp. nov.
57. *Andreisporis mariae* Belsky, Boltenhagen & Potonié, 1965
58-69. *Gothanipollis descretus* sp. nov.
60-61. *Turonipollis helmigii* Van Ameron, 1956
62. *Vacuopollis pyramis* Pflug. 1953.
63-64. *Victorisporis ornatus* sp. nov.
65. *Ulmipollenites rugulatus* sp. nov.
66. *Intratriporopollenites* sp.
76. *Monosulcites foveolatus* sp. nov.
68. *Myrtaceidites eugeniioides* Cookson & Pike, 1954
40. *Tricolpites gillii* Cookson, 1957
70-72. *Clavainaperturites ornatus* sp. nov.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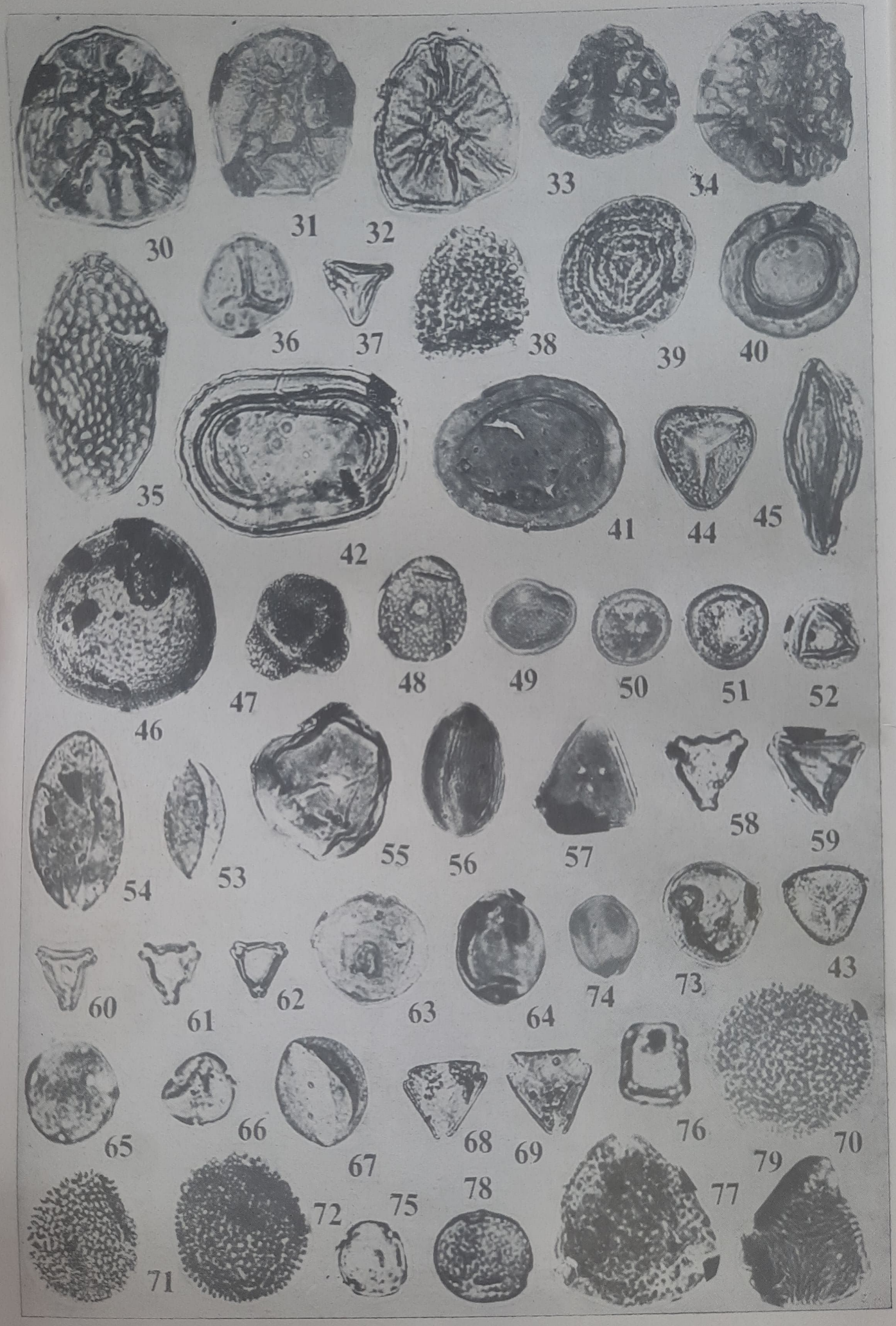
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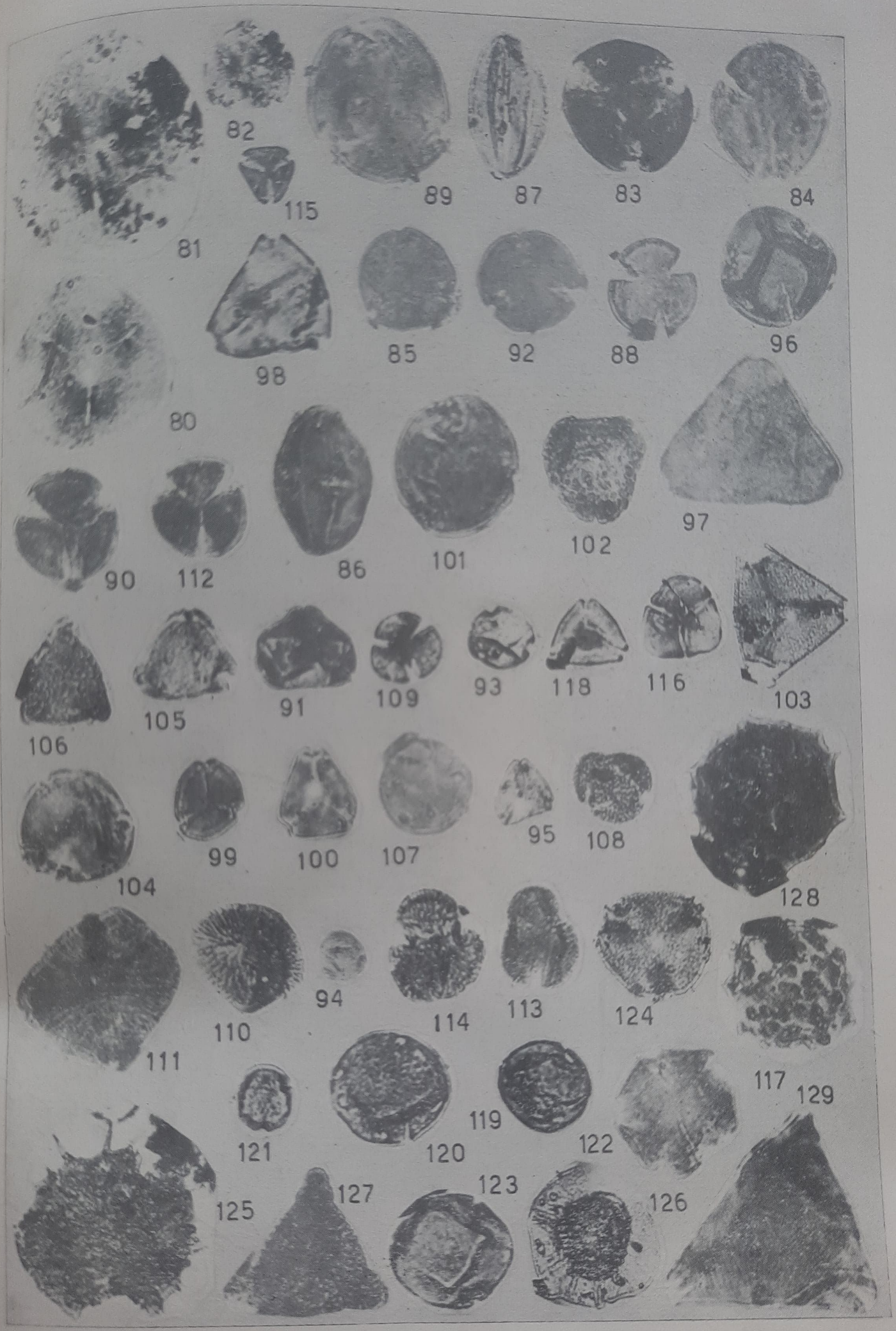
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75. *Ulmipollenites tetraporites* sp. nov.
76. *Ulmipollenites arcuatus* sp. nov.
77. *Proteacidites tuberculatus* Cookson, 1950
78. *Triporopollenites rugatus* Newman, 1965
79. *Cranwellia cauveriensis* sp. nov.

PLATE 3

80-81. *Constantinisporis jacquei* Belsky, Boltenhagen & Potonié, 1965 (Fig. 2, × 1000)
82. *Constantinisporis sulcatus* sp. nov.
83. *Tricolpites pannosus* Dettmann & Playford, 1968
84-96. *Psilatricolporites pseudolaevigatus* sp. nov.
85-92. *Tricolpites pausifoveolatus* sp. nov.
86. *Striatricolporites conspicuus* Muller, 1968
87-88. *Tricolpites reticulatus* Cookson, 1947
89. *Tricolpopollenites globularis* Groot, Penny & Groot, 1961.
90-8112. *Tricolpites crassimarginatus* sp. nov.
91. *Proteacidites decorus* sp. nov.
93. *Engelhardtiapollenites* sp.
94. *Triatriopollenites minutus* sp. nov.
95. *Myrtaceidites parvus* Cookson & Pike, 1954
97. *Proteacidites cauverii* sp. nov.
98. *Scabratriporites simpliformis* Hoeken- Klinkenberg, 1966
99. *Retisyncolporites cauweriensis* sp. nov.
100. *Psilatricolporites vridhachalamensis* sp. nov.
101. *Triporopollenites* sp. 1
102. *Verrutricolporites distinctus* sp. nov.
103. *Cupanieidites reticularis* Cookson, 1954
104. *Psilatricolporites operculatus* V. d. Hammen & Wijmstra, 1964
105-106. *Proteacidites amolosexinous* Dettmann & Playford, 1968
107. *Victorisporis tetraporoides* sp. nov.
108. *Tricolpites pilosus* sp. nov.
109-106. *Tricolpites microreticulatus* Belsky, Boltenhagen & Potonié, 1965
110-111. *Striatriporites cauveriana* sp. nov.
113-114. *Tricolpites americana* Wijmstra, 1966
115. *Tricolpites triangularis* sp. nov.
117. Pollen type 2.
118. *Myrtaceidites mesonesus* Cookson & Pike, 1954
119. *Triporopollenites rugatus* Newman, 1965
120. *Ulmipollenites rugulatus* sp. nov.
121. *Triporopollenites minimus* sp. nov.
122. *Scabrastephanocolpites pentaaperturites* sp. nov.
123. *Krutzipites annulatus* Norton, 1969
124. *Foveotricolporites brevicolpatus* sp. nov.
125. Pollen type 1
126. *Pterospermopsis* sp.
127. *Triorites* sp.
129. *Scollardia conferta* sp. nov.