PALYNOLOGY OF THE MESOZOIC SEDIMENTS OF KUTCH, W. INDIA—5. SPORES AND POLLEN FROM KATROL EXPOSURES NEAR BHUJ, KUTCH DISTRICT, GUJARAT STATE

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ABSTRACT

The present paper deals with the palynological investigation of the Katrol sediments (Upper Jurassic) exposed around Bhuj, Kutch district, Gujarat State, W. India. Nine sections were measured and samples were collected systematically for palynological studies.

Applanopsis, *Araucariacites* and *Laricoidites* are dominant genera in the assemblage. *Cyathidites*, *Concavissimisporites*, *Lycopodiacidites*, *Lycopodiumsporites*, *Foveotriletes*, *Impardecispora*, *Contignisporites*, *Alisporites* and *Podocarpidites* are Subdominant. *Trilobosporites*, *Matonisporites* and *Katrolaites* are rare in the assemblage.

INTRODUCTION

JURASSIC — Cretaceous sediments, of Kutch which are rich in animal and plant fossils have attracted great attention from Geologists and Palaeontologists since 1873. The Katrol sediments have been extensively studied by Waagen and Stoliczka (1873), Oldham (1893), Vredenburg (1910), Rajnath (1932, 1942, 1952), Spath (1933), Wadia (1957), Pascoe (1959), Poddar (1959) and others; however, there is no unanimous opinion regarding the age and position of the Katrol sediments (TABLE 1).

Mathur and Mathur (1965) reported for the first time the occurrence of Gnetalean pollen from the Katrol sediments. The present paper deals with a systematic study of palynological fossils from Katrol sediments around Bhuj (TEXT-FIG. 1).

MATERIAL AND METHODS

Nine exposures around ten miles of Bhuj belonging to Katrol sediments were measured and samples were collected from each lithological unit for palynological investigation (TEXT-FIG. 2).

The lithology of the exposures are detailed below:

Section A (Registered number Birbal Sahni Institute of Palaeobotany-903)

This section is exposed in a nala about two miles north-west of Kukma Railway Station, adjacent to the village Ler. 12 samples were collected but none yielded palynological fossils. The nature of the exposure is as follows:

Lithology	*Thickness (in feet)*
Fine grained, sandstone (upper part eroded)	6
Grey-carbonaceous, compact shale	6
Coarse grained sandstone	3
Grit	35
Gypseous, fossiliferous shale (the base not seen)	30
Total thickness	80

Section B (Registered number Birbal Sahni Institute of Palaeobotany-904)

This section is exposed about a mile south-west of Ler and comprises mostly sandstones. Thirty samples were collected but none yielded palynological fossils. The lithology of the section is as follows:

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CLASSIFICATION AND CORRELATION OF THE UPPER JURASSIC AND LOWER CRETACEOUS ROCKS OF KUTCH (GUJARAT) INDIA

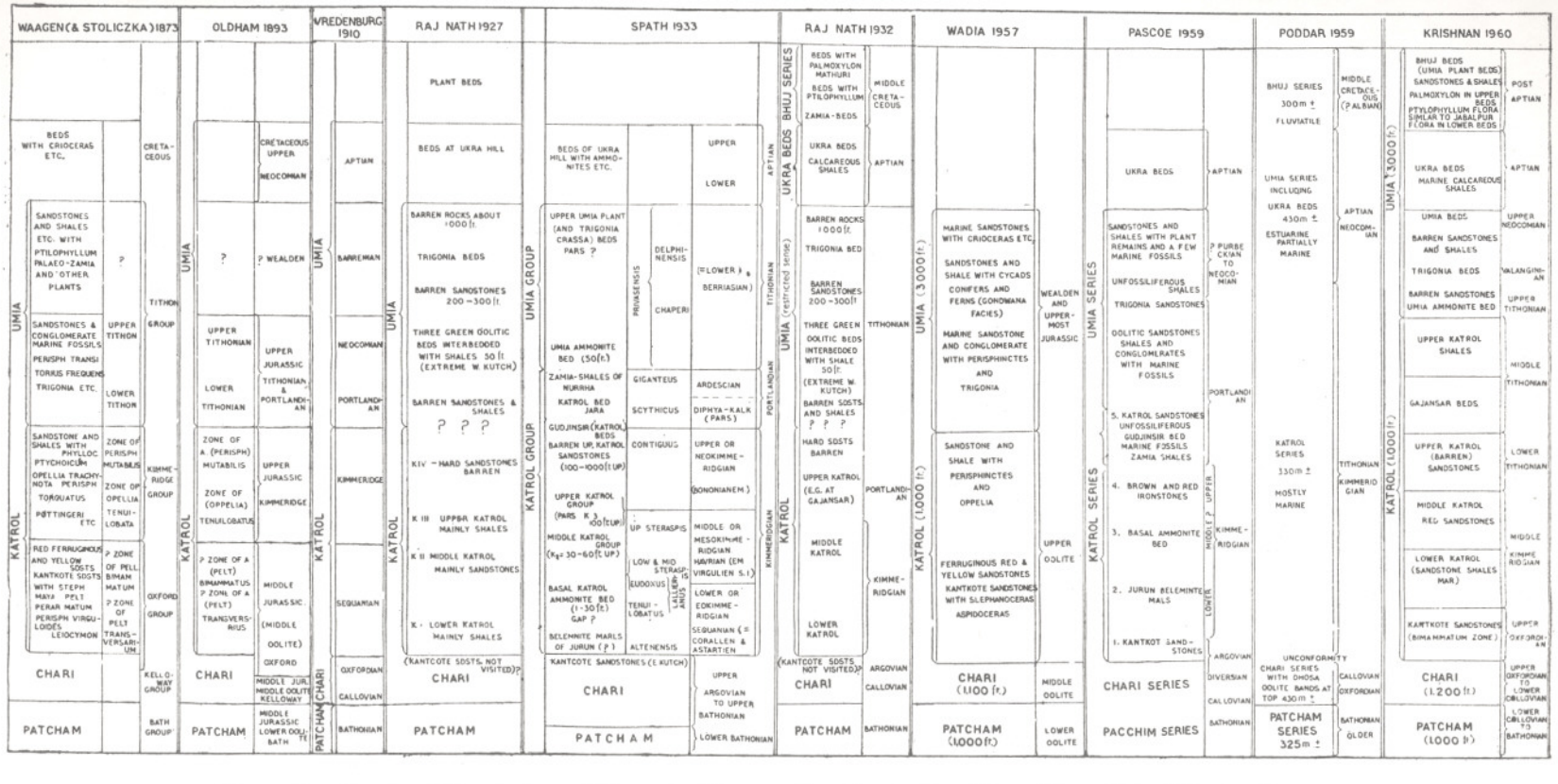
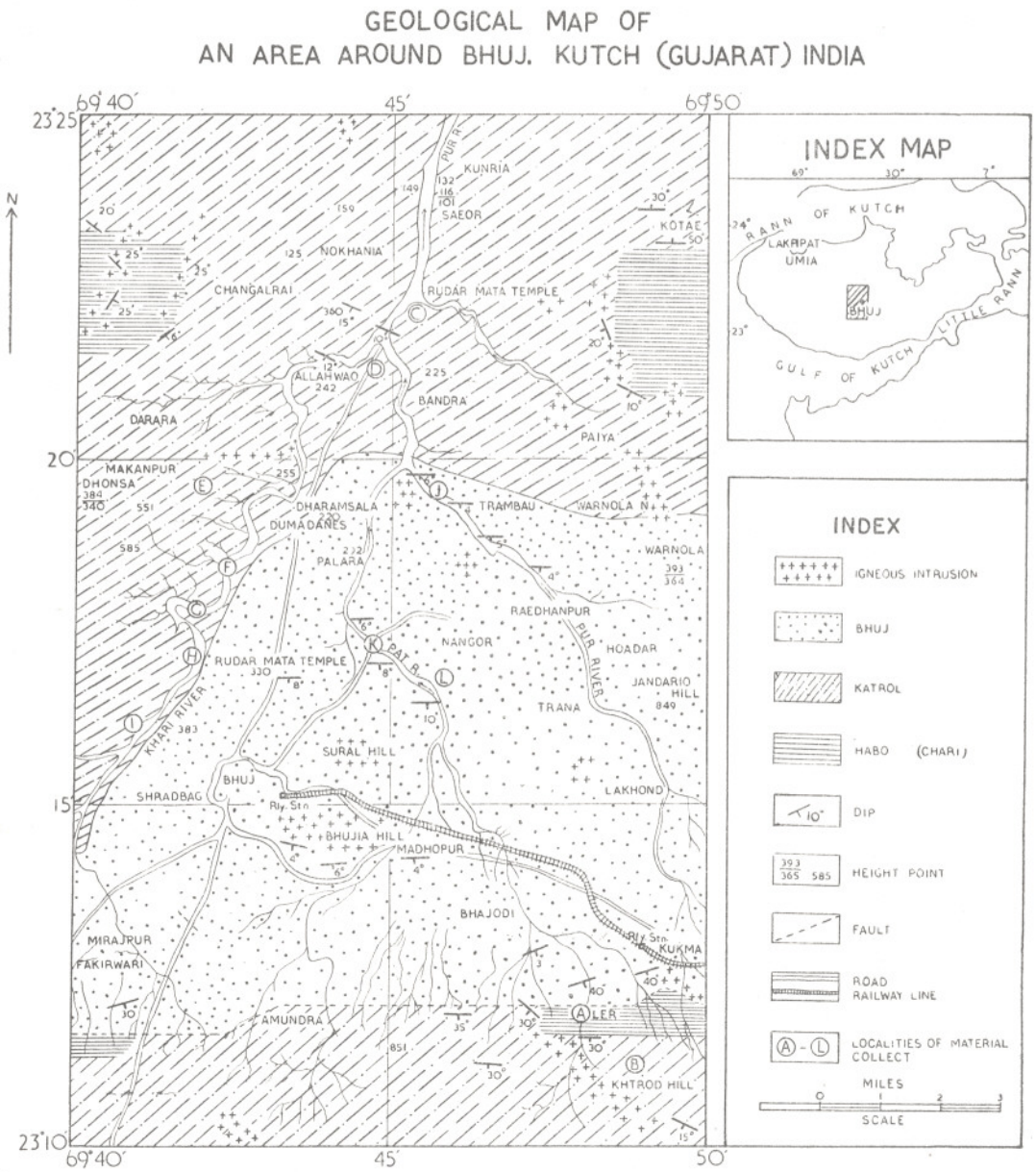


TABLE 1 — Showing different views of the geologists regarding the stratigraphic position of the Katrol sediments.



TEXT-FIG. 1 — Geological map around Bhuj showing the Katrol exposures.

Lithology	*Thickness (in feet)*
Coarse grained, massive sandstone (upper part eroded)	100
Dark brown ferruginous shale	16
Grit	15
Light-dark brown ferruginous shale	2
Grey coloured carbonaceous shale	4
Dark brown ferruginous shale	2
Carbonaceous shale	2
Light brown ferruginous shale	6
Grey-carbonaceous shale	1
Dark brown ferruginous shale	2
Grey coloured shale	3
Light-dark brown ferruginous shale	6
Grey coloured, occasionally carbonaceous shale	10
Coarse grained sandstone (base not seen)	2
Total thickness	171

Section C (Registered number Birbal Sahni Institute of Palaeobotany-900)

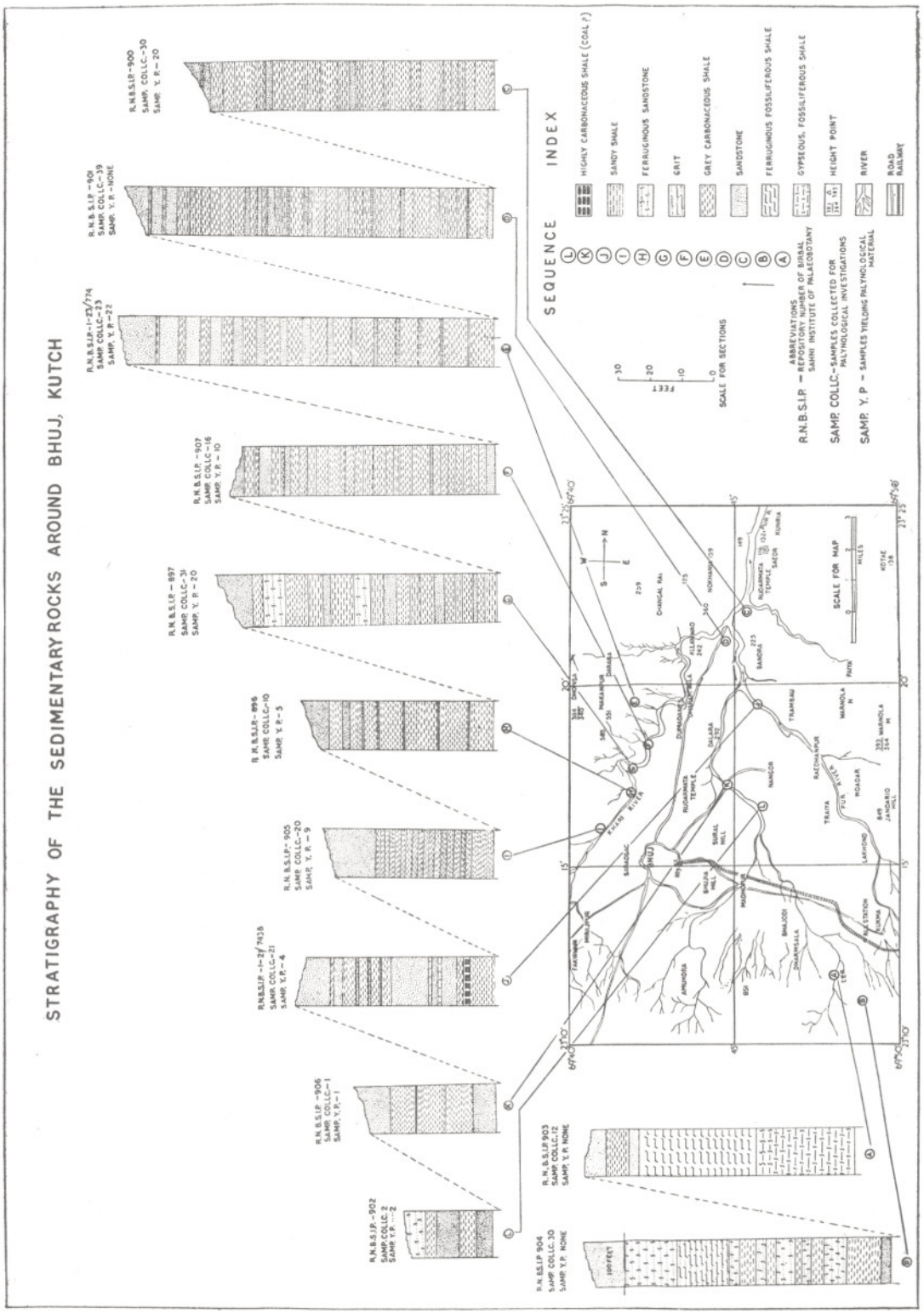
This section is exposed on the southern side of the Pur river about one mile west of Rudra Mata temple. Thirty samples were collected and 20 yielded palynological fossils. The lithology of the section is as follows:

Lithology	*Thickness (in feet)*
Fine grained sandstone (upper part highly eroded)	10
Grey coloured shale alternating with thin bands of sandstone and sandy shale	12
Fine grained sandstone	2
Grey coloured shale	2
Shale alternating with thin bands of sandstone and sandy shale	10
Coarse grained sandstone	4
Grey coloured shale	4
Sandy shale	3
Fine grained sandstone	2
Sandy shale	2
Grey shale alternating with sandy shale	6
Sandy shale	2
Grey-carbonaceous shale	4
Grey shale alternating with sandstone	2
Grey coloured shale	6
Grey-carbonaceous shale alternating with sandy shale	8
Grey-carbonaceous shale (base not known)	10
Total thickness	89

Section D (Registered number Birbal Sahni Institute of Palaeobotany-901)

Thirtynine samples were collected from an exposure on the western side of the confluent of the Khari and the Pur rivers. Palynological fossils have not been found. The lithology of the exposure is as follows:

Lithology	*Thickness (in feet)*
Fine grained sandstone (upper part eroded)	8
Sandy shale	½
Coarse grained sandstone	3
Sandy shale	½
Fine grained sandstone	3
Sandy shale	6
Shale with very thin bands of sandy shale	13
Grey - carbonaceous shale alternating with bands of sandstone and sandy shale	8
Coarse grained sandstone	2
Sandy shale	3
Fine grained sandstone	1
Carbonaceous shale	4
Coarse grained sandstone	1
Grey coloured shale with occasional bands of sandstone	8
Sandy shale	3
Grey - carbonaceous shale alternating with thin bands of shale and sandstone	6



TEXT-FIG. 2 — Showing the lithology of the Katrol exposures collected for palynological investigation.

Lithology	*Thickness (in feet)*
Sandy shale	2
Grey coloured shale alternating with thin bands of sandstone	6
Fine grained sandstone	1
Grey coloured shale alternating with thin bands of sandstone	10
Sandy shale	10
Grey - carbonaceous shale alternating with thin bands of sandy shale	5
Fine grained sandstone (base unknown)	2
Total thickness	106

Section E (Registered number, Birbal Sahni Institute of Palaeobotany — 1-23/774)

Katrol sediments are well exposed on the north, north-eastern side of the Khari river on the way towards the village Dhosa. These outcrops are mostly made up of grey-carbonaceous shales and sandstones. One of these exposures (*see* TEXT-FIG. 2) was measured and 23 samples were collected. Twentytwo samples yielded spore-pollen, hystrichosphaerids and dinoflagellates. The exposure at the base consists mostly of shale alternating with thin bands of sandstone and sandy shale. At the upper part, however, huge massive sandstone bands form the bulk. The thickness of each lithological unit is as follows:

Lithology	*Thickness (in feet)*
Coarse grained sandstone (upper part eroded)	10
Grey coloured shale	1
Fine grained sandstone	6
Carbonaceous shale	3
Coarse grained sandstone	4
Grey coloured shale	2
Fine grained sandstone	4
Grey coloured shale	3
Sandstone	3
Carbonaceous shale	3
Fine grained sandstone	4
Grey-carbonaceous shale	3
Fine grained sandstone	2
Grey coloured shale with very thin bands of sandy shale	4
Sandstone	1
Grey coloured shale	5
Coarse grained sandstone	1
Grey-carbonaceous shale	5
Sandstone and sandy shale	1
Grey coloured shale	5
Fine grained sandstone	1
Grey coloured shale with very thin bands of sandy shale	6
Sandy shale	$\frac{1}{2}$
Grey coloured shale	7
Fine grained sandstone	$\frac{1}{2}$
Grey-carbonaceous shale (base not seen)	8
Total thickness	93

Section F (Registered number, Birbal Sahni Institute of Palaeobotany-907)

About three miles north-east of Bhuj, on the bank of the Khari river an outcrop comprising sandstone and shale is exposed. In this section shale is well developed at base and sandstone at the upper part. Sixteen samples were collected but only 10 samples yielded spore and pollen. The lithological characteristic of the exposure is as follows:

Lithology	*Thickness (in feet)*
Coarse grained sandstone (upper part eroded)	3
Dark-light grey shale with thin bands of sandstone	6
Fine grained sandstone	5
Highly laminated shale	4
Fine grained sandstone	2
Grey-carbonaceous shale with occasional bands of sandstone	6
Coarse grained sandstone	2
Dark-light grey shale with thin bands of sandstone and sandy shale	12
Sandy shale	3
Grey-carbonaceous shale with occasional bands of sandstone and shale	6

Lithology	*Thickness (in feet)*
Coarse grained sandstone	1
Dark-light grey shale with thin bands of sandstone and sandy shale	10
Fine grained sandstone	1
Grey-carbonaceous shale alternating with thin bands of sandstone and sandy shale	16
Fine grained sandstone (actual thickness not known)	2
Total thickness	79

Section G (Registered number Birbal Sahni Institute of Palaeobotany-897)

Thirtyone samples were collected from an exposure on the bank of the Khari river about half a mile north-west of the section F and 20 samples yielded palynological fossils. The lithology of the section is as follows:

Lithology	*Thickness (in feet)*
Coarse grained sandstone (upper part eroded)	11 feet
Grey-carbonaceous shale	3
Light-dark brown ferruginous shale	6
Grey-carbonaceous shale with occasional thin bands of sandstone	7
Carbonaceous shale	4
Fine grained sandstone	2
Dark-light grey shale	7
Light-dark brown ferruginous shale	3
Sandy shale	5
Fine grained sandstone	4
Grey-carbonaceous shale	3
Sandy shale	2
Dark-light grey shale	4
Coarse grained sandstone	3
Grey-carbonaceous shale	3
Sandy shale	1
Dark-light grey shale	2
Fine grained sandstone	1
Grey coloured shale	2
Sandy shale (actual depth not known)	3
Total thickness	76

Section H (Registered number Birbal Sahni Institute of Palaeobotany-896)

This section is exposed on the bank of the Khari river about quarter of a mile west from the exposure G. The lithology of the section is as follows:

Lithology	*Thickness (in feet)*
Coarse grained sandstone (upper part eroded)	8
Dark-light grey shale	3
Fine grained sandstone	2
Grey-carbonaceous shale with thin bands of sandstone	4
Grey coloured shale	4
Sandy shale	½
Grey-carbonaceous shale	8
Fine grained sandstone	½
Dark-light grey shale with thin bands of sandstone and shale	10
Sandy shale	½
Grey-carbonaceous shale	9
Sandy shale	½
Dark-light grey shale (base not seen)	10
Total thickness	60

Section I (Registered number Birbal Sahni Institute of Palaeobotany-905)

Twenty samples were collected from a section exposed about a mile north-west of the exposure H. Nine samples yielded spore-pollen. The lithology of the section is as follows:

Lithology	*Thickness (in feet)*
Coarse grained sandstone (upper part eroded)	14
Grey-carbonaceous shale with alternate bands of sandstone and sandy shale (base not known)	36
Total thickness	50

Method of Investigation—Ten-fifteen grams of material were kept in Hydrofluoric acid (40 %) for 3-5 days followed by a treatment of commercial Nitric acid (60 %)

for 4-6 days. Potassium hydroxide solution (5 %) was used as an oxidizing agent for 2-4 minutes. The macerates were dried with polyvenyl alcohol on cover glasses and mounted in canada balsam. The slides and unused material have been deposited at the repository of the Birbal Sahni Institute of Palaeobotany, Lucknow.

SYSTEMATIC PALYNOLOGY

The following genera and species are recovered from the present material: Taxa common to both Bhuj and Katrol sedirnents and illustrated in Venkatachala (1969) are not illustrated and described here; only new species are described.

Anteturma — *Sporites* H. Pot. 1893
Turma — *Triletes* (Rein.) Pot. & Kr. 1954
Subturma — *Azonotriletes* Lub. 1935
Infraturma — *Laevigati* (Benn. & Kidst.) Pot. 1956

Genus — *Cyathidites* Coup. 1953

Type Species — *Cyathidites australis* Coup., 1953.

Cyathidites flavatus sp. nov.

Holotype — Pl. 1, Fig. 2. Slide No. 3273.
Type Locality — Section H, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores roundly triangular, 54-72 μ, interapical margins convex. Trilete, rays upto three-fourth radius long. Exine laevigate.
Description — Spores generally roundly triangular in polar view. Apices very broadly rounded. Trilete rays slightly raised, uniformly broad, commissure well recognizable. Exine upto 2 μ thick, laevigate.
Comparison — The present species resembles *Cyathidites grandis* Singh *et al.* (1964) in its size range and convex interapical margins, but is readily distinguished by its punctate structure. The other known species of this genus can be differentiated by their straight — concave interapical margins.

Genus — *Alsophilidites* (Cooks.) Pot. 1956

Type Species — *Alsophilidites kerguelensis* Cooks., 1947.

Alsophilidites bellus sp. nov.

Pl. 1, Figs. 3-4

Holotype — Pl. 1, Fig. 3. Slide No. 3289.
Type Locality — Section I, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores subtriangular, 50-60 μ. Apices rounded, interapical margins straight — slightly convex. Trilete, rays mostly open, upto three-fourth radius long. Exine upto 3 μ thick, ± laevigate, weakly infrastructured.
Comparison — *Alsophilidites grandis* Sah & Jain (1965) is distinguished form the present species by its larger size and concave interapical margins. *A. exilis* Sah & Jain (1965) has ± similar size range with the present species but is distinguished by its thinner exine and extension of the trilete upto the margin which is flanked by distinctly raised margo.

Genus — *Concavisporites* Pflug, in Thomson & Pflug, 1963

Type Species — *Concavisporites rugulatus* Pfl. in Thom. & Pfl.

Concavisporites crassus sp. nov.

Pl. 1, Figs. 5-6

Holotype — Pl. 1, Fig. 5. Slide No. 3283.
Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular, 50-60 μ; interapical margins not straight. Trilete, rays extending almost upto equator, bordered by kyrtome. Exine laevigate, valvate, valvae upto 16 μ broad, not thickened.
Description — Spores triangular in polar view with acute — broadly rounded apices. Trilete rays slightly raised, uniformly broad, commissure well discernible. Kyrtome strongly developed, accompanying rays extend upto margin. Exine 2-4 μ thick, laevigate, sometimes weakly infrastructured, valvate, valvae flangy, not thickened, upto 16 μ broad at angles.
Comparison — The flangy equatorial valvae distinguish this species from the known ones. *C. indicus* has spines that occurs in both Katrol and Bhuj sediments is distinguished by a thick equatorial valvae.

Infraturma — *Apiculati* (Benn. & Kidst.) Pot. 1956

Genus — *Lophotriletes* (Naum.) Pot. & Kr. 1954

Type Species — Lophotriletes gibbosus (Ibr.) Pot. & Kr., 1954.

Lophotriletes sp.

Pl. 1, Fig. 7

Description — Spore triangular, 40 μ. Apices rounded, interapical margins concave. Trilete, rays well developed extending upto three-fourth the radius. Exine 2 μ thick, coni sparsely distributed, 1 μ in height.

Genus — *Concavissimisporites* (Delc. & Sprum.) Delc. *et al.* 1963

Type Species — Concavissimisporites verrucosus (Delc. & Sprum.) Delc. *et al.*, 1963.

Concavissimisporites plexus sp. nov.

Pl. 1, Figs. 9-10

Holotype — Pl. 1, Fig. 10, Slide No. 3274.
Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular, 80-98 μ. Apices broadly rounded. Trilete. Exine sculptured with verrucae, verrucae upto 5 μ high.
Description — Spores mostly triangular, Sometimes subtriangular. Apices broadly rounded, forming an obtuse angle, interapical margins straight — slightly concave. Trilete, rays not well developed, tapering at ends, extending about two-third the radius, commissure not distinct. Exine upto 4 μ thick, verrucae closely placed, uniformly distributed.
Comparison — Concavissimisporites kutchensis Venkatachala (1969) closely resembles the present species in size but is distinguished by the presence of low-set verrucae as sculptural elements. *C. subverrucosus* Venkatachala (1969) is also differentiated by its low-set verrucae. *C. verrucosus* (Delc. & Sprum.) Delc. *et al.* (1963) is readily distinguished by their markedly concave interapical margins and more strongly built verrucae.

Infraturma — *Murornati* Pot. & Kr., 1954
Genus — *Lycopodiacidites* (Coup.) Pot., 1956

Type Species — Lycopodiacidites bullerensis Coup., 1953.

Lycopodiacidites subtriangulus sp. nov.

Pl. 1, Figs. 11-12

Holotype — Pl. 1, Fig. 11, Slide No. 3280.
Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores subtriangular, 50-60 μ. Trilete, rays extending three-fourth radius. Exine proximally laevigate, distally verrucose-rugose.
Description — Spores generally subtriangular, sometimes roundly triangular in polar view. Trilete in most cases well developed, commissure not prominent. Exine 2-4 μ thick, distally sculptured with verrucae, sometimes verrucae are low-set forming a rugose surface pattern.
Comparison — Lycopodiacidites asperatus Dettm. (1963) closely resembles the present species in size but is distinguished by its subcircular-circular shape, mostly ill-developed trilete rays and rugose distal surface. *L. bullerensis* approximates the present species in size but is differentiated by its shape and presence of perispore on equatorial margin. *L. cristatus* Coup. (1953) is subcircular and cristate.

Genus — *Lycopodiumsporites* Thierg. ex Delc. & Sprum., 1955

Type Species — Lycopodiumsporites agathoecus (Pot.) Thierg., 1938.

Lycopodiumsporites baculatus sp. nov.

Pl. 1, Figs. 13-14

Holotype — Pl. 1, Fig. 13, Slide No. 3289.
Type Locality — Section I, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular-subtriangular, 20-27 μ. Trilete, rays ill-developed. Exine on distal side reticulate, mesh-size 3-5 μ.
Description — Spores mostly triangular with rounded apices and convex interapical margins. Trilete rays hardly discernible, do not extend more than three-fourth the radius. Reticulation well-developed, ± uniformly broad.
Comparison — Lycopodiumsporites baculatus resembles the present species in triangular — subtriangular shape but is distinguished by its larger size and imperfect muri. *L. austroclavatidites, L. circolumenus,*

L. nodosus and *L. facetus* Dettm. (1963) are differentiated by their larger size range.

Genus — *Foveotriletes* (V. d. Hamm.) ex Pot., 1956

Type Species — *Foveotriletes scrobiculatus* (Ross) Pot., 1956.

Foveotriletes triangulus sp. nov.

Pl. 1, Figs. 17-18

Holotype — Pl. 1, Fig. 17, Slide No. 3282.
Type Locality — Section G, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular-subtriangular, 40-50 μ. Trilete, rays extending upto equator. Exine foveolate, foveola ± 1 μ in size, closely placed.
Description — Spores mostly triangular, sometimes subtriangular. Apices rounded, interapical margins straight — slightly convex. Trilete, rays narrow, uniformly broad. Exine 2·5-3·5 μ thick, foveolate, foveola closely placed, evenly distributed.
Comparison — *Foveotriletes parviretus* (Balme) Dettm. (1963) closely resembles the present species in shape and foveolate structure, the latter can, however, be distinguished by its smaller size. *Foveotriletes kutchensis* is differentiated by its bigger size and presence of perisporal covering over the spores.

Foveotriletes foveolus sp. nov.

Pl. 1, Figs. 19-20

Holotype — Pl. 1, Fig. 19, Slide No. 3283.
Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular, 70-85 μ. Trilete, rays ± well-developed. Exine foveolate, foveola upto 4 μ in size, closely placed.
Description — Spores mostly triangular, sometimes subtriangular in polar view. Apices rounded, interapical margins ± straight to ± concave. Trilete, rays generally ill-developed, not extending more than three-fourth the radius. Exine 2-3 μ thick; foveolate, foveola 2-4 μ in size, closely placed, evenly distributed.
Comparison — *Foveotriletes parviretus* is comparable to the present species in size and shape but is distinguished by its small-sized foveola. *F. triangulus* is smaller in size and possesses foveola of ± 1 μ in size. *F. foveolus* proposed here is distinguished from all other known species by its large foveola which are 2-4 μ in size.
Remarks — The specimens included here perhaps were subjected to fungal attack.

Foveotriletes sp.

Pl. 1, Fig. 21

Description — Spore subtriangular, 95 μ. Interapical margins convex. Trilete, rays well developed, slightly raised, uniformly broad, extending upto three-fourth the radius. Exine 2 μ thick, foveolate, foveola ± 1 μ in size, closely placed, evenly distributed.
Comparison — *Foveotriletes triangulus* is differentiated from the present species by its smaller size. *F. foveolus* has concave interapical margins and the foveola are bigger in size than the present species.

Genus — *Klukisporites* Coup., 1958

Type Species — *Klukisporites variegatus* Coup., 1958.

Klukisporites apunctus sp. nov.

Pl. 1, Figs. 22-23

Holotype — Pl. 1, Fig. 22, Slide No. 3275.
Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.
Diagnosis — Spores triangular, 50-60 μ. Trilete, rays well developed. Exine 2-5 μ thick, proximally laevigate, distally reticulate, mesh-size 4-8 μ.
Description — Spores mostly triangular, sometimes subtriangular in polar view. Trilete rays ± uniformly broad, extending upto three-fourth the radius. Exine proximally laevigate, distal muri raised upto 8 μ, anastomosing to form reticulum.
Comparison — *Klukisporites punctatus* resembles the present species in shape and size but is differentiated by its punctate exine. *K. scaberis* is distinguished by its subcircular — circular shape and broad reticulum.

Genus — *Cicatricosisporites* Pot. & Gell., 1933

Type Species — *Cicatricosisporites dorogensis* Pot. & Gell., 1933.

Cicatricosisporites sp.

Pl. 2, Fig. 25

Description — Spore laterally flattened, 70×34 μ. Trilete, rays not very well developed. Exine about 2·5 μ thick, muri coalescing with corresponding muri. Muri 2-4 μ wide.

Subturma — *Zonotriletes* Waltz, 1935
Infraturma — *Auriculati* (Schopf) Pot. & Kr., 1954

Genus — *Trilobosporites* Pant ex Pot., 1956

Type Species — Trilobosporites hannonicus (Delc. & Sprum.) Pot., 1956.

Trilobosporites sp.

Pl. 2, Fig. 26

Description — Spore triangular, 84 μ. Apices rounded, interapical margins ± straight. Trilete, rays well developed, uniformly broad, extending upto three-fourth the radius. Exine 6 μ thick, valvae at apices upto 10 μ thick, exine sparsely ornamented with low-set verrucae.

Comparison —Trilobosporites sp. described here can easily be differentiated from *T. hannonicus* by its bigger size and ill-developed valvae at the apices.

Genus — *Matonisporites* (Coup.) Dettm., 1963

Type Species — Matonisporites phlebopteroides Coup., 1958.

Matonisporites sp.

Pl. 2, Fig. 27

Description — Spore triangular, 70 μ. Apices rounded, interapical margins ± straight. Trilete, rays narrow, uniformly broad, extending upto inner part of cingulum. Cingulum ± 10 μ broad, laevigate.

Comparison — The present species is distinguished from *Matonisporites kutchensis* by its smaller size.

Infraturma — *Cingulati* Pot. & Kl., 1954

Genus — *Boseisporites* (Dev) Singh et al., 1964

Type Species — Boseisporites praeclarus (Dev) Singh *et al.*, 1964.

Boseisporites minutus sp. nov.

Pl. 2, Figs. 28-29

Holotype — Pl. 2, Fig. 28, Slide No. 3289.

Type Locality — Section I, Katrol Series (Upper Jurassic), Kutch, Gujarat.

Diagnosis — Spore cingulate, triangular, 37-44 μ. Trilete, rays extending upto the margin of cingulum. Cingulum 4-10 μ broad, exine laevigate and intrapunctate.

Description — Spores triangular, apices broadly rounded, interapical margins slightly convex. Trilete, rays uniformly broad, commissure distinct. Exine closely intrapunctate, cingulum laevigate and ± translucent.

Comparison — Boseisporites praeclarus, B. insignitus, B. punctatus and *B. lobatus* are differentiated from the present species by their larger size.

Genus — *Contignisporites* Dettm., 1963

Type Species — Contignisporites glebulentus Dettm., 1963.

Contignisporites kutchensis sp. nov.

Pl. 2, Figs. 30-31

Holotype — Pl. 2, Fig. 30, Slide No. 3289.

Type Locality — Section I, Katrol Series (Upper Jurassic), Kutch, Gujarat.

Diagnosis — Spores subcircular, 22-30 μ. Trilete, rays ill-developed; exine proximally ± laevigate to sparsely verrucose, distally muri 10-15 in number. Cingulum upto 10 μ wide, laevigate.

Description — Spores subcircular-subtriangular. Haptotypic mark hardly perceptible in most of the specimens. Exine proximally generally laevigate sometimes seems to be verrucose. Muri on distal side well developed, upto 4 μ wide, ± parallel to each other. Cingulum well recognisable in most specimens, mostly laevigate and transluscent.

Comparison — Contignisporites glebulentus is comparable to the present species in shape but is distinguished by its larger size and well developed verrucae on proximal side. *C. multimuratus* is ± oval in shape. *C. cooksonii* and *C. fornicatus* can easily be differentiated by their larger size range.

Contignisporites triletus sp. nov.

Pl. 2, Figs. 32-33

Holotype — Pl. 2, Fig. 32, Slide No. 3278.

Type Locality — Section C, Katrol Series (Upper Jurassic), Kutch, Gujarat.

Diagnosis — Spore roundly triangular, 50-71 μ. Trilete, rays extending upto inner margin of cingulum. Exine proximally granulose, distal muri ill-developed. Cingulum ± uniformly broad.

Description — Spores mostly roundly triangular, sometimes subcircular in polar view. Trilete rays narrow, slightly raised, commissure distinct or indistinct. Grana closely or sparsely placed on proximal side. Distal muri slightly raised. Cingulum 8-12 μ broad, laevigate, ± transluscent.

Comparison — *Contignisporites dettmannii* Singh & Kumar (1966) resembles the present species in shape and size but is distinguished by its well developed muri on distal side. *C. psilatus* Singh & Kumar (1966) is proximally laevigate and possesses well developed muri distally. *C. kutchensis* approximates the present species in granulose exine, but is readily distinguished by its smaller size and raised muri.

Genus — *Densoisporites* (Weyl. & Krieg.) Dettm., 1963

Type Species — *Densoisporites velatus* Weyl. & Krieg., 1963.

Densoisporites sp.

Pl. 2, Fig. 52

Description — Spores triangular-subtriangular, 50-58 μ. Trilete, rays hardly perceptible. Cingulum well developed, 10-12 μ broad with entire or dentate equatorial margin.

Turma — *Hilates* Dettm., 1963

Genus — *Coptospora* Dettm., 1963

Type Species — *Coptospora striata* Dettm., 1963.

Coptospora sp.

Pl. 2, Fig. 49

Description — Spore subcircular, 58 μ, slightly constricted at one end. Exine differentially thickened, central region thinner than rest part.

Comparison — *Coptospora kutchensis* is usually larger in size and the differential thickening of the exine is more prominent in the central region.

Turma — *Monoletes* Ibr., 1933
Subturma — *Azonomonoletes* Lub., 1935
Infraturma — *Sculptatomonoleti* Dyb. & Jachow., 1957

Genus — *Polypodiisporites* Pot., 1934

Type Species — *Polypodiisporites vavus* (Pot.) Pot., 1934.

Polypodiisporites sp.

Pl. 2, Fig. 34

Description — Spore oval, 70×50 μ. Monolete, lip extending three-fourth along longitudinal axis. Exine 3 μ thick, verrucose, verrucae upto 6 μ thick, verrucose, verrucae upto 6 μ high, closely placed, uniformly distributed.

Genus — *Schizaeoisporites* Pot., 1951

Type Species — *Schizaeoisporites dorogensis* Pot., 1951.

cf. Schizaeoisporites sp.

Pl. 2, Fig. 36

Description — Spore oval, 52×42 μ. Monolete, lip ill-developed, bent at middle, not extending more than half along longer axis. Exine ± 2 μ thick, sculptured with horizontal ridges, parallel to each other. Incipient sacci present on lateral sides.

Remarks — Only one specimen has been recovered. The present spore is conspicuous by its presence of incipient (?) sacci and hence it has only been compared to *Schizaeoisporites*.

Genus — *Podocarpidites* (Cooks) ex Coup., 1953

Type Species — *Podocarpidites ellipticus* Cooks., 1947.

Podocarpidites sp.

Pl. 2, Fig. 46

Description — Bisaccate, bilaterally symmetrical pollen grain, 74×50 μ. Central body distinct, horizontally oval, 60×50 μ, intramicroreticulate. Proximal attachment

of sacci to central body equatorial, distal attachment subequatorial. Sacci ill-developed, leathery, ± intramicroreticulate.

Comparison — *Podocarpidites* sp. described here is distinguished from *P. ornatus*, *P. minisulcus*, *P. grandis* and *P. densus* by its horizontally oval central body and leathery sacci.

Subturma — *Polysaccites* Cooks., 1947

Genus — *Podosporites* Rao, 1943

Type Species — *Podosporites tripakshii* Rao, 1943.

Podosporites sp.

Pl. 2, Fig. 45

Description — Pollen grain trisaccate, 52×50 μ. Central body subcircular, distinct, intramicroreticulate. Proximal attachment of sacci to central body equatorial, distal subequatorial. Sacci small, ± equal in size, ± intrareticulate.

Comparison — The present species is distinguished from *Podosporites tripakshii* by its bigger central body and ill-developed sacci. *P. cf. tripakshii* Rao described by Sah and Jain (1965) from the Rajmahal Stage resembles the present species in size range but is distinguished by its well developed sacci which are coarsely intrareticulate.

Turma — *Aletes* Ibr., 1933
Subturma — *Azonaletes* (Luber) Pot. & Kr., 1954
Infraturma — *Psilonapiti* Erdtm., 1947

Genus — *Laricoidites* Pot., Thoms. & Thierg., 1950

Type Species — *Laricoidites magnus* (Pot.) Pot., 1934.

Laricoidites kutchensis sp. nov.

Pl. 2, Fig. 48

Holotype — Pl. 2, Fig. 48, Slide No. 3277.

Type Locality — Section C, Katrol Series, (Upper Jurassic), Kutch, Gujarat.

Diagnosis — Pollen grains subcircular, 50-70 μ, non-aperturate. Exine ± laevigate infrastructure present or absent.

Description — Pollen grains mostly subcircular, sometimes circular. Exine 1·5-2·5 μ thick, mostly laevigate, rarely sparsely granulose. Infrastructure ill-developed, seems to be intrapunctate in some specimens, exine occasionally irregularly folded.

Incertae sedis

Genus — *Exesipollenites* Balme, 1957

Type Species — *Exesipollenites tumulus* Balme, 1957.

Exesipollenites sp.

Pl. 2, Fig. 50

Description — Pollen grain subcircular, 25×26 μ. Exine upto 3 μ thick, differentially thickened, ± laevigate, central region depressed.

Remarks — The present specimen closely resembles *Exesipollenites* sp. Jain & Sah, 1966 in shape, size and ornamentational pattern.

The following taxa are also present in the assemblage:

Cyathidites australis Coup.
C. minor Coup.
C. asper (Bolkhov.) Dettm.
C. concavus (Bolkhov.) Dettm.
C. cf. *C. concavus* (Bolkhov.) Dettm.
C. medius Sah & Jain
C. trilobatus Sah & Jain
C. rajmahalensis Sah & Jain
Biretisporites potoniaei Delc. & Sprum.
Alsophilidites exilis Sah & Jain
Dictyophyllidites pectinataeformis (Bolkhov.) Dettm.
Concavisporites indicus Venkat.
Todisporites major Coup.
T. minor Coup.
Osmundacidites wellmanii Coup.
O. minutus Sah & Jain
Concavissimisporites verrucosus (Delc. & Sprum.) Delc. *et al.*
C. crassatus (Delc. & Sprum.) Delc. *et al.*
C. penolaensis Dettm.
C. punctatus (Delc. & Sprum.) Singh
C. variverrucatus (Coup.) Singh
C. kutchensis Venkat.
C. subverrucosus Venkat.
C. cf. *C. subverrucosus* Venkat.
Impardecispora uralensis (Bolkhov.) Venkat. *et al.*

I. purverulentus (Verbits) Venkat. *et al.*
I. trioreticulosus (Cooks.& Dettm.) Venkat. *et al.*
Pilosisporites grandis Dettm.
Bhujiasporites hirsutus Venkat. *et al.*
Lycopodiacidites asperatus Dettm.
Lycopodiumsporites austroclavatidites (Cooks.) Pot.
L. circolumenus Cooks. & Dettm.
L. eminulus Dettm.
Foveotriletes parviretus (Balme) Dettm.
F. kutchensis Venkat.
Klukisporites scaberis Cooks. & Dettm.
K. kutchensis Venkat.
K. scaberis Cooks. & Dettm.
K. punctatus Venkat.
Matonisporites kutchensis Venkat.
Boseisporites praeclarus (Dev) Singh *et al.*
B. insignitus Venkat.
B. punctatus Venkat.
B. lobatus Venkat.
Contignisporites glebulentus Dettm.
C. cooksonii (Balme) Dettm.
C. multimuratus Dettm.
C. fornicatus Dettm.
Coptospora kutchensis Venkat.
Katrolaites kutchensis Venkat. & Kar
Leschikisporis indicus Singh *et al.*
Applanopsis lenticularis Doer.
A. dampieri (Balme) Venkat. & Kar
A. trilobatus (Balme) Venkat. & Kar
A. segmentatus (Balme) Venkat. & Kar
A. monoalasporus (Dev) Venkat. & Kar
A. lucidus (Poc.) Venkat. & Kar
A. triletus (Singh *et al.*) Venkat. & Kar
A. grandis (Sah & Jain) Venkat. & Kar
A. punctatus Venkat. & Kar
A. ovatus Venkat. & Kar
A. granulatus Venkat. & Kar
Alisporites grandis (Cooks.) Dettm.
A. thomasii (Coup.) Poc.
A. similis (Balme) Dettm.
Podocarpidites multesimus (Bolkhov.) Poc.
P. ornatus Poc.
P. canadensis Poc.
P. minisulcus Singh
P. grandis Sah & Jain
P. cristiexinus Sah & Jain
P. densus Venkat.
Microcachryidites antarcticus Cooks.
Podosporites tripakshi Rao
Classopollis classoides (Pfl.) Poc. & Jain
C. torosus (Reiss.) Coup.
Laricoidites indicus Singh *et al.*
L. communis Sah & Jain
Araucariacites australis Cooks.
Schizosporis laevigatus Venkat.

PALYNOLOGICAL COMPOSITION

The palynological fossils recovered from the Katrol sediments studied here represent 36 genera comprising 108 species. The trilete, monosaccate, bisaccate and alete pollen are well represented while monolete, hilate and porate pollen are meagrely present. Monocolpate and polyplicate pollen are not found in the material studied.

Trilete, pteridophytic spores — *Cyathidites, Concavissimisporites, Lycopodiacidites, Lycopodiumsporites, Foveotriletes, Impardecispora* and *Contignisporites* are frequently found, however *Biretisporites, Concavisporites, Alsophilidites, Dictyophyllidites, Todisporites, Osmundacidites, Lophotriletes, Bhujiasporites, Trilobosporites, Matonisporites* and *Densoisporites* are present in the material but are hardly met with in the counts of 200. *Matonisporites* and *Boseisporites* are found in some sections quite frequently but absent in others.

Monolete spores represented by *Polypodiisporites* and *Leschikisporis* are very rare and not found within the counts.

Hilate spores are rare in the assemblage *Coptospora* is present in small percentage in most of the sections. *Cooksonites* and *Katrolaites* are mostly not found within the counts.

Applanopsis is found in abundance in all the samples.

Gymnospermous bisaccate pollen; *Alisporites* and *Podocarpidites* are fairly well represented while polysaccate pollen *Microcachryidites* and *Podosporites,* are rare.

Alete araucarian pollen *Laricoidites* and *Araucariacites* are very well represented in all the sections.

The following account details the palynological contents in each of the sections studied:

Section C

The exposure is 89 ft. thick. 30 samples were collected and 20 samples yielded palynological fossils. Twenty-three genera and 61 species are present in the assemblage. *Applanopsis, Araucariacites* and *Laricoidites* are very well represented. *Applanopsis* is

dominant in the lower part of the section while *Araucariacites* and *Laricoidites* are dominant in the upper part. *Cyathidites, Concavissimisporites, Impardecispora, Matonisporites, Boseisporites, Coptospora* and *Microcachryidites* are represented in small percentage. *Alisporites* and *Podocarpidites* are well represented. The followings are the list of genera and species found in this section (TEXT-FIG. 3):

Cyathidites australis, C. minor, C. asper C. cf. C. concavus, C. rajmahalensis, C. flavatus sp. nov., *Concavisporites indicus, C. crassus* sp. nov., *Todisporites major, Osmundacidites wellmanii, Concavissimisporites verrucosus, C. crassatus, C. penolaensis, C. punctatus, C. kutchensis, C. subverrucosus, C. plexus* sp.n ov., *Impardecispora apiverrucata, I. trioreticulosus, Pilosisporites grandis, Lycopodiacidites asperatus, L. subtriangulus* sp. nov., *L. paucimurus* sp. nov., *Foveotriletes parviretus, F. triangulus* sp. nov., *F. foveolus* sp. nov., *Klukisporites scaberis, K. punctatus, K. apunctus* sp. nov., *Matonisporites kutchensis, Boseisporites praeclarus, B. insignitus, B. punctatus, B. lobatus, B. minutus, Contignisporites glebulentus, C. cooksonii, C. fornicatus, C. multimuratus, C. dettmannii, C. psilatus, C. triletus* sp. nov., *Coptospora minutus* sp. nov., *Katrolaites kutchensis, Polypodiisporites* sp. *Leschikisporis indicus, Alisporites grandis, A. thomasii, Podocarpidites multesimus, P. ornatus, P. canadensis, P. minisulcus, P. grandis, Microcachryidites antarcticus, Classopollis classoides, Laricoidites indicus, L. communis, L. kutchensis, Araucariacites australis, A. cooksonii, Exesipollenites* sp.

Section E

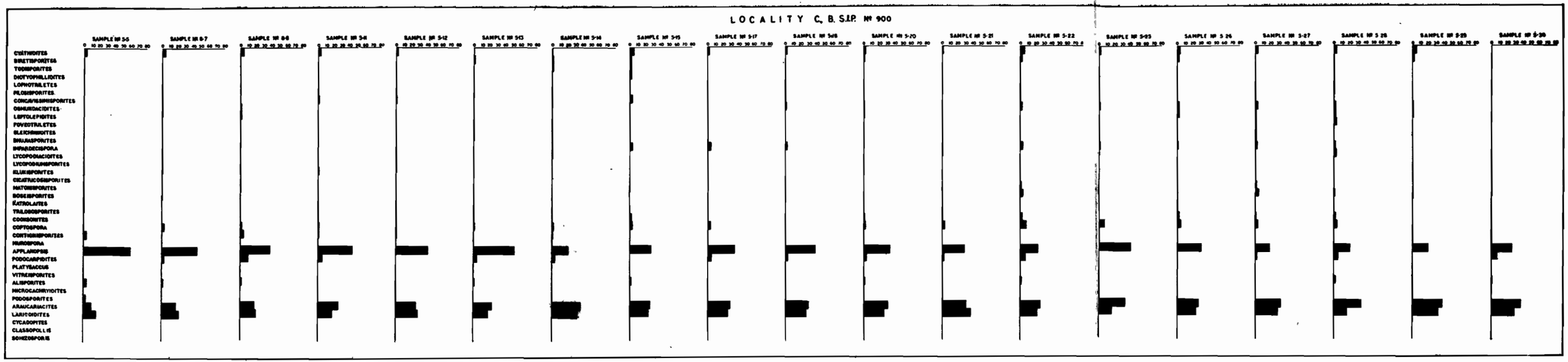
This exposure is 95 ft. thick comprising mostly shales and sandstones. Twentythree samples were collected and 22 samples yielded palynological fossils. *Hystrichosphaerids* and *dinoflagellates* have also been recorded in some samples. *Araucariacites* is dominant and amounts to 50-75 per cent of the assemblage. *Laricoidites* is next in abundance and its percentage varies from 10-25 per cent. *Podocarpidites* is also well represented. *Applanopsis* is present in all the sections with considerable abundance. *Cyathidites, Lophotriletes, Bhujiasporites* and *Impardecispora* are found in small percentages in the assemblage. The following genera and species are present in this section (TEXT-FIG. 4):

Cyathidites australis, C. minor, C. concavus, C. rajmahalensis, C. asper, Biretisporites convexus, Osmundacidites wellmanii, Lophotriletes sp. 1, *Lophotriletes* sp. 2, *Concavissimisporites verrucosus, C. crassatus, C. punctatus, C. kutchensis, Impardecispora apiverrucata, I. trioreticulosus, I. uralensis, Bhujiasporites hirsutus, Lycopodiacidites asperatus, Foveotriletes parviretus, F. triangulus, F. foveolus, Klukisporites scaberis, K. punctatus, K. apunctus, Matonisporits, kutchensis, Boseisporites praeclarus, B. insignitus, B. punctatus, B. lobatus, B. minutus, Contignisporites glebulentus, C. cooksonii, C. fornicatus, C. dettmannii, C. triletus, Coptospora kutchensis, C. minutus, Katrolaites kutchensis, Applanopsis lenticularis, A. dampieri, A. trilobatus, A. segmentatus, A. monoalasporus, A. lucidus, A. triletus, A. grandis, A. punctatus, A. ovatus, A. granulatus, Microcachryidites antarcticus, Classopollis classoides, Araucariacites australis, A. cooksonii, Laricoidites indicus, L. communis, Laricoidites kutchensis, Schizosporis laevigatus.*

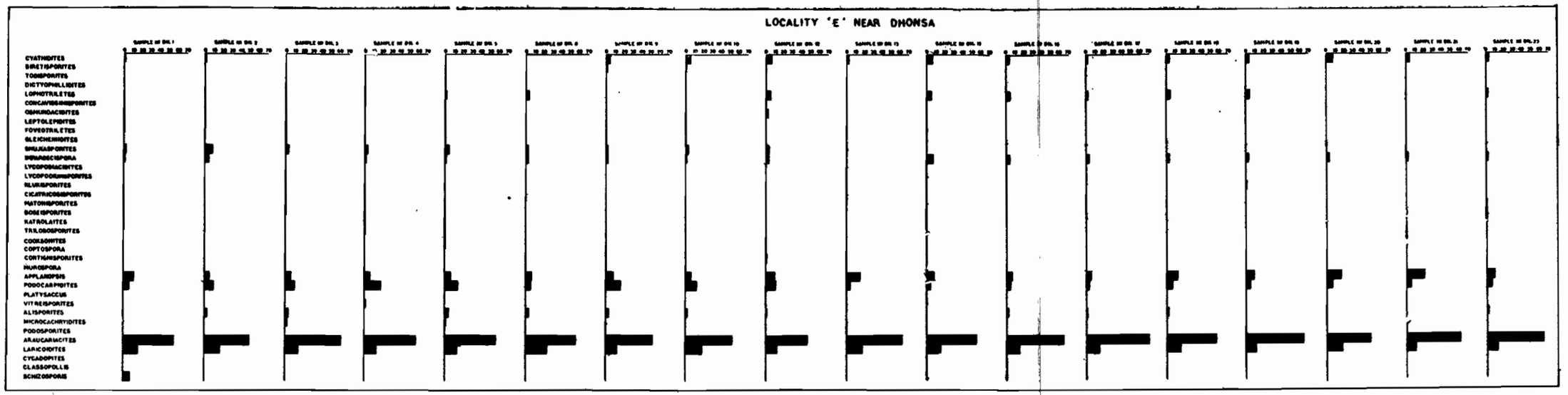
Section G

This exposure is 76 ft. thick and comprises shales and sandstones. The sandstone is mostly ferruginous and shale varies from sandy-grey carbonaceous. *Applanopsis, Araucariacites* and *Laricoidites* are very well represented. *Podosporites, Alisporites* and *Microcachryidites* are meagrely present in some samples. Among the trilete spores *Cyathidites, Concavissimisporites, Osmundacidites, Bhujiaspora, Impardecispora, Lycopodiacidites* and *Lycopodiumsporites* are frequently found within the counted specimens. The following spore-pollen genera are present in the assemblage (TEXT-FIG. 5):

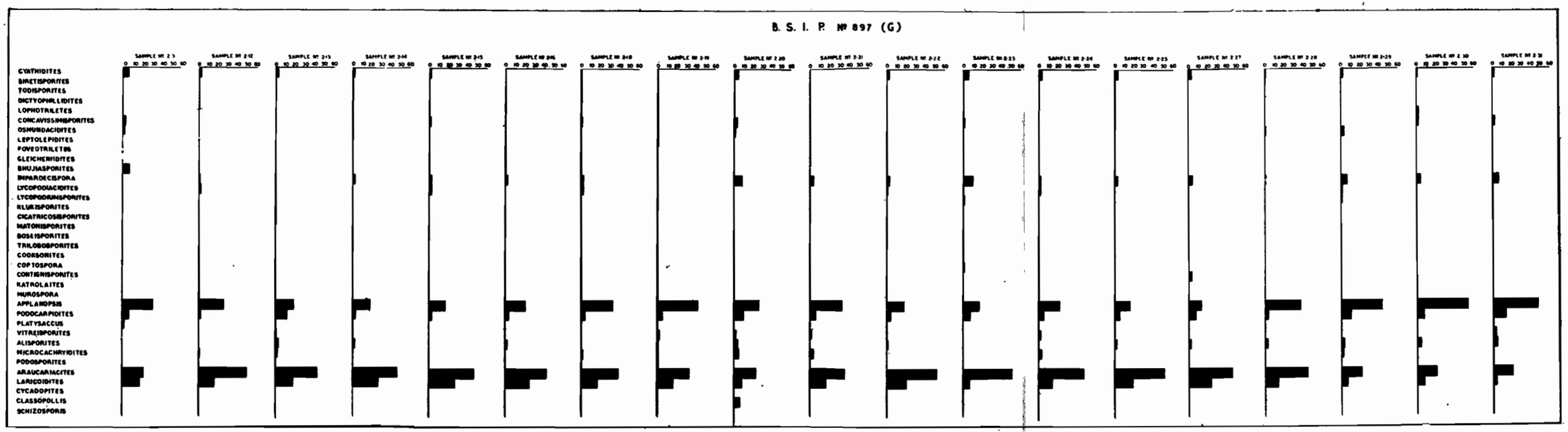
Cyathidites australis, C. minor, C. punctatus, C. concavus, C. medicus, C. flavatus, C. asper, Biretisporites potoniaei, Alsophilidites exilis, Todisporites minor, Dictyophyllidites pectinataeformis, Osmundacidites wellmanii, Lophotriletes sp. 1, *Lophotriletes* sp. 2, *Concavissimisporites penolaensis, C. subverrucosus, C. variverrucatus, Impardecispora uralensis, I. purverulentus, Pilosisporites grandis, Bhujiasporites hirsutus, Lycopodiacidites*



TEXT-FIG. 3 — Histogram pattern of spores-pollen genera present in the section.



TEXT-FIG. 4 — Histogram pattern of spores-pollen genera present in the section.

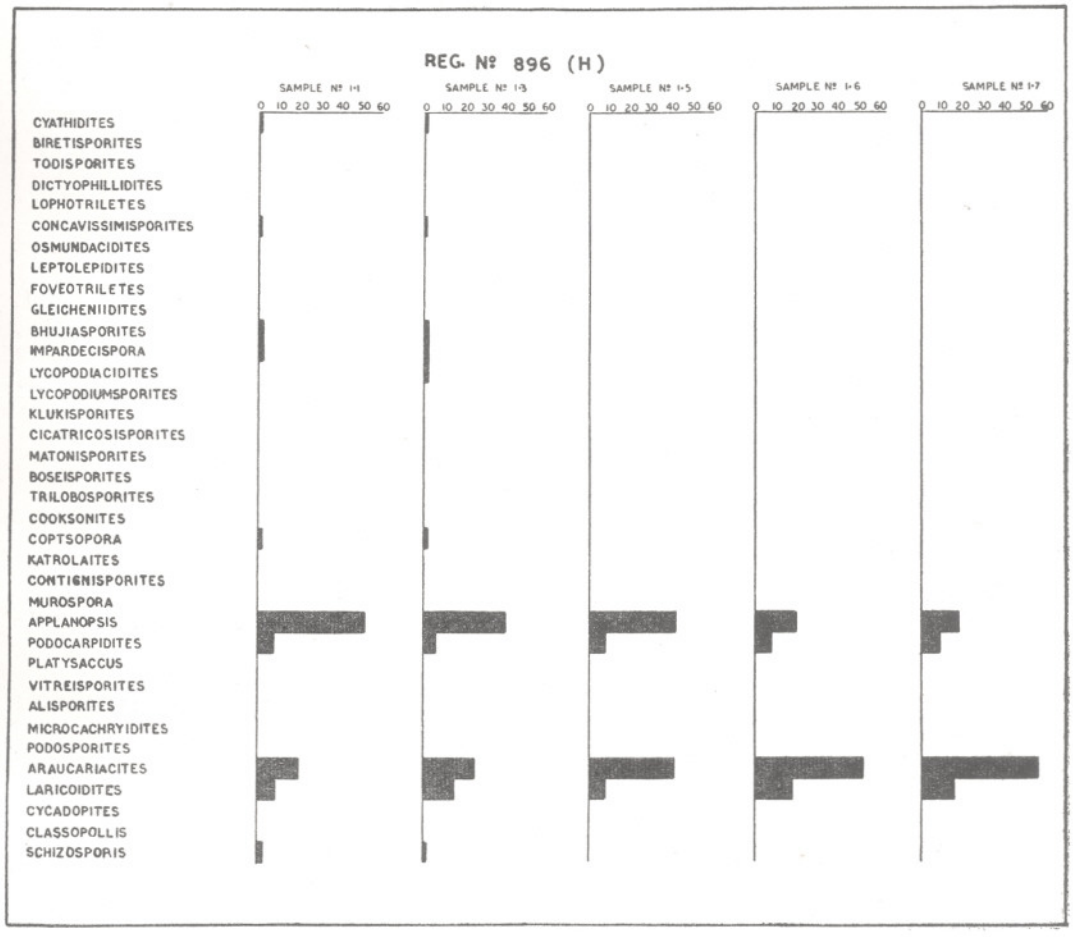


TEXT-FIG. 5 — Histogram pattern of spores-pollen genera present in the section.

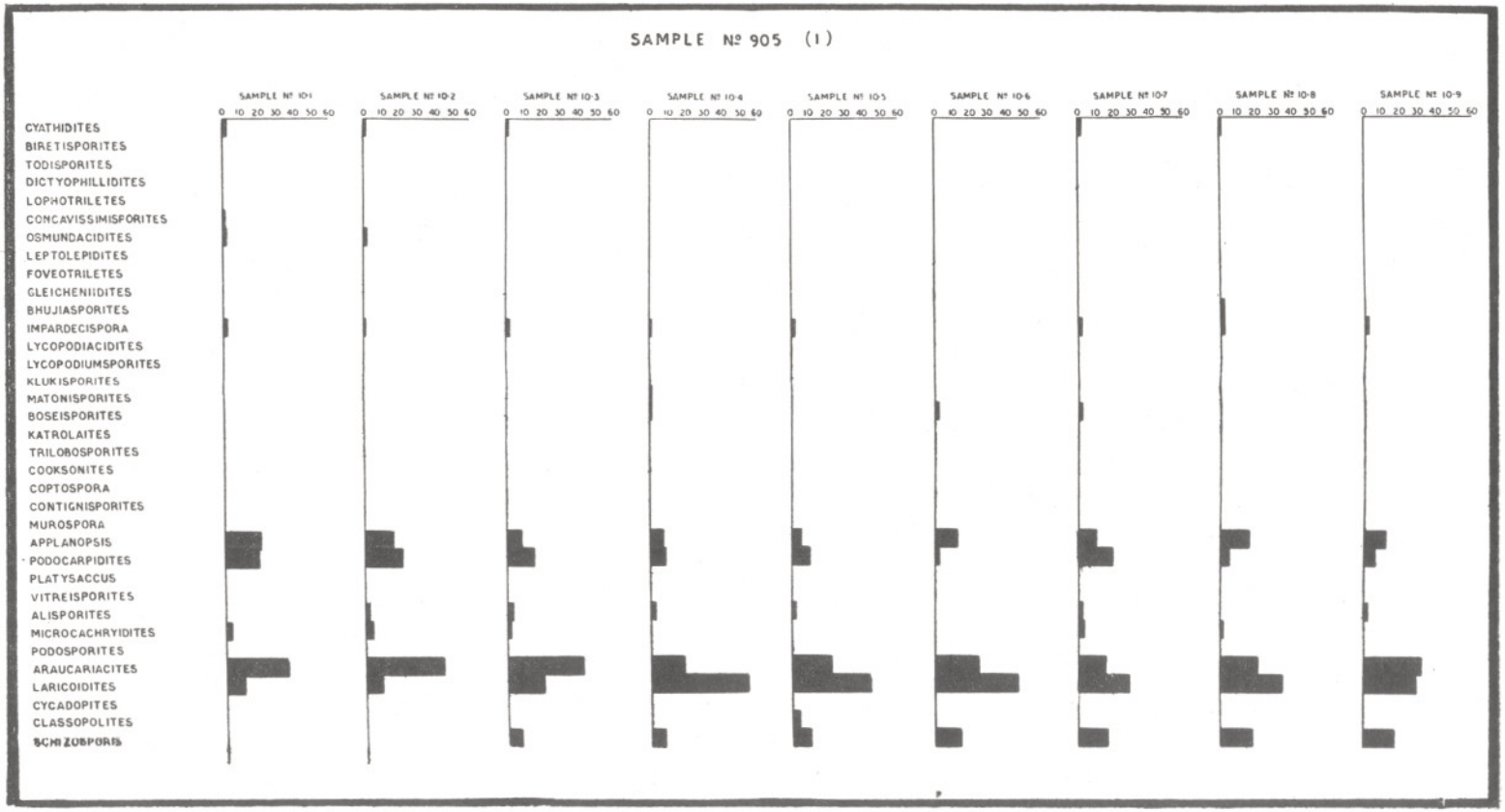
asperatus, Lycopodiumsporites austroclavatidites, L. eminulus, L. baculatus, Foveotriletes triangulus, Klukisporites punctatus, Matonisporites kutchensis, Boseisporites punctatus, B. minutus, Contignisporites glebulentus, C. cooksonii, C. kutchensis, Coptospora kutchensis, Katrolaites kutchensis, Applanopsis lenticularis, A. dampieri, A. trilobatus, A. segmentatus, A. monoalasporus, A. lucidus, A. triletus, A. grandis, A. punctatus, A. granulatus, Podocarpidites multesimus, P. canadensis, P. minisulcus, P. cristiexinus, P. densus, Microcachryidites antarcticus, Classopollis classoides, Araucariacites australis, A. cooksonii, Laricoidites communis, Schizosporis laevigatus.

Section H

The exposure is 60 ft. thick and consists of shales and sandstones. 10 samples were collected, out of which 5 samples yielded spores and pollen. The assemblage is dominated by *Applanopsis, Araucariacites* and *Laricoidites. Podocarpidites* and *Alisporites* are present in small percentages in all the samples. *Cyathidites, Concavissimisporites, Bhujiasporites, Impardecispora* and *Lycopodiacidites* are occasionally met with in the counts. The following genera and species have been recorded in the assemblage (TEXT-FIG. 6).



TEXT-FIG. 6 — Histogram pattern of spores-pollen genera present in the section.



TEXT-FIG. 7 — Histogram pattern of spores-pollen genera present in the section.

Cyathidites australis, C. minor, C. punctatus, C. rajmahalensis, C. medicus, C. flavatus, C. asper, Biretisporites potoniaei, Alsophilidites exilis, Todisporites minor, Osmundacidites wellmanii, Lophotriletes sp. 1, *Lophotriletes* sp. 2, *Concavissimisporites penolaensis, C. punctatus, C. subverrucosus, C. variverrucatus, Impardecispora uralensis, I. purverulentus, Pilosisporites grandis, Bhujiasporites hirsutus, Lycopodiumsporites austroclavatidites, L. eminulus, L. baculatus, Foveotriletes parviretus, F. triangulus, Klukisporites punctatus, Matonisporites kutchensis, Boseisporites punctatus, B. minutus, Contignisporites glebulentus, C. cooksonii, C. kutchensis, Coptospora kutchensis, Katrolaites kutchensis, Applanopsis lenticularis, A. dampieri, A. trilobatus, A. segmentatus, A. monoalasporus, A. lucidus, A. triletus, A. grandis, A. punctatus, A. ovatus, A. granulatus, Podocarpidites multesimus, P. minisulcus, P. densus, P. cristiexinus, Microcachryidites antarcticus, Classopollis classoides, Araucariacites australis, A. cooksonii, Laricoidites communis, Schizosporis laevigatus.*

Section I

The exposure is 50 ft. thick. Sandstone and shale alternate throughout the section. Twenty samples were collected and 9 samples yielded spores-pollen. The assemblage is dominated by *Araucariacites, Laricoidites, Applanopsis* and *Podocarpidites. Cyathidites, Concavissimisporites, Osmundacidites, Impardecispora, Alisporites* and *Microcachryidites* are frequently found within the counts. The following genera and species are present in the assemblage (TEXT-FIG. 7).

Cyathidites australis, C. medicus, C. trilobatus, Alsophilidites exilis, Osmundacidites wellmanii, O. minutus, Lophotriletes sp. 1, *Lophotriletes* sp. 2, *Concavissimisporites subverrucosus, Impardecispora uralensis, cf. Pilosisporites* sp., *Bhujiasporites hirsutus, Lycopodiumsporites austroclavatidites, L. circolumenus, L. eminulus, L. baculatus, L. minutus, Lycopodiumsporites* sp., *Klukisporites punctatus, Cicatricosisporites* sp., *Boseisporites minutus, Contignisporites glebulentus, C. cooksonii, C. multimuratus, C. kutchensis, Coptospora* sp., *Leschikisporis indicus, cf. Schizaeoisporites* sp., *Alisporites grandis, A. similis, Podocarpidites multesimus, Microcachryidites antarcticus, Podosporites tripakshii, Podosporites* sp., *Classopollis classoides, Araucariacites australis.*

PALYNOLOGICAL COMPARISON

The palynological assemblage in the sections studied here shows uniformity in the dominance of pollen grains. *Applanopsis, Araucariacites* and *Laricoidites* are the three dominant genera in all the samples of the sections. These three genera contribute to 60-90 per cent of the assemblage. *Podosporites* is also found in good percentage in some sections. Other genera though present in the assemblage are hardly met within the counts of 200 fossils per sample.

The palynological assemblage described by Sah and Jain (1965) from the Rajmahal hills (Middle-Upper Jurassic) Bihar resembles the present assemblage in the presence of following genera:

Cyathidites, Alsophilidites, Concavissimisporites, Osmundacidites, Lycopodiumsporites, Cicatricosisporites, Impardecispora, Applanopsis, Alisporites, Platysaccus, Podocarpidites, Araucariacites, Laricoidites, Classopollis.

The Rajmahal assemblage can, however, be distinguished by the presence of:

Deltoidospora, Gleicheniidites, Divisisporites, Callispora, Converrucosisporites, Verrucosisporites, Baculatisporites, Acanthotriletes, Neoraistrickia, Ceratosporites, Paucibaculisporites, Foveosporites, Ischyosporites, Cingulatisporites, Foraminisporis, Phyllocladidites, Vitreisporites, Trisaccites, Dacrycarpites, Cycadopites.

The present palynological assemblage closely resembles the *Dampieri* — assemblage recorded by Balme (1964) from the Middle-Upper Jurassic of Western Australia. In both the assemblages *Applanopsis, Araucariacites, Cyathidites, Lycopodiumsporites* are common. In the present assemblage, *Laricoidites* is also one of the dominant genera. *Gleicheniidites* which is common in the Western Australian sediments has not been recorded here.

The *Microcachryidites* — assemblage of Balme (1964) is dominated by saccate pollen of the *Podosporites — Microcachryidites* types. Though *Applanopsis, Classopollis* and *Araucariacites* are abundant in this assemblage, *Cingulatisporites, Concavisporites, Aequitriradites* and *Schizosporis* are distinctive elements of this assemblage (*see also* VENKATACHALA, 1969). This assemblage is not comparable with the Katrol assemblage described here.

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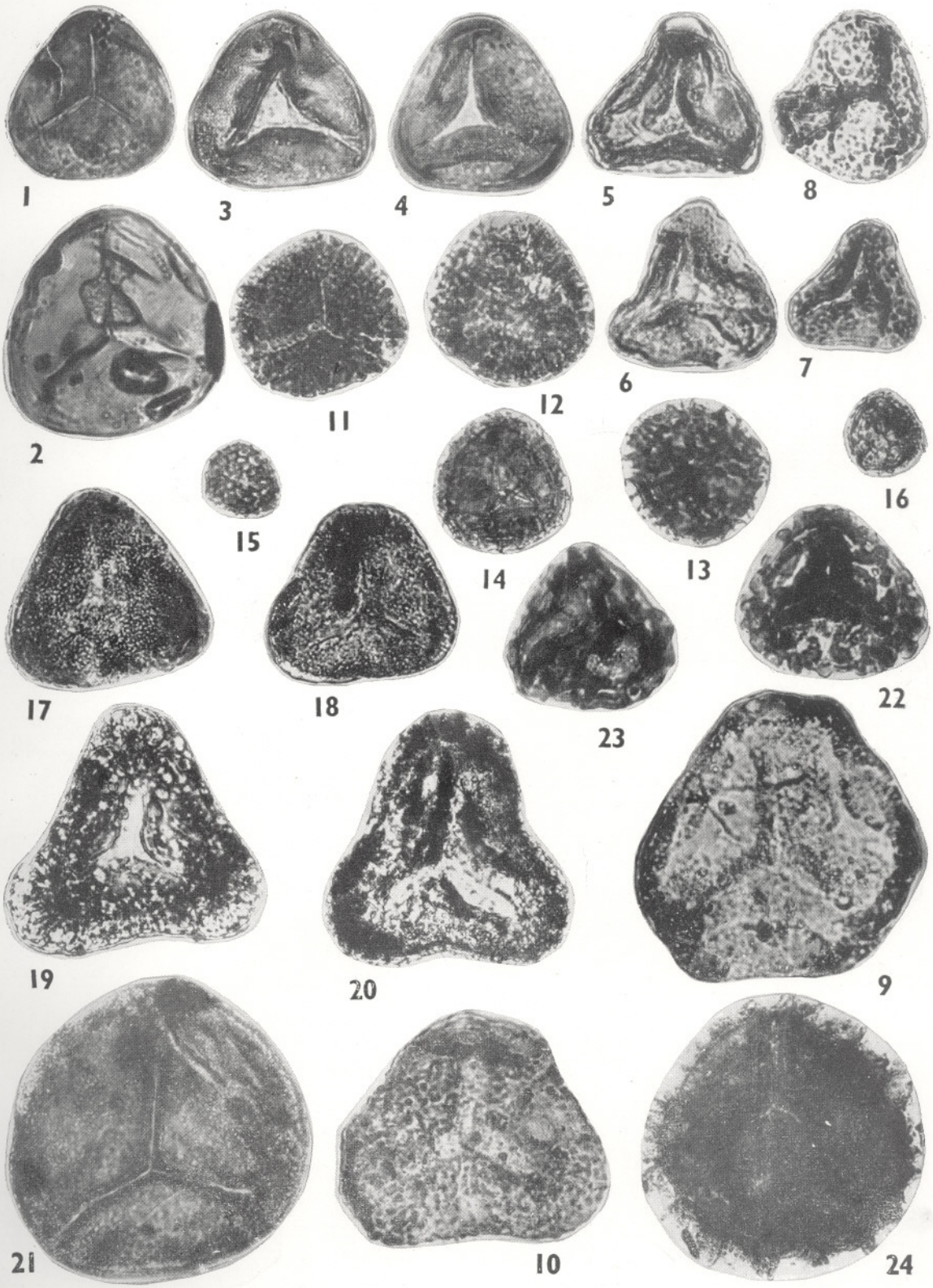
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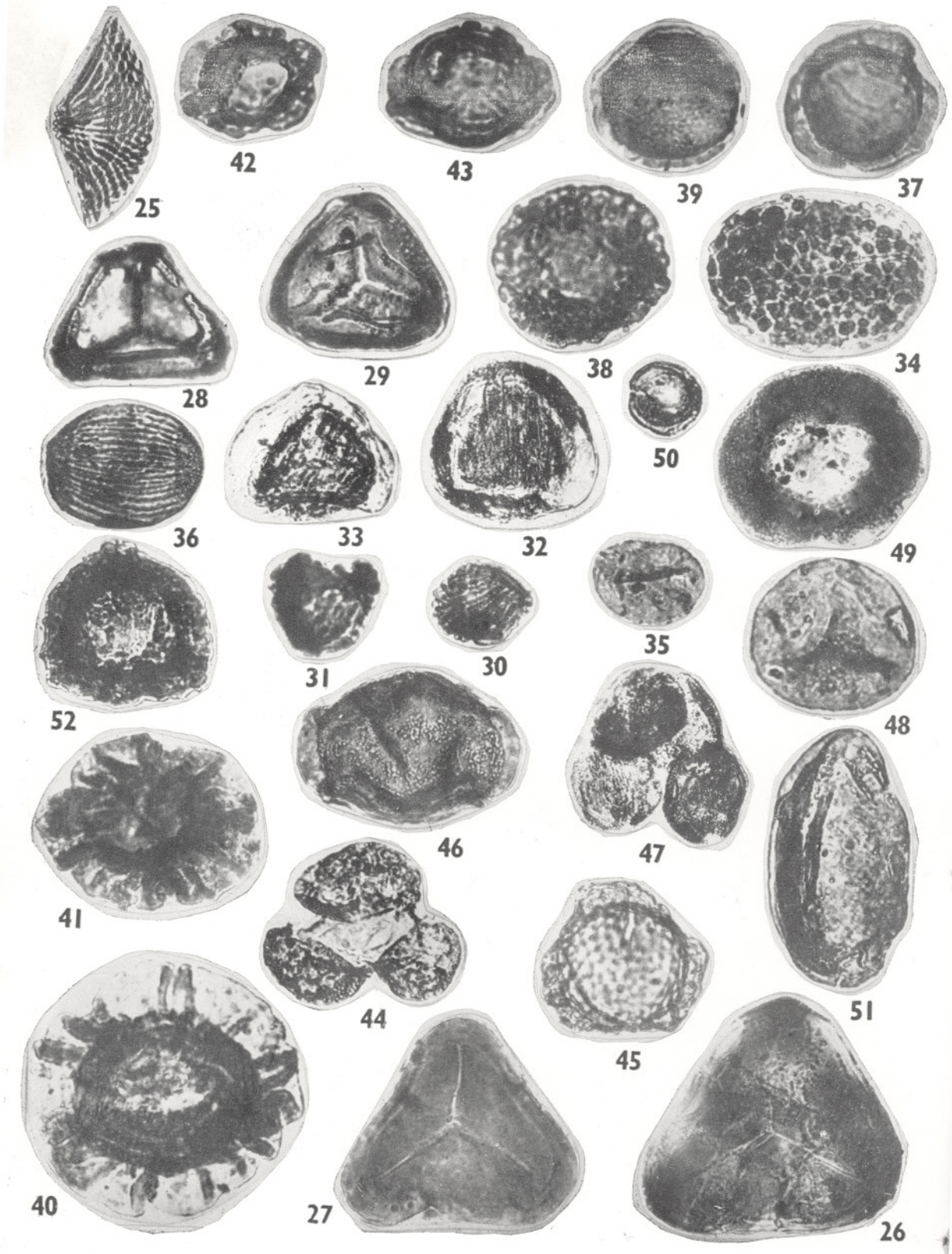
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EXPLANATION OF PLATES

(*All photomicrographs are enlarged ca.* × 500)

Plate 1

1-2. *Cyathidites flavatus* sp. nov. Slide nos. 3294, 3273.
3-4. *Alsophilidites bellus* sp. nov. Slide nos. 3289, 3284
5-6. *Concavisporites crassus* sp. nov. Slide no. 3283
7. *Lophotriletes* sp. 1. Slide no. 3298
8. *Lophotriletes* sp. 2. Slide no. 3289
9-10. *Concavissimisporites plexus* sp. nov. Slide nos. 3273, 3274.
11-12. *Lycopodiacidites subtriangulus* sp. nov. Slide no. 3280
13-14. *Lycopodiumsporites baculatus* sp. nov. Slide no. 3289
15-16. *Lycopodiumsporites* sp. Slide no. 3289.
17-18. *Foveotriletes triangulus* sp. nov. Slide nos. 3282, 3273
19-20. *Foveotriletes foveolus* sp. nov. Slide nos. 3283, 3279
21. *Foveotriletes* sp. Slide no. 3285
22-23. *Klukisporites apunctus* sp. nov. Slide nos. 3275, 3274
24. *Bhujiasporites hirsutus*. Slide no. 3305

Plate 2

25. *Cicatricosisporites* sp. Slide no. 3288
26. *Trilobosporites* sp. Slide no. 3273
27. *Matonisporites* sp. Slide no. 3275
28-29. *Boseisporites minutus* sp. nov. Slide nos. 3289, 3293
30-31. *Contignisporites kutchensis* sp. nov. Slide nos. 3289, 3293
32-33. *Contignisporites triletus* sp. nov. Slide no. 3278
34. *Polypodiisporites* sp. Slide no. 3276.
35. *Leschikisporis indicus*.Slide no. 3288.
36. *cf. Schizaeoisporites* sp. Slide no. 3288.
37-39. *Applanopsis ovatus* sp. nov. Slide nos. 3274, 3294
40-41. *Applanopsis punctatus* sp. nov. Slide nos. 3276, 3275
42-43. *Applanopsis granulatus* sp. nov. Slide nos. 3293, 3294
44. *Podosporites tripakshii*. Slide no. 3289.
45. *Podosporites* sp. Slide no. 3291.
46. *Podocarpidites* sp. Slide no. 3300.
47. *Classopollis classoides*. Slide no. 3278.
48. *Laricoidites kutchensis* sp. nov. Slide no. 3277
49. *Coptospora* sp. Slide no. 3278.
50. *Exesipollenites* sp. Slide no. 3281.
51. *Schizosporis laevigatus*. Slide no. 3306.
52. *Densoisporites* sp. Slide no. 3306.