DESCRIPTIVE

1. Genus - Ptilophyllum Morris 1840

1. Ptilophyllum acutifolium Morris 1840

The description is based upon fragmentary fronds measuring 3.5 cm long and 1.5 cm broad. Shape of pinna is linear to lanceolate. Rachis is fully or partially concealed and 2 mm thick. Pinnae are attached to the rachis by entire decurrent base at an angle of 60°. They are closely set. A single pinnae measures 1.1 cm in length and 4 mm in breadth. Pinnae margin falcate. Apex is acute. Number of veins are 8. They start from the entire base running parallel across the pinna and show forking.

Type - CHG/39/85

Locality - Chinna-Ganjam (Prakasam district) Andhra Pradesh

Horizon - Upper Jurassic (Kota stage)

Identification : The specimen closely resembles with P. acutifolium Morris 1840, in having following characters :

a) Linear and long pinnae,

b) Attachment of pinnae to the rachis by entire base,

c) Veins parallel,

d) Apex is acute.

Hence, the present specimen is identified as P. acutifolium Morris.

Remarks : P. acutifolium has been described by Morris in 1840 is commonly met with at Kakadbhit in Kutch and Mariparia, Narsinghpur district. And also found in Basgo-bed, Bindaban, Sakrigalighat and Onthea in Rajmahal hills. It has also been reported from Gollapalle, Raghavapuram, Vemavaram and Raghudevapuram in the East Coast of Andhra Pradesh.

The present specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh. It is first time being reported from this area.

2. Ptilophyllum cutchense Morris 1840

The specimen is a pinnate frond measuring 4.6 cm long and 6 mm broad. Rachis is partially concealed. Pinnae is linear, 3 mm long and 1 mm broad. They are attached to the rachis on the upper side by the entire base at an angle of 70°. Pinnae are closely set, having entire margins. Apex is obtuse. Veins are 4-5, arising from the base and show forking.

Type - CHG/44/86,

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen resembles with P. cutchense Morris in having

1) Linear pinnae,

2) Obtuse apex

3) Rounded acroscopic margin,

4) Basiscopic margin straight. Hence it is identified as such.

Remarks : P. cutchense has been previously reported from Kutch, Rajmahal hills and Raghavapuram and Vemavaram in East Coast. Mahabale & Satyanarayana (1979) reported it from Raghudevapuram in East Godavari district of Andhra Pradesh.

The present specimen is collected from Chinna-Ganjam (Prakasam district) A.P. which is a new locality for this plant.

3. Ptilophyllum rarinervis (Feistm.) Bose and Kasat 1972.

The specimen is a fragmentary frond measuring 3 cm in length and 6-8 mm in breadth, tapering towards the apex. Rachis is slender, 5 mm wide. Pinnae are attached on upper side of the rachis at an angle of 57°-60°. They are closely set. Pinnae are short, linear, alternate, measuring 6 mm long and 1 mm broad. The apex is sub-acute, pointed towards the upper part of the frond. Margins of the pinnae straight. Pinnae are closely set, veins 2-3 in number and arise from entire base and show forking.

Type - CHG/48/85

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage)

Identification - The specimen agrees with P. rarinervis

(Feistm.) Bose and Kasat 1972 in having pinnae attached to the rachis at an angle of 57°-60°; apex is rounded and margins straight; decurrent base and few veins, 3 in number. Hence, it is identified as P. rarinervis (Feistm.) Bose and Kasat 1972.

Remarks : P. rarinervis is a very rare species. So far it is collected from Vemavaram, Raghavapuram and Raghudevapuram in Andhra Pradesh and Onthea in Rajmahal hills.

The present specimen is from Chinna-Ganjam (Prakasam district) A.P. which is a new locality for the species. Hence it appears that it is more common in the East Coast.

4. Ptilophyllum sp. cf. P. institacallum Bose 1959

Biseriately pinnate shoot measuring 5.5 cm long and 2.1 cm broad. Rachis is partially concealed by bases of pinnae. It is 1 mm thick. Pinnae linear, 1.2 cm long and 3 mm broad, attached on the upper side of the rachis at an angle of 70°. They are closely set having auriculate base. Acroscopic and basiscopic margins falcate. Apex is acute. Veins are 7 in number arising from the whole base, forking at all levels.

Type - CHG/55/85

Locality - Chinna Ganjam (Prakasam district), A.P.

Horizon - Upper Jurassic (Kota stage).

Identification : The present specimen closely agrees with

the P. institacallum Bose 1959 in having linear pinnae attached to the axis by their auriculate base at an angle of 70°; falcate margins, acute apex turning upwards and veins arising at the base forking at all levels.

It agrees with the morphological characters given by Bose & Kasat (1972) of P. institacallum. Since the cuticle is not present in our specimen it is described as Ptilophyllum sp. cf. P. institacallum.

Remarks - P. institacallum has been reported from Sehora (Narsinghpur district), M.P. Mahabale & Satyanarayana (1979) reported it from East Godavari district in Andhra Pradesh. Our specimen is collected from Chinna-Ganjam in Prakasam dist. of Andhra Pradesh from where it is reported for the first time. Hence it is a second report from the East Coast of Andhra Pradesh.

5. Ptilophyllum sp. cf. P. sahnii Gupta and Sharma 1968

(The description is based on 3 specimens - CHG/18/85, CHG/19/87, CHG/24/85).

Fragmentary shoots measuring 3.5 cm long and 9 mm broad. Rachis is exposed and 1.5 mm in thickness. Pinnae attached on the upper side of the rachis at an angle of about 80°, alternate, closely set, measuring 4 mm long and 1 mm broad. Pinnae oblong, acroscopic margin rounded. Apex is obtuse.

Veins are 5-6 in number, arising from entire base, forking.

Type - CHG/24/85

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The specimens closely resembles with the characters of P. sahni Gupta and Sharma (1968b) in following morphological features - pinnae having oblong shape, attachment of pinnae by entire base at an angle of 80°, upper basal angle decurrent, veins 5-6 developed from the whole base and obtuse apex.

Cuticle is absent in our specimen therefore, it is described as Ptilophyllum sp. cf. P. sahnii Gupta and Sharma.

Remarks - P. sahnii had been earlier reported from Amarjola, Chilgojuri and Nipania in Rajmahal Hills, Bihar. Mahabale & Satyanarayana (1979) reported it from East Godavari district in Andhra Pradesh.

Our specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh which is a new locality for this species. And it is the second report from East Coast of Andhra Pradesh.

6. Ptilophyllum sp. cf. P. distans (Feistm.) Jacob and Jacob 1954

The specimen is an imparipinnate frond measuring

4.5 cm in length and 2.5 cm in breadth in the middle gradually narrowing towards base and apex. Rachis is partially concealed by pinnae bases. Pinnae linear, 1 to 1.6 cm in length and 3 mm in breadth. Leaves are at a distance of 0.1 cm from each other, alternate, attached on the upper surface of the rachis at an angle of 60°. Apex is sub-acute. Base of the pinnae are slightly auriculate. Margins falcate, upper basal angle rounded and lower basal angle straight. Veins are 4-5 arising from entire base, forking twice.

Type - CHG/11/87

Locality - Chinna-Ganjam (Prakasam district), A.P.

Horizon - Upper Jurassic (Kota stage)

Identification - The present specimen closely agrees with P. distans (Feistm.) Jacob and Jacob 1954 morphologically in having following characteristics.

i) Pinnae linear and long,

ii) Pinnae attached to the rachis at an angle of 60°,

iii) Pinnae with falcate margins,

iv) Upper basal angle free and rounded,

v) Lower basal angle straight.

Hence it is described as such.

Remarks : P. distans is earlier reported by Jacob and Jacob (1954) and also by Bose and Kasat (1972) from Sehora

(District Narsinghpur), M.P. and Trambau, Kutch. Mahabale & Satyanarayana (1979) reported it from Raghudevapuram in East Godavari dist. of Andhra Pradesh.

The present specimen is collected from Chinna-Ganjam (Prakasam district) A.P. from where it is reported for the first time. It appears that it is reported from East Coast of Andhra Pradesh in more than one place.

7) Ptilophyllum sp. cf. P. jabalpurense Jacob and Jacob 1954

The specimen is a pinnate shoot measuring 5.2 cm long and 2.2 cm broad, tapering towards base and apex. Rachis is partially concealed by pinnae having a width of 2 mm. Pinnae are linear, 1.3 cm long and 2 mm broad, placed alternate, closely set, on the upper side of the rachis, arising at an angle of 65°. Acroscopic and basiscopic margins falcate. Apex is apiculate. Veins are 5 in number arising from the entire base and shows forking.

Type - CHG/2/87
Locality - Chinna-Ganjam (Prakasam district) A.P.
Horizon : Upper Jurassic (Kota Stage)

Identification - The present specimen closely agrees with the P. jabalpurense in having linear pinnae attached to the axis by their convex base at an angle of 65°, falcate margin, apiculate apex and veins are 5 in number.

It agrees with all the morphological characters given by Bose and Kasat (1972). Since the cuticle is not present in our specimen it is described as Ptilophyllum sp. cf. P. jabalpurense.

Remarks : P. jabalpurense had been earlier reported by Jacob and Jacob (1954) from Sehora (District Narasinghpur), M.P. and also by Mahabale and Satyanarayana (1979) from Raghudevapuram in E. Godavari district of Andhra Pradesh. Our specimen is collected from Chinna-Ganjam (District Prakasam) in Andhra Pradesh from where it is reported for the first time. It appears that it is found in A.P. in more than one locality.

8) Ptilophyllum sp. cf. P. amarjolense Bose 1953

(The description is based on 2 specimens - CHG/34/87, CHG/13/87).

Pinnate fronds measuring 10 cm long and 1.2 cm broad. Lower expanded end of petiole forming pulvinus, at base 3 mm in breadth. Rachis is exposed and 3 mm in width. Lower portion of rachis is devoid of pinnae, 2.5 cm from the base. Pinnae are attached by their truncate base on the upper surface of rachis, alternate, arising at an angle of 60^{o}. Pinnae is linear, 8 mm long and 2 mm broad. Acroscopic and basiscopic margins are straight. Apex is acute. Veins are 5 in number and forked.

Type - CHG/34/87

Locality - Chinna-Ganjam (Dist. Prakasam), A.P.

Horizon- Upper Jurassic (Kota Stage).

Identification : The present specimen closely resembles with P. amarjolense Bose 1953 in having lower expanded part of petiole forming pulvinus, pinnae attached by truncate base, acroscopic and basiscopic margins straight, pinnae apex acute.

Cuticle is absent in the present specimen therefore it is described as Ptilophyllum sp. cf P. amarjolense.

Remarks : P. amarjolense was earlier described by Bose (1953) and Bose and Kasat (1972) from Amarjola, Chilgojuri and Nipania in Rajmahal Hills, Bihar. Mahabale and Satyanarayan (1979) reported Ptilophyllum sp. cf. P. amarjolense from Raghudevapuram in A.P. Our specimen is collected from Chinna-Ganjam (Prakasam dist.) in A.P. which is a new locality for this species.

Hence, this is the second report from the East Coast.

9. Ptilophyllum tenerrimum Feistmantel 1877

The specimen is a biserriately pinnate fragmentary shoot measuring 4 cm long and 2.4 cm broad. Rachis is 2 mm thick. Pinnae are alternate, linear, elongated, attached by their truncate base on the upper side of the rachis at an angle of 70^{o}, measuring 1.2 cm long and 0.3 cm broad. Apex

is obtuse. Acroscopic and basiscopic margins are straight. Veins are 6-7 in number and shows forking.

Type - CHG/28/85

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely agrees with the characters of P. tenerrimum Feistmantel 1877 in having elongated pinnae attached to the rachis at an angle of 70° by a truncate base, straight margins and obtuse apex. Hence it is described as such.

Remarks : P. tenerrimum is reported from Onthea in the Rajmahal Hills, Bihar. Mahabale and Satyanarayana (1979) reported it from Raghudevapuram in East Godavari district of A.P.

Our specimen is reported from Chinna-Ganjam in Prakasam district of Andhra Pradesh which is a new locality for the species. Hence it is the second report from East Coast.

2. Genus - Pterophyllum Brongniart, 1928

1) Pterophyllum footeanum Feistmantel 1879

(The description is based on two specimens : CHG/7/85, CHG/6/85)

The specimen is a fragmentary frond measuring 7 cm in length and 4 cm in breadth.

Rachis is partially exposed, 4-5 mm wide, fairly thick even in the upper part, striated in the longitudinal direction. Pinnae linear, the largest is 3.5 cm long and 3 mm broad. They are attached to the rachis at an angle of 50°. They are placed 1 to 1.55 mm apart. Margins entire. Parallel along major part of pinnae. Apex is not seen. Acroscopic margin curving upward, basiscopic margin decurrent. Veins are 5-6 simple or forked.

Type - CHG/7/85

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification : The specimen closely agrees with characters of P. footeanum Feistm. emended by Bose and Banerjee (1981) in shape of pinnae and venation pattern, entire margin, attachment of pinnae to the rachis at an angle of 50°, apex is missing.

Hence it is described as such.

Remarks : P. footeanum Feistm. had earlier been reported from Vemavaram. Vagyani (1986) reported it from Uppugunduru in Prakasam district of Andhra Pradesh.

Our specimen is collected from Chinna-Ganjam of Prakasam district in A.P. This indicates wide distribution of P. footeanum in Prakasam district.

2) Pterophyllum kingianum Feistm. 1877

Large leaf specimen measuring 21 cm long and 10 cm broad. Rachis is exposed fully showing fine longitudinal striations, measures 0.5 cm wide. Pinnae are sub-opposite, attached to the rachis at an angle of 60^{o}-70^{o}, near apex arising at an angle of 50^{o}. They are 10 cm long and 4-5 cm broad, straight or somewhat falcate with sub-acute apex. Margins of pinnae parallel, both acroscopic and basiscopic margins curving upwards. Veins are 7-10 in number, simple and parallel.

Type - CHG/15/86

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely agrees with P. kinganum Feistm. in having fully exposed rachis with longitudinal striations, more upwardly inclined, long, linear, pinnae, vein number 7-10, simple, parallel. Hence, our specimen is described as P. kingianum.

Remarks : P. kingianum is earlier described by Feistmantel from Gollapalle in A.P. It is also reported from Vemavaram in A.P. Our specimen is described from Chinna-Ganjam in Prakasam district of A.P. from which it is reported for the first time.

3) Pterophyllum morrisianum Oldham 1863

Large leaf specimen measuring 15 cm in length and 11 cm in breadth, gradually narrowing towards apex. Rachis is fully exposed, 5 mm thick, tapering towards apex and longitudinally striated. Pinnae are opposite, laterally attached to the rachis at an angle of 70^{o}. Pinnae are linear, measure 9 cm in length and 1.5 cm in breadth. Apex is obtuse. Base is slightly expanded. Margins are falcate. Both acroscopic and basiscopic margins slightly curving upwards. Veins are 17-19, mostly simple, when forking mostly once.

Type - CHG/28/87

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely resembles with P. morrisianum Oldham in having exceptionally large pinnae, with falcate margin, rachis is exposed and longitudinally striated, veins are 17-19 in number. Mostly simple, when forking mostly once.

Hence, it is described as such.

Remarks : P. morrisianum is earlier reported from Bindaban, Sakrigalighat and Onthea in the Rajmahal Hills, Bihar.

Our specimen is collected from Chinna-Ganjam in Prakasam district of A.P. from where it is reported for the first time. It appears that it is a rare plant in the East Coast.

3. Genus - Dictyozamites Oldham, 1863

1) Dictyozamites feistmantelli Bose and Zeba-Bano, 1976

The specimen is a imparipinnate leaf. It measures 17.5 cm long and width in the middle region is 3-5 cm. Rachis is exposed. Near the base rachis is 3-4 mm wide, gradually narrowing towards the apex and striated longitudinally. Pinnae are alternate, slightly sparse with obtuse apex. They measure 2-3 cm in length and 8 mm in breadth. Both acroscopic and basiscopic margin of pinna auriculate with a small constricted stalk, noticeable in upper part of frond. Pinnae are attached to the rachis at an angle of 70^{o} in the middle part and reducing at the upper part. Veins numerous, radiating from the base, forking and anastomosing to form meshes. Along the middle region forming longer meshes, meshes near the margin are smaller in size.

Type - CHG/30/87

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification : The present specimen closely agrees with D. feistmantelli Bose and Zeba-Bano 1976 in having alternate pinnae with auriculate base and small constricted stalk, veins numerous, radiating from base forking and anastomosing. Hence the specimen is described as such.

Remarks : D. feistmantelli Bose and Zeba-Bano 1976 is earlier reported from Gollapalle, Raghavapuram, Vemavaram and Sriperamatur in the East Coast; Paraspani and Jatmao in Hoshangabad district of Madhya Pradesh.

One specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh, which is a new locality for the species. It appears that it is the characteristic species of the East Coast.

2) Dictyozamites falcatus (Morris) Medlicott & Blandford 1879

The specimen is a fragmentary frond having pinnules on only one side of rachis.

Leaves pinnate, measuring 7.5 cm long and 3.5 cm broad. Rachis exposed at the base and 4 mm wide. Pinnae are closely set, and attached to the rachis by their entire base at an angle of 70°. Pinnae linear, lanceolate with falcate margins. Apex is obtuse. Acroscopic and basiscopic margin abruptly rounded near base, forming an auriculate base. Veins developed from the base, profusely forked to form meshes. Meshes of middle region of pinnae elongated, rectangular, almost parallel, towards margin and near pinnae base meshes are smaller in size.

Type - CHG/18/86

Locality - Chinna-Ganjam (Dist. Prakasam), A.P.

Horizon - Upper Jurassic (Kota Stage).

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Identification : The present specimen resemble D. falcatus (Morris) Medlicott and Blandford in having

1) Linear lanceolate pinna,
2) obtuse apex,
3) falcate margin,
4) acroscopic and basiscopic margin rounded forming an auriculate base.
5) pinnae attached to the rachis at an angle of 70°.

Hence our specimen is described as such.

Remarks : D. falcatus was first described from Chilgojuri, Amrapura by Oldham and Morris. Bose & Kasat (1972) described D. falcatus from Amarjola in Rajmahal Hills, Bihar. Recently Mahabale and Satyanarayana reported D. falcatus from Raghudevapuram (East Godavari district) in A.P.

Our specimen is from Chinna-Ganjam of Prakasam district in A.P. It appears that D. falcatus is widely distributed in Andhra Pradesh and it ranges from Rajmahal hills in Bihar to Andhra Pradesh.

3) Dictyozamites indicus Feistmantel, 1876

The specimen is an imparipinnate frond measuring 8 cm long and 4 cm broad. Rachis is 3 mm broad, partially covered by pinnae. Pinnae closely set, touching the adjacent pinnae. They are attached to the rachis at an angle of 70°-80°. Pinnae are 2.5 cm long and 7 mm broad. Basiscopic margin is partially

covered by acroscopic margin of pinna below. Margins are entire. Apex is obtuse. Veins diverging from base, forking and forming meshes, except near basiscopic margins and along margin meshes are almost of equal size. They are slightly larger near the middle region.

Type - CHG/19/86

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification : The present specimen closely resembles with D. indicus Feistm. 1876 in having closely set, uniformly broad pinnae. Entire margin. Pinnae are attached to the rachis at an angle of 70^{o}-80^{o}. Apex is obtuse. Veins diverging from base, forking and forming meshes.

Remarks : D. indicus is earlier reported from Murrero, Bindaban, Basgo-Bedo, Maharajpur, Onthea, Kasamau and Chilgojuri in Rajmahal Hills, Bihar; near Paraspani, district Hoshangabad, Madhya Pradesh and Vemavaram, district Prakasam, Andhra Pradesh.

Our specimen is from Chinna-Ganjam area in Prakasam district of A.P. It appears that D. indicus is not widely distributed in the East Coast.

4) Dictyozamites hallei Sahni and Rao 1933.

Imparipinnate frond measuring 2 cm long and 2.6 cm broad, gradually tapering towards apex. Rachis is slender,

1 mm in width. Pinnae are alternate, closely set, arising at an angle of 60°. Pinnae narrow, elongated, falcate, gradually narrowing into bluntly pointed apex. Pinnae are 2 cm long and 2.5 mm broad. Margin is entire. Base is auriculate. Veins are 6 in number, radiating from the base, forking and forming inter-connections areoles few, majority similar in size and shape, narrow and elongated, 1-3 mm or more in length. Near the middle, areoles are few and elongated and near the margin they are smaller.

Type - CHG/14/85

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification : The present specimen resembles D. hallei Sahni and Rao, 1933 in having the pinnae narrow and elongated with falcate margin, base is auriculate, 6 veins are present at the base of the pinnae, veins are interconnected to form areoles apex is bluntly pointed.

Hence, the specimen is described as such.

Remarks : D. hallei is reported from Onthea, Bagjori and Sakrigalighat in Rajmahal Hills, Bihar. Our specimen is from Chinna-Ganjam area in Prakasam district of Andhra Pradesh, which is a new locality for this species. This indicates that it is a rare species in the East Coast.

4. Genus - Otozamites Braun 1843

1) Otozamites sp.

The specimen is a pinnate frond measuring 6.2 cm long and 0.6 cm broad, narrower toward base and apex. Rachis is slender, 1 mm wide, partially concealed. Pinnae alternate, contiguous at their bases, sometimes overlapping, arising at an angle of 60° to the rachis pinnae measure 3 mm long and 2.5 mm wide, upper basal angle expanded and rounded. Apex is rounded obtuse. Veins arising near the point of attachment, radiating, 4-5 in number, forking at all levels.

Type - CHG/42/85

Locality - Chinna-Ganjam (District Prakasam) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification - The present specimen closely agrees with Otozamites sp. described by Bose in 1974 from Cutch in having pinnae which is rectangular in shape, arising at an angle of 60°, upper basal angle rounded, apex obtusely rounded, and veins arising at the point of attacheme.

Remarks : Bose (1974) reported Otozamites sp. from Kakadbhit, Cutch. Our specimen is collected from Chinna-Ganjam area (Prakasam district) in Andhra Pradesh, which is a new locality for the species.

2) Otozamites sp. cf. O. imbricatus Feistmantel 1876

The frond is pinnate, measuring 2 cm in length and

1.2 cm in breadth. The rachis is 4 mm wide and contains pinnule mostly on one side. Pinnae are alternate, attached to the rachis at an angle of 60°. Pinnae are 1 cm long and 4 mm broad, having falcate margin. Apex is obtuse. Veins arising from the point of attachment and radiating to the rest of the pinna, 7 to 9 in number, dichotomizing at all levels.

Type - CHG/18/87

Locality - Chinna-Ganjam (Prakasam dist.) A.P.

Horizon -

Identification - The present specimen resembles O. imbricatus Feistmantel morphologically in having pinnate leaf, broad rachis, closely set pinnae having falcate margin, veins arising at the point of attachment and radiating into rest of the pinna, dichotomizing at all levels.

Cuticle is not present in our specimen hence it is described as Otozamites sp. cf. O. imbricatus.

Remarks : O. imbricatus was described by Feistmantel (1876) from Loharia and Trambau in Kutch. Later Bose & Banerji (1984) described it from the same locality.

Otozamites sp. cf. O. imbricatus is described from Chinna-Ganjam (Prakasam dist.) in A.P. for the first time which is new locality for the species.

3) Otozamites sp. cf. O. kachchhensis. Bose & Banerji 1984

The specimen is a fragmentary frond measuring 5 cm long and 9 mm wide. Rachis is almost concealed by pinnae bases. Pinnae are sub-opposite, closely set at an angle of 70°. Pinnae gradually tapers towards both the end. Pinnae are falcate, measuring 5 mm long and 3 mm broad. Apex is rounded. Veins are 4 in number, diverging from the base.

Type - CHG/37/87

Locality - Chinna Ganjam (Prakasam dist.) A.P.

Horizon - Upper Jurassic (Kota Stage)

Identification - The present specimen closely agrees with O. kachchhensis Bose and Banerji (1984) morphologically in having sub-opposite pinnae with falcate margin, attached to the rachis at an angle of 70°, apex is obtuse and 4 veins diverging from the base of pinnae.

Since cuticle is not present in present specimen it is described as Otozamites sp. cf. O. kachchhensis.

Remarks - Bose and Banerji (1984) had earlier described O. kachchhensis in 1974 from Kakadbhit and Chawad River.

Our specimen is collected from Chinna-Ganjam in Prakasam dist. of Andhra Pradesh which is a new locality for the species.

4) Otozamites vemavaramensis Bose and Jain 1967

Leaves imparipinnate, measuring 4-5 cm in length and 5 mm wide, slightly narrower towards the apex. Rachis is concealed by the pinnae. Pinnae attached on the upper surface of the rachis at an angle of 80°, some even at 90°. Pinnae are closely set. They are deltoid or nearly circular in shape, measuring 3 mm in length and 3 mm in breadth. Apex is obtuse. Base is truncate. Veins few, obscurely marked.

Type - CHG/14/83

Locality - Chinna-Gankam (Prakasam dist.) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely agrees with O. remavarensis Bose and Jain in having deltoid pinna, attached to the rachis at an angle of 80°-90°, obtuse apex and few veins.

Hence the specimen is described as such.

Remarks : Bose and Jain (1967) earlier described it from Vemavaram (Dist. Prakasam) in Andhra Pradesh.

Our specimen is collected from Chinna-Ganjam in Prakasam dist. of A.P. which is a new locality for this plant. Hence, it shows that the specimen is widely distributed in East Coast of Andhra Pradesh.

5. Genus - Taeniopteris Brongniart 1832

1) Taeniopteris kutchensis Bose and Banerji 1981

The specimen is a linear leaf impression, measuring 3 cm long and 2.1 cm broad. Base of the leaf is not seen. Apex is obtuse. Margin is entire or at places torn to give a false idea of incomplete segmentation. Secondary veins arising from the midrib at an angle of 60° near the apex. Veins are 13 in number per cm, Veins fork at different levels, rarely veins fork just after emergence and out of these the ones closer to margin may fork again.

Type - CHG/12/87

Locality - Chinna-Ganjam (Dist. Prakasam) Andhra Pradesh.

Horizon - Upper Jurassic

Identification - The specimen closely resembles to T. kutchensis Bose and Banerji in having wavy margin which gives false idea of segmentation, apex obtuse, vein 13 per cm, some of which fork just after emergence and may fork again near the margin. Hence, it is described as T. kutchensis.

Remarks : Bose and Banerji reported T. kutchensis from Kakadbhit and Dhawrha Mota in Kutch.

Our specimen is collected from Chinna-Ganjam, (Prakasam dist.) in Andhra Pradesh which is a new locality for the species. It appears that T. kutchensis ranges from Kutch to Andhra Pradesh.

CONIFERALES

6. Genus - Elatocladus, Halle 1913

1) Elatocladus plana (Feistm.) Seward 1919

The specimen is a sterile shoot with biseriately arranged narrow linear leaves very gradually tapering to a point, attached spirally by the full width of the decurrent bases. The shoot measures 4.5 cm in length and 3.5 cm in breadth. Rachis is slender, 2 mm broad and longitudinally striated. Pinnae are linear, narrowly lanceolate, measuring 2.2 cm long and 1 mm broad and spread in one plane. They are attached to the rachis at an angle of 70°. Apiscopic and basiscopic margins straight, upper basal angle free and rounded, lower basal angle is decurrent. Apex is subacute. Veins are two, on either side of the midrib, running parallel to it.

Type - CHG/47/86

Locality - Chinna-Ganjam (Dist: Prakasam) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The specimen closely resembles to F. plana (Feistm.) Seward in having biseriately arranged narrow linear leaves and spreading in one plane gradually tapering to a point. Pinnae are attached to the rachis by the broad truncate base at an angle of 70°, rachis is slender, longitudinally striated, apex is subacute and veins 2 in number on either

side of the midrib, running parallel to it.

Hence, the specimen is described as such.

Remarks : E. plana is common in Ragavapuram, Sriperamatur shales in A.P., it is also found in Bansa near Chandia (S. Rewah) in M.P.

Recently Vagyani and Jamane (1987) reported it from Uppugunduru in Prakasam district of A.P. The present specimen is collected from Chinna-Ganjam in Prakasam district of A.P.

Hence it appears that E. plana has wider distribution in Jurassic beds of Andhra Pradesh.

2) Elatocladus conferta (Oldham & Morris) Halle 1913.

The specimen is a fragmentary frond having linear, lanceolate on oblong leaves, spirally attached but more or less spread in two rows, measuring 4 cm long and 3.5 cm broad. Rachis is slender, 1 mm broad. A single pinna measures 1.8 cm long and 1 mm broad. A single well defined midrib runs upto the more or less pointed apex. Leaf base contracted. The leaves are placed at an angle of 60^{o}.

Type CHG/18/87

Locality - Chinna-Ganjam (Prakasam district), A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The specimen closely resembles to E. conferta (Oldham & Morris) Halle 1913 in having linear, lanceolate or

oblong pinna spirally attached but more or less spread in two rows, contracted leaf base, and presence of single well-defined midrib.

Hence it is described as such.

Remarks : E. conferta (Oldham & Morris) Halle 1913 is reported from Bindabun, Onthea and Murrero in Rajmahal Hills in Bihar; Golapalle Nellore Kavali Taluq, Chirakunt, in Andhra Pradesh Sher river, Bansa in Madhya Pradesh, Kurbi, Gadhsisa and Kakadbhit in Kutch.

Our specimen is collected from Chinna-Ganjam (Prakasam district) in Andhra Pradesh which is a new locality for the species.

3) Elatocladus sp. cf. E. tenerimma (Feistm.) Sahni 1928

The specimen is a fragmentary shoot measuring 4 cm long and 2.2 cm broad. Stem is 0.8 - 1 mm wide. Leaves are spirally arranged but in a compressed state spreading on lateral sides. They are attached by broad decurrent bases making an angle of 40°-50°. Leaves are narrow, elongated on linear in shape measuring 1.2 cm in length and 0.5 - 0.8 mm in width. Margins entire. Apex is obtuse. Midrib usually indistinct.

Locality - Chinna-Ganjam (Prakasam dist.) A.P.

Type - CHG/28/87

Horizon - Upper Jurassic (Kota Stage).

Identification - The specimen closely resembles with E. tenerimma (Feistm.) Sahni 1928 in having spirally arranged leaves, attached to the rachis by broad decurrent bases, leaves narrow, elongate or linear in shape, with mostly obtuse apex and indistinct midrib. Cuticle is absent in our specimen hence it is described as Elatocladus sp. cf. E. tenerimma.

Remarks - E. tenerimma (Feistm.) Sahni was earlier reported from Sriperamatur in Tamilnadu, Sher river in Madhya Pradesh, Jamthara and Kakadbhit in Kutch.

Our specimen is collected from Chinna-Ganjam (Prakasam district) in Andhra Pradesh, which is a new locality for the species.

4) Elatocladus jabalpurensis (Feistm.) Seward 1919

The specimen is a slender shoot with very narrow but rather stiff leaves. It measures 3 cm. in length and 2.2 cm in breadth. Rachis is 2 mm thick with longitudinal striations. Pinnae are closely set on the upper side of the rachis. They are 2.2 cm long and 1 mm broad. Pinnae are attached to the rachis by their entire base at angle of 52°. Acroscopic and basiscopic margins are falcate. There is a clearly marked midrib and the tip is rounded.

Type - CHG/44/85

Locality - Chinna-Ganjam (Prakasam dist.) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification : The present specimen resembles with E. jabalpurensis (Feistm.) Sahni in having rather narrow and stiff leaves attached to the rachis at an angle of 50°, falcate margins and obtuse apex. Based on these characters the present specimen is assigned to E. jabalpurensis.

Remarks : E. jabalpurensis (Feistm.) Sahni 1928 is earlier reported from Jabalpur and Satpura in Madhya Pradesh, Vemavaram in Andhra Pradesh, Chawad river in Kutch.

Our specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh, from which it is collected for the first time. Hence it appears that it is widely distributed in Prakasam district of Andhra Pradesh.

5) Elatocladus vemavaramensis sp. nov.

Sterile conifer twig with a twisted axis measuring 1.5 mm wide. Leaves inserted spirally but they are not lying in one plane. Leaves are linear elongated 1 cm in length and 1 mm in width, dorsiventrally flattened. Margins entire. The leaves are attached to the axis by broad decurrent base at an angle of 50° but it varies greatly from base to apex. They are opposite. Leaf apex is sub-acute. Leaves are arranged on the axis in a irregular manner. Laminna is with a single conspicuous median vein reaching upto the apex.

number

Holotype - CHG/20/85

Locality - Vemavaram (Prakasam dist.), A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification - The specimen resembles with E. tenerimma (Fst.) Sahni 1928 in having broad, decurrent base and spiral arrangement of leaves. In E. tenerimma midrib is indistinct but the present specimen is having distinct midrib.

It also resembles E. pseudotenerimma Maheshwari and Kumaran (1974) in having single conspicuous midvein but it differs from E. pseudotenerimma in having leaf base which is broad and decurrent. In E. pseudotenerimma leaf base is slighly constricted. Besides, the present specimen is having larger leaves.

Since this specimen differs from all the species of Elatocladus described from India so far, it is named as E. vemavaramensis sp. nov.

Chinna-Ganjam area belong to Vemavaram beds hence the name Vemavaramensis is given after it.

7. Genus - Brachyphyllum Brongniart 1828

1) Brachyphyllum rhombicum (Feistm.) Sahni 1928

The specimen is a fragmentary frond measuring 4 cm in length and 4 mm in breadth. Branched shoot, branches emerging at an angle of 45°-60°. Sparsely branched shoot. Leaves are spirally arranged; they are attached to the rachis at an angle of 50°. Rachis is concealed. The leaves are closely appressed, almost flattened against the stem. They are rhomboidal in outline, measuring 2 mm long and 3 mm broad. Leaves are devoid of keel and do not project beyond the outline of axis.

Type - CHG/6/86

Locality - Chinna Ganjam (Prakasam district), A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely resembles with B. rhombicum (Feistm.) Sahni 1928 in having sharply marked rhomboidal outlines of the leaves, sparsely branched habit, leaves are closely appressed almost flattened against the stem, they are devoid of keel and do not project beyond the outline of the axis. Hence, it is described as such.

Remarks : B. rhombicum(Feistm.) Sahni 1928 is reported from Sriperamatur in Tamilnadu and South Rewah in Madhya Pradesh.

Our specimen is reported from Chinna-Ganjam in Prakasam district of Andhra Pradesh from which it is reported for the first time.

2) Brachyphyllum expansum (Sterb.) Seward 1917

The description is based on two specimens - CHG/28/85, CHG/3/86.

The specimen is a thin sterile dorsiventrally flattened branched shoot measuring 3 cm long and 3 mm broad, with branchlets ± 1.5 cm long and 3 mm broad. Branches usually come off at an angle of 45°. The leaves are apressed, minute, traingularly arranged with sub-acute apex. The leaves are attached to the axis at an angle of 50°. Free part of leaf at places slightly spreading.

Type - CHG/3/86

Locality - Chinna-Ganjam (Dist. Prakasam) A.P.

Horizon - Upper Jurassic (Kota stage)

Identification - The present specimen resembles with B. expansum (Sterb). Seward 1917 in having appressed, minute, scale like leaves with obtuse or rounded apex.

Hence it is described as such.

Remarks : B. expansum (Sternb.) Seward 1917 is reported from Gollapalle, Vemavaram, in Andhra Pradesh, South Rewah in Madhya Pradesh and Kakadbhit in Kutch.

Our specimen is collected from Chinna-Ganjam (Prakasam dist.) Andhra Pradesh which is a new locality for this plant.

3) Brachyphyllum mamillare Brongn. 1828

The specimen is a much branched shoot measuring 6 cm in length and 4 cm in breadth. Each branch is 2 mm thick. The lateral axis come off at acute angles and often tend to lie parallel to main stem. The leaves are almost diagrammatic lozenge-shaped (which lie parallel to the axis of stem) in outline. The leaves are 2 mm long and about 1.5 mm broad.

Type - CHG/25/85

Locality - Chinna Ganjam (Dist. Prakasam) Andhra Pradesh

Horizon - Upper Jurassic (Kota stage)

Identification : Our specimen closely resembles with B. mamillare Brongn. in having branched shoot, which come off at acute angle and often tend to lie parallel to main axis and almost diagrammatic lozenge-shaped leaves. Hence it is described as B. mamillare.

Remarks : B. mamillare Brongn. 1828 is earlier reported from Rajmahal Hills (Rajmahal stage), Jabalpur, Satpura basin, Bansa in M.P.(Jabalpur stage).

Our specimen is described from Chinna-Ganjam in A.P. (Kota stage) which is a new locality for the specimen. Its

occurrence here shows that this species is quite rare in the East-coast of India.

4) Brachyphyllum feistmantelli (Halle) Sahni 1928

The specimen is a branched shoot measuring 4.5 cm long and 0.5-1 cm broad. It gives out lateral branches and gradually tapers toward the apex. Leaves are short, triangular, keeled, thick, pointed and sometimes at right angles to the branch. The branches are rugged and thorny caused by peculiar shape of the leaf. The apex of the leaf is sharply pointed and curved upward. It measures 5 mm long and 1 mm broad.

Type - CHG/87/87

Locality - Chinna-Ganjam (Prakasam district), A.P.

Horizon - Upper Jurassic (Kota stage)

Identification - Sahni 1928 amended the description of B. feistmantelli given by Halle. According to Sahni the character of this species are - "Branches thick, very gradually tapering, those of higher order given off at wide or nearly at right angles. Leaves short, triangular, keeled, very thick (about as thick as broad), at right angle to the branch, pointed..... The branches have a very rugged and thorny aspect, caused by the peculiar shape of the leaves .... The apex of the leaf is sharply pointed and often somewhat curved upwards on downwards".

These characters are present in our specimen hence it is described as such.

Remarks : B. feistmantelli is earlier reported in India from Bansa near Chandia in South Rewah (Jabalpur stage) of M.P. and Vemavaram (Kota stage) of A.P. Our specimen is from Chinna-Ganjam (District - Prakasam) A.P. which is a new locality for the specimen.

5) Brachyphyllum sp. cf. B. royii, Bose & Banerji 1984.

The specimen is a well preserved dorsoventrally compressed shoot measuring 3.7 cm long and 8 mm broad. Leaves spirally arranged, attached at an angle of 80°. Leaves are thick, mostly rhomboidal in shape, keeled, 4 mm long and 3 mm broad. Margins entire. Apex is acute. Free part of leaf mostly directed upwards, rarely at places slightly spreading.

Type - CHG/65/87

Locality - Chinna-Ganjam (Prakasam dist.), A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen closely resemble with B. royii Bose and Banerji 1984 in having spirally arranged leaves, attached at an angle of 80°, thick, rhomboidal in shape, with entire margin and acute apex, free part of leaf mostly directed upwards.

Cuticle is absent in our specimen hence it is described as Brachyphyllum sp. cf. B. royii.

Remarks : B. royii is earlier reported from Trambau, Sukhpur, Kera, Kakadbhit and Chawad river.

Our specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh which is a new locality for this species.

8. Genus - Pagiophyllum , Heer 1881

1) Pagiophyllum sp. cf. P. morrisii Bose & Banerji 1984

(The description is based on two specimens - CHG/4/86, CHG/27/86)

The specimen is a repeatedly branched twig measuring 4.7 cm long and 5 mm broad, gradually tapering towards apex. The branches are given off at 45°, bearing spirally arranged leaves. Leaves measuring 2 mm long and 1 mm in width. Shape of the leaves are triangular, larger leaves are mostly spreading. All leaves are keeled. Margins are entire. Apex is acute. Bases mostly concealed by the apices of leaves lying below.

Type CHG/27/86

Locality - Chinna-Ganjam (Prakasam district) A.P.

Horizon - Upper Jurassic (Kota stage).

Identification - P. morrisii is described by Bose & Banerji 1984 from Kutch. Our specimen resembles P. morrisii morphologically is having repeatedly branched shoot, branched at an angle of 45°, bearing spirally arranged leaves. Leaves are triangular, keeled, apex acute and entire margins.

Cuticle is absent in our specimen, hence it is described as Pagiophyllum sp. cf. P. morrisii.

Remarks : P. morrisii is earlier reported from Chawad

River in Kutch.

Our specimen is collected from Chinna-Ganjam in Prakasam district of Andhra Pradesh which is a new locality for the species. And this is the first report from Andhra Pradesh.

2) Pagiophyllum sp.

The specimen is an unbranched twig measuring 4.1 cm long and 1.2 cm broad. Leaves are spirally arranged, lanceolate, 9 mm in length and 1 mm in breadth. They are directed towards apex. Margins of the pinna are slightly falcate. They are crowded at the apex. Pinna are broader at the base and narrow towards the apex. Apex of the pinna rounded.

Type - CHG/1/87
Locality - Chinna-Ganjam (Prakasam district) Andhra Pradesh.
Horizon - Upper Jurassic (Kota Stage).

Identification - The present specimen resembles with Pagiophyllum sp. described by Jain (1967) from Vemavaram in having unbranched twig with spirally arranged lanceolate leaves, crowded towards apex, margins falcate and pinnae broader at the base with rounded apex.

Hence it is described as such.

Remarks : Jain (1967) reported Pagiophyllum sp. from Vemavaram in Andhra Pradesh. Our specimen is reported from Chinna-Ganjam in Prakasam district of A.P. Hence, this is the second report from the East Coast of Andhra Pradesh.

9. Genus - Pachypteris Brongniart, 1828.

1) Pachypteris sp. cf. P. specifica Feistmantel, 1876

The specimen is a bi-pinnate frond, measuring 23 cm long and 14 cm broad. Primary rachis is 7 mm thick. Each pinna is imparipinnate. Pinnae rachis is 2 mm wide, having a median groove. Pinnae are 9 cm long and 3 cm broad, emerging at an angle of 50°. Mostly alternate. Pinnules lanceolate or oval, attached at an angle of 45°, gradually decreasing in size towards the apex, alternate on sub-opposite. Pinnules measure 1.7 cm long and 5 mm broad. Margins are entire. Acroscopic margin curving downward, basiscopic margin decurrent. Apex is obtuse. Basiscopic margin of pinna attached directly to main rachis. Midrib is present, secondary veins arising at low angles, mostly simple or forking once.

Type - CHG/8/85

Locality - Chinna-Ganjam (District - Prakasam) A.P.

Horizon - Upper Jurassic (Kota Stage).

Identification : The specimen resemble with P. specifica Feistmantel, morphologically in having bipinnate frond, having imparipinnate frond, pinnules are lanceolate attached at an angle of 45°, midrib present and secondary veins arising at low angles, simple or forking once.

Cuticle is absent in our specimen, hence it is described as Pachypteris sp. cf. P. specifica.

Remarks : P. specifica is earlier reported from Bhajodi, Khari River, Kuar Bet, Jamthara, Kurbi, Gadhsisa, Kakadbhit and Chawad river in Kutch.

Our specimen is collected from Chinna-Ganjam (Prakasam district) A.P. which is a new locality for the species. It is for the first time this species is being reported from East Coast of Andhra Pradesh. It shows this species ranges from Kutch to Andhra Pradesh.

10. Genus - Dicroidium Gothan, 1912

1) Dicroidium sp.

The specimen is a pinnate frond, measuring 2 cm long and 1 cm broad. Rachis is stout, 1.5 mm broad, narrow towards apex, striae is prominent. Pinnules sub-opposite to alternate in arrangement. Pinnules are 6 mm in length and 5 mm in breadth. Apex is rounded. Venation is odontopteroid type.

Type - CHG/7/87 ? See p. 84

Locality - Chinna-Ganjam (Prakasam dist.), Andhra Pradesh.

Horizon - Upper Jurassic (Kota stage).

Identification - The present specimen agrees with generic character of Dictroidium in having pinnate frond, odontopteroid venation and indistinct midrib. Since the specimen is fragmentary, it is described as Dicroidium sp.

Remarks : Jain (1968) reported ?Dictoidium from Vemavaram; Rao (1959) reported D. fiestmantelli from Vemavaram, Baksi (1968) reported D. sp. from Raghavapuram and Rao and Shah (1960b) reported D. odontopteroides from Chikiala shows wide range of Dicroidium in India.

Our specimen is collected from Chinna-Ganjam (Prakasam dist.) A.P. which is a new locality for the plant.

11. Genus - Desmiophyllum Lesquereux 1878

1) Desmiophyllum indicum Sahni 1928

It represents a linear leaf measuring 3 cm long and 9 mm broad with 7 parallel veins and where mode of attachment is not known. Apex is blunt.

Type - CHG/74/87

Locality - Chinna-Ganjam (District Prakasam) Andhra Pradesh

Horizon - Upper Jurassic (Kota stage).

Identification : The specimen resemble with D. indicum Sahni in having blunt apex, entire margin, linear leaf with parallel veins. The mode of attachment is unknown. Hence, it is described as such.

Remarks : Sahni (1928) described D. indicum from Jabalpur, Shakkar valley in Chindwara district, Sher river in Satpura basin of M.P. and Raghavapuram in A.P. Recently Vagyani (1984) reported it from Vemavaram.

Our specimen is described from Chinnaganjam in Prakasam district of A.P. which is a new locality for the species. It appears that Desmiophyllum indicum is found in the east coast at several places.

oOo

Explanation of Text Figures - 1

1) Ptilophyllum acutifolium X $1\frac{1}{4}$

2) Ptilophyllum cutchense X $1\frac{1}{4}$

3) Ptilophyllum rarinervis X $1\frac{1}{2}$

4) Ptilophyllum sp. cf. P. institacalum X N.S.

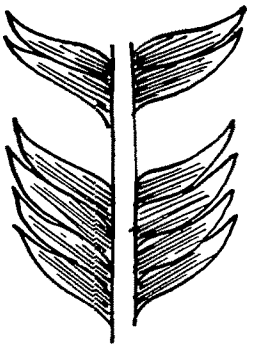
5) Ptilophyllum sp. cf. P. sahni X $1\frac{1}{4}$

6) Ptilophyllum sp. cf. P. distans X $1\frac{1}{4}$

7) Ptilophyllum sp. cf. P. jabalpurense X $1\frac{1}{4}$

8) Ptilophyllum sp. cf. P. amarjolense X $1\frac{1}{4}$

9) Ptilophyllum tenerrimum X $1\frac{1}{4}$



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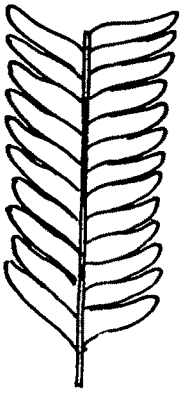

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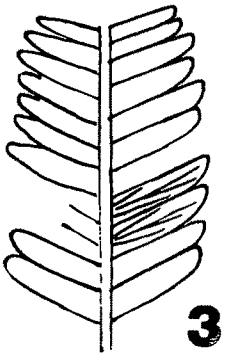

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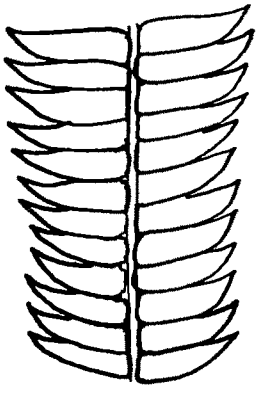

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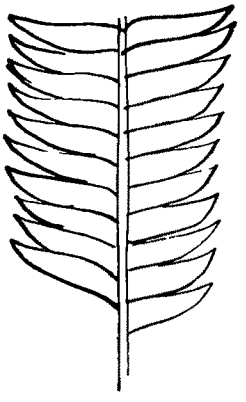

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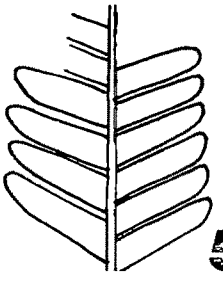

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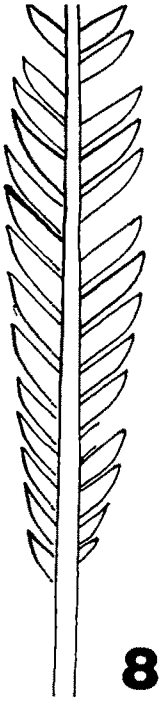

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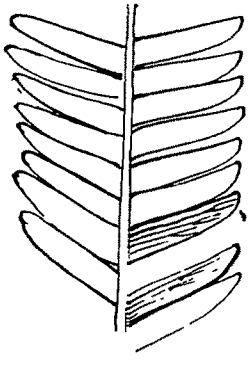

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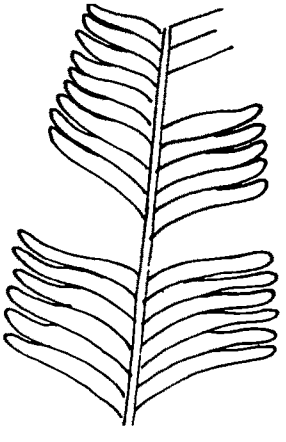


7

EXPLANATION OF PLATE - I

1. Ptilophyllum acutifolium X $2\frac{1}{4}$

2. Ptilophyllum cutchense X $1\frac{3}{4}$

3. Ptilophyllum rarinervis X $3\frac{1}{2}$

4. Ptilophyllum sp. cf. P. institacallum X $1\frac{1}{2}$

5. Ptilophyllum sp. cf. P. sahnii X $2\frac{1}{4}$

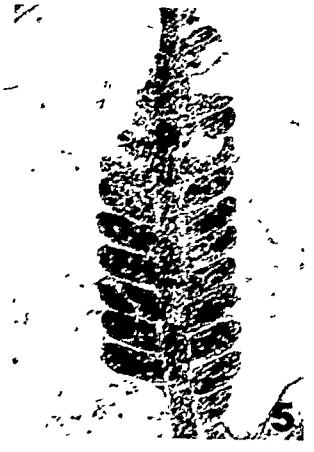
6. Ptilophyllum sp. cf. P. distans X $1\frac{3}{4}$

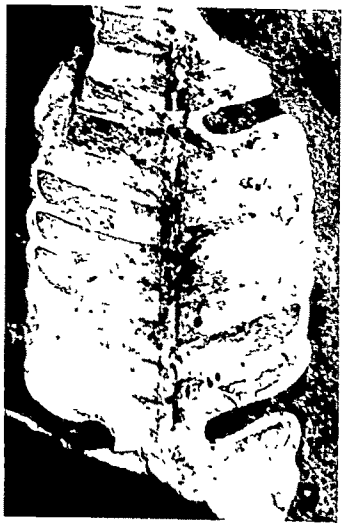
7. Ptilophyllum sp. cf. P. jabalpurense X $1\frac{3}{4}$

8. Ptilophyllum sp. cf. P. amarjolense X $1\frac{1}{4}$

9. Ptilophyllum tenerrimum X $2\frac{1}{4}$

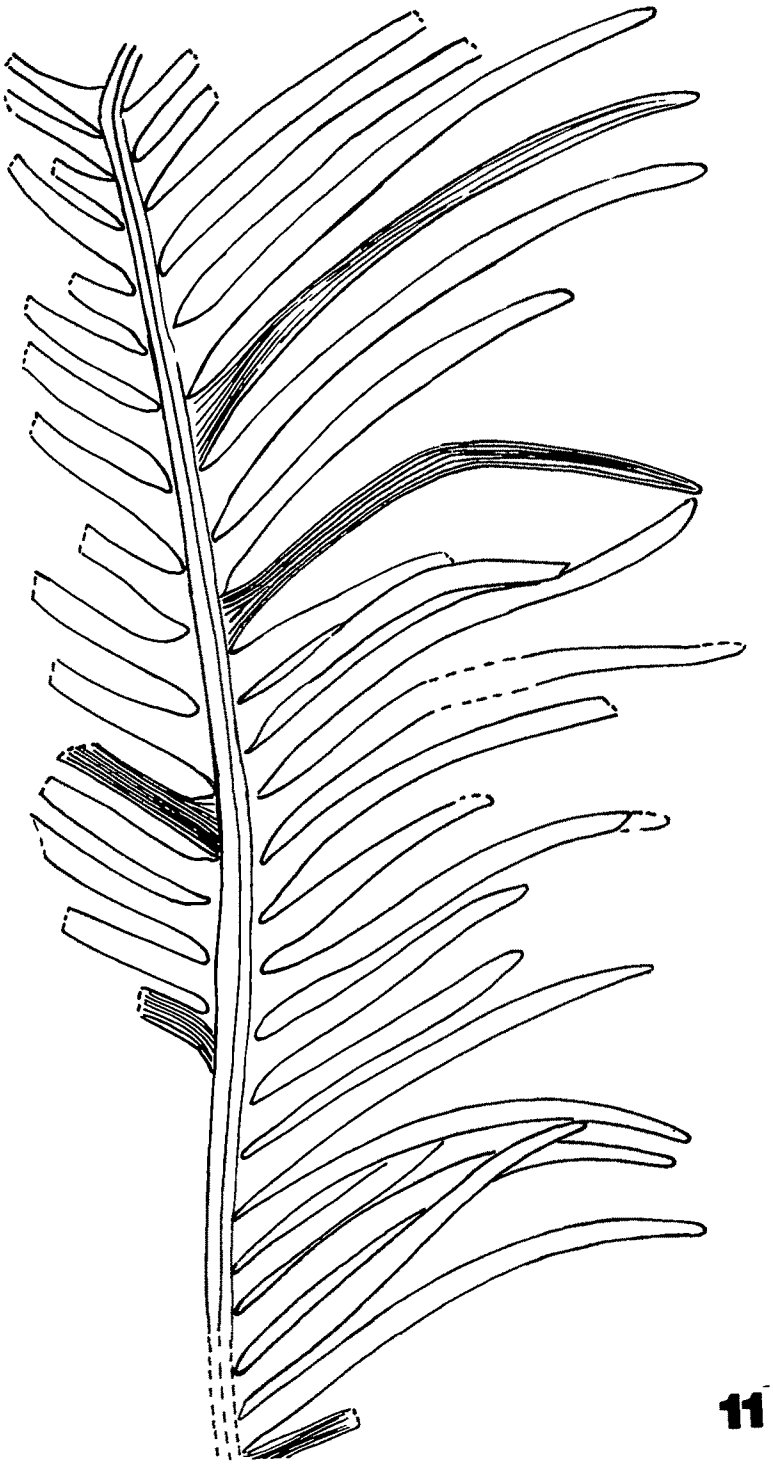

55/85





Explanation of Text Figures -II

11) <u>Pterophyllum kingianum</u> X $1\frac{1}{4}$



11

Explanation of Text Figures -III

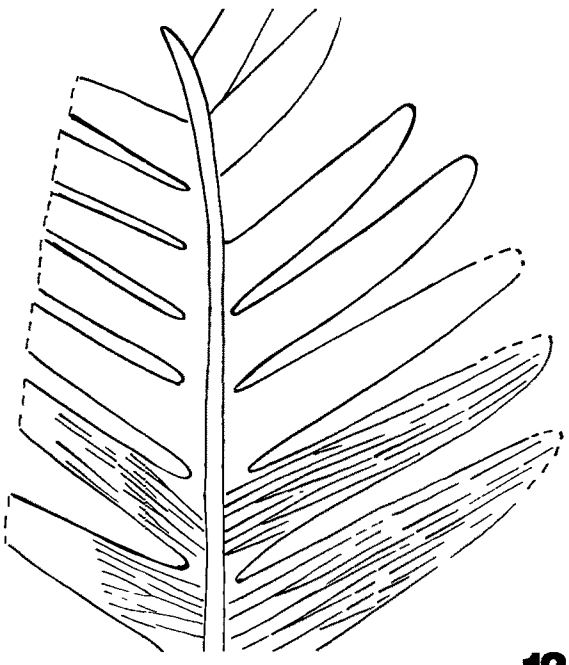
10) *Pterophyllum footeanum* X $1\frac{1}{2}$

12) *Pterophyllum morrisianum* X 3/4

13) *Dictyozamites feistmantelli* X 3/4

14) *Dictyozamites falcatus* X $1\frac{1}{2}$

15) *Dictyozamites indicus* X $1\frac{1}{4}$



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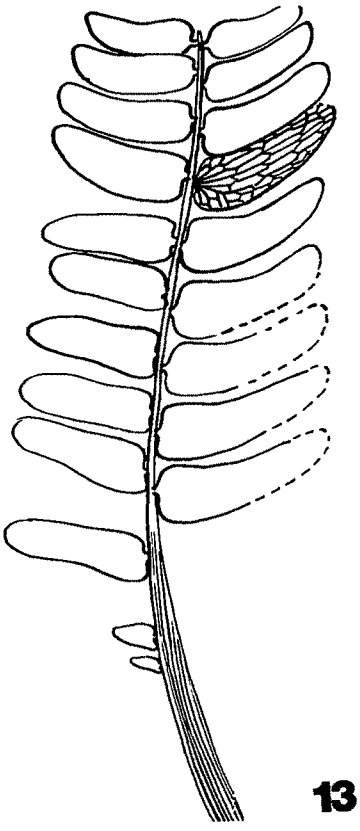

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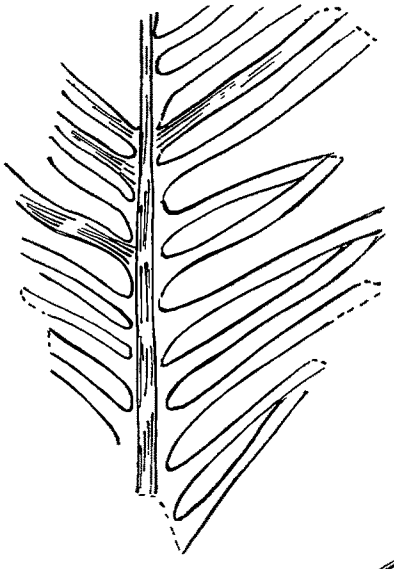

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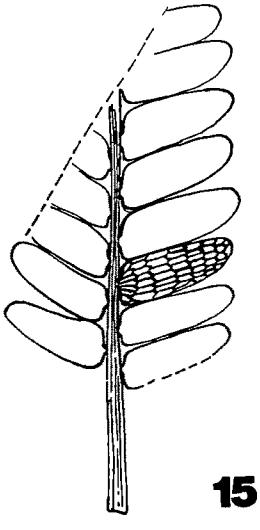

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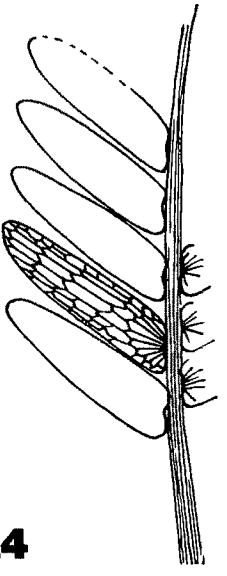


14

EXPLANATION OF PLATE II

10. Pterophyllum footeanum X $1\frac{1}{4}$

11. Pterophyllum kingianum X 1/2

12. Pterophyllum morrisianum X 1/2

13. Dictyozamites feistmantelli X 3/4

14. Dictyozamites falcatus X $1\frac{1}{4}$

15. Dictyozamites indicus X $1\frac{1}{2}$

16. Dictyozamites hallei X $3\frac{1}{4}$

Explanation of Text figures : - IV

16) Dictyozamites hallei X $2\frac{1}{2}$

17) Otozamites sp. X $1\frac{3}{4}$

18) Otozamites sp. cf. O. imbricatus X $2\frac{1}{2}$

19) Otozamites sp. cf. O. kachchhensis X $1\frac{1}{2}$

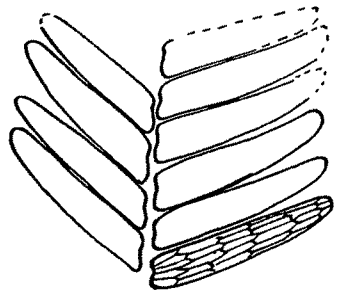
20) Otozamites vemavaramensis X $1\frac{3}{4}$

21) Taeniopteris kutchchensis X $2\frac{1}{2}$

22) Elatocladus plana X $1\frac{3}{4}$

23) Elatocladus conferta X $2\frac{1}{2}$

24) Elatocladus sp. cf. E. tenerimma X $2\frac{1}{4}$



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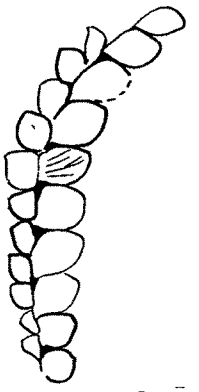

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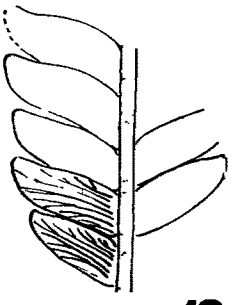

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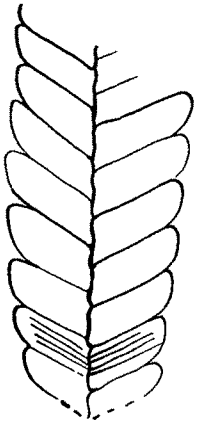

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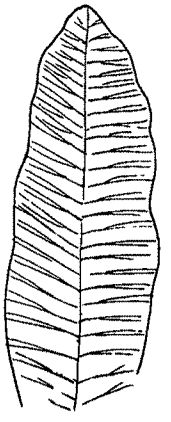

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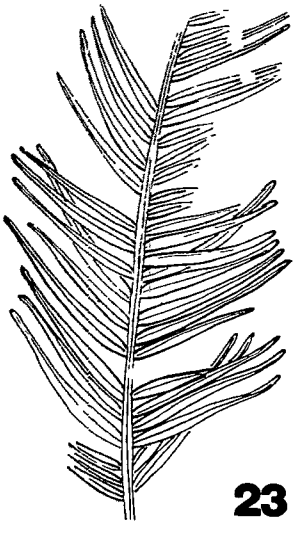

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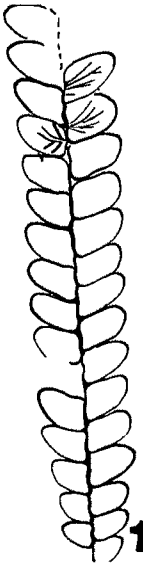

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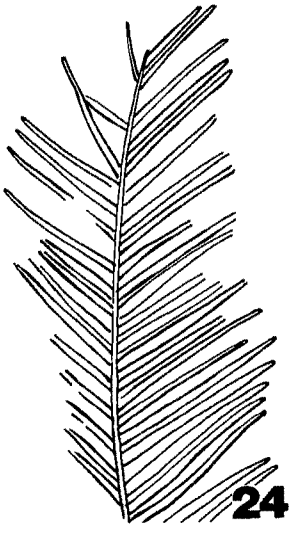

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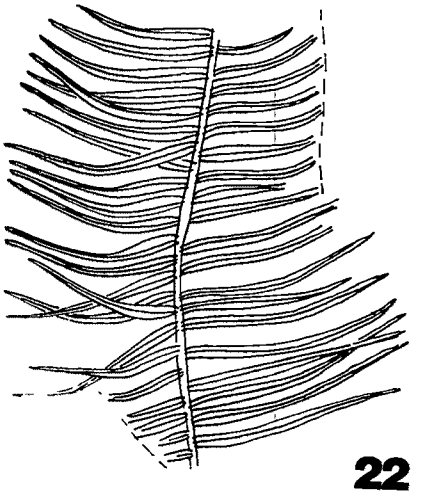

22

EXPLANATION OF PLATE III

17. *Otozamites* sp. X $1\frac{3}{4}$

18. *Otozamites* sp. cf. *O. imbricatus* X $3\frac{3}{4}$

19. *Otozamites* sp. cf. *O. kachchhensis* X $2\frac{1}{4}$

20. *Otozamites vemavaramensis* X $2\frac{1}{4}$

21. *Taeniopteris kutchchensis* X 2

22. *Elatocladus plana* X $1\frac{3}{4}$

23. *Elatocladus conferta* X $2\frac{1}{4}$

24. *Elatocladus tenerrima* X $2\frac{1}{4}$? See p. 71

25. *Elatocladus jabalpurensis* X $2\frac{1}{2}$

26. *Elatocladus vemavaramensis* sp. nov. X 10 ✓

27. *Brachyphyllum rhombicum* X $2\frac{1}{2}$


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25) Elatocladus jabalpurensis X $2\frac{1}{4}$

26) Elatocladus vemavaramensis X $8\frac{1}{4}$ Sp. nov.

27) Brachyphyllum rhombicum X $1\frac{3}{4}$

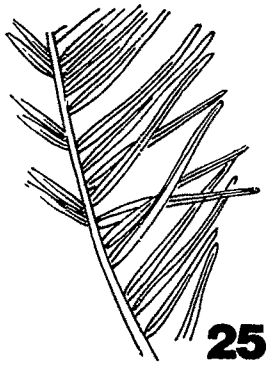
28) Brachyphyllum expansum X $2\frac{3}{4}$

29) Brachyphyllum mamillare X $1\frac{1}{2}$

30) Brachyphyllum feistmantelli X $2\frac{1}{4}$

31) Brachyphyllum sp. cf. B. royii X $2\frac{1}{2}$

33) Pagiophyllum sp. X $1\frac{1}{2}$



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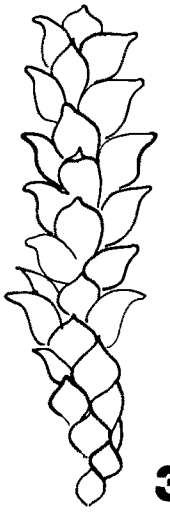

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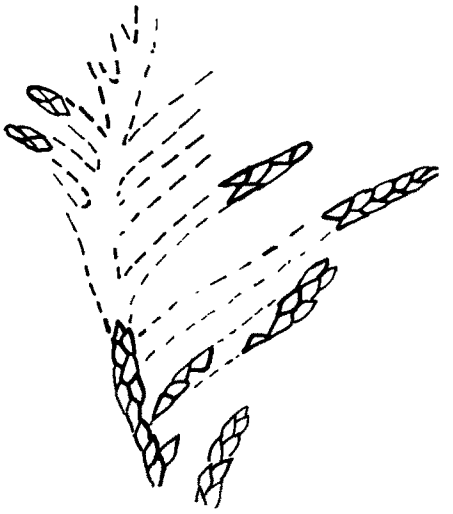

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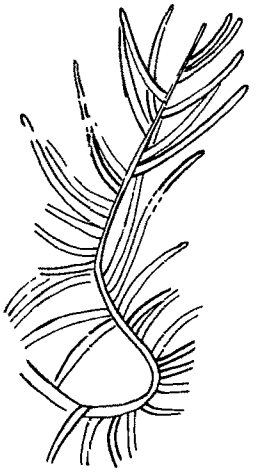

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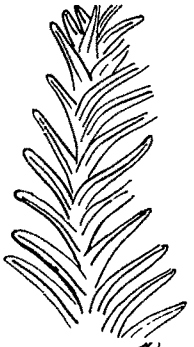

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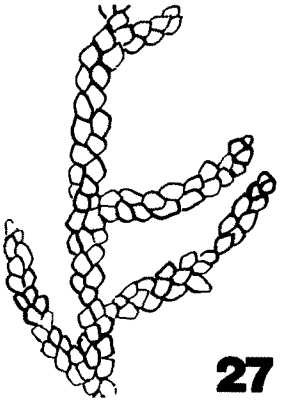

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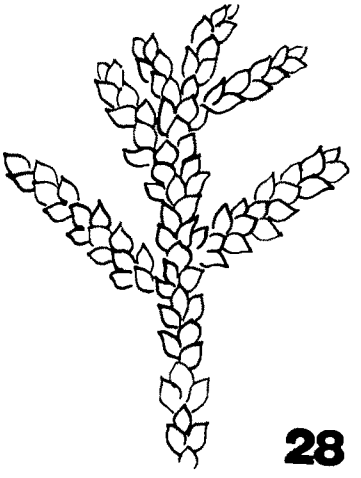

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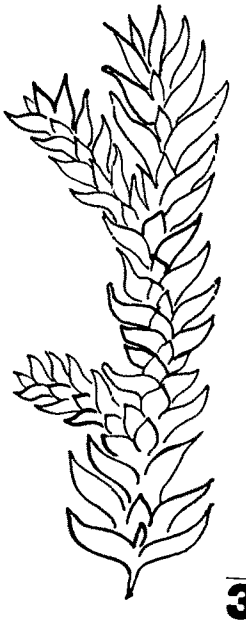

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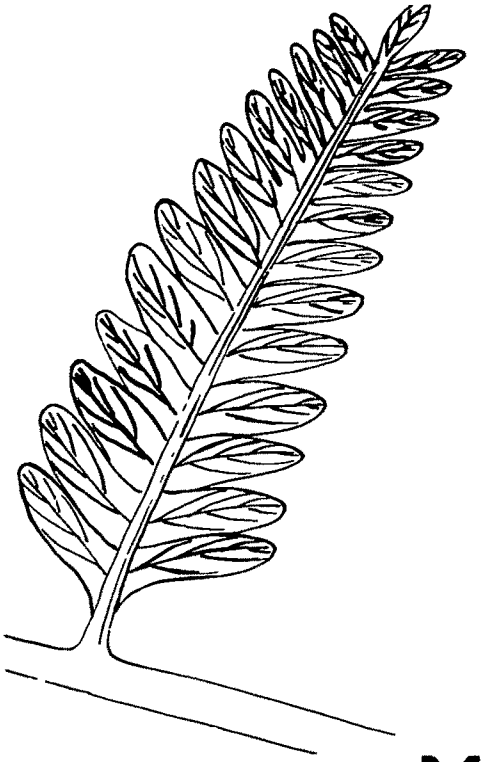
Explanation of Text Figures VI

32) Pagiophyllum morrisii X $2\frac{1}{4}$

34) Pachypteris sp. cf. P. specifica X $1\frac{1}{2}$

35) Dicroidium sp. ? X $3\frac{1}{2}$

36) Desmiophyllum indicum X $2\frac{1}{2}$



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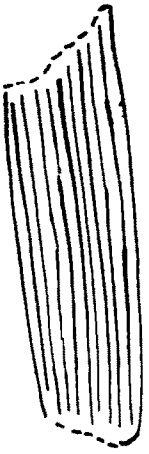

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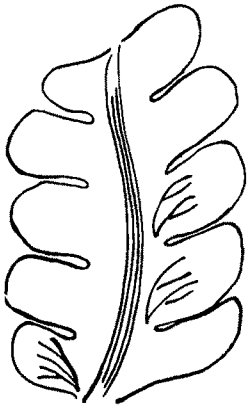

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EXPLANATION OF PLATE IV

28. Brachyphyllum expansum X $3\frac{1}{4}$

29. Brachyphyllum mamillare X $1\frac{1}{2}$

30. Brachyphyllum feistmantelli X $2\frac{1}{4}$

31. Brachyphyllum sp. cf. B. royii X $2\frac{1}{2}$

32. Pagiophyllum sp. cf. P. marririi X $2\frac{1}{4}$

33. Pagiophyllum sp. X $1\frac{3}{4}$

34. Pachypteris sp. cf. P. specifica X 1/2

35. Dicroidium sp. X $3\frac{3}{4}$

36. Desmiophyllum indicum X $2\frac{3}{4}$


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