

ON SOME CYCADOPHYTIC LEAVES FROM THE JABALPUR SERIES

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ABSTRACT

The paper describes a new species of *Ctenis* (*C. imjhiriensis*) and three species of *Pterophyllum*. One of the species of *Pterophyllum*, viz., *P. medicottianum* Oldham & Morris is already known from the Rajmahal Hills, the other has been compared with *P. distans* Morris also from the Rajmahal Hills and the third species is, so far, not known from anywhere in India. A brief remark has also been made on the occurrence of *Glossopteris* in the Jabalpur Series.

Key-words — Cycadophytic leaves, Jabalpur Series (India).

सारांश

जबलपुर श्रेणी से कुछ साइकेडोफाइटी पत्तियाँ — महेन्द्र नाथ बॉस एवं जेबा-बानो ।

इस शोध-पत्र में टीनिस की एक नई जाति (टी० इमजिरियेन्सिस) तथा टेरोफिलम की तीन जातियों का वर्णन किया गया है। टेरोफिलम की एक जाति, टे० मेडिकोटियैनुम् ग्रोलडहेम एवं मॉरिस, राजमहल-पहाड़ियों से पहले से ही ज्ञात हैं, दूसरी की तुलना राजमहल-पहाड़ियों ही की टे० डिस्टेंस से की गई है तथा तीसरी जाति अभी तक भारतवर्ष में कहीं से भी ज्ञात नहीं है। जबलपुर श्रेणी में ग्लॉसॉप्टेरिस की प्राप्ति पर एक संक्षिप्त टिप्पणी भी की गई है।

INTRODUCTION

A LIST of fossil plants from the various localities in the Jabalpur Series was published by Crookshank (1936). Recently, one of us (M.N.B.) visited some of these localities, viz., Jatamao (22°23' : 77°35'), Parsapani, Hasnapur etc. and collected many specimens. Of special interest in this collection are a few fragmentary net veined leaves and three species of *Pterophyllum*. In addition to the localities mentioned by Crookshank (1936), a new locality was discovered near Imjhiri (22°49'50" : 79°18'30"). Imjhiri is about 4.8 km S.S.E. of Bachai Rest House and about 17.5 km S.E. of Narsinghpur. The fossils were collected from an old clay quarry and the road cutting near the quarry. The assemblage includes *Todites indicus*, *Sphenopteris* sp., a species each of *Ctenis* and *Pterophyllum*, *Ptilophyllum acutifolium*, *Pagiophyllum* sp., *Brachyphyllum* sp., *Desmiophyllum* sp. and *Araucarites cutchensis*. In this paper only a few cycadophytic fronds collected from some of the earlier known localities and Imjhiri have been dealt with.

DESCRIPTION

Genus — *Ctenis* Lindley & Hutton, 1834

Ctenis imjhiriensis n. sp.

Pl. 1, figs 1-3; Text-fig. 1A

Diagnosis — Leaf pinnate, available length 8 cm, breadth exceeding 18 cm. Rachis stout, about 5 mm wide, longitudinally striated. Pinnae attached to rachis by entire base at an angle of about 75°-85°, alternate to sub-opposite, oblanceolate, 6.5-9.5 cm long, slightly above base 2.0-2.5 cm broad, gradually narrowing towards apex. Acroscopic margin contracted, basiscopic margin contracted or running straight to rachis, apex sub-acute or rounded, margin entire. Veins 8-17, arising directly from base, prominent, forked, more or less parallel, 9-11 veins per cm, occasionally anastomosing, distant and irregular; vein meshes broad, about 1.2-5 cm or even longer, near apex veins forking but rarely anastomosing.

Holotype — B.S.I.P. no. 35121.

Locality — Imjhiri, Narsinghpur District, Madhya Pradesh.



TEXT-FIG. 1 — A. *Ctenis imjhiriensis* n. sp., B.S.I.P. no. 35121 \times 1. B. A fragment of a net veined leaf showing small polygonal meshes, B.S.I.P. no. 35122 \times 1. C. Another fragment showing long and narrow meshes, B.S.I.P. no. 58/1434 \times 1.

Horizon & Age — Jabalpur Series, ?Upper Jurassic.

Comparison — *Ctenis imjhiriensis* differs from most species of *Ctenis* in having broad and long vein meshes, also near apex in having forked or unforked veins which are rarely anastomosing. It resembles most, *Ctenis orovilliensis* Fontaine described by Ward (1905), *C. fallax* Nathorst described by Harris (1932), *C. japonica* Ôishi (1932) and *C. afghanensis* Jacob & Shukla (1955). *C. orovilliensis* differs from the present species in having longer pinnae and shorter and nar-

rower vein meshes. In *C. fallax* Nathorst, pinnae bases are expanded. In this species the vein meshes are more like *C. imjhiriensis* but the number of vein meshes in the former species is much more. In *C. japonica* too, the pinnae bases are expanded and in some of the specimens (Ôishi, 1932, pl. 47, figs 5, 7) the meshes are much broader. The pinnae of *C. afghanensis* are longer and narrower and they have expanded bases. Here the vein meshes are much more in number and also narrower than in *C. imjhiriensis*. Amongst the Yorkshire species

described by Harris (1964), *C. kaneharai* Yokoyama may be compared with *C. imjhiriensis*. Both have contracted bases, but in the former species the pinnae are much longer and have shorter vein meshes.

REMARKS ON THE OCCURRENCE OF GLOSSOPTERIS IN THE JABALPUR SERIES

Feistmantel (1877) described and figured two specimens as *Glossopteris* comp. *communis* Feistmantel and *Glossopteris*? or *Sagenopteris*? The former was described from Sher River and the latter from the shales near Jabalpur. One very doubtful specimen was listed from Jabalpur as *Glossopteris* cf. *communis* by Crookshank (1936). Recently, Shah and Singh (1965) have described a specimen, from 800 m east of Jatamao (22°23': 77°35'), as *Glossopteris* cf. *taeniopteroides* Feistmantel.

Out of the two specimens figured by Feistmantel (1877), *Glossopteris* comp. *communis* is now misplaced and the other, viz., *Glossopteris*? or *Sagenopteris*? on re-examination proved to be a detached pinnule of *Cladophlebis medicottiana* (Oldham) Pascoe. Both Crookshank (1936) and Shah and Singh (1965) have not figured their specimens. The specimen of Shah and Singh (1965) when re-examined was found to be a small fragment from the apical portion of a net veined leaf. From this fragment it is rather difficult to make out the nature (simple, pinnate or segmented), shape and size of the original leaf. It could be a portion of *Glossopteris* Brongniart (1828) or *Sagenopteris* Presl (1838) or it may as well belong to such fronds as *Anthrophyopsis* Nathorst (1878), *Quervainia* Harris (1932) or *Mexiglossa* Delevoryas & Person (1975). It resembles very much the apical pinna of *Ctenis* cf. *formosa* Vakhrameev described by Kimura and Sekido (1976) from Mekko-dani, Japan. Their venation pattern is very similar, only Shah and Singh's (1965) specimen is slightly smaller in size.

Shah and Singh's (1965) specimen shows a strong midrib about 3 mm broad and has secondary veins which are anastomosing and forming long narrow meshes. The vein meshes have been compared with those of *Glossopteris taeniopteroides* Feistmantel (1878). The meshes also somewhat resemble the meshes of *G. divergens* Feistmantel (1881). An extremely fragmentary piece (Pl. 2, fig. 5;

Text-fig. 1B), having similar type of vein meshes, has been collected by us from Jatamao. The vein meshes of this specimen resemble the meshes of ?*Sagenopteris* figured by Crookshank (1935) from Jatamao. All these pieces, besides showing resemblance to *G. taeniopteroides* type of meshes, also resemble the venation pattern of some of the species of *Ctenis* Lindley & Hutton (1834). Amongst the genus *Ctenis*, the vein meshes of *C. uwatokoii* Toyama & Ôishi (1935) resemble most the meshes of Shah and Singh's specimen and the one figured here. The vein meshes also resemble the vein meshes of *C. potockii* Stür described by Raciborski (1894) and *C. kaneharai* Yokoyama described by Harris (1964). Besides these two fragments, one more fragment, also from Jatamao, has been figured here in Pl. 1, fig. 1 and Text-fig. 1C. This specimen seems to be a pinna or a segment of a *Ctenis* type of leaf. Here, the vein meshes are rather narrow and elongated. The vein meshes of this fragment resembles the meshes of *C. yamanarii* Kawasaki (1939), ?*Ctenis* sp. 2 described by Jones and Jersey (1947) and *C. reedi* Harris (1964) and *C. pontica* Delle (1967).

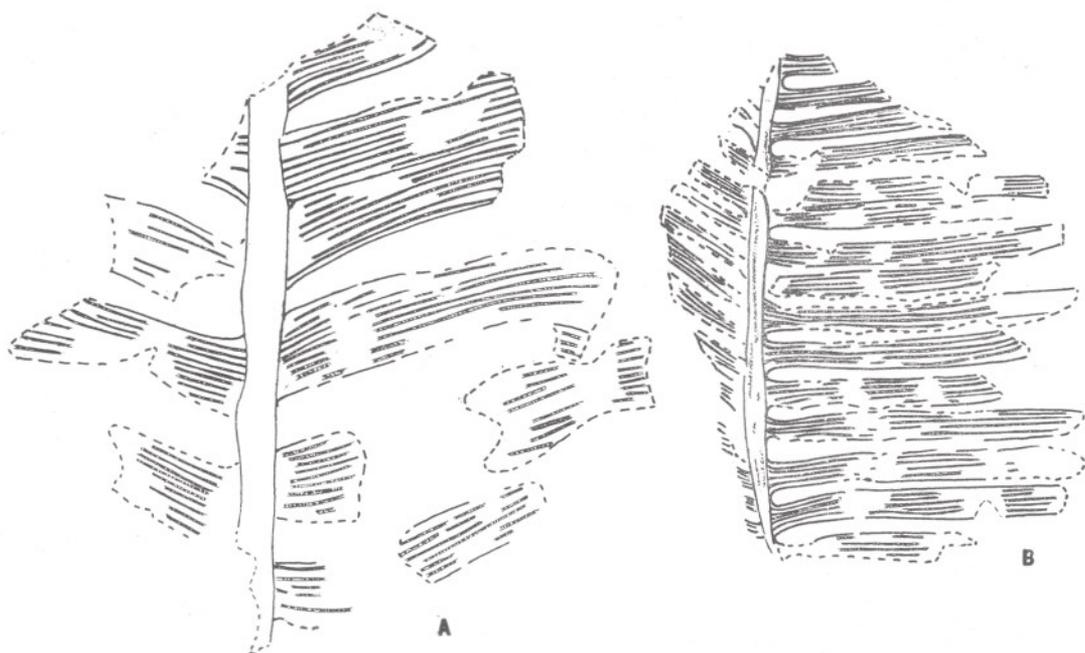
Now that we know that the genus *Ctenis* occurs in the Jabalpur Series, viz., at Imjhiri it is quite possible that some of the above fragments and the fragment described by Feistmantel (1877) may belong to the genus *Ctenis*. Shah and Singh's (1965) specimen perhaps belongs to such a type of *Ctenis* leaf which has apex like that of *C. uwatokoii* Toyama & Ôishi (1935, pl. 3, figs 2-3).

Genus — *Pterophyllum* Brongniart, 1828

Pterophyllum medicottianum Oldham & Morris

Pl. 2, fig. 7; Text-fig. 2A-B

Description — Frond pinnate, large, length probably exceeding 30 cm (largest available specimen measuring 19.7 × 14.5 cm). Rachis 5 mm wide, gradually tapering towards apex, longitudinally striated. Pinnae distinct, rarely a few touching each other, alternate to sub-opposite, linear, straight or slightly falcate, largest pinnae towards base up to 10.7 cm long and 1.0 cm broad (sometimes 1.8 cm wide), becoming smaller towards apex; base expanded, occasionally joining



TEXT-FIG. 2 — A, B. *Pterophyllum medicottianum* Oldham & Morris, B.S.I.P. nos. 26/1439 and 44/1440 $\times 1$.

each other, sometimes pinnae little above base slightly constricted, attached laterally to rachis by whole width of base at an angle of about 55° to 95° . Margin entire. Apex subacute or obtuse. Veins mostly 5-8 (rarely up to 16), arising directly from base, thick and prominent, channeled, running parallel, mostly unforked, very rarely forking once.

Locality — Imjhiri, Narsinghpur District, Madhya Pradesh.

Horizon & Age — Jabalpur Series, ?Upper Jurassic.

Comparison — In gross features the present specimens resemble *Pterophyllum medicottianum* Oldham & Morris (1863) described from the Rajmahal Hills. The Imjhiri specimens, however, show a wider range of pinnae width and vein numbers. Otherwise the specimens from the two localities are indistinguishable from each other. In both, the veins are channeled and they are mostly 6-8 in number. Unfortunately, both lack cuticle so it is not possible to compare them further. Outside India, *P. medicottianum* comes very close to *Pseudoctenis* cf. *medlicottiana* and *P. ensiformis* described by Halle (1913) from Graham Land. Both these species are based on rather fragmentary

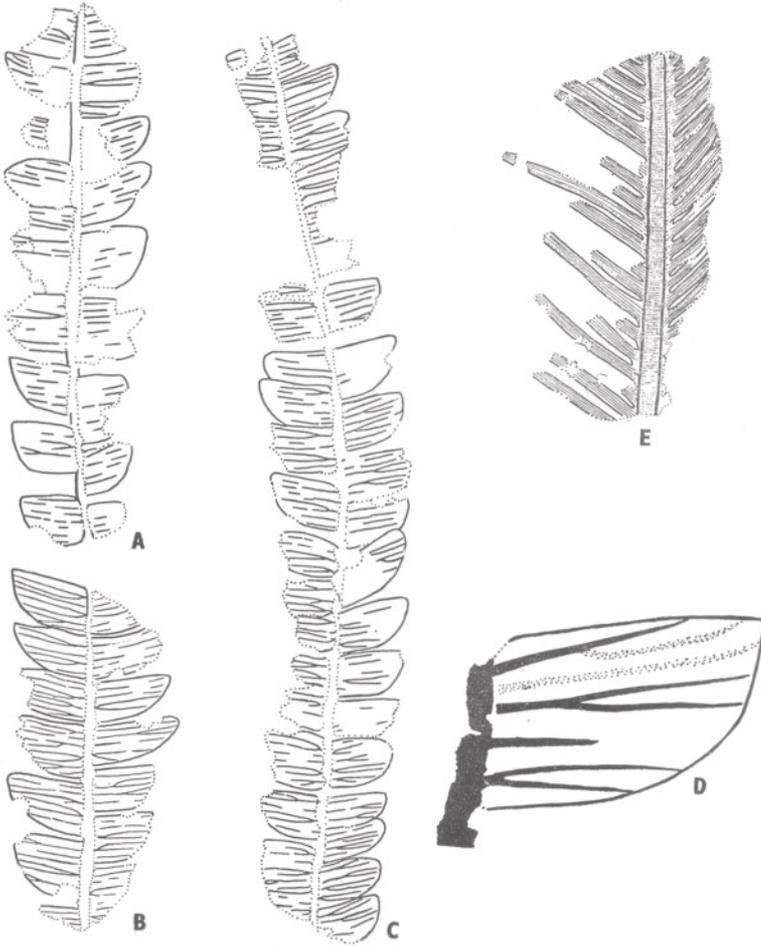
specimens but the nature of pinnae and their venation pattern seems to be like that of *P. medicottianum* described here. *P. medicottianum* also resembles very much *P. ctenoides* Ôishi (1932) in the general form of leaves and venation pattern. In the Japanese specimens pinnae apices are not preserved.

Genus — *Pterophyllum* Brongniart, 1828

Pterophyllum sp. cf. *P. distans* Morris

Pl. 2, fig. 6; Text-fig. 3E

Description — Incomplete pinnate leaf, 4.9×2.8 cm in size. Rachis up to 3 mm wide showing transverse striations or rectangular or polygonal meshes. Pinnae alternate to sub-opposite, attached slightly above lateral margin at an angle of about 50° - 65° , closely set, slightly broader at base and then of uniform breadth for most of the length, sometimes slightly constricted just after the expanded base, linear, up to 2.2 cm long and about 2 mm wide. Pinnae usually connected with each other at their expanded or decurrent bases. Margin en-



TEXT-FIG. 3 — A-C. *Pterophyllum* sp., B.S.I.P. nos. 14/1442, 3/1442 and 29/1442 \times 1. D. A pinna magnified from the specimen no. 29/1442 showing venation \times 4. E. *Pterophyllum* sp. cf. *P. distans* Morris, B.S.I.P. no. 26/1434 \times 1.

ture. Apex not preserved. Veins 4, arising directly from base, running parallel, unforked.

Locality — Near Jatamao, Hoshangabad District, Madhya Pradesh.

Horizon & Age — Jabalpur Series, ?Upper Jurassic.

Comparison — The *Pterophyllum* sp. cf. *P. distans* Morris resembles closely *Pterophyllum distans* Morris (in Oldham & Morris, 1863) described from the Rajmahal Hills. In both, general morphology of pinnae is similar and they have same number of veins, viz., usually 4. But as the present specimen belongs to the apical portion of a frond,

it has narrower and closely set pinnae as compared to *P. distans*.

Pterophyllum sp. cf. *P. distans* is very close to *P. georgiense* Doludenko & Svanidze (1969). Both have similar type of pinnae and venation. In both, the number of veins is four. In *P. georgiense*, the pinnae are not so closely set as in *Pterophyllum* sp. cf. *P. distans*.

Pterophyllum sp.

Pl. 1, fig. 4; Text-fig. 3A-D

Description — Leaves as a whole lanceolate, incomplete, up to 12 cm long and 2 cm

wide. Rachis stout, uniformly broad, 2 mm wide. Segments sub-opposite or alternate, inserted laterally or slightly above margin of rachis, almost at right angle, some slightly inclined forward, more or less squarish or cuneate, 8.9 × 7.8 mm in size, attached by their entire base; sometimes bases of adjacent segments joined together, when free basal margins joined straight to rachis. Margin entire. Apex truncate. Veins 6-8, distant, arising directly from base, parallel, simple or forked, when forked mostly once, forking at different levels.

Locality — Near Hasnapur, Narsinghpur District, Madhya Pradesh.

Horizon & Age — Jabalpur Series, ?Upper Jurassic.

Comparison — *Pterophyllum* sp. described here compares with quite a few species of *Anomozamites* Schimper (1870). The segments in the present species are slightly longer than broad, but they are not exactly squarish. Such segments are quite frequent amongst the species of *Anomozamites*. So there is every possibility that the specimens described here may as well belong to the

genus *Anomozamites*. They are quite different from most of the Pterophyllums, hitherto described from India. At present we have refrained ourselves from placing them under *Anomozamites* because the present specimens are supposed to have come from the Upper Jurassic. According to Harris (1969) they are more common in the Rhaeto-Liassic. Moreover, so far we do not know anything about their cuticular structure, nor have we got any associated fertile organs resembling *Wielandiella* Nathorst (1910).

Pterophyllum sp. shows some resemblance, in shape and angle of attachment of pinnae, with some of the leaves of *P. schenki* (Zeiller) described by Harris (1932) from Greenland and Ôishi (1932) from Japan. But in *P. schenki* pinnae are of variable size, they are comparatively longer and have greater concentration of veins. *Pterophyllum* sp. may be compared with *P. fissum* Feistmantel (1877) described from the Rajmahal Hills, but the latter species is much smaller in size and the pinnae apices are mostly incised.

REFERENCES

- BRONGNIART, A. (1828). *Histoire des végétaux fossiles ou recherches botaniques et géologiques sur les végétaux renfermés dans les diverses couches du globe*, 1: 488. Paris.
- CROOKSHANK, H. (1936). Geology of the northern slopes of the Satpuras between the Morand and the Sher rivers. *Mem. geol. Surv. India*, **46** (2): 173-381.
- DELLE, G. V. (1967). The Middle Jurassic flora of the Tkvarchelian Coal-Basin (Transcaucasia). *Trudy bot. Inst. Akad. Nauk SSSR*, **8**, *Palaeobotanica*, **6**: 53-132.
- DELEVORYAS, T. & PERSON, C. P. (1975). *Mexiglossa varia* gen. et sp. nov., a new genus of glossopteroid leaves from the Jurassic of Oaxaca, Mexico. *Palaeontographica*, **154B** (1-4): 114-120.
- DOLUDENKO, M. P. & SVANIDZE, TS. I. (1969). The Late Jurassic flora of Georgia. *Acad. Sci. U.S.S.R., Geol. Inst. Trans.*, **178**: 1-116.
- FEISTMANTEL, O. (1877). Jurassic (Liassic) flora of the Rajmahal Group, in the Rajmahal Hills. *Mem. geol. Surv. India Palaeont. indica*, **1** (2): 53-163.
- FEISTMANTEL, O. (1877). Flora of the Jabalpur Group (Upper Gondwanas) in the Son Narbada region. *Mem. geol. Surv. India Palaeont. indica*, **2** (2): 1-25.
- FEISTMANTEL, O. (1878). Palaeozoische und mesozoische Flora des östlichen Australiens. *Palaeontographica*, Suppl. iii, 3.
- FEISTMANTEL, O. (1881). The fossil flora of the Gondwana System — II. The flora of Damudapanchet divisions. *Mem. geol. Surv. India Palaeont. indica*, **3** (2): 1-149.
- HALLE, T. G. (1913). The Mesozoic Flora of Graham land. *Ergebn. Schwed. Südpolarexped.* (1901-1903) Stockholm, **3** (14): 1-123.
- HARRIS, T. M. (1932). The fossil flora of Scoresby Sound, East Greenland, 2. *Meddr Grönland*, **85** (3): 1-112.
- HARRIS, T. M. (1932). The fossil flora of Scoresby Sound, East Greenland. Part 3: Caytoniales and Bennettiales. *Meddr Grönland*, **85** (5): 1-133, pls. 1-19.
- HARRIS, T. M. (1964). The Yorkshire Jurassic Flora (Part) 2. Caytoniales, Cycadales and Pteridosperms. *Br. Mus. (Nat. History), Lond.*, :1-191.
- HARRIS, T. M. (1969). The Yorkshire Jurassic Flora, III. Bennettiales. *Br. Mus. (Nat. Hist.), Lond.*, :1-186.
- JACOB, K. & SHUKLA, B. N. (1955). Jurassic plants from the Saighan Series of Northern Afghanistan and their palaeo-climatological and palaeogeographical significance. *Mem. geol. Surv. India Palaeont. indica*, n.s., **33** (2): 1-64.
- JONES, O. A. & DE JERSEY, N. J. (1947). The flora of the Ipswich coal measures — morphology and floral succession. *Publs. Univ. Qd. Dep. Geol. Brisbane* (n.s.), **3** (3): 1-88.
- KAWASAKI, S. (1939). Second addition to the older Mesozoic plants in Korea. *Bull. geol. Surv. Chosen, (Korea) Keijo*, **4** (3): 1-69.

- KIMURA, T. & SEKIDO, S. (1976). *Dictyozamites* and some other Cycadophytes from the Early Lower Cretaceous Oguchi Formation. The Itoshiro Group, Central Honshu, Japan. *Trans. Proc. Palaeont. Soc. Japan*, N.S., **101**: 291-312.
- LINDLEY, J. & HUTTON, W. (1831-37). The fossil flora of Great Britain: or figures and descriptions of the vegetable remains found in a fossil state in this country. 3 vols. London.
- NATHORST, A. G. (1878-86). Om floran i skånes Kolförande Bildningar-1, Floran vid Bjuf. *Sver. geol. Unders. Afh.*, **C227**: 1-131.
- ŌISHI, S. (1932). The Rhaetic plants from the Nariwa District, Prov. Bilchu. (Okayama Prefecture), Japan. *J. Fac. Sci. Hokkaido Univ., Sapporo*, **1** (4): 257-279.
- OLDHAM, T. & MORRIS, J. (1863). Fossil flora of the Rajmahal Series in the Rajmahal Hills. In: "Fossil flora of the Gondwana System". *Mem. geol. Surv. India Palaeont. indica*, ser. 11, **1** (1): 1-52.
- PRESL, G. B. (1838). See Sternberg, C. (1838).
- RACIBORSKI, M. (1894). Flora Kopalna ogniotr-walych glinek Krakowshick. *Akad. umbiejet, Wydzialu matematyczno-Przyrodniczego*, **18**: 141-243.
- SCHIMPER, W. P. (1870). *Traité de Palaeontologie Végétale, ou la Flore du Monde primitif dans ses rapports avec les formations géologiques et la Flore du Monde actuel*, Paris. 2: 522, pls. 54-90.
- SHAH, S. C. & SINGH, G. (1965). On the occurrence of *Glossopteris* from Jabalpur Series. *Indian Miner.*, **19** (3): 263.
- STERNBERG, C. (1820-1838). *Versuch einer geognostischbotanischen Darstellung der Flore der Vorwelt*. Leipzig & Prag. Pt. 7-8: 220.
- TOYAMA, S. & OISHI, S. (1935). Notes on some Jurassic plants from Chalai-nov, Prov. North Hsingan, Manchoukuo. *J. Fac. Sci. Hokkaido Imp. Univ., Sapporo*, **3** (1): 61-77.
- WARD, LESTER F. (1905). Status of the Mesozoic floras of the United States (2nd paper): *Monogr. U.S. geol. Surv.*, **48**, Pt. I: 1-616.; pt. II: 1-119.

EXPLANATION OF PLATES

PLATE 1

1. A portion of a net veined leaf, showing elongated and narrow meshes; B.S.I.P. no. 58/1434. $\times 1$.
2. *Ctenis imjhiriensis* n. sp.; B.S.I.P. no. 35129. $\times 1$.
3. *C. imjhiriensis* n. sp.; holotype — B.S.I.P. no. 35121. $\times 1$.
4. *Pterophyllum* sp.; B.S.I.P. no. 29/1442. $\times 1$.

PLATE 2

5. A portion of a net veined leaf, showing polygonal meshes; B.S.I.P. no. 35122. $\times 1$.
6. *Pterophyllum* sp. cf. *P. distans* Morris; B.S.I.P. no. 26/1434. $\times 1$.
7. *Pterophyllum medlicottianum* Oldham & Morris; B.S.I.P. no. 55/1440. $\times 1$.

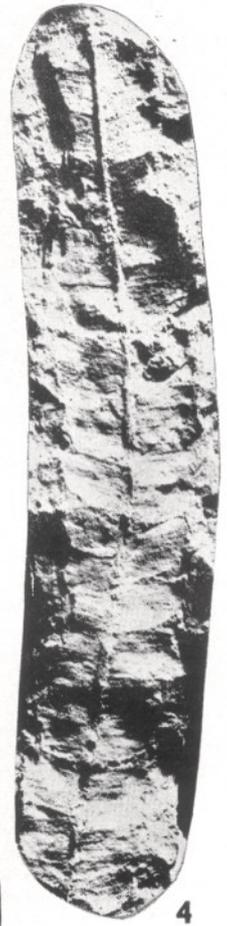
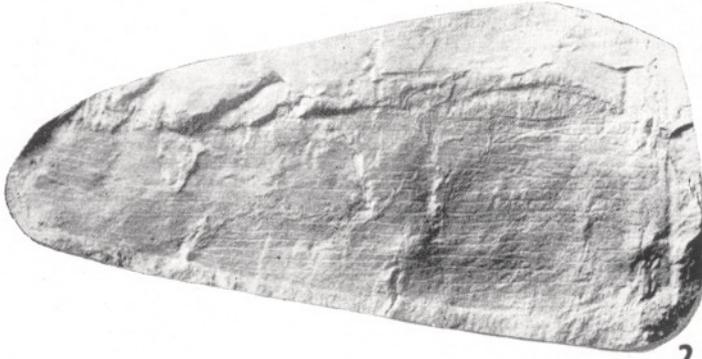
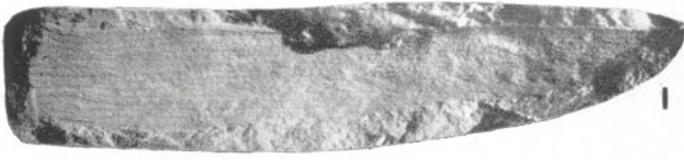




PLATE 2