SOME PLANT FOSSILS FROM THE GOPAD RIVER SECTION NEAR NIDPUR, SIDHI DISTRICT, MADHYA PRADESH

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ABSTRACT

The paper deals with some plant fossils collected from three different exposures along the Gopad River Valley near Nidpur, Sidhi District. The important elements of the assemblages are *Sphenopteris* sp., *Glossopteris* (8 spp.), *Scutum* sp., *Vertebraria* sp., *Taeniopteris* sp., *Dicroidium* (3 spp.) and a few scale- and seed-like bodies. On the basis of the contained plant fossils, the stratigraphic positions of the three exposures have been discussed.

INTRODUCTION

THE Gopad River Valley forms a part of the South Rewa Gondwana Basin. Hughes (1881) mapped the area and collected some plant fossils from Bajbai and Chanduidol. These were later described by Feistmantel (1882), who proposed an Upper Permian age (Raniganj Stage) for these beds. Ahmad and Rao (1954, see Krishnan, 1958, p. 11) examined the sedimentary formations near Marhwas and on the basis of plant fossils suggested a Raniganj age for these beds. The Raniganj age for the Marhwas beds was also supported by palaeontological studies (Tripathi, 1962). Maheshwari (1967) reported the presence of Raniganj beds in subsurface near Gothara.

Satsangi (1964) discovered a very interesting plant assemblage in the Gopad River Section near the village Nidpur (locally known as *Nidhpuri*) in the Sidhi District, Madhya Pradesh. This assemblage contains three distinct species of the genus *Dicroidium* along with fragments of *Glossopteris* leaves. The presence of *Dicroidium* in these beds indicates the presence of a definite Triassic horizon in the area.

The present work deals with the megafossils collected from three new exposures along the Gopad River between the village Gothara and the Sehrha stream (Text-fig.1). The three megafossil yielding localities are (1) about $1\frac{1}{4}$ km N.N.W. of Nidpur on the west bank of the Gopad River, (2) about 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River and (3) about 1 km North of Nidpur on the west bank of the Gopad River. The megafossils occur as impressions on clayey to arenaceous shales. The beds are disturbed due to the presence of faults and folds and hence the stratigraphical sequence in the section is still not clear.

DESCRIPTION

Genus — *Sphenopteris* (Brongniart) Sternberg, 1825

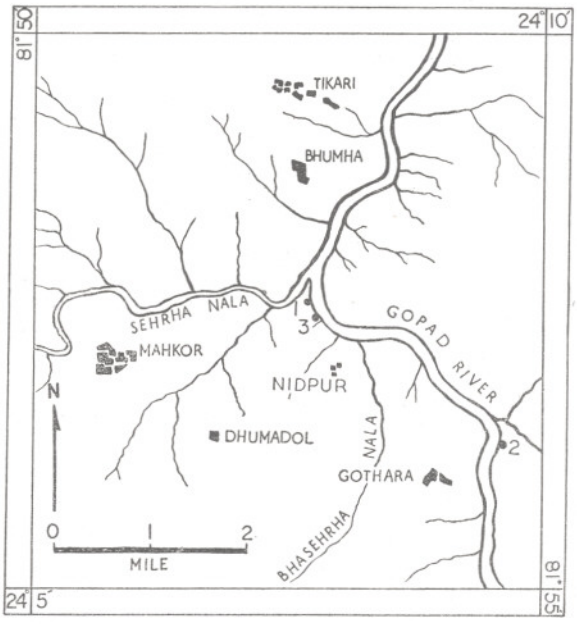
?*Sphenopteris* sp.

Pl. 1, figs. 2, 3; Text-fig. 6G

Preserved portions 1·7 to 2 cm long. Pinna rachis slightly winged, 0·5 to 1 mm broad. Pinnules alternate or sub-opposite, 0·8-1·2 cm long and 0·4-0·5 cm broad, oval in shape, margin slightly lobed to almost straight; basiscopic margin decurrent; midrib flexuous, evanescent towards apex. Venation typically sphenopteroid, comprising lateral veins which dichotomise once or twice and then pass into pinnule lobes.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — The description is based on two extremely fragmentary specimens which resemble most *Sphenopteris hughesi* (Feistmantel) Zeiller described from the Lower Gondwanas of India. Recently Maithy (1974) has described some Indian Palaeozoic species of *Sphenopteris* under a new genus *Neomariopteris*, relying more on the character of the pinnule base than on the venation pattern. The evidence available from our specimens is too meagre to attempt a distinction between *Sphenopteris* and *Neomariopteris*.



TEXT-FIG. 1 — Map showing the fossil localities near Nidpur, Sidhi District, Madhya Pradesh.

Genus — *Glossopteris* Brongniart, 1828

Glossopteris browniana Brongniart, 1828

Pl. 1, figs. 4-7; Text-figs. 2A, B

Only 2 specimens present. More complete specimen with part and counter part (Pl. 1, figs. 6, 7), 3·8 cm long, 1 cm broad at the widest portion, lanceolate-spathulate in shape, tapering towards both ends; apex acute; base sessile. Midrib distinct but flat, about 1·5 mm broad at base, faintly longitudinally ribbed, persisting up to apex; secondary veins arising at an angle of 35-40°, dichotomising and anastomosing to form oblong-polygonal meshes, slightly narrower towards margin. Other specimen (Pl. 1, figs. 4, 5) is an impression of the apical part of a morphographically similar but larger leaf, concentration of veins variable between 20-24 per cm near the margin.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — In venation pattern these specimens closely agree with the specimens described and figured by Feistmantel (1881, pl. 29, figs. 3, 6, 8) but they are much smaller in size. The specimens are quite similar to forms of *G. browniana* Brongniart described by Kulkarni (1971, pl. 1, fig. 7) in size, shape and venation pattern.

Glossopteris gopadensis sp. nov.

Pl. 1, figs. 13-15; Text-figs. 2D-F

Diagnosis — Leaves linear-lanceolate, base slightly contracted, apex (?) acute. Midrib distinct, strong, persistent; secondary veins sinuous, arising at acute angles, after a gentle curve passing on straight to margins, dichotomising and anastomosing to form elongate-polygonal meshes with wavy sides.

Description — Species represented by several incomplete specimens but showing different parts of the leaf. Incomplete specimens 3·5 to 6·3 cm in length, 0·4 to 1·3 cm in width at the widest, margin entire, contracted both towards base and apex. Apex probably acute, base sometimes narrowing up to 0·4 cm. Midrib distinct, 1 mm broad at base, finely longitudinally striated. Secondary veins arise at acute angles, take a sharp curve and then pass out straight to the margins. Veins slightly flexuous, dichotomise and anastomose to form elongate-

TEXT-FIG. 2. A-B, *Glossopteris browniana*, line drawings showing venation pattern, specimen nos. 21/1526 × 3, 22/1526 × 3; C, *G. communis*, showing venation pattern, specimen no. 19/1526 × 1·5; D-F, *G. gopadensis* sp. nov., showing venation pattern, specimen nos. 93/1521 × 1·5; 71/1521 × 2, and 74/1521 × 4; G, *G.* sp. cf. *G. damudica*, showing venation pattern, specimen no. 30/1526 × 2.

polygonal meshes, slightly broader near midrib, becoming narrower towards the margin. Concentration of veins at the margin 26 to 28 per cm.

Holotype — B.S.I.P. no. 93/1521 (Pl. 1, figs. 14, 15; Text-fig. 2D).

Type Locality — About 1 km North of Nidpur on the west bank of Gopad River, Madhya Pradesh.

Horizon & Age — ?Panchet Group; Triassic.

Remarks — The new species may be compared with *G. angustifolia* Brongniart, 1828, *G. linearis* McCoy, 1847 and *G. taenioides* Feistmantel, 1882 in its linear-lanceolate shape. The resemblance with *G. angustifolia* is striking except that in the new species the secondary veins are flexuous. The flexuous nature of the secondary veins differentiates it from other narrow-leaved species of the genus *Glossopteris*.

Glossopteris sp. cf. *G. damudica* Feistmantel, 1881

Pl. 1, fig. 8; Text-fig. 2G

A fragmentary specimen showing a part of the leaf on one side of the midrib. Available width of lamina 2·7 cm. Midrib distinct, strong, 1·25 mm broad with fine longitudinally running ridges. Secondary veins arising at acute angles but immediately after emergence taking a sharp bend and continuing straight towards margin meeting it at open angles. Veins dichotomising and anastomosing to form oblong-polygonal meshes, which are broader near midrib; concentration of veins near midrib 6 per cm and near margin 14 per cm.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — The specimen agrees in venation pattern with specimens of *G. damudica* described by Feistmantel (1881, p. 105, pl. 30, fig. 2a) and Maheshwari and Prakash (1965, pl. 2, fig. 16).

Glossopteris communis Feistmantel, 1876

Pl. 1, fig. 9; Text-fig. 2C

Specimens 6·4-7·2 cm long, 2·4-3·2 cm broad at widest, shape lanceolate-spathulate; margin entire, contracting towards base; apex (?)acute. Midrib distinct, flat, 1·5-2·5 mm broad at base, gradually tapering towards apex; secondary veins arising at an angle of 20-35° and after a gentle curve outwards running straight towards margin, dichotomising and anastomosing 2-3 times to form elongate-narrow meshes of almost equal width throughout the lamina. Concentration of veins near midrib 24-26 per cm, and 34-36 per cm towards margin.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River; about 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — In shape and nature of meshes the present specimens resemble *Glossopteris communis* Feistmantel (1881, pl. 26, fig. 1, 4; pl. 38, fig. 1).

Glossopteris retifera Feistmantel, 1881

Pl. 1, fig. 10; Text-fig. 3E

Leaf impressions 1·5-6 cm in length, 2-3·2 cm broad at the widest region, apical and basal portions not preserved; margin entire. Midrib distinct, longitudinally ribbed, 1-2 mm broad; secondary veins arising at about 45°, dichotomising and anastomosing 5-7 times to form broad oblong-polygonal meshes; concentration of veins near midrib 8-10 per cm and 10-14 per cm towards margin.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River.

Remarks — The specimens resemble most *Glossopteris retifera* described by Feistmantel (1880, p. 28, fig. 2) and Maheshwari and Prakash (1965, pl. 3, fig. 19; text-fig. 9).

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TEXT-FIG. 3. A-D, *Glossopteris stenoneura* (Feistmantel) n. rank, showing venation pattern, specimen nos. 52/1522 × 2, 48/1522 × 2, 30/1522 × 2 and 56/1522 × 2; E, *G. retifera*, showing venation pattern, specimen no. 39/1522 × 1·5; F-G, *G.* sp. cf. *G. senii*, showing venation pattern, specimen nos. 79/1521 × 2, 84/1521 × 3.

TEXT-FIG. 3

Glossopteris sp. cf. *G. senii* Srivastava, 1969

Pl. 1, figs. 11, 12; Text-figs. 3F, G

Leaves narrow, ribbon-shaped; 0·8-5·7 cm long and 0·5-1·2 cm broad at the widest, margin entire; apical and basal portions not preserved. Midrib distinct, strong, 0·5-1·5 mm broad, longitudinally striated, giving rise to secondary veins at angles of 50-60°; veins dichotomising and anastomosing to form polygonal meshes, broad and short near midrib and narrow and long towards margin.

Locality — About 1 km North of Nidpur on the west bank of Gopad River.

Remarks — In external morphology the specimens show a definite resemblance to the specimens of *Glossopteris senii* Srivastava reported from same region. As *G. senii* is primarily based on its epidermal characters so the present specimens have been described here as *Glossopteris* sp. cf. *G. senii*.

Glossopteris stenoneura (Feistmantel, 1881) n. rank

Pl. 2, figs. 16-18; Text-figs. 3A-D, 4A-B

1881 — *Glossopteris communis* var. *stenoneura* Feistmantel: p. 99, pl. 32, fig. 3, pl.33, fig. 1, pl. 38, fig. 5.

Diagnosis — Leaves small, spathulate to oblong-spathulate in shape. Midrib distinct for most part, becoming evanescent just near apex; secondary veins arising at acute angles and running towards margin with a slight curve, veins slightly wavy, forming narrow-elongate meshes of ± equal size throughout lamina.

Description — Mostly incomplete impressions of leaves, very seldom apex and base preserved. Incomplete specimens 4·3-5·8 cm long and 2-2·9 cm in width at the widest, apex broadly acute, margin entire, gradually tapering towards base, sessile. Midrib distinct, flat, 1·5-2 mm broad, evanescent near apex. Secondary veins arising at acute angles from the midrib and with gentle curve passing towards margin. Veins slightly wavy, dichotomising and anastomosing to form more or less equal-sized narrow, elongate meshes throughout the lamina; concentration of veins 18-20 per cm.

Holotype — Specimen no. 5268 (Feistmantel, 1881, pl. 32, fig. 3) of G.S.I., Calcutta.

Type Locality — Raniganj Coalfield.

Horizon & Age — Barakar Formation; Permian.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River.

Remarks — Feistmantel (1881, p. 99; pl. 32, fig. 3; pl. 33, fig. 1; pl. 38, fig. 5) described and figured similar leaves as var. *Stenoneura* of *Glossopteris communis*. Srivastava (1956) studied the cuticle of apparently similar looking leaves and suggested that var. *stenoneura* was same as *G. communis*. However, cuticle is not known from the type specimens of the variety or the species. As such a merger of the two on the basis of Srivastava's specimens is not justified.

Infact Feistmantel's specimens of var. *stenoneura* are morphologically very different from that of *G. communis* (Feistmantel, 1881, pl. 26, fig. 1, 4; pl. 27, fig. 1; pl. 36, figs. 1, 2). *G. communis* is a large leaf, usually lanceolate to lanceolate-spathulate in shape, whereas, var. *stenoneura* is a small leaf spathulate to oblong-spathulate in shape. In *G. communis* the concentration of veins per centimetre is comparatively more and the veins are not wavy. On the basis of these differences it is felt that var. *stenoneura* should be separated from *G. communis* and raised to the specific rank as *G. stenoneura* (Feistmantel, 1881) n. rank.

Glossopteris taeniopteroides Feistmantel, 1878

Pl. 2, fig. 19; Text-fig. 4C

Only middle portion preserved, 5·8 cm long and 5·6 cm broad. Margin entire; midrib distinct, strong, 1·5 mm broad, with a few lumps. Secondary veins arising at acute angles and immediately thereafter curving sharply and running at right angles to the midrib; veins 13-14 per cm, dichotomising and anastomosing once or twice to form long narrow meshes.

Locality — About 1 km North of Nidpur on the west bank of the Gopad River.

Remarks — The specimen is comparable to *Glossopteris taeniopteroides* Feistmantel, except that in Feistmantel's specimens the concentration of veins per cm is slightly higher (15-16 per cm).

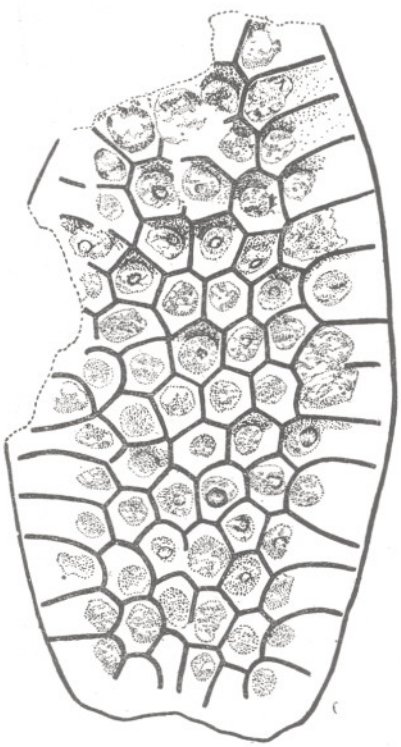
TEXT-FIG. 4. A-B, *Glossopteris stenoneura* (Feistmantel) n. rank, showing venation pattern, specimen nos. 45/1522 × 2, 40/1522 × 2; C, *G. taeniopteroides*, showing venation pattern, specimen no. 72/1521 × 1·5; D-F, scale-like leaves-Type 1., showing venation pattern, specimen nos. 41/1522 × 2·5, 47/1522 × 1, 42/1522 × 2·5; G, Type 2, specimen no. 33/1522 × 2.

Genus — *Scutum* Plumstead, 1952

Scutum sp.

Pl. 2, figs. 20-23; Text-fig. 5

Specimen 2·3 cm long and 1·1 cm broad, elliptical-oval in shape, towards base slightly broad, with a well-defined marginal fluted wing-like structure. Major part of fructification covered by compact, spirally arranged, polygonal areas, each area having a distinct subcircular region. Sometimes a well-defined small boss seen within the subcircular area, which may be the vascular supply to the seed or the ovule. Marginal seeds are bigger in size and give the appearance of having a thin scale-like appendage.



TEXT-FIG. 5. *Scutum* sp., line drawing showing marginal wing and surface is covered by compact, spirally arranged ovule (?seed) within the polygonal areas, specimen no. 17/1526 × 4·5.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — Most of the *Scutum* species are based upon the leaf species on which they are borne. Otherwise there is very little difference between them. The present specimen does have a superficial resemblance to *S. elongatum* Surange & Chandra, 1974.

Plumstead (1958) regarded *Scutum* as a bilaterally symmetrical two-sided cupule. Surange and Chandra (1974) also believe that *Scutum* is bilaterally symmetrical but with a 'veined-half' and a 'seed-bearing half'. The 'seed-bearing half' or the 'ovule-bearing receptacle' of *Scutum* has been compared with the ovule-bearing receptacle of *Rajmahalia paradoxa* as interpreted by Bose (1966). The present specimen shows only the ovules (?seeds) and they are perhaps preserved upside down. The receptacle is missing in this specimen.

Genus — *Vertebraria* Royle, 1840

Vertebraria sp.

Pl. 2, figs. 24, 25

Fragmentary axes, 2·4-6 cm long and 0·5-0·9 cm broad, showing two series of superposed rectangular areas running in longitudinal direction.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River.

Genus — *Dicroidium* Gothan, 1912

Dicroidium sp. A

Pl. 3, figs. 34, 35; Text-fig. 6A

Fronds fragmentary, available length 0·7-1·3 cm. Pinnules alternate-subopposite,

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TEXT-FIG. 6. A, *Dicroidium* sp. A, showing shape of the pinnules and decurrent base, specimen no. 16/1521 × 7·5; B, *Dicroidium* sp. C, showing the venation pattern, specimen no. 86/1521 × 1·5; C, Leaf Type 1, showing shape and venation of pinnules, specimen no. 29/1526 × 3; D-E, *Dicroidium* sp. B, showing shape and venation pattern, specimen nos. 85/1521 × 1·5, 18/1521 × 2; F, *Taeniopteris* sp. cf. *T. glandulata*, showing the venation pattern and glandular structures in between the veins, specimen no. 88/1521 × 2; G, *Sphenopteris* sp., showing venation pattern, specimen no. 23/1526 × 4.

TEXT-FIG. 6

attached to pinna rachis by whole base, ovate-oblong; margin entire: apex obtuse basiscopic margin slightly decurrent, acroscopic margin convex; venation ?odontopteroid.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — As the venation of the specimens is obscure, it is difficult to refer them to a definite species.

Dicroidium sp. B

Pl. 3, figs. 36, 37; Text-figs. 6D, E

Pinnae lanceolate in shape, 1·5-7·5 cm long; pinna rachis 0·5-1 mm broad, longitudinally striated. Pinnules sub-opposite, attached to pinna rachis at an angle of 45-60°, generally oblong-lanceolate, sometimes oval in shape, 0·5-1·7 cm long and 0·3-0·6 cm broad at its widest region; basiscopic margin slightly decurrent; acroscopic margin more or less straight to slightly convex. Venation is typically odontopteroid, sometimes with a faint suggestion of a midrib.

Locality — About 1 km North of Nidpur on the west bank of Gopad River.

Remarks — In shape and venation pattern, the specimens resemble closely *Dicroidium nidpurensis* Bose & Srivastava, 1971 and *D. papillosum* Bose & Srivastava, 1971. These two species, which are primarily based on their cuticular features, are morphographically similar. As such it is difficult to place the present specimens in either of the two species.

?*Dicroidium* sp. C

Pl. 3, fig. 38; Text-fig. 6B

Specimen measuring 4·2 cm in length. Pinna lanceolate, rachis 0·5 mm broad. Pinnules subopposite, linear-lanceolate in shape, 1-1·5 cm long, 0·4 cm broad; margin slightly wavy; apex acute; base slightly decurrent. Midrib distinct; lateral veins forking once or twice.

Locality — About 1 km North of Nidpur on the west bank of Gopad River.

Remarks — The pinnules of the specimen, in general shape and venation pattern, are somewhat similar to *D. gopadensis* Bose & Srivastava, 1971. Also in general shape of the pinnules and in the presence of midrib the specimen compares favourably with one of the specimens from Chicharia described by Lele (1961, p. 51, pl. 1, fig. 3; text-fig. 2C-E) as *D. odontopteroides* (Morris) Gothan.

Genus — *Taeniopteris* Brongniart, 1832

Taeniopteris sp. cf *T. glandulata* Srivastava 1971

Pl. 3, fig. 39; Text-fig. 6F

Leaves measuring 2·1-3 cm in length, 1·9 cm in breadth apical and basal portions not available. Leaf margin entire; midrib distinct, longitudinally striated, 1-1·5 mm broad. Secondary veins arising at an angle of 50-80°, sometimes bifurcating just after emergence, 6-10 gland-like structures present between veins.

Locality — About 1 km North of Nidpur on the west bank of Gopad River.

Remarks — The specimens are morphologically similar to *Taeniopteris glandulata* Srivastava, 1971. As the cuticular features of the specimens are not known, so they are provisionally placed under *T. glandulata.*

INCERTAE-SEDIS

Leaf type-1

Pl. 1, fig. 1; Text-fig. 6C

Fragmentary pinnate leaf, about 1·2 cm long. Pinnules alternate, attached obliquely by entire base; basiscopic margin slightly decurrent, acroscopic margin, straight. Pinnules linear, 6 mm long, 3 mm broad at base; apex acute; margin entire. Midrib distinct, giving rise to faint, bifurcating lateral veins.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

SCALE-LIKE LEAVES

Several scale-like leaves have been recovered from two localities. Similar leaves have earlier been reported from the Permian under the name *Squama* (Seward & Sahni,

1920). The lamina of *Eretmonia* du Toit is also similar but has a pedicel which bore a pair of sporangium-bearing stalks (Surange & Maheshwari, 1970; Holmes, 1974). The exact nature of such leaves in the present collection is not known as no fertile organ has been found attached to them.

Type — 1

Pl. 2, figs. 26, 27; Pl. 3, figs. 28-31; Text-figs. 4D-F

Scale leaves oblong-ovate in shape, 1·4-2 cm in length and 1-1·6 cm in width, margin entire, apex acute or broadly rounded. Several veins entering base, dichotomising and anastomosing to form elongate meshes throughout entire surface; meshes near margin narrow and towards base broad.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River; about 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — The specimens show close similarity with *Squama* forma *integerrima* Seward & Sahni, 1920 in venation pattern but differ in overall shape.

Type — 2

Pl. 3, fig. 32; Text-fig. 4G

Single pear-shaped scale leaf in part and counterpart, 1 cm long as well as broad. Margin entire, surface fluted, several veins enter the base, bifurcate and probably anastomose. A more or less circular depression seen in the apical region.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River.

Remarks — The specimen differs from type 1 in overall shape and in having a circular depression in the apical region.

Type — 3

Pl. 3, fig. 33

Specimens lanceolate in shape, 2·2 cm long and 1 cm broad; tip acute; base narrow, sessile; margin entire. Several veins entering base, subparallel at base and seem to converge towards apex, sometimes forking but anastomosing is not clear.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — The specimens differ from types-1 and 2 in the apparent lack of anastomosing of the veins and in overall shape.

SEED-LIKE BODIES

Type — 1

Pl. 3, fig. 42

Solitary impression of an ovate seed-like body, 6·5 mm long and 5·5 mm wide, apex broadly obtuse, base rounded; about 1 mm broad border present all around.

Locality — About 1¼ km N.N.W. of Nidpur on the west bank of Gopad River.

Remarks — The specimen may be compared with *Cordaicarpus ovatus* Lele from the Middle Triassic of South Rewa Gondwana Basin.

Type — 2

Pl. 3, fig. 41

Seed-like body, shape cordate-ovate, 3 mm long and 2 mm broad at base; base cordate; apex slightly pointed; probably a narrow border present all around.

Locality — About 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River.

Remarks — The present specimen agrees somewhat with *Cordaicarpus* sp. cf. *C. cordai* Geinitz, described by Seward and Sahni (1920), in having a broad base and acute apex but differs in the absence of a definite border and fine striations on the nucule.

Type — 3

Pl. 3, fig. 40

Radiospermic, cordate-ovate shaped seeds, 3-4 mm long, 2·5-4 mm broad at base; apex acute; base broad.

Locality — About 1 km North of Nidpur on the west bank of Gopad River.

Remarks — Somewhat similar seed-like bodies have been described earlier by Maithy (1965) as *Rotundocarpus*.

DISCUSSION

In the present paper, megafossils have been described from three newly discovered plant-bearing beds in the Gopad River sectoin between Gothara village and the Sehrha nala confluence.

The megafossil assemblage at the locality no. 1 (about $1\frac{1}{4}$ km N.N.W. of Nidpur on the west bank of Gopad River) comprises: *Glossopteris communis, G. retifera, G. stenoneura, Vertebraria* sp. and various types of scale leaves. G. *stenoneura* is most abundant at this locality. Scale leaves are also quite common. There being no typical Triassic plants present, it is difficult to assign a definite age to these beds. However, the occurrence of *Glossopteris retifera* does show that these beds may probably be equivalent to the Upper Raniganj or the basal most Panchets of the Raniganj coalfield. The total absence of the genus *Dicroidium* shows that these beds are definitely older than the Nidpur bed discovered by Satsangi (1964).

The assemblage at locality no. 2 (about 3 km E.S.E. of Nidpur and 1 km E.N.E. of Gothara on the east bank of Gopad River) comprises: ? *Sphenopteris* sp., *Glossopteris, browniana, G. communis, G.* sp. cf. *G. damudica, Scutum* sp., *Dicroidium* sp. A., scale leaves and seeds. The presence of the genus *Dicroidium* at the locality, though meagrely represented, points towards a Triassic age. The various species of *Glossopteris* found have a wide range both vertically and horizontally. The absence of *G. retifera* and the definite presence of *Dicroidium* show that these beds may probably be somewhat younger than the basal Panchets of the Raniganj coal-field. It is, however, possible that the beds are older than Satsangi's Nidpur bed in which *Dicroidium* is most common.

The fossil flora at locality no. 3 (about 1 km North of Nidpur on the west bank of Gopad River) comprises: *Glossopteris gopadensis, G.* sp. cf. *G. senii, G. taeniopteroides, Dicroidium* spp., *Taeniopteris* sp. cf. *T. glandulata* and seeds. This assemblage is very similar to the one described from Nidpur carbonaceous beds. However, at this locality *Dicroidium* is not as common as in the carbonaceous beds. Therefore, it is likely that locality no. 3 beds are slightly older in age.

Thus we find that the Triassic System in Sidhi District which was so far known only from a very small exposure near Nidpur also occurs in other small patches within 3·5 km stretch between the Gothara village and the Sehrha nala confluence. So it will be worthwhile if a detailed surface and subsurface mapping of the area is undertaken in order to find out the total extent of the Triassic beds in this region.

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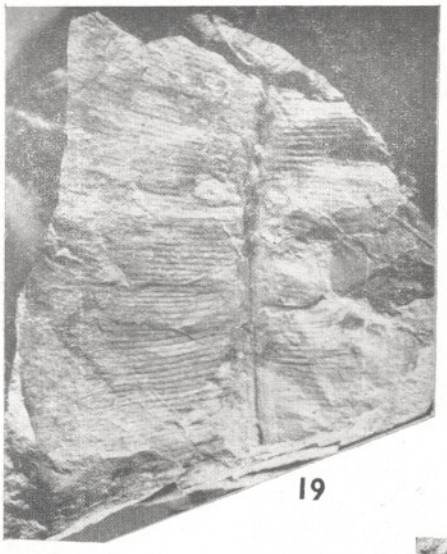
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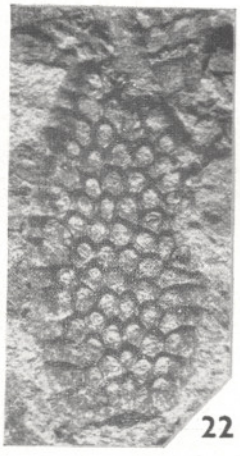
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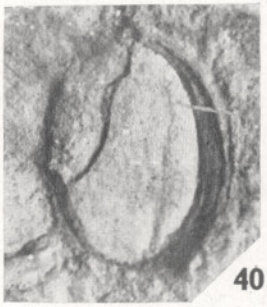
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EXPLANATION OF PLATES

PLATE 1

1. Leaf type 1.
   B.S.I.P. no. 29/1526. × 1.
2, 3. ? *Sphenopteris* sp.
   2. B.S.I.P. no. 23/1526. × 1.
   3. Specimen in figure 2 enlarged, showing venation. × 2.
4-7. *Glossopteris browniana* Brongniart
   4. B.S.I.P. no. 22/1526. × 1.
   5. Specimen in fig. 4 enlarged. × 2.
   6. B.S.I.P. no. 21/1526. × 1.
   7. B.S.I.P. no. 22/1526. × 2.
8. *Glossopteris* sp. cf. *G. damudica* Feistmantel
   B.S.I.P. no. 30/1526. × 1.
9. *Glossopteris communis* Feistmantel
   B.S.I.P. no. 19/1526. × 1.
10. *Glossopteris retifera* Feistmantel
   B.S.I.P. no. 39/1522. × 1.
11, 12. *Glossopteris* sp. cf. *G. senii* Srivastava
   11. B.S.I.P. no. 77/1521. × 1.
   12. B.S.I.P. no. 79/1521. × 1.
13-15. *Glossopteris gopadensis* sp. nov.
   13. B.S.I.P. no. 71/1521. × *Ca* 2.
   14. Counter part of the holotype. × 1.
   15. Holotype, B.S.I.P. no. 93/1521. × 1.

PLATE 2

16-18. *Glossopteris stenoneura* (Feistmantel) n. rank
   16. B.S.I.P. no. 48/1522. × 1.
   17. B.S.I.P. no. 56/1522. × 1.
   18. B.S.I.P. no. 35/1522. × 1.
19. *Glossopteris taeniopteroides* Feistmantel
   B.S.I.P. no 73/1521. × 1.
20-23. *Scutum* sp.
   20. B.S.I.P. no. 17/1526. × 1.
   21. Counter part of specimen in fig. 20. B.S.I.P. no. 24/1526. × 1.
   22. Specimen in fig. 21 enlarged. × 2.
   23. Specimen in fig. 20 enlarged. Note the round seed-scars in the polygonal areas as well as at the base of the seed scale. × 2.
24, 25. *Vertebraria* sp.
   24. B.S.I.P. no. 51/1522. × 1.
   25. Counter part of above specimen B.S.I.P. no. 53/1522. × 1.
26, 27. Scale like leaves-Type 1
   26. B.S.I.P. no. 46/1522. × 2.
   27. Counter part of specimen no. 26 (42/1522). × 2.

PLATE 3

28-33. Scale-like leaves
   28. Type 1. B.S.I.P. no. 47/1522. × 2.
   29. Type 1. B.S.I.P. no. 41/1522. × 2.
   30. Type 1. B.S.I.P. no. 34/1522. × 2.
   31. Type 1. B.S.I.P. no. 15/1526. × 2.
   32. Type 2. B.S.I.P. no. 33/1522. × 2.
   33. Type 3. B.S.I.P. no. 26/1526. × 2.
34, 35. *Dicroidium* sp. A
   34. B.S.I.P. no. 16/1526. × 4.
   35. B.S.I.P. no. 18/1526. × 2.
36, 37. *Dicroidium* sp. B.
   36. B.S.I.P. no. 81/1521. × 1.
   37. B.S.I.P. no. 85/1521. × 1.
38. ?*Dicroidium* sp. C.
   B.S.I.P. no. 86/1521. × 1.
39. *Taeniopteris* sp. cf. *T. glandulata* Srivastava
   B.S.I.P. no. 88/1521. × 1.
40-42. Seed-like bodies
   40. Type 3. B.S.I.P. no. 70/1521. × 5.
   41. Type 2. B.S.I.P. no. 25/1526. × 5.
   42. Type 1. B.S.I.P. no. 54/1522. × 5.