SOME FRAGMENTARY PLANT REMAINS FROM THE LOWER TRIASSIC OF AURANGA VALLEY, DISTRICT PALAMAU

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ABSTRACT

The paper deals with some Lower Triassic megafossils collected from two different exposures in Auranga valley, District Palamau. The fossils were obtained mainly near Deobar Village. From here *Trizygia speciosa, Schizoneura gondwanensis, Glossopteris angustifolia, G. communis, G. indica, Vertebraria indica,* ?*Noeggerathiopsis* sp., *Dicroidium* sp. and some other fragmentary plants have been reported. In addition, a few detached ?pinnules with cuticle like that of *Lepidopteris* have been described from Sukri River near Tubed.

INTRODUCTION

LOWER Triassic plant fossils from Auranga valley were first collected by Ball (1878). Some of these were later listed by Feistmantel (1886). While resurveying the area, Bhattacharyya (1963) reported a few Lower Triassic plants from Deobar. All these records have recently been reviewed by Bose (1974). In the present paper a detailed description of plant fossils, collected during three field seasons, from opposite Deobar Village and an outcrop on the southern bank of the Sukri River about 0·8 km from Kaima and 1·6 km south-west of Tubed is given here.

Genus — *Trizygia* Royle, 1839

Trizygia speciosa Royle

Pl. 1, figs. 1, 2; Text-fig. 1A

Sphenophyllum speciosum: Bhattacharyya, p. 125.

Represented by three incomplete specimens, largest specimen 3·2 cm long. Stem articulate, 1·0 mm broad, nodal region slightly swollen, nodes about 1·5 cm apart, with leaves in whorls. Each whorl consisting of 6 leaves in 3 pairs, two pairs of leaves larger than third pair. Larger leaves 1·1-1·2 cm long, 0·7 cm broad at the broadest region, ovate-cuneate in shape, margin entire. Smaller leaves 0·6 cm long, 0·5 cm broad. Number of veins entering leaf base not clear, probably 1, veins dichotomising and approaching margin without anastomosing.

Collection — Nos. 35173/1246 (Pl. 1, fig. 1; Text-fig. 1A) and 35174/1246 (Pl. 1, fig. 2) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Remarks — The specimens, though incomplete, can easily be identified with *Trizygia speciosa* Royle (1839) by their characteristic arrangement of leaves in 3 pairs at each node. They compare fairly well with the specimens of *T. speciosa* figured by Feistmantel (1880), Pant and Mehra (1963) and Surange (1966). The species is most common in the Permian but Bhattacharyya (1963) had earlier reported its occurrence from the Triassic of Deobar. Present study further confirms his findings.

Genus — *Schizoneura* Schimper & Mougeot, 1844

Schizoneura gondwanensis Feistmantel

Pl. 1, fig. 3

1963 — *Schizoneura gondwanensis*: Bhattacharyya, p. 125.

Schizoneura gondwanensis is extremely rare at Deobar. The collection includes a fragmentary specimen in counterparts. The specimen shows only a portion of the leaf sheath without any axis.

Collection — Nos. 35175/1246 (Pl. 1, fig. 3) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Genus — *Glossopteris* Brongniart, 1828

Glossopteris indica Schimper

Pl. 1, figs. 12, 13; Pl. 2, fig. 14

1963 — *Glossopteris indica*: Bhattacharyya, p. 125.

Leaves fragmentary, largest leaf 7·0 cm long and 3·5 cm broad at its broadest region. Shape as a whole oblanceolate — spathulate; apex obtuse, margin entire, gradually tapering towards base. Midrib prominent, about 4·0 mm broad near base, gradually thinning out towards apex, longitudinally striated; secondary veins arising at an angle of about 30-40°, nearer base almost parallel to midrib, dichotomising and anastomosing, forming broad and smaller meshes near midrib and narrow, elongated meshes towards margin. Concentration of veins around midrib 12-14 per cm and 16-20 per cm near margin.

Collection— Nos. 35184/1246 (Pl. 1, fig. 12), 35185/1246 (Pl. 1, fig. 13) and 35186/1246 (Pl. 2, fig. 14) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Remarks — The leaves in general form and venation pattern resemble the specimens of *Glossopteris indica* Schimper figured by Feistmantel (1881, pl. 25A, figs. 1-3). Deobar specimens, however, differ from Feistmantel's specimens in being smaller in size. In size they are more closer to the specimens described by Schimper (1874, pl. 38, fig. 10) and Kulkarni (1971, pl. 1, fig. 4).

Besides Deobar, in the Lower Triassic of India, *G. indica* has also been figured from Ramkola by Feistmantel (1881, pl. 23A, fig. 10). This specimen too, seems to be smaller in size. The specimen is rather incomplete for detailed comparison.

Glossopteris angustifolia Brongniart

Pl. 1, figs. 4-8

Leaves measuring 5-8·5 cm in length and 1·5-2·0 cm in breadth, oblanceolate-spathulate; margin entire, apex acute, gradually tapering towards base. Midrib distinct throughout the entire length, finely striated, 1·0-2·0 mm wide near base, thinner above; secondary veins near base almost parallel to midrib, otherwise arising at an angle of 15°-20°. Veins 15-23 per cm near midrib, forming broad and somewhat oblong meshes, near margin meshes narrower, 20-30 per cm.

Collection — Nos. 35180/1246 (Pl. 1, fig. 8), 35178/1246 (Pl. 1, fig. 6), 35179/1246 (Pl. 1, fig. 7), 35176/1246 (Pl. 1, fig. 4) and 35177/1246 (Pl. 1, fig. 5) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Remarks — Deobar specimens closely compare with the specimens described by Feistmantel (1881, pl. 27A, figs. 11-13; pl. 34A, fig. 3; pl. 39A, figs. 1, 2), Maithy (1965, pl. 5, fig. 33) and Kulkarni (1971, pl. 1, fig. 10).

Glossopteris communis Feistmantel

Pl. 1, fig. 9

Leaves 6·5-14·2 cm long and 1·5-4·8 cm broad at its broadest region, oblanceolate-spathulate. Apex obtuse, margin entire, gradually narrowing towards base. Midrib 2·0 mm wide near base, finely striated, rarely evanescent near tip. Secondary veins arising at an angle of about 30°-50°, towards margin slightly arched. Veins dichotomising and anastomosing, forming long, narrow and somewhat uniform meshes throughout lamina, about 20-35 per cm.

Collection — No. 35181/1246 (Pl. 1, fig. 9) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age —Panchet; Lower Triassic.

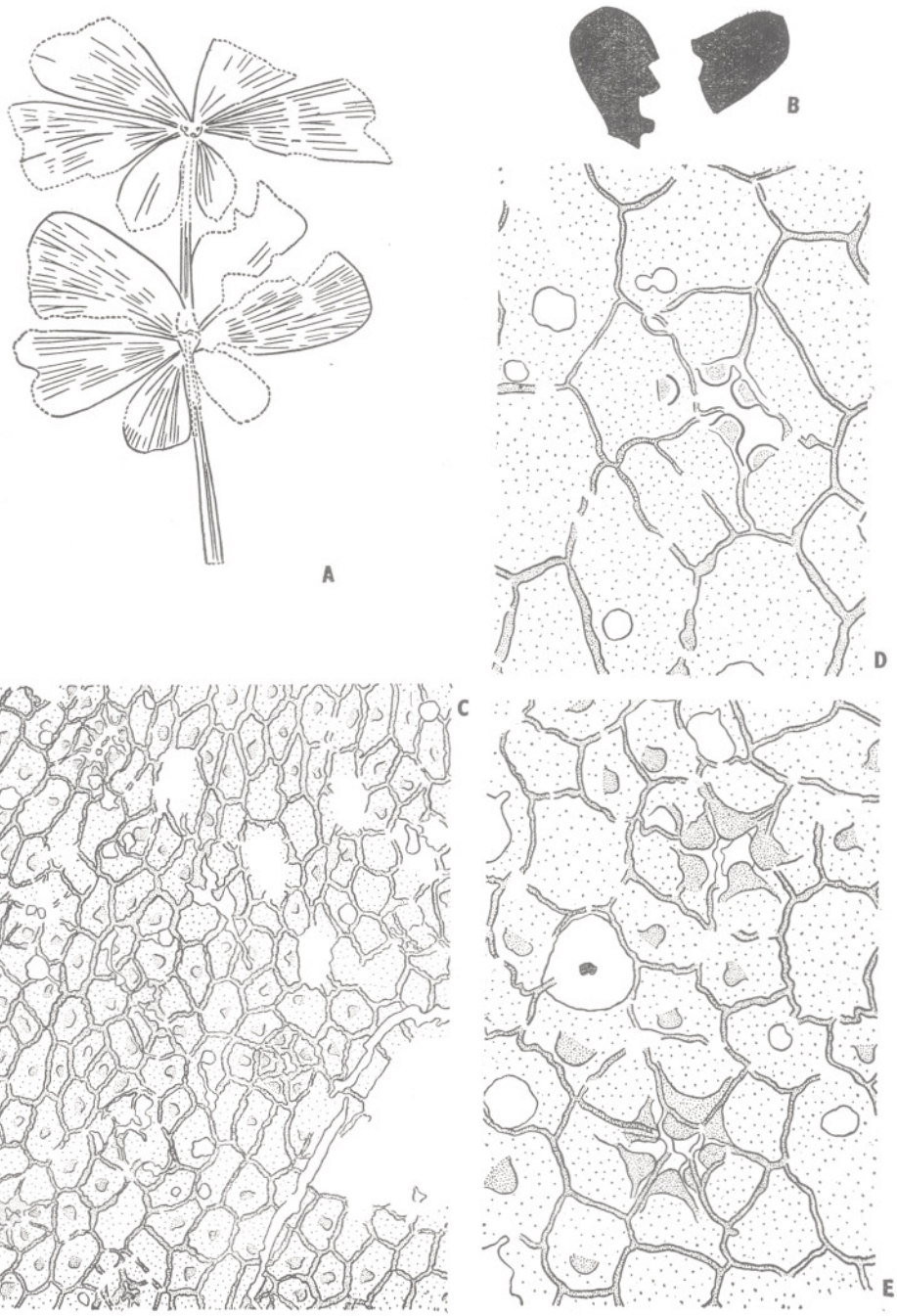
Remarks— The present specimens resemble most the smaller specimens of *G. communis* described by Feistmantel (1881, pl. 26A, fig. 4; pl. 32A, fig. 2).

DETACHED ?PINNULE WITH CUTICLE LIKE *LEPIDOPTERIS*

Pl. 2, figs. 15, 16, 21-23; Text-figs. 1B-E

Pinnules about 2·0-3·0 mm long, 2·0 mm broad, oblong in shape; apex obtuse, margin entire, base somewhat decurrent; venation obscure.

Cuticle 2·5-3 μ thick, one surface is slightly thicker than the other; stomatal concentration more on thicker surface. Cells



TEXT-FIG. 1.— A, *Trizygia speciosa* Royle, showing venation pattern, B.S.I.P. no. 34134 × 2. B, two detached ?pinnules with cuticle like *Lepidopteris*, B.S.I.P. no. 35187/1246 × 5. C, cuticle showing distribution of stomata on thinner surface, slide no. 35187/1246-3 × 150. D & E, showing stomata on thinner surface, slide nos. 35187/1246-3 and 35187/1246-2 × 500 .

on both surfaces polygonal, walls straight or slightly wavy, thick; surface wall papillate; papillae solid, mostly circular. Stomata mono- or dicyclic, irregularly scattered, without any definite orientation; subsidiary cells 5-7, mostly 6; papillate; papillae arching over stomatal pit or forming cutinized lappets. Guard cells thinly cutinized, generally not preserved. A few with trichome bases.

Collection — No. 35187/1246 (Pl. 2, figs. 15, 16) of B.S.I.P., Lucknow.

Locality— Tubed, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Remarks — The above description is based on a specimen showing a pinnule on one side and three on the other (Pl. 2, figs. 15, 16) and also detached pinnules obtained by bulk maceration. The specimen is extremely fragmentary and does not show any lumps on the rachis. Therefore, the frond along with the detached pinnules have been referred to *Lepidopteris* only on the basis of cuticular character, viz., papillate nature of the cells, and characteristic lappets overhanging the stomatal pit (Townrow, 1956).

Comparison — The detached pinnules, in external features, match exactly the pinnules of ?*Dicroidium* described by Satsangi (1971, 1974). They differ from all the known species of *Lepidopteris* by their minute size. In size and shape they resemble most the pinnules of *L. stuttgardiensis* Zeiller figured by Townrow (1956, text-fig. 6D). Cuticle of *L. stuttgardiensis* is not known so far. In *L. indica* Bose & Srivastava (1970) the pinnules are much bigger in size and they have papillate cells only on thicker surface. Unlike the present specimens, in *L. madagascariensis* Carpentier, emended by Townrow (1966), the stomata are monocyclic and they have mostly 5 subsidiary cells. However, in size and shape some of the smaller pinnules of the latter species resemble the present pinnules.

Genus — *Dicroidium* Gothan, 1912

Dicroidium sp.

Pl. 2, figs. 18-20

1963 — *Thinnfeldia sahnii*: *Bhattacharyya*, p. 125; pl. 1, fig. 7; pl. 2, figs. 13, 15.

Pinnae measuring 1·2-3·2 cm in length and 0·7-1·8 cm in width. Rachis thin about 1·0-1·5 cm wide. Pinnules alternate or sub-opposite, closely set 0·7-1·6 cm long and 0·3-1·0 cm broad, apex obtuse, basiscopic margin slightly decurrent, margin entire. Veins usually obscure, when visible odontopteroid or sphenopteroid, mostly arising from lower half of base, often forking.

Collection — Nos. 35190/1246 (Pl. 2, fig. 19), 35189/1246 (Pl. 2, fig. 18) and 35191/1246 (Pl. 2, fig. 20) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age— Panchet; Lower Triassic.

Remarks — The specimens are too fragmentary as such their exact habit is not known. Here for description they have been assumed to be bipinnate. The venation pattern and shape of the pinnules are more like *Dicroidium odontopteroides* (Morris) Gothan but some of them have also venation like the apical pinnules of *D. sahnii* (Seward) Rao & Lele (1962). As such, at present, due to their fragmentary nature it is rather difficult to place them under any definite species.

INCERTAE SEDIS

Stems with Ridges and Grooves

Pl. 1, fig. 10

Stems 2·2-6·4 cm in length and 0·6-1·6 cm in width, showing distinct nodes and internodes. Nodes 5·0-6·0 cm apart. Ridges and grooves prominent, continuous from one node to the other. Leaf sheath absent.

Collection — Nos. 35182/1246 (Pl. 1, fig. 10) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age — Panchet; Lower Triassic.

Remarks — Somewhat similar stems have been described by Lele (1955), from Parsora in the South Rewa Gondwana basin, as *Neocalamites foxii*. In the absence of leaf sheaths and other details we prefer not to assign the present specimens to any genus.

Genus — *Vertebraria* Royle, 1839

Vertebraria indica Royle

Pl. 1, fig. 11

1963 — *Vertebraria indica*: Bhattacharyya, p. 125.

Specimens about 5·0 mm in width. The axes show 3 longitudinal series of rectangular areas of unequal sizes. Each of the rectangular area separated by ridges and grooves.

Collection — No. 35183/1246 (Pl. 1, fig. 11) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age — Panchet; Lower Triassic.

Genus — *Noeggerathiopsis* Feistmantel, 1879

?Noeggerathiopsis sp.

Pl. 2, fig. 25

Specimen incomplete both at base and apex; measuring 6·5 cm in length and 1·2 cm in width at its broadest region, gradually narrowing towards base. Several veins entering base, frequently bifurcating at all levels. Veins fine, closely set, about 28-30 per cm.

Collection — No. 35193/1246 (Pl. 2, fig. 25) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age — Panchet; Lower Triassic.

Remarks — In the concentration of veins *?Noeggerathiopsis* sp. comes closest to *N. densinervis* Maithy (1965). But in the former specimen veins are finer and more closely set. In size, the present specimen may be compared with the specimens of *Noegerathiopsis* sp. described by Srivastava (1971), but in the latter species the veins are more sparse.

LEAF TYPE-1

Pl. 2, fig. 24

Description is based on a solitary specimen. Leaf as a whole cuneate, 3·1 cm long and 1·0 cm broad at its broadest region. Near base about 8 veins visible, forking 1-3 times at all levels.

Collection — No. 35192/1246 (Pl. 2, fig. 24) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age — Panchet; Lower Triassic.

Remarks — The specimen in general shape resembles *Ginkgoites crassipes* (Feistmantel) Seward (1919) but is much smaller in size than the latter species.

? SCALE-LEAF

Pl. 2, fig. 17

Detached ?scale-leaf, more or less rhomboidal, measuring 1·6 cm in length and 2·4 cm width. A large number of veins entering from base, frequently anastomosing.

Such scale-leaves have been earlier described by Feistmantel (1881, pl. 47A, fig. 25), Zeiller (1902), Walkom (1922), Walton (1929) and Lacey and Kulkarni (1969). Amongst these the present specimen resembles most the specimens described by Zeiller (1902, pl. 3, figs. 7, 8) from Reohal, South Rewa, India.

These scale-leaves have rather characteristic shape and venation. Some of these scale-leaves show distinct pits arranged in single files.

Collection — No. 35188/1246 (Pl. 2, fig. 17) of B.S.I.P., Lucknow.

Locality — Deobar, District Palamau, Bihar.

Horizon & Age — Panchet; Lower Triassic.

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EXPLANATION OF PLATES

PLATE 1

1, 2. *Trizygia speciosa* Royle. 1. B.S.I.P. no. 35173/1246. × 1. 2. B.S.I.P. no. 35174/1246. × 4.

3. *Schizoneura gondwanensis* Feistmantel. B.S.I.P. no. 35175/1246. × 1.

4-8. *Glossopteris angustifolia* Brongniart. 4. B.S.I.P. no. 35176/1246. × 1. 5. B.S.I.P. no. 35177/1246. × 1. 6. B.S.I.P. no. 35178/1246. × 1. 7. B.S.I.P. no. 35179/1246. × 1. 8. B.S.I.P. no. 35180/1246. × 1.

9. *Glossopteris communis* Feistmantel. B.S.I.P. no. 35181/1246. × 1.

10. Stem with ridges and grooves. B.S.I.P. no. 35182/1246. × 1.

11. *Vertebraria indica* Royle. B.S.I.P. no. 35183/1246. × 1.

12-13. *Glossopteris indica* Schimper. 12. B.S.I.P. no. 35184/1246. × 1. 13. B.S.I.P. no. 35185/1246. × 1.

PLATE 2

14. *Glossopteris indica* Schimper. B.S.I.P. no. 35186/1246. × 2.

15, 16. Detached ?pinnules with cuticle like *Lepidopteris*. 15. B.S.I.P. no. 35187/1246 (the specimen has been consumed) × 1. 16. the above magnified. × 4.

17. ?Scale-leaf. B.S.I.P. no. 35188/1246. × 1.

18-20. *Dicroidium* sp. 18. B.S.I.P. no. 35189/1246. × 1. 19. B.S.I.P. no. 35190/1246. × 1. 20. B.S.I.P. no. 35191/1246. × 1.

21-23. Detached ?pinnules with cuticle like *Lepidopteris*. 21. Showing stomatal distribution on thicker surface. Slide no. 35187/1246-3. × 150. 22. Thicker surface showing stomata. Slide no. 35187/1246-3. × 500. 23. Thinner surface showing two stomata. Slide no. 35187/1246-2. × 500.

24. Leaf type-1. B.S.I.P. no. 35192/1246. × 1.

25. ?*Noeggerathiopsis* sp. B.S.I.P. no. 35193/1246. × 1.


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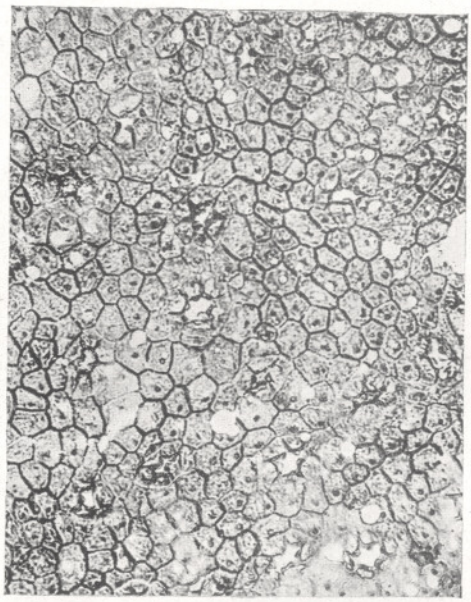

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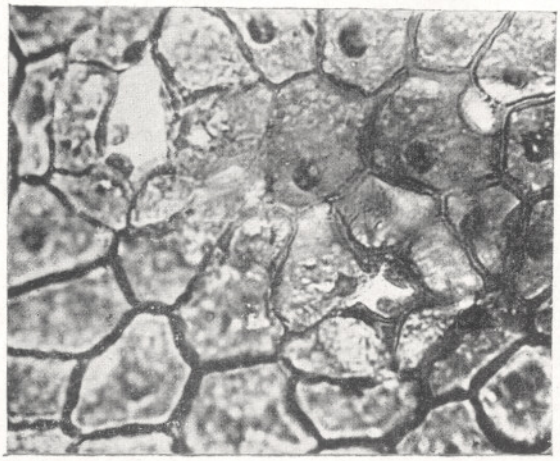

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