Observations on the genus *Gangamopteris*

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Singh, SM 2002. Observations on the genus *Gangamopteris*. *Geophytology* **30**(1&2): 43-45.

The paper discusses the different specific characters of the genus *Gangamopteris* and two species from Barakar Formation of South Karanpura and West Bokaro Coalfields.

Key-words– *Gangamopteris*, Lower Barkar Foramtion, Gondwana, India.

INTRODUCTION

FIFTEEN leaf specimens of the genus *Gangamopteris* were collected as impressions and compressions from the Barakar Formation of South Karanpura and West Bokaro Coalfields. The cuticular pieces have also been recovered from some of the leaves. The specimens are preserved in the museum of the Birbal Sahni Institute of Palaeobotany, Lucknow, India.

Common Indian species of *Gangamopteris* are characterized by the following features:

Shape-Lanceolate: *G. gondwanensis*, *G. fibrosa*, *G. karharbariensis* Maithy; Linear-lanceolate : *G. cyclopteroides*, *G. angustifolia*, *G. mucronata* Maithy; Elliptical : *G. angustifolia, G. mucronata*; Obovate : *G. obliqua, G. clarkeana;* Ovate : *G. intermedia;* Rhomboidal : *G. major*

Apex-Obtuse : *G. cyclopteroides, G. gondwanensis;* Pointed: *G. karharbariensis, G. major*; Acute: *G. angustifolia*; Pointed mucronate: *G. mucronata;* Broadly pointed: *G. obliqua;* Broadly obtuse: *G. clarkeana, G. intermedia, G. fibrosa*

Base-Narrow tapering: *G. clarkeana, G. major, G. cyclopteroides*; Tapering: *G. gondwanensis, G. angustifolia, G. karharbariensis, G. mucronata, G. obliqua, G. fibrosa.*

Venation-Since the midrib is absent, the median region is occupied by sub-parallel veins. From these median veins the secondary veins arise. The characters of the secondary veins, i.e., angle of origin, dichotomies, anastomoses and shape of the meshes are characteristics of each species.

Cuticular features-Characters of the cuticle that have been taken into consideration for speciation are:

i. *Stomata*-The presence of stomata on one (hypostomatic) or both (amphistomatic) the surfaces of the leaf.

ii. *Shape and arrangement of cells* - Arragement of the cells in vein and mesh areas are decipherable. The cells over the veins are usually narrow, elongate, rectangular or squarish and arranged end-to-end in longitudinal rows. The cells in the mesh areas are polygonal, rectanguloid or very rarely trianguloid and squarish and do not show a regular arrangement.

iii. *Cell walls* - The anticlinal and periclinal walls of the cells may be straight, slightly undulate or sinuous. The surface walls may be smooth or papillate; the number of papillae may be numerous or only one. When the papillae are many in number they are usually small and rounded.

iv. Distribution and orientation of the stomata - The Stomata occur only in mesh areas and are usually haplocheilic and anomocytic (irregular number of subsidiary cells). The stoma may have only one ring of encircling cells (monocyclic), rarely two rings (dicyclic); sometimes the encircling cells may partly cover the stoma. Usually the stomata do not exhibit any regularity in distribution and orientation.

v. Types of guard cells - The guard cells may be normal or sunken. The nature of the stomatal pore is difficult to decipther in fossil cuticle.

vi. Stomatal index : It refers to the number of stomata in an unit area.

For diagnosis of the genus *Gangamopteris* (see Pant and Singh, 1968)

SYSTEMATIC DESCRIPTION

Gangamopteris sp. cf. *G. buriadica* Feistmantel, 1879

Plate 1, Figs. 1, 3, 4, 5, 7

Specimen nos.– 18/4739, 16/4743, 18/4743, 6/ 5007-A

Locality– Ara and Kuju Collieries, West Bokaro Coalfield; Gidi A Colliery, South Karanpura Coalfield

Horizon– Barakar Formation

Remarks : The specimens apparently resemble those of *Gangamopteris buriadica* Feistmantel (1879) but as details of venation are not clear leaves are provisionally referred to the species. Only small pieces of cuticle showing nonstomatiferous surface could be recovered. Cells are elongated-polygonal over the veins and polygonal in mesh areas. The shape and venation of this species, especially the erect course of the nerves, recall some of the leaves included under *Noeggerathiopsis hislopii* Bunbury but differs chiefly in having anastomosing venation pattern.

Gangamopteris cyclopteroides, Fiestmantel, 1876

Plate 1, Figs. 2, 6

Specimen nos.– 21/4997, U/4997

Locality– Urimari Colliery, South Karanpura Coalfield

Horizon– Barakar Formation.

Remarks : Cuticle not recovered. In external features the leaf is indistinguishable from those earlier reported under *Gangamopteris cyclopteroides* Feistmantel (1876, 1879), White (1908), Archangelsky (1958) and Dolianit (1954) considered *G. cytopteroides* synonymous to *G. obovata* but Maithy (1965) in detail study of *Gangomoptris* leaves from India has observed that the two species are distinct to each other. *Gangamopteris maheshwarii* (Bajpai 1990) and *G. obtusifolia* (Pant & Singh 1968) are almost similar in external features. But these two species are based on cuticular feature; *G. maheshwarii* is hypostomatic and *G. obtusifolia* is amphistomatic.

Discussion – On the basis of the study carried out it has been found that in specific circumscription aggregate of characters be taken into account and attempt be made to verify difference in one character by other characters too.

ACKNOWLEDGEMENT

I am thankful to Dr. H.K. Maheshwari, Dy Director BSIP, for critically going through the manuscript. I am also thankful to the Director Prof. A.K. Sinha, Birbal Sahni Institute of Palaeobotany, Lucknow for providing necessary research facilities.

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Plate-1 →

1, 7 - *Gangamopteris* sp. cf. *G. buriadica* Feistmantel, specimen Nos. 16/4743, 18/4743, Barakar Formation, Ara Colliery, West Bokaro Coalifield, Bihar, x nat. size.

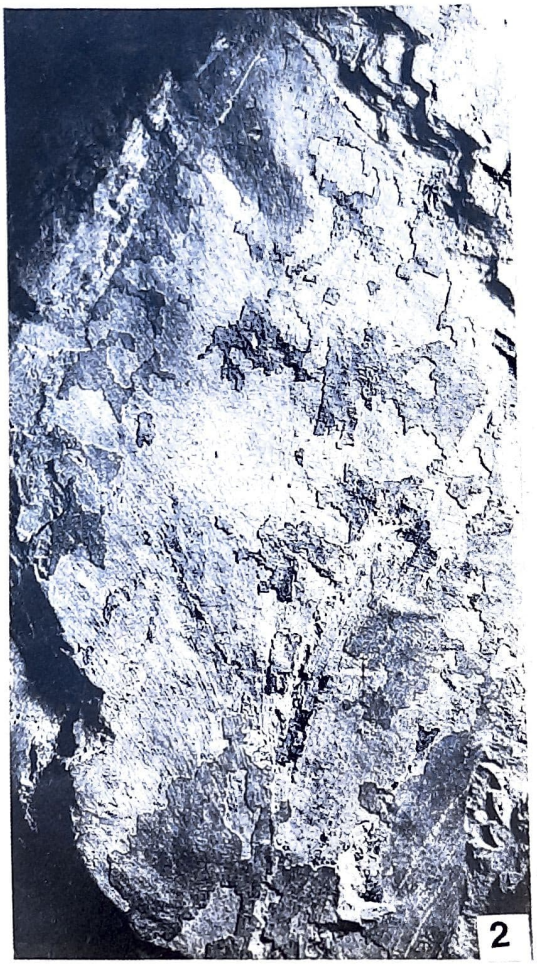
3- *Gangamopteris* sp. cf. *G. buriadica,* specimen Nos. 14/4739, Barakar Formation, Kuju Colliery, West Bokaro Coalfield, Bihar, x nat. size.

4- *Gangamopteris* sp. cf. *G. buriadica,* specimen Nos. 6/5007A , Barakar Formation, Gidi-A Colliery, South Karanpura Coalifield, Bihar, x nat. size.

5- A very small piece of cuticle of *Gangamopteris* sp. cf. *G. buriadica,* specimen Nos. 16/4743, x 100.

2, 6- *Gangamopteris cyclopteroides* Feistmante 1876, specimen Nos. U/4997, 21/4997, Barakar Formation, Urimari Colliery, South Karanpura Coalfield, Bihar, X nat. size.


1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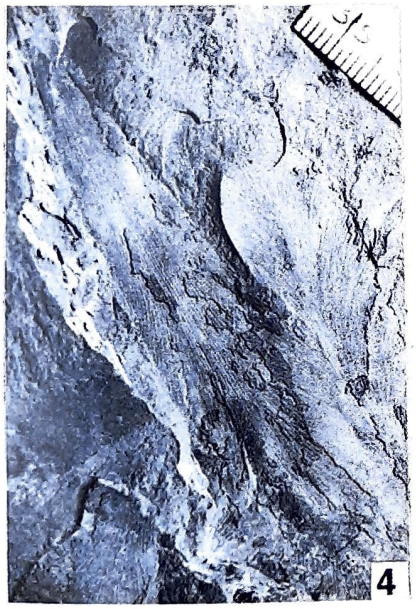
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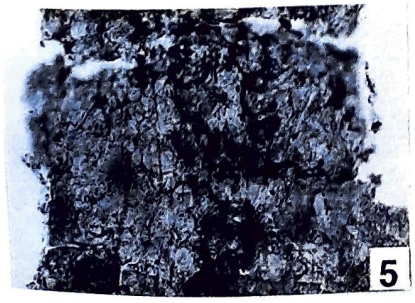
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PLATE-1