ISSN 0376-5156
Geophytology 48(2): 125-129
November 2018

Occurrence of Barakar (Early Permian) coal from Barapukuria Basin, Bangladesh

Ratan Kar[1*], Subrata Saha[2], F. Haque[3], Subhankar Pramanik[1] and Amit K. Ghosh[1]

[1]Birbal Sahni Institute of Palaeosciences, 53 University Road, Lucknow, India
[2]Environment Science Discipline, Khulna University, Khulna, Bangladesh
[3]Department of Geology, Dhaka University, Dacca, Bangladesh
*Corresponding author's e-mail: ratankar@yahoo.com

Manuscript received: 17 August 2018
Accepted for publication: 22 October 2018

ABSTRACT

Palynological investigation of bore-hole GDH-42, drilled at Barapukuria Basin, Dinajpur District, Bangladesh, has for the first time indicated that the coal belongs to Barakar Formation of Early Permian age. Earlier known occurrences of coal from the same basin had placed the deposits in the Raniganj Formation

Key words: Barakar Formation, Palynological assemblage, Barapukuria Basin, Bangladesh.

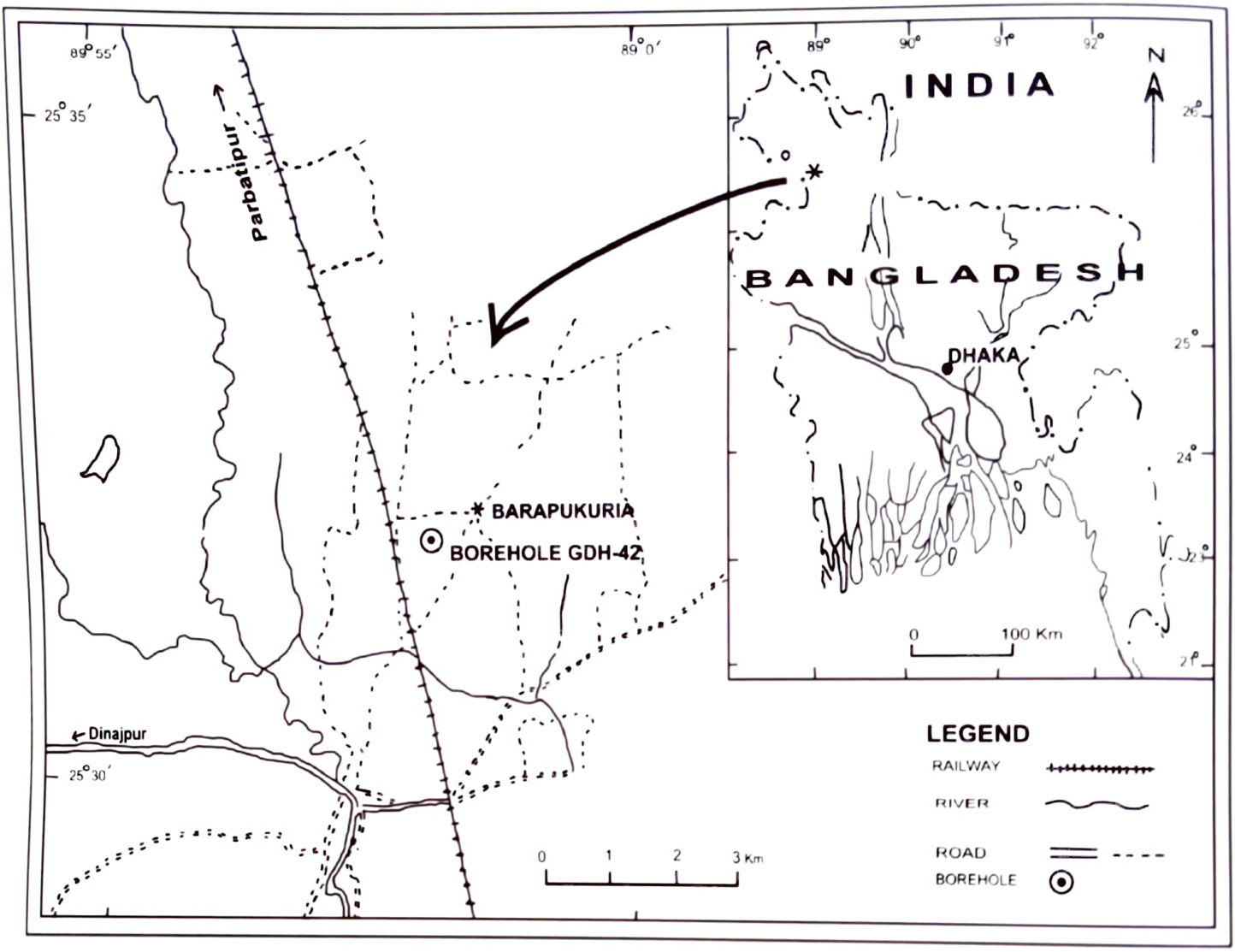
INTRODUCTION

Coal is indeed a rare commodity in Bangladesh and occurs only in sub-surface deposits in the northern part of the country at Barapukuria Basin, Dinajpur District (Text-Figure 1). The various organizations, such as Geological Survey of Bangladesh, Wardell Armstrong and China National Machinery Corporation drilled in the area for exploration and exploitation of coal. They located seven seams occurring between the depths of 130 m to 509 m below the surface. The average composite thickness of the seams is 51 m and seam VI is the thickest with a maximum thickness of 42 m (Bakr et al. 1996).

The coal belongs to the Gondwana Supergroup and was deposited in an asymmetrical, faulted, half-graben type of intracratonic basin. The sediments of the Gondwana Supergroup are sandwiched unconformably between the Precambrian basement complex and the Pliocene Dupitila Formation. The Gondwana sequence is roughly 457m thick and mostly comprises feldspathic sandstone, ferruginous sandstone, carbonaceous shale, conglomerates and coal beds (Bakr et al. 1996, Khan 1991, Rahman 1993).

MATERIAL AND METHODS

The samples for the present study were collected from bore-hole GDH-42 situated in the southernmost part of the basin (Text-Figure 1). The coal in the bore-hole is confined between the depths of 216.46 m to 190.55 m. Two samples at the depth of 213.30 m and 187.60 m were selected for palynological investigation. Standard process of maceration was employed for the release of palynomorphs. This involved crushing the coal to 2 mm pellets and thereby treating with concentrated nitric acid for 5-7 days. When the paynomorphs were released and relatively clear, the precipitate was thoroughly washed with water and treated with 5% KOH solution to further improve the clarity. The macerates were spread in polyvinyl solution and mounted on glass slides with canada balsam. Of the



Text-Figure 1. Map of the area showing location of bore-hole GDH-42.

above two samples, the lower one was found to be more productive than the upper and also shows better preservation of palynomorphs.

RESULTS AND DISCUSSION

The Palynological assemblage comprises 27 genera belonging to triletes (4), monoletes (1), monosaccates (6), striate bisaccates (8), non-striate bisaccates (4), polysaccates (2), monocolpates (1) and polyplicate (1) types (Table 1, Plate 1, Figs. a-q). In the sample at 213.30 m depth, *Scheuringipollenites* (27%) is most abundant, closely followed by *Striatopodocarpites* (25%) and *Faunipollenites* (20%). Other commonly occurring genera are *Rhizomaspora* (5%), *Verticipollenites* (4%), *Corisaccites* (3%) and *Cuneatisporites* (3%). Six monosaccate genera viz. *Virkkipollenites*, *Parasaccites*, *Crucisaccites*, *Striomonosaccites*, *Barakarites* and *Divarisaccus* are present and of them, *Parasaccites* (2%), *Divarisaccus* (2%), *Virkkipollenites* (1%) and *Barakarites* (1%) are occasionally found in the count (Table-1).

The sample at 187.60 m shows complete dominance of *Scheuringipollenites* (56%) followed by *Faunipollenites* (18%) and *Striatopodocarpites* (13%). The other commonly occurring genera are *Striatites* (4%), *Rhizomaspora* (2%) and *Verticipollenites* (2%), while *Callumispora*, *Cuneatisporites*, *Valiasaccites*, *Parasaccites* and *Striasulcites* each contribute 1% to the assemblage (Table-1).

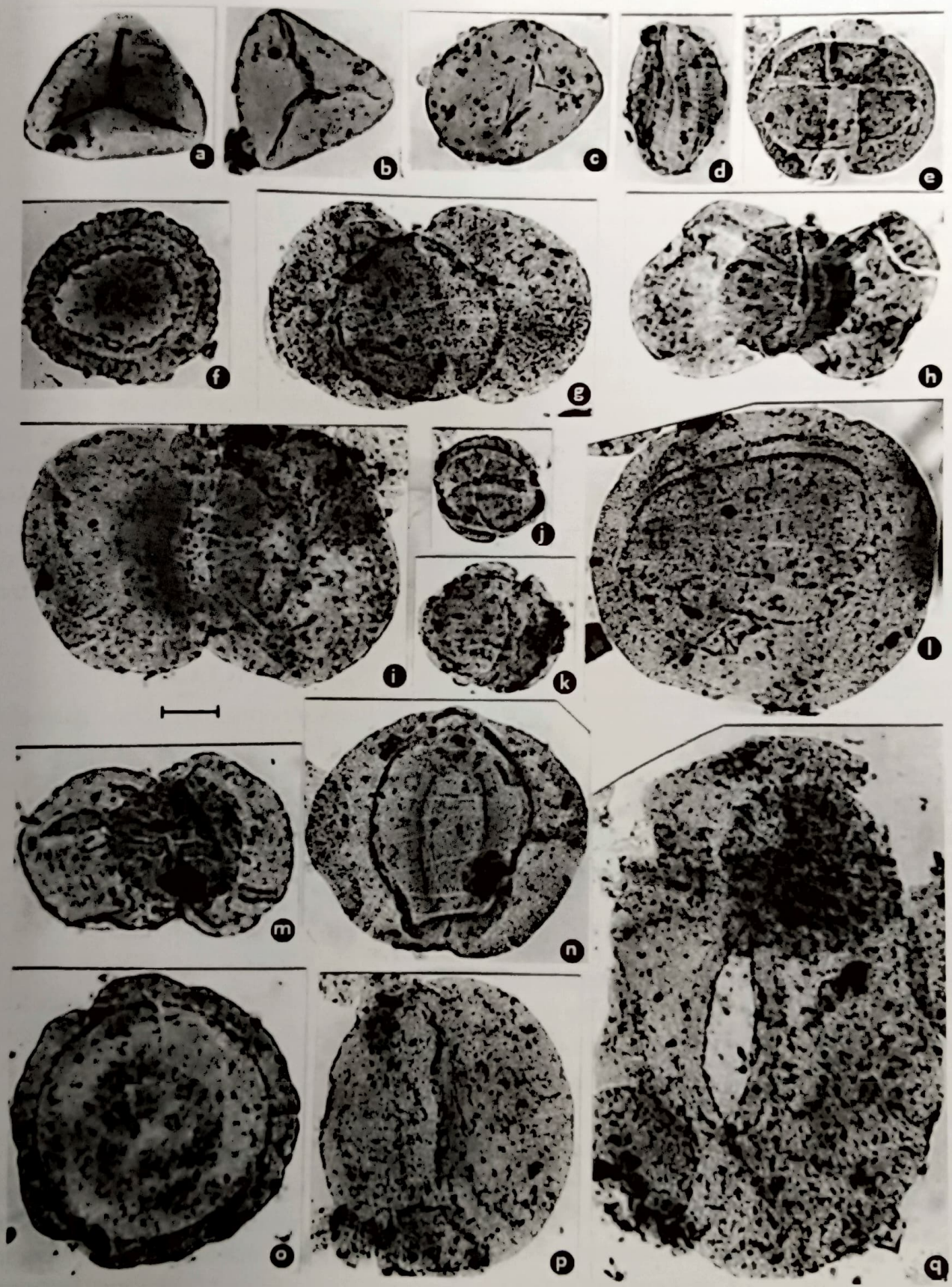


PLATE 1

Fig. a. *Psilalacinites triangulates*, **Fig. b.** *Lacinitriletes badamensis*, **Fig. c.** *Verrucosisporites* sp, **Fig. d.** *Striasulcites tectus*, **Fig. e.** *Coricasaccites alutas*, **Fig. f.** *Virkipollenites triangularis*, **Fig. g.** *Striatites notus*, **Fig. h.** *Verticipollenites gibbosus*, **Fig. i.** *Striatopodocarpites decorus*, **Fig. j.** *Guttulapollenites hannonicus*, **Fig. k.** *Schizopollis woodhousei*, **Fig. l.** *Faunipollenites varius*, **Fig. m.** *Rhizomaspora radiate*, **Fig. n.** *Crescentipollenites* sp., **Fig. o.** *Barakarites indicus*, **Fig. p.** *Scheuringipollenites barakarensis*, **Fig. q.** *Divarisaccus lelei*. (Scale Bar = 10μm).

Table 1. Showing percentage frequency of spore-pollen taxa in bore-hole GDH-42 (+ denotes only the presence of that particular genus not represented in counting)

GENERA	DEPTH	
	231.30 m	187.60 m
Psilalacinites		+
Lacinitriletes		+
Verrucosisporites		+
Cyclogranisporites		+
Indotriradites		+
Callumispora	+	1
Laevigatosporites	2	
Striatopodocarpites	25	13
Verticipollenites	4	2
Faunipollenites	20	18
Striatites	1	4
Crescentipollenites		+
Hamiapollenites	1	
Striasulcites	1	1
Corisaccites	3	
Scheuringipollenites	27	56
Rhizomaspora	5	2
Cuneatisporites	3	1
Valiasaccites	1	1
Barakarites	1	
Striamonosaccites	+	
Divarisaccus	2	
Crucisaccites	+	
Parasaccites	2	1
Virkipollenites	1	
Schizopolis		+
Guttulapollenites		+
Platysaccus		+
Gondwanaeaplicates	1	

The Palynological investigation done earlier from the Barapukuria Basin placed the coal from the nearby bore-hole GDH-38 in the Raniganj Formation (Late Permian). The Raniganj palynological assemblage is subdivided into a lower *Gondisporites raniganjensis* Zone and an upper *Densipollenites magnicorpus* Zone. The former zone has *Densipollenites*, *Verticipollenites* and *Scheuringipollenites* as the dominant genera, while the later is characterized by the prominence of *Crescentipollenites*, *Striatopodocarpites*, *Verticipollenites* and *Densipollenites* (Kar 1973, Tiwari & Tripathi 1992). The total absence of *Gondisporites* and *Verticipollenites*, both important constituents of the Raniganj Palynoflora, in GDH-38, does not favour its inclusion in the Raniganj Formation.

In the present study, at 187.60m depth, the palynological assemblage shows an overwhelming dominance of *Scheuringipollenites* (56%) followed by *Faunipollenites* (18%). The sample at the depth of 213.30m exhibits more or less equal dominance of *Scheuringipollenites* (27%), *Striatopodocarpites* (25%) and *Faunipollenites* (20%). Besides, a number of monosaccate genera are quite common throughout the assemblage. The monosaccate genera are found in abundance in the lower part of Gondwana Supergroup (Talchir and Karhabari Formations) and their numbers gradually come down in the upper part (Kulti and Raniganj Formations) (Venkatachala & Kar 1968). The overall palynological assemblage recovered from bore-hole GDH-42 is thus characterized by the dominance of non-striate disaccate *Scheuringipollenites* and sub-dominance of striate disaccates.

CONCLUSIONS

The Barakar Formation has been palynologically divided into the older *Scheuringipollenites* dominant complex and the younger striate disaccate dominant complex (Bharadwaj 1974). The palynological assemblage recorded in the present study in bore-hole GDH-42 from Barapukuria Basin, Bangladesh, shows a close resemblance with the palynoflora described from the Barakar Formation of different Indian Gondwana sequences like Son-Mahanadi, Damodar and Godavari valley basins (Tiwari 1973, Bharadwaj & Srivastava 1973, Banerjee & D'Rozario 1988, Srivastava & Jha 1995, Kar 2001, Kar & Srivastava 2003, Jha et al. 2018).

ACKNOWLEDGMENTS

S.S and F.H are thankful to Khulna and Dacca Universities respectively, for cooperation. We thank the Director, Birbal Sahni Institute of Palaeosciences, Lucknow for providing infrastructural facilities. One of us (S.P.) is thankful to the authorities of BSIP for the Birbal Sahni Research Fellowship.

REFERENCES

Bakr M.A., Rahman Q.M.A., Islam M.M., Islam M.K., Uddin M.N., Resan S.A., Haider M.J., Islam M.S.U., Ali M.W., Chowdhury M.E.A., Mannan K.H. & Anam A.N.M.H. 1996. Geology and coal deposits of Barapukuria Basin, Dinajpur district, Bangladesh. Rec. Geol. Soc. Bangladesh, 8: 1-42.

Banerjee M. & D' Rozario A. 1988. Palynostratigraphy and environment of deposition in the Lower Gondwana sediments of Chuberbita coalfield, Rajmahal Hills. Jour. Palaeont. Soc. Ind., 33: 73-90.

Bharadwaj D.C. 1974. Palynological subdivisions of Damuda Series. In: Surange K.R et al. (Eds.) Aspects and Appraisals of Indian Palaeobotany, Birbal Sahni Institute of Palaeobotany, Lucknow, pp. 392-396.

Bharadwaj D.C & Srivastava. S.C. 1973. Subsurface palynological succession in Korba Coalfield. Palaeobotanist, 20: 137-151.

Jha N, Aggarwal N, Mishra S 2018. A review of the palynostratigraphy of Gondwana sediments from the Godavari Graben, India: Global comparison and correlation of the Permian-Triassic palynoflora. Asian Jour. Earth Sciences, 163: 1-21.

Kar R.K. 1973. Palynological delimitation of the Lower Gondwanas in the North Karanpura sedimentary basin, India. Palaeobotanist, 17: 9-21.

Kar R. 2001. Application of palynology in coal exploration: case study from an Indian Gondwana coalfield. Minetech, 22: 33-41.

Kar R. & Srivastava S.C. 2003. Palynological delimitation of the coal-bearing Lower Gondwana sediments in the southern part of Tatapani-Ramkola Coalfield Chhattisgarh, India. Jour. Geol. Soc. Ind., 61: 557-564.

Khan F.H. 1991. Geology of Bangladesh, Wiley Eastern Limited, New Delhi, 1991, pp. 1-207.

Rahman K.U. 1993. Geology of Bangladesh, Gebruder- Borntraeger, Berlin, 1993, pp. 1-160.

Srivastava S.C & Jha N.1995. Palynostratigraphy and correlations of Permian-Triassic sediments in Budharam Area, Godavari Graben, India. Jour. Geol. Soc. Ind., 46: 647-653.

Tiwari R.S. 1973. Palynological succession in the Barakar type area. Geophytology, 3: 166-183.

Tiwari R.S & Tripathi A.1992. Marker Assemblage Zones of spore and pollen species through Gondwana Palaeozoic-Mesozoic sequence in India. Palaeobotanist, 40: 194-236

Venkatachala B.S & Kar R.K.1968. Palynology of North Karanpura Basin, Bihar, India-2. Palaeobotanist, 16: 56-90.