PALYNOSTRATIGRAPHY OF THE DAMUDA GROUP IN THE BRAHMINI COALFIELD, RAJMAHAL HILLS, BIHAR

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ABSTRACT

Four exposures of the Damuda Group in the Brahmini Coalfield, Rajmahal Hills have been palynologically investigated. The miospore assemblage comprises 27 genera, and is characterised by the abundance of the genera *Faunipollenites*, *Gondwanipollenites*, *Densipollenites* and *Sulcatisporites*. The assemblage compares well with the Barren Measures assemblages earlier recovered from surface and subsurface sediments in the Jharia and the North Karanpura coalfields.

INTRODUCTION

The general succession of the sedimentary deposits in the Rajmahal Hills is as follows in descending order:

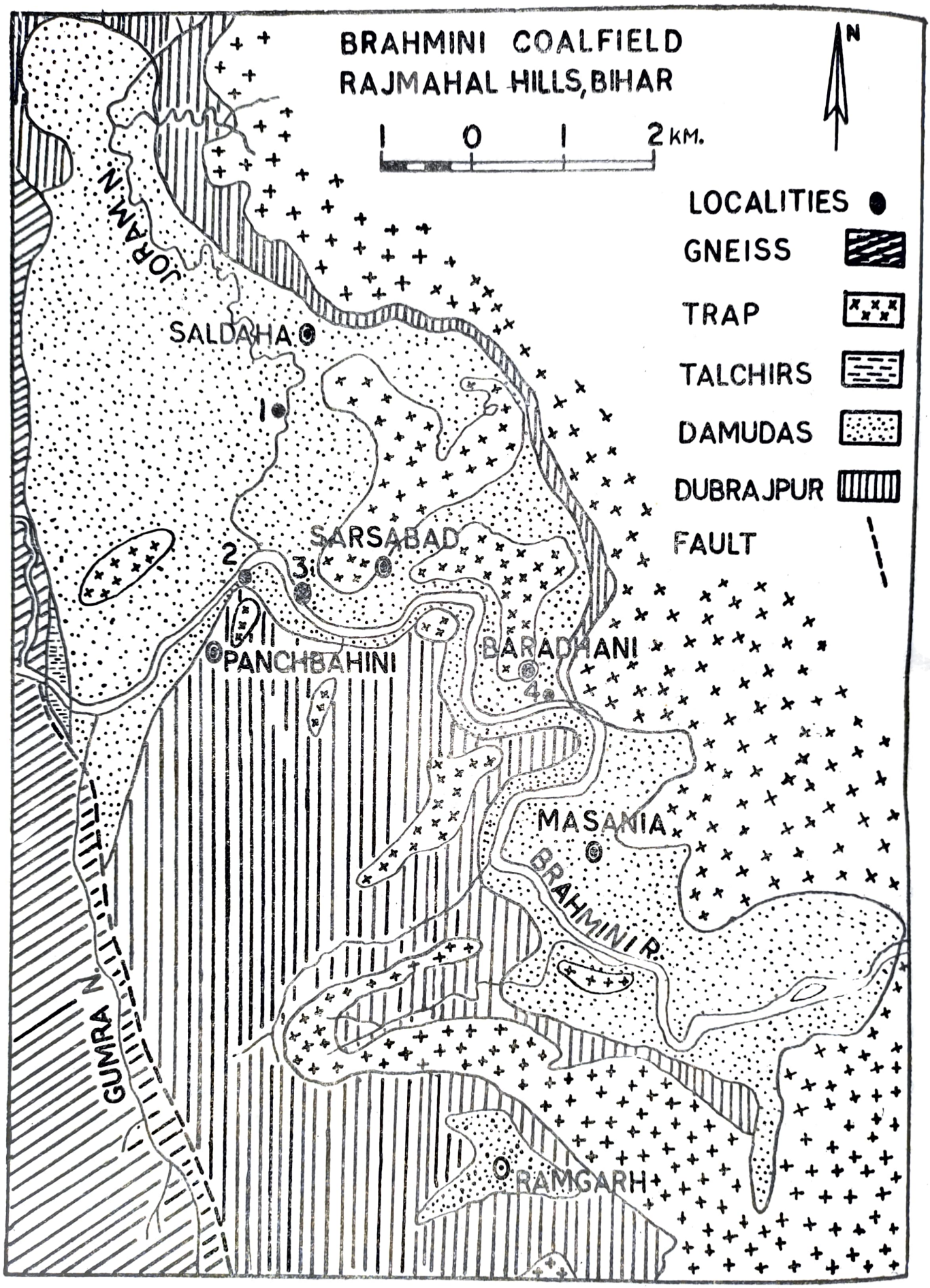
4. Alluvium
3. Laterite
2. Gondwana Sequence
   - d. Rajmahal Group — 450 metres
   - c. Dubrajpur Group — 137 metres
   - b. Damuda Group — 150 metres
   - a. Talchir Group — ?

——————unconformity——————

1. Metamorphics

The Damuda Group covers an area of about 180 square kilometres and occurs in patches in fringes roughly along longitude 87°30'E and between latitudes 24° 15′ N and 25° N. The thickness of the beds does not exceed 150 metres in any of the sections of Damuda Group exposed in these hills. In places it thins out to nothing, the superimposed Dubrajpur beds or trap, as the case may be, gradually overlapping the gneisses or Talchirs. The coal seams are all shaly and poor in quality, though some of them are capable of furnishing a large quantity of low grade coal.

There had been considerable controversy regarding the age of the Damuda Group in the Rajmahal Hills. BALL (1877, p. 26) was of the opinion that the rocks of the northern area, i.e. Hura tract may be of Raniganj age whereas the rocks of the southern area, i.e., Gumani Coalfield, Bansloi Coalfield, Mahuagarhi tract and Brahmini Coalfield were of Barakar age. FEISTMANTEL (1880) and PASCOE (1959, p. 1018), also believed that the Damudas of the Rajmahal Hills were of Barakar age except for the rocks of the Hura tract which may possibly be of Raniganj age. Fox (1934) opined that the coal-bearing Damudas of Rajmahal Hills are of Barakar age. MAHESHWARI (1966, 1967a) studied the palynology of the Damuda Group in the Bansloi Coalfield and confirmed their Barakar age.



Map—1. Showing collection localities.

Thus, we find that while Barakar and Raniganj formations of the Damuda Group have been recognized in the Rajmahal Hlils, the intervening Ironstone Shale Formation (Barren Measures) is seemingly absent and that is intriguing. Therefore, palynological studies were extended to cover other Damuda exposures in these hills.

THE BRAHMINI COALFIELD

The area reported in the present study (Map 1) is the southernmost patch of Damuda Group in the Rajmahal Hills and was named as Bramini Coalfield by BALL (1877). "The Damuda rocks seen on both sides of the Dubrajpur ridge, which trends south-east, re-appear from beneath the trap and basal Upper Gondwana rocks in the valley of the Brahmini (Bramini) river. Just below the junction of the Gumra *nala* with the Brahmini a strong fault throwing eastward brings in the Talchirs. These beds are followed downstream (eastward) by Damudas for nearly ten miles, in which coal seams and beds of carbonaceous shales are seen" (Fox, 1934, p. 57). Good exposures are seen west and north-west of Sarsabad (24°18′ : 87°32′), north-west of Masania (24°16′ : 87°33′), just north of Saharbera (24°14′ : 87°34′) and a small inlier at Ramgarh (24°14′ : 87°32′). According to Fox (1934, p. 57), the strong north to south fault along the western side of the Brahmini field makes it different from the other Damuda areas of the Rajmahal Hills. Not only there is a great hiatus between the Damudas and the Dubrajpurs, but there also is a discordance between the Dubrajpur beds and the overlying basalts of the Rajmahal Group. In the Sarsabad area, the basalts rest directly on the Damudas.

PREVIOUS WORK

Till the 1960s not much information was available on the Damuda floras of the Rajmahal Hills. FEISTMANTEL (1880) reported some megaplant fossils from Burgo (Bansloi Coalfield), Lohundia (Hura tract) and Gopikandar (Mahuagarhi Tract). Recently MAHESHWARI and GYAN-PRAKASH (1965), MAHESHWARI (1966, 1967a, 1972) and SAH and MAHESHWARI (1969) have intensively worked out the palaeobotany and palynology of the Bansloi Coalfield.

In the Brahmini Coalfield, BALL (1877, p. 27) mentions the occurrence of some *Glossopteris* leaves from shales near Ramgarh, South of the Brahmini River. FEISTMANTEL (1880, p. 2) reports *Vertebraria indica* Royle and *Glossopteris* sp. from Masania, on the Brahmini River. We, too, have a few species of *Glossopteris* on carbonaceous shale from different exposures along the Brahmini River. But so far no palynological work has been done on this area.

MATERIALS

Table 1. gives the details of samples investigated.

Table 1—Showing details of samples collected from Brahmini Coalfield, Rajmahal Hills

Sample numbers	Lithotypes	Spore incidence
	Locality–1. Joram nala Section	
	(a) exposure about 450 m. downstream from road crossing	
5	Coarse gritty sandstone	×
4	Carbonaceous shale	Tracheids profuse

Sample numbers	Lithotypes	Spore incidence
3	Coarse grained sandstone	×
2	Carbonaceous shale	Tracheids profuse
1	Coal (mostly submerged)	Rich in miospores
	(b) exposure about 50 m. downstream from the above	
12	Ferruginous sandstone	×
11	Coarse gritty sandstone	×
10	Carbonaceous shale	Miospores rare, tracheids profuse
9	Sandy carbonaceous shale	×
8	Sandstone	×
7	Carbonaceous shale	Miospores rare, tracheids profuse
6	Coal (mostly submerged under water)	Miospores rare, tracheids profuse
	(c) exposure about 600 m. downstream from road crossing	
16	Gritty sandstone	×
15	Highly ferruginous sandstone (*Glossopteris*)	×
14	Arenaceous shale	Miospores rare
13	Carbonaceous shale (*Glossopteris, Vertebraria*)	Rich in miospores
—	Coarse grained sandstone	

BRAHMINI RIVER SECTION

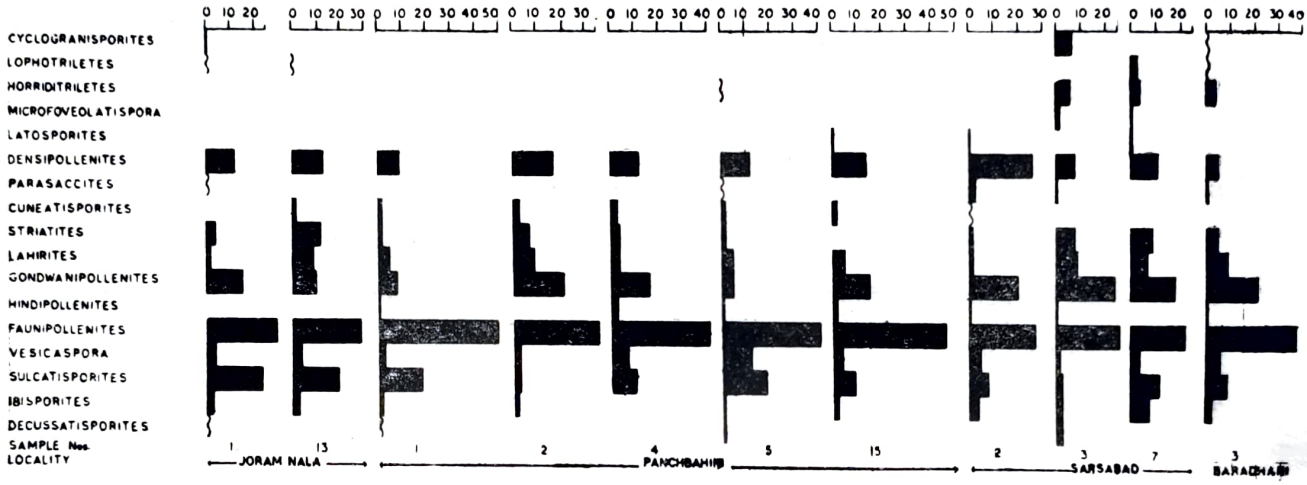
Locality-2. North-east of Panchbahini

(a) exposure 250 m. west of Joram nala confluence

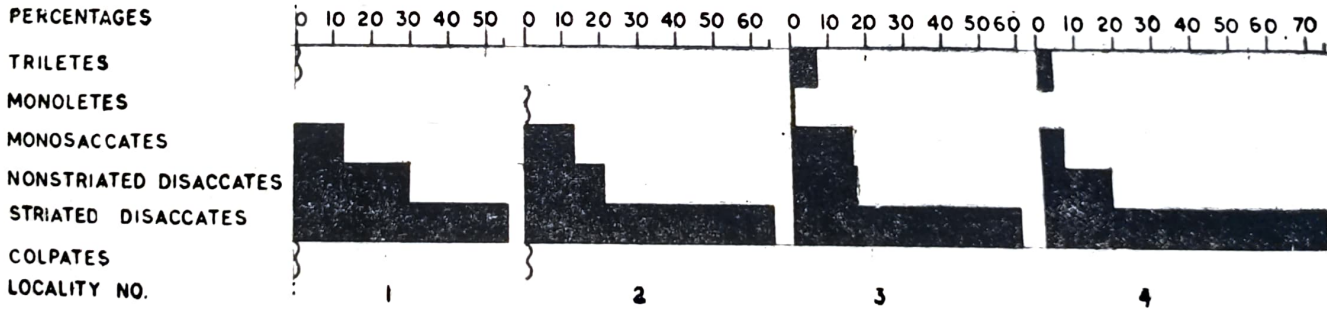
17	Coarse grained sandstone	×
16	Ferruginous sandstone	×
15	Blue shale	Rich in miospores
14	Coal	Full of tracheids & cuticles
13	Arenaceous shale	No miospores
12	Coal	Full of woody elements
11	Arenaceous shale	No miospores

Sample numbers	Lithotypes	Spore incidence
	(b) a few meters further downstream	
—	Coarse grained sandstone	
—	Arenaceous shale	
—	Blue shale	
—	Coarse grained sandstone	
—	Arenaceous shale	
—	Blue argillaceous shale	
—	Sandstone	
19	Coal	Full of tracheids
—	Coarse grained sandstone	
18	Sandy carbonaceous shale	Full of tracheids
	(c) exposure just before the Joram Nala Junction	
10	Ferruginous sandstone	×
9	Arenaceous shale	Miospores rare
8	Sandy carbonaceous shale	Miospores rare
7	Arenaceous shale	Organic detritus, no miospores
6	Sandy Carbonaceous shale	Organic detritus, no miospores
5	Arenaceous shale	Rich in miospores
4	Carbonaceous shale (*Phyllotheca*, *Glossopteris* and *Vertebraria*)	Rich in miospores
3	Ferruginous sandstone	×
2	Arenaceous shale	Rich in miospores
1	Carbonaceous shale	Rich in miospores
	Locality-3. West-South-west of Sarsabad	
	Exposures on left bank about 500 m. downstream from the junction	
11	Coarse gritty sandstone	×
10	Arenaceous shale	×
9	Sandy Carbonaceous shale	No miospores
8	Coarse gritty sandstone	×
7	Coal	Rich in miospores
6	Sandstone with Carbonaceous flakes	×
5	Coal	×
4	Coarse-grained sandstone	×
3	Coal	Rich in Miospores
2	Carbonaceous shale	Rich in miospores
1	Ferruginous sandstone	×

Sample numbers	Lithotypes	Spore incidence
	Locality-4. Near Baradhani	
7	Coarse grained ferruginous sandstone	×
6	Earthy shales	No Miospores
5	Coarse grained ferruginous sandstone	×
4	Arenaceous shale	Rich in miospores
3	Carbonaceous shale	Rich in miospores
2	Arenaceous shale	×
1	Arenaceous and micaceous sandstone	×



Histogram 1



Histogram 2

MIOFLORAL COMPOSITION

The spores and pollen grains recovered from the sediments of Brahmini Coalfield, Rajmahal Hills, Bihar belong to following 27 genera:

Hennellysporites, *Cyclogranisporites*, *Lophotriletes*, *Brevitriletes*, *Horriditriletes*, *Microfoveolatispora*, *Latosporites*, *Densipollenites*, *Parasaccites*, *Striomonosaccites*, *Potonieisporites*, *Cuneatisporites*, *Platysaccus*, *Lueckisporites*, *Striatites*, *Verticipollenites*, *Lahirites*, *Lunatis-*

porites, *Gondwanipollenites*, *Hindipollenites*, *Faunipollenites*, *Distriatites*, *Vesicaspora*, *Sulcatisporites*, *Ibisporites*, *Gnetaceaepollenites* and *Decussatisporites*.

The occurrence of various genera within different localities is almost uniform except a few of them (Table 1, histogram 1). *Faunipollenites* is the most dominant genus in all the localities. It averages up to 29 per cent in the Joram Nala exposure (locality 1) and increases significantly towards south (locality 2, north-east of Panchbahini, 42 per cent). It again decreases further downstream (locality 3, west-south-west of Sarsabad) to increase once again in locality 4 near Baradhani.

Gondwanipollenites is lowest in the north but increases in southern and eastern parts of the coalfield. *Densipollenites* also follows a similar course but decreases to its minimum in the east (locality 4). *Sulcatisporites* registers, however, a reverse trend. It is highest in the north (locality 1) and decreases to its minimum in the eastern part of the coalfield. Thus, the total percentage of striated disaccate pollen grains exceeds all groups of miospores in all the areas. It is lowest in the north and highest in the eastern part of the coalfield (histogram 1). Nonstriated disaccates are maximum in the northern part but decrease gradually to a minimum in the eastern areas. Alete monosaccates do not exhibit much variation from locality nos. 1 to 3 but suddenly decline in locality no. 4. The trilete group of miospores is very inconsistent as a whole and its per cent occurrence is insignificant. It has been recorded up to 7 per cent and 4 per cent in locality nos. 3 and 4 respectively. Monolete miospores are represented by *Latosporites*, which records its appearance although rarely, only in locality nos. 2 and 3.

The genera *Densipollenites*, *Gondwanipollenites*, *Faunipollenites* and *Sulcatisporites* characterise the miofloral spectrum in all the localities investigated here. The trilete spore genera occur inconsistently and rarely. The alete sporomorphs have not been encountered during the quantitative estimation of the miofloras. As shown in table 2 and histogram 2 the assemblage is overwhelmingly characterised by the abundance of striated disaccate pollen grains. *Faunipollenites* dominates the association and is sharply followed by *Gondwanipollenites* and *Sulcatisporites*. *Densipollenites* is also characteristically associated with the above genera in all the samples.

DISCUSSION

The miofloras reported above resemble a miospore assemblage described by Bharadwaj, Sah and Tiwari (1965) from Sibbabudih and Katri nalas in Jharia Coalfield, the type area of the Barren Measures. However, the mioflora described by Bharadwaj, Sah and Tiwari (1965) consists of thirty genera and appears to be more diversified. Some of the genera, viz., *Punctatisporites*, *Indotriradites*, *Reticulatisporites*, *Cyclobaculisporites*, *Gondisporites*, *Barakarites*, *Rhizomaspora* and *Welwitschiapites* have not been recorded in the present assemblage. Also the Barren Measures mioflora of the Jharia Coalfield is marked by the dominance of *Gondwanipollenites* (=*Striatopodocarpites*) in contrast to *Faunipollenites* (=*Protohaploxypinus* and *Striatopiceites*) in the present investigation. The mioflora of the Katri Nala (KTR) compares well with the mioflora of locality no. 4 while the mioflora of Sibbabudih Nala (SBB) is more closer to those of localities 1 to 3. Thus the mioflora of the eastern part of the Brahmini Coalfield (locality no. 4) marks a slight variation from rest of the areas investigated. Kar (1966, 1968) described the Sporae dispersae from a bore core (no. J. K. 5) from Jharia Coalfield covering 1200 metres of the subsurface sediments which incorporate all sorts of lithologies including carbonaceous shales The mioflora has been attributed to 38 genera but the author has not given the

Table-3—Percentage of group of miospores in Brahmini Coalfield, Rajmahal Hills

	Joram Nala	Panchbahini	Sarsabad	Baradhani
Laevigate Triletes	..	..	..	0.5
Apiculate Triletes	0.5	..	6.0	4.0
Varitriletes	..	..	1.0	..
Monoletes	..	0.5	1.0	..
Trilete monosaccates	0.5	..	1.0	1.0
Alete monosaccates	12.5	13.0	15.0	4.5
Striated disaccates	56.0	65.0	58.5	72.0
Non-striated disaccates	30.0	21.0	17.5	18.0
Colpates	0.5	0.5	..	..

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