

A NOTE ON RECENT FORAMINIFERA FROM COLVA BEACH SANDS, GOA

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IN recent years, great emphasis is being placed on the exploration of oil and gas in the off-shore regions of India and studies of Recent Foraminifera of Indian waters are, therefore, important for a better understanding of their fossil counterparts of these regions. The present note is based on the investigation carried out on the systematic studies of Recent Foraminifera from Colva Beach Sands, Goa, facing the Arabian sea. The samples were collected from near Tourist Entrance Gate of Colva Beach covering an area of approximately 1 km during December 1983.

Characteristics of beach material: The Colva Beach (15°17' N, 73°54' E) is a 30 km stretch of sandy beach in Goa and is situated between Cansaulium in the North and Betul point in the South. In general, the beach fore-shore is wide and steep at its extreme ends. It has a gentle gradient and is backed by well-developed sand-dunes. The beach material is composed of medium-to-fine sand and moderate-to-very well sorted sediments with dominating sand size particles of quartz. The average grain size of the fore-shore sediments of Colva beach ranges between 135 μ and 152 μ (*vide etiam*)¹.

Foraminiferal Assemblage: The foraminiferal assemblage of Colva beach sands comprises 29 species belonging to 12 families. The present assemblage is characterized by calcareous as well as agglutinated forms. The ratio of agglutinated and calcareous tests is 1:15.

Table 1 shows the occurrence of different species of Foraminifera in the Colva beach sands. The frequency distribution of different species is based on the number of specimens counted in a representative material weighing 5 g of sand per sample.

In the present assemblage, *Ammonia annectens* is abundant while *Spiroloculina excavata*, *Ammonia papillosus*, *Nonion boueanum* are common. Other species are either frequent or rare in occurrence. The Colva foraminiferal assemblage is chiefly benthic and belongs to warm water environment. However, the sporadic occurrence of planktonic forms, e.g. *Globigerina bulloides*, *Globigerinoides ruber* and *Globoquadrina hexagona*, which generally flourish in the off-shore regions in the present assemblage may be attributed to oceanic

Table 1 Occurrence of Smaller Foraminifera, Colva Beach Sands, Goa.

Foraminifera	Occurrence
<i>Textularia conica</i> Orbigny	R
<i>Textularia foliacea</i> Heron-Allen and Earland	R
<i>Spiroloculina depressa</i> Orbigny	R
<i>Spiroloculina excavata</i> Orbigny	C
<i>Spiroloculina eximia</i> Cushman	F
<i>Spiroloculina</i> cf. <i>S. inflata</i> Terquem	R
<i>Quinqueloculina ludwigi</i> Reuss	R
<i>Quinqueloculina seminulum</i> (Linnaeus)	R
<i>Quinqueloculina</i> sp.-A	R
<i>Quinqueloculina</i> sp.-B	R
<i>Triloculina terquemiana</i> (Brady)	R
<i>Triloculina tricarinata</i> Orbigny	R
<i>Brizalina</i> sp. indet.	R
<i>Glabratella</i> sp. indet.	R
<i>Ammonia annectens</i> (Parker and Jones)	A
<i>Ammonia dentata</i> (Parker and Jones)	R
<i>Ammonia papillosus</i> (Brady)	C
<i>Elphidium advenum</i> (Cushman)	F
<i>Elphidium indicum</i> (Cushman)	F
<i>Elphidium</i> sp. indet.	R
<i>Globigerina bulloides</i> Orbigny	R
<i>Globigerinoides ruber</i> (Orbigny)	R
<i>Globoquadrina hexagona</i> (Natland)	R
<i>Poroepionides lateralis</i> (Terquem)	F
<i>Amphistegina radiata</i> (Fichtel and Moll)	R
<i>Cibicides refulgens</i> Montfort	R
<i>Nonion boueanum</i> (Orbigny)	C
<i>Florilus elongatus</i> (Orbigny)	R
<i>Florilus scaphus</i> (Fichtel and Moll)	F

R = Rare = upto 2 specimens; F = Frequent = 3 to 5 specimens; C = Common = 7 specimens; A = Abundant = Over 10 specimens

currents and/or sea-storms in the region. *Textularia conica*, *T. foliacea*, *Globoquadrina hexagona*, *Spiroloculina* c.f., *S. inflata*, *Glabratella* sp, *Brizalina* sp are being recorded for the first time from Goa region.

The Colva beach foraminiferal assemblage exhibits close affinities with foraminiferal assemblage described by earlier workers²⁻⁷ from other beaches of the West Coast of India.

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Table 1 Chromosome associations in heptaploid (7x) *Gloriosa rothschildiana*.

Associations	No. of cells observed	Percentage
1. 1 VII + 30 II + 10 I	1	4.0
2. 1 IV + 33 II + 7 I	8	32.0
3. 1 IV + 34 II + 5 I	2	8.0
36 II + 5 I	4	16.0
35 II + 7 I	6	24.0
38 II + 1 I	4	16.0

MEIOSIS IN A HEPTAPLOID *GLORIOSA**

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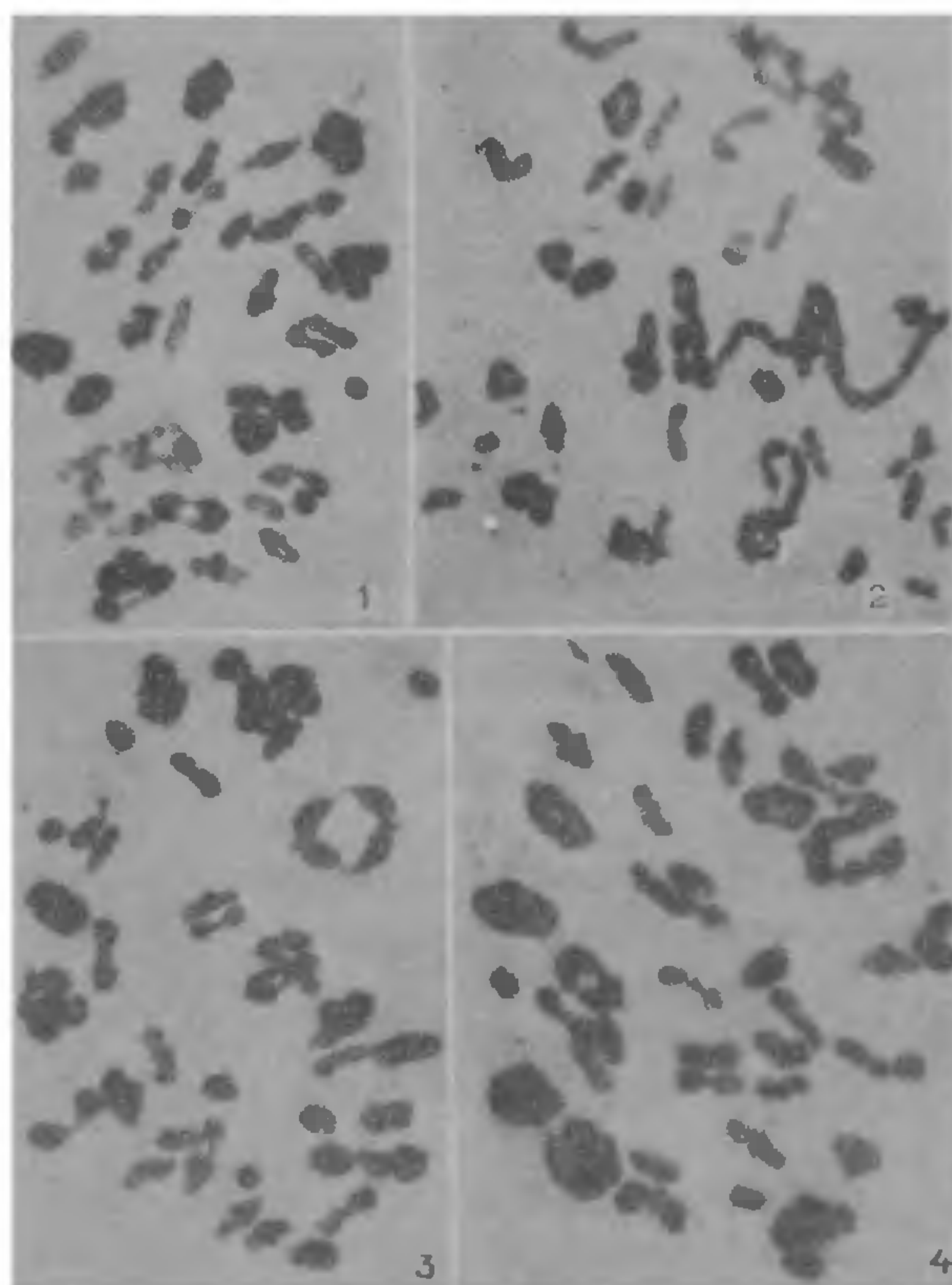
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DURING cytological investigations, a clone of *Gloriosa rothschildiana* (voucher specimen G/10) was observed to be a heptaploid with $2n = 77$ chromosomes based on $x = 11$. The heptaploid plant along with several *G. rothschildiana* ($2n = 88$) plants was obtained from M/S Chandra Nursery, Sikkim. In the present work the detailed meiotic behaviour of this taxon has been studied.

Microsporogenesis of the heptaploid plant showed a variety of chromosome configurations at metaphase I of meiosis (figures 1–4 and table 1). The chromosome associations were: 1 IV + 33 II + 7 I (32%, figure 3) 36 II + 5 I (16%), 35 II + 7 I (24%) 38 II + 1 I (16%) and 1 IV + 34 II + 5 I (8%, figure 4). The mean chromosome association per cell being 0.04 ± 0.002 VII + 0.4 ± 0.01 IV + 36.0 ± 0.24 II + 3.12 ± 0.34 I (table 2), chromosomes. The chiasma frequency ranged from 43 to 52 per cell and the average being 1.4 per pair of chromosome.

Anaphase I was characterized by unequal segregation of chromosomes to each poles. The usual segregations at anaphase I was 40:37 (43%) and 41:36 (57%) chromosomes. The bivalents and quadrivalents disjuncted normally; the multivalents and univalents were observed to be distributed irregularly. Telophase II of meiosis was also abnormal resulting into 6–8 micronuclei per microspore. Nearly 42% pollen grains were stainable. The plant was completely seed sterile.

G. rothschildiana was studied cytologically by Tjio¹, Khoshoo² and Narain³. Tjio¹ and Khoshoo² recorded it to be a diploid ($2n = 22$) while Narain³ observed



Figures 1–4. Microsporogenesis in a heptaploid ($2n = 77$) *G. rothschildiana*. Metaphase I. $\times 1400$. 1. 35 II + 7 I. 2. 1 VII + 30 II + 10 I. 3. 1 VII + 33 II + 7 I. 4. 1 VII + 34 II + 5 I.

G. rothschildiana as an octoploid ($2n = 88$). This indicated that both diploid and octoploid races were available in *G. rothschildiana*. Further, Khoshoo² observed existence of a hexaploid *Gloriosa* variety (Mrs. Bhima Laxmi $2n = 66$) besides other chromosomal races like diploid, tetraploid, octoploid and