

The foregoing, therefore, reveals that the development of the female gametophyte in *Polystachya flavescens* is not only bisporic as recorded by Swaminathan¹, but also monosporic. Further, it is always, six-nucleate, the reduction in the number of nuclei at the chalazal end being due to the fusion of spindles at the 4-8 nuclear division stage of the embryo sac. Apparently, it is never 8-nucleate or 7-nucleate as reported by Swaminathan. Moreover, the fusion of polars occurs near the antipodal cell and not near the egg as stated by him (Swaminathan¹).

The fusion of spindles during the last nuclear division leading to the formation of a 6-nucleate embryo sac with 4 haploid nuclei at the micropylar end and 2 diploid nuclei at the chalazal end has been reported as only occasional in *Epipactis pubescens* (Brown and Sharp²) and *Paphiopedilum insigne* (Afzelius³). However, it is a regular feature in *Polystachya flavescens*. This type of female gametophyte organisation essentially conforms to the G3¹ type of Abe⁴.

One of the authors (KGE) is grateful to C.S.I.R. India, for the award of a Junior Research Fellowship.

Department of Botany,
University of Mysore,
Manasagangotri,
Mysore 570 006, India.
August 4, 1977.

K. G. EKANTHAPPA.
GOVINDAPPA D. AREKAL.

1. Swaminathan, D., *Curr. Sci.*, 1967, 36 (14), 384.
2. Brown, W. H. and Sharp, L. W., *Bot. Gaz.*, 1911, 52, 439.
3. Afzelius, K., *Svensk Bot. Tidskr.*, 1916, 10, 183.
4. Abe, K., *Sci. Rep. Tohoku Univ. Ser. IV*, 1972, 36 (3), 179.

SOME NEW STONE AGE SITES IN THE UPPER MAHANADI VALLEY, MADHYA PRADESH

THE Upper Mahanadi Valley has not been explored much but the lower reaches and its tributaries have been studied by Mohapatra¹ who found a number of Palaeolithic and a few Mesolithic sites in the valley. Later, Tripathi² also discovered a number of sites of Palaeolithic and Mesolithic cultures from the tributaries of the lower reaches of Mahanadi Valley.

A large number of stone age sites were discovered by the author in the Raipur District of Madhya Pradesh, during the course of his explorations in that region from January to March, 1977. The new sites discovered are: Manchewa, Paterapali, Mahasamund, Bemcha, Kudar Nadi, Jalki Dongri, Jogideepa, Borid Barbaspur, Sukda, Bhandora, Putpura, Pairagura, Balamdi Nadi, Turibhatha, Thakurdaiya, Parsada, Nandnia, Borsi, Bagar, Goalindih,

The tools found in the present explorations of the Upper Mahanadi Valley belong to the Mesolithic culture. The material utilized in their manufacture is predominantly chert, though chalcedony and quartz have also been used. The tools include blades, points, lunates, triangles scrapers, borers, and cores. While blades, lunates and points have been found in profusion at all the sites, triangles are very rare and trapezes are altogether absent. This fact indicates that the present sites of Raipur District belong to early phase of Mesolithic culture.

Most of the sites are located on the slopes of the hills or on rocky surfaces (Fig. 1). Some, however, are found on the banks of the streams in the alluvial deposits away from the hills. All the sites discovered in the present exploration are in fact factory sites because finished tools are found in less number as compared to the manufacturing waste (cores, flakes, chips, etc.).



FIG. 1. Hill slope on the right bank of Mahanadi near Bhandora.

The present studies show that large population was inhabiting the hilly slopes in Raipur District during the Mesolithic period. The ecology of the entire area seems to have favoured the hunting-gathering economy of the people.

The Mahanadi Valley therefore provides a rich potential area for detailed investigations.

The author is grateful to Professor R. V. Joshi for his guidance.

Deccan College, Pune 411 006, R. P. PANDEY,
India, July 14, 1977.

1. Mohapatra, G. C., *Stone Age Cultures of Orissa*, Deccan College, Pune, 1961.
2. Tripathi, K. C., *Lithic Industries of South-Western Orissa*, 1972, (unpublished Ph.D. Thesis, Utkal University).