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Short Communication

Occurrence of *Azolla cretacea* Stanley from Meghalaya, North-East India

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OCCURRENCE of pteridophytic spores has been known since the Palaeozoic. Plants producing both micro-and mega-spores continue to survive till date. During the Cretaceous Period fossils of aquatic ferns (Hydropterideae) assignable to *Azolla*, *Azollopsis*, *Parazolla* and *Glomerisporites* are known. Extant genera of *Marselia*, *Salvinia* and *Azolla* are remarkable in their ability to adapt to fresh water ecosystems.

The modern *Azolla* inhabits tropical-sub-tropical regions and occurs in stagnant pools, marshes, brooks and streams. It has a folded bilobed leaf and roots.

The stomata are rudimentary. The chamber at the base of leaf contains filaments of blue green alga *Anabaena* (Rao, 1935; Mahabale, 1963; Srivastava, 1968, 1975; Kar 1992).

Sahni (1941) grouped *Azolla* into *Euazolla* with three floats and well developed massulae having anchor tipped glochidia on all sides and *Rhizosperma* group with many floats and poorly developed glochidia on massulae and devoid of anchor tips.

The Mahadek Formation is characterised by massive glauconitic and occasionally associated with coarse and arkosic sandstones. It is overlain by the Langpar Formation with calcareous sandstone and shale. The type section of the Mahadek Formation of Maastrichtian age is about 145 m thick and consists of thin lenses of shale on the top and it conformably overlies the Jadukata Formation. At Ranikor (Fig.1) near the road leading to the PWD Inspection bungalow, thin streaks of coal are exposed at the basal part of the sandstone. The samples collected were macerated using conventional macerating process and the slides were mounted with Canada Balsam.

The samples yielded a rich palynoassemblage represented by *Azolla cretacea, Araucariacites australis, Ariadnaesporites intermedius, Cyathidites australis, C. minor, Concavisiporites concavus, Todisporites major, T. minor, Contignisporites assamicus, C. bellus, Triporoletes densicorpus, T. reticulata, Microfoveolatosporites mahadekensis, Cycadopites problematicus, Stephanoporopollenites poratus,* Normapolles', fungal spores, dinoflagellates, etc.

SYSTEMATICS

AZOLLACEAE

AZOLLA Lamarck 1873

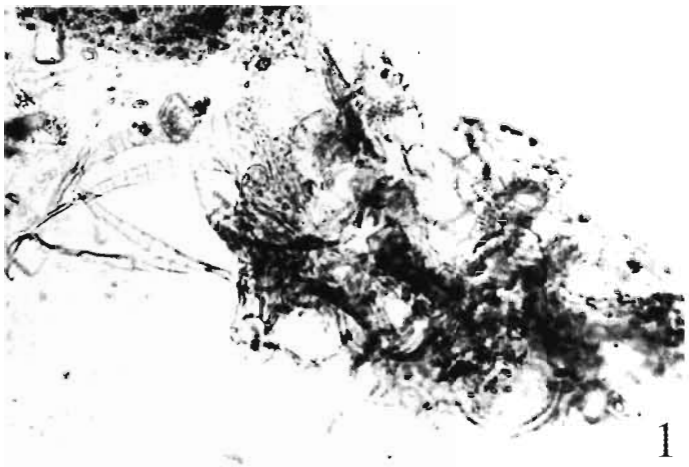
AZOLLA CRETACEA Stanley 1965

(Pl. 1·1-8)

Massulae—Irregular in shape, and occasionally sub-circular, 50-250 µm long, surface covered with closely placed anchor shaped glochidia, 12-15 µm in size, strongly build, microspores, 30-35 µm in size, laevigate, trilete ill-developed. laesurae do not extend more than half of the radius.

Megaspore—Mega-spores found in the same samples as that of microspores, sub-circular, about 300 µm in size, exine wall two layered, inner layer (endospore) granular, 2 µm wide, outer layer (exospore) 7-10 µm wide.

Remarks—Glochidia recovered shows resemblance with other reported forms of *Azolla* from the Cauvery, Krishna-Godavari basins and Deccan Intertrappeans (Venkatachala & Sharma, 1974, 1982; Trivedi & Verma, 1971; Sahni *et al.*, 1996; Patil *et al.*, 1995; Ramanujam *et al.*, 1996). The megaspores associated with the microspores have been tentatively described here assuming that the same might have been produced by the similar type of fossil plant which produced the microspores assigned to *Azolla cretacea*. In all about 30 species of *Azolla* are known to occur as fossils (Trivedi & Verma, 1971) and only a few are described in detail. Palynofossils of Upper Cretaceous sediments of North-East India are also studied (Kar & Singh, 1986; Nandi, 1990). Massulae bearing glochidia of *Azolla* from the Assemblage Zone 4 *Zlivisporis-Ariadnaesporites* assemblage Zone were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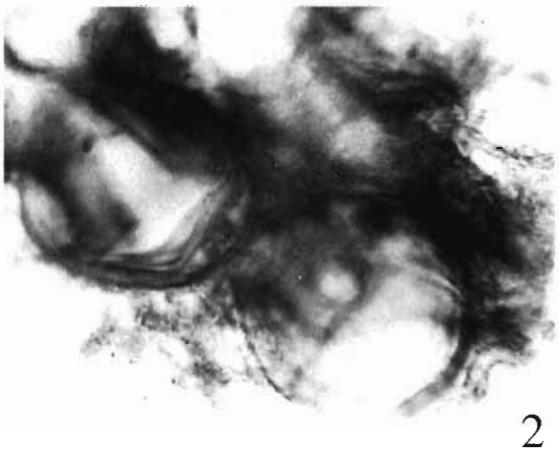
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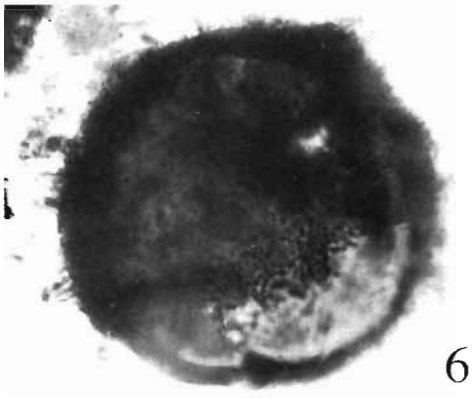
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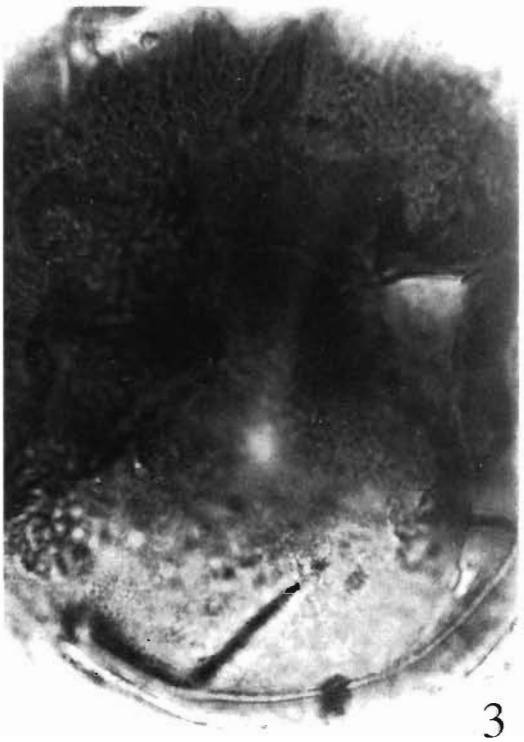
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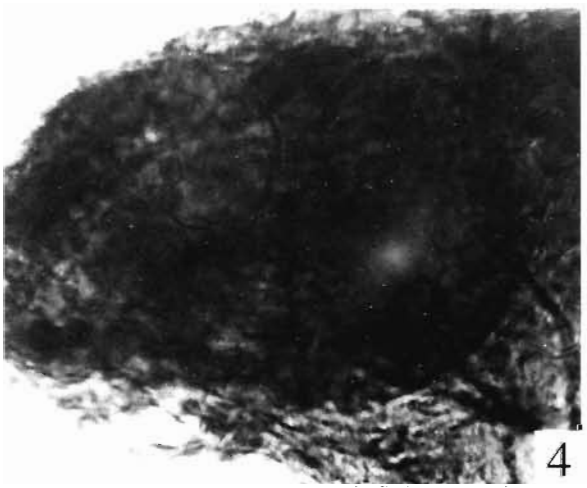
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PLATE 1

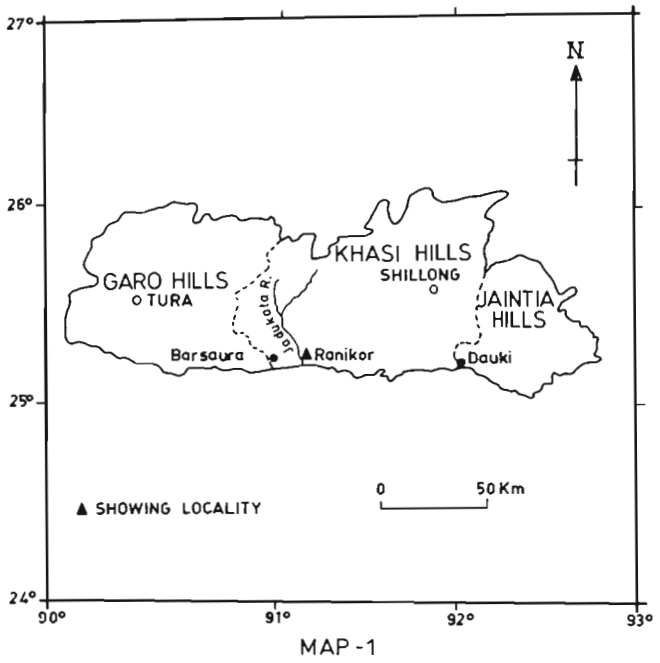

Fig.1—Locality Map.

reported. Recovery of massulae of *Azolla cretacea* from the Mahadek Formation indicates existence of fresh water conditions. Records of *Azolla* from the other Upper Cretaceous sediments of India further corroborate its wide distribution (Kumaran *et al.*, 1997; Kar & Srinivasan, 1998). Association of spore/pollen and dinoflagellates in the Mahadek palynoflora indicates mixing of fresh water and marine waters during its deposition.

Further, recovery of massulae of *Azolla cretacea* indicates marginal marine conditions during the deposition time of the sediments.

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PLATE 1

1 Massulae with sub-circular microspores. Also note multi-cellular filaments attached to the massulae. Slide no. BSIP 12506. x 200.

2, 7. Microspores enlarged. Slide no. BSIP 12507. x 500.

3. Massulae with microspores. Slide no. BSIP 12506. x 150.

4, 5, 6. Megasporangium. Slide no. BSIP 12506. (4) x 400, (5) x 200, (6) x 100.

8. Showing glochidia. Slide no. BSIP 12506. x 300.