

Fossil Charophyta from the Deccan intertrappean beds of Gurmatkal, Gulbarga District, Karnataka

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A taxonomically diverse charophyte assemblage (10 species, 8 genera) has been recovered from the Deccan intertrappean sequences around Gurmatkal, northern Karnataka. Most of the taxa are recorded for the first time and suggest, in conjunction with associated ostracodes, that these peripheral outcrops lying on the southeastern margin of the Deccan volcanic province were deposited close to the Cretaceous–Tertiary transition (Maastrichtian–? earliest Palaeocene). The long held Upper Eocene–Oligocene assignment for the Gurmatkal intertrappeans based on charophytes needs to be discounted.

THE intertrappean sequences exposed in parts of

Gulbarga district, northern Karnataka demarcate the southeastern margin of the Deccan basaltic province of peninsular India. Though recorded over a century ago¹, these beds were investigated in some detail only as late as 1945 (ref. 2). Over the past several years, a diverse charophytic flora has been reported (but not adequately described or illustrated) from several intertrappean localities around Gurmatkal^{3,4}. Ages as young as Oligocene have been assigned to the Gurmatkal intertrappeans and are often cited as evidence of long continued volcanic activity^{5,6}.

Fossil biotas from the Gurmatkal intertrappeans assume all the more significance in the context of recent geochronologic data^{7,8} which place the Deccan volcanic activity close to the Cretaceous–Tertiary (K–T) boundary within an age bracket of 64–69 Ma. These biotas help in establishing temporal relationships of Gurmatkal beds with other similar occurrences along the northern and eastern margin of the Deccan Traps. This in turn has a bearing on the current issue of southward age progression of the Deccan volcanics based on geochemical mapping of lava flows⁹.

A diverse charophyte assemblage was recovered in association with ostracodes, molluscs and fishes from three sections around Gurmatkal designated as GI (77° 24' 28" E: 16° 52' 12" N), GII (77° 27' E: 16° 51' 42" N) and GIII (77° 27' 5" E: 16° 53' 45" N) (Figure 1). Lithologically, these sections are similar and comprise a sequence of chert, cherty marl and claystone.

In terms of taxonomic diversity this charophyte assemblage is one of the largest known from the Deccan intertrappeans. It comprises 8 genera and 10 species (Table 1), most of which are being reported for the first time from Gurmatkal. Among the most abundant species are *Platychara perlata* and *Peckichara varians*. Also, apart from *Harrisichara muricata* and

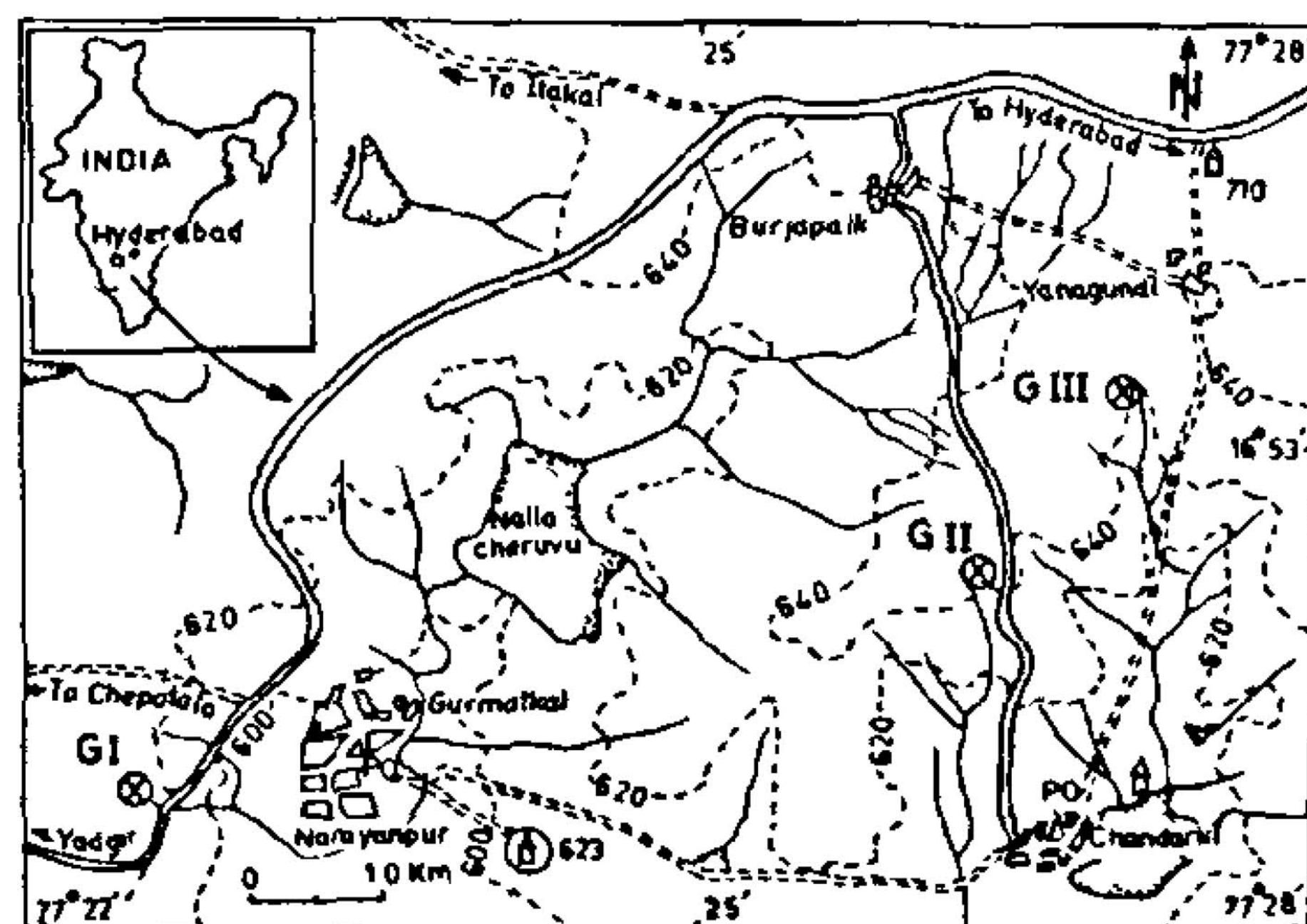


Figure 1. Map showing the location of charophyte-yielding samples (⊕).

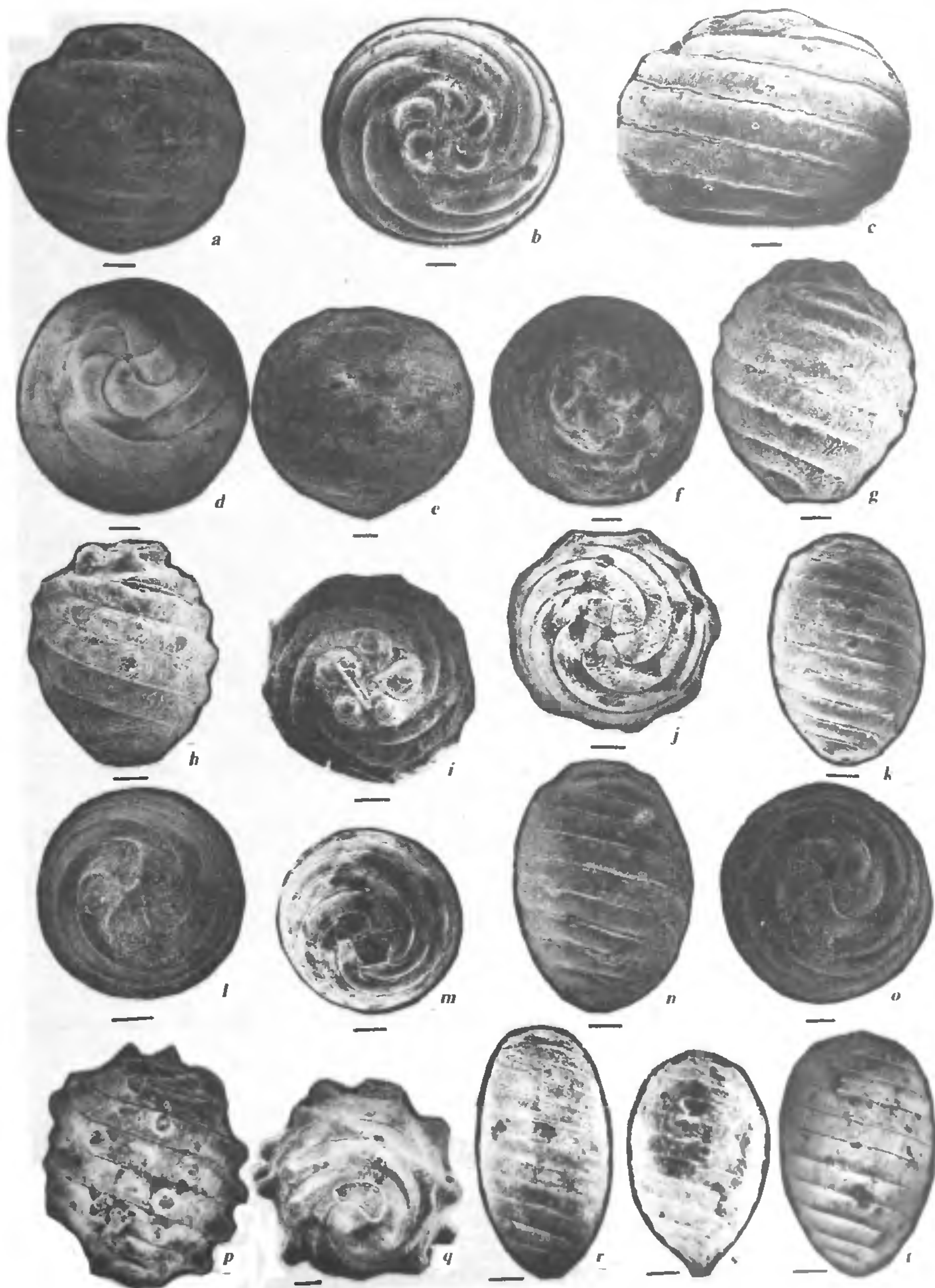


Table 1. Distribution of charophyte taxa from investigated sections

Taxa	G I	G II	G III
<i>Platychara perlata</i>	p	p	p
<i>P. compressa</i>	a	p	a
<i>P. sahnii</i>	a	p	a
<i>Peckichara varians</i>	a	p	a
<i>Harrisichara muricata</i>	a	p	a
<i>Nemegtichara grambasti</i>	a	a	p
<i>Stephanochara</i> cf. <i>S. levis</i>	a	a	p
<i>Grambastichara</i> sp.	a	p	a
<i>Microchara</i> sp.	a	p	a
<i>Chara</i> sp.	p	p	a

p-Present; a-Absent

Stephanochara cf. *S. levis* recorded herein for the first time from the Deccan intertrappeans, most of the taxa are common to other intertrappean localities of peninsular India. *P. perlata* is known from Nagpur¹⁰, Asifabad¹¹, Rangapur¹² and Kachchh¹³; *P. compressa* from Rajahmundry (Kateru)¹⁴; *P. varians* from Nagpur¹⁰ and Asifabad¹¹; *Nemegtichara grambasti* from Rangapur¹².

Chronologically the Gurmatkal assemblage includes taxa (*P. perlata*, *P. compressa*) which range in age from Late Cretaceous to Early Palaeocene¹⁵ as well as those that are largely restricted to the European Palaeocene (*P. varians*, *H. muricata*, *S. levis*)¹⁶⁻¹⁹. Significantly these species occur in association with a diverse ostracode assemblage which includes several taxa (*Talicypridea*, *Altanicypris*, *Mongolianella*, *Cypridea*, *Candona*) which are characteristic of nonmarine uppermost Cretaceous sequences of Mongolia and China²⁰. Also included in the ostracode assemblage are forms such as *Timiriasevia*, *Bisulcocypis* which are long ranging (Jurassic-Late Cretaceous) but whose known record does not extend into the Tertiary.

The presence of cosmopolitan species such as *Platychara perlata* and *P. compressa* is consistent with a Late Cretaceous (Maastrichtian) ostracode assemblage from Gurmatkal. However, the record of certain other taxa namely *P. varians*, *H. muricata* and *Stephanochara* cf. *S. levis* is in apparent conflict with the overwhelming ostracode evidence and introduces the possibility that

the uppermost parts of investigated sections around Gurmatkal may be Early Palaeocene in age. Alternatively, and more likely, the three species in question may have had an extended stratigraphic range down into Maastrichtian. In any case the Gurmatkal intertrappean beds were deposited very close to the K-T transition and the long held Upper Eocene-Oligocene age needs to be discounted.

1. Foote, B., *Mem. Geol. Surv. India*, 1876, 12, 1-268.
2. Kazim, S., *J. Hyderabad Geol. Surv.*, 1945, 6, 1-5.
3. Shivarudrappa, T. V., *Mysore Univ. J. Section B Sci.*, 1977, 27, 73-93.
4. Shivarudrappa, T. V., 1st International symposium on extant and fossil charophytes, Montpellier, France, 1989, p. 54.
5. Sastri, V. V., *Mem. Geol. Soc. India*, 1981, 3, 296-299.
6. Mahoney, J. J., in *Continental Flood Basalts* (ed. McDougall, J. D.), Kluwer Academic Publishers, Dordrecht 1988, p. 151-194.
7. Courtillot, V. et al., *Nature*, 1988, 333, 843-846.
8. Duncan, R. A. and Pyle, D. G., *Nature*, 1988, 333, 841-843.
9. Mitchell, C. and Widdowson, M., *J. Geol. Soc. London*, 1991, 148, 495-505.
10. Bhatia, S. B. and Rana, R. S., *Mem. Geol. Soc. France*, 1984, 147, 29-35.
11. Prasad, G. V. R., *Res. Bull. Sci. Panjab Univ.*, 1986, 37, 65-77.
12. Bhatia, S. B., Riveline, J. and Rana, R. S., *Palaeobotanist*, 1990a, 37, 316-323.
13. Bajpai, S. et al., Proceedings of the seminar cum workshop on IGCP 216 & 245, Chandigarh, 1990, p. 101-105.
14. Chanda, S., Deb, V. and Mukherjee, T. N., 1st International symposium on extant and fossil charophytes, Montpellier, France, 1989, p. 11.
15. Peck, R. E. and Forester, R. M., *Rev. Palaeobot. Palynol.*, 1979, 28, 233-236.
16. Feist, M., Cretaceous-Tertiary boundary events Symposium, Copenhagen, Denmark, 1979, p. 18-24.
17. Grambast-Fessard, N., *Rev. Palaeobot. Palynol.*, 1980, 30, 67-88.
18. Massieux, M., *Bull. Soc. Hist. Nat. Toulouse*, 1977, 133, 289-292.
19. Feist-Castel, M., *Thesis U.S.T.L. Montpellier, France*, 1975, p. 1-82.
20. Bhatia, S. B., Proceedings of the seminar cum workshop on IGCP 216 & 245, Chandigarh, 1990b, p. 47-49.

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Figure 2. a, b, *Platychara perlata* (a, lateral view, VPL/S 1050; b, apical view, VPL/S 1051); c, d, *P. compressa* (c, lateral view, VPL/S 1048; d, apical view, VPL/S 1048); e, f, *P. sahnii* (e, lateral view, VPL/S 1055; f, apical view, VPL/S 1056); g, h, *Peckichara varians* (g, lateral view, VPL/S 1058; h, apical view, VPL/S 1059); i, j, *Nemegtichara grambasti* (i, lateral view, VPL/S 1070; j, basal view, VPL/S 1070); k, l, *Stephanochara* cf. *S. levis* (k, lateral view, VPL/S 1081; l, apical view, VPL/S 1082); m, *Harrisichara muricata* (m, lateral view, VPL/S 1076; n, apical view, VPL/S 1084); o, *Microchara* sp. (lateral view, VPL/S 1085); p, *Chara* sp. (lateral view, VPL/S 1088). Bar = 100 µm in all cases.