

CHAROPHYTES FROM THE INFRATRAPPEAN BEDS OF PAPRO, LALITPUR DISTRICT, UTTAR PRADESH¹

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ABSTRACT

The paper records and illustrates charophyte gyrogonites from the infratrappeans exposed in the vicinity of Papro hamlet, Lalitpur district, Uttar Pradesh. The charophyte oogonia were obtained from a 2-4 metre thick grey to greyish black silicified tuff. They comprise of four genera and five species of which two are new.

Gastropods and ostracodes occur in association with the charophytes, the former including dextral and sinistral forms of *Physa* as well as *Lymnaea*. A check list of fossil charophytes from India is also given.

INTRODUCTION

Investigations of the Papro area (78° 49' 20" : 24° 14') Lalitpur District, U. P. in the winter of 1977 by the author in collaboration with Professor S. N. Singh and Dr. Surendra Kumar, have led to a systematic collection of a freshwater Infratrappean flora and fauna comprising of charophytes, gastropods and ostracodes. This paper deals with the description and systematics of fossil charophytic gyrogonites which have been recovered from a ash-grey to greyish-black silicified tuff, measuring 2-4 meters in thickness. These fossiliferous tuffs belong to the Papro Formation of Kumar, Singh and Singh (1978). On the basis of lithology, the Papro Formation has been further subdivided as shown below in Table 1.

Table 1

Deccan Trap	Dark greenish-black basalt
Papro Formation	Pitchstone Member 3 meters
	Silicified Tuff Member 2-4 meters
	Conglomerate Member 2-3 meters
-----Unconformity-----	
Kaimur Sandstone	Light, brown, subordinate siltstone
-----Unconformity-----	
Bijawar Formation	Phyllites and Schists.

The best exposures are to be found in two different nala cuttings sharing a Kaimur Sandstone divide, 3 km NNE of Papro (*loc. cit.*), tiny hamlet located 15 km SE of Sonrai (76°45'45" : 24°19'15"). Sonrai is about 80 km SE of district head quarters of Lalitpur. The area falls under Survey of India Toposheet No. 54 L/15 and 54 L/16. (Fig. 1).

Associated with the fossil charophytes are the remains of ostracodes, as well as the gastropods—*Physa* and *Lymnaea*. The occurrence of *Physa* is particularly inter-

esting because of the rather wide intra-specific variation, with forms varying from 1 cm to 12 cm and the occurrence of both sinistral and dextral forms. A check list of all known fossil charophytes from India is given in Table 9.

The first known record of fossil charophyte from India is by Sowerby (1857) who described and figured *Chara malcolmsonii* from Suchet Hills, near Nagpur. This report was followed by Carter (1857) and Hislop (1860). However the most comprehensive account of intertrappean charophytes was given by Rao and Rao (1939) who described and illustrated 13 species from the intertrappeans of Kateru, Rajahmundry. Other notable contributors are Sahni and Narayan Rao (1943), Mahadevan and Sharma (1948), Vishnu Mittre (1952), Rama Rao (1955) Horn of Rantzien (1957), Bhatia and Khosla (1967) and Bhalla and Khan (1969).

During the present decade Bhatia and Mathur (1970, 1978), Shivarudrappa (1972), Tewari and Sharma (1972 a, 1972 b), Lakhanpal et al., (1974), Bhatia and Mannikeri (1976, 1977), have made significant contributions to our knowledge of fossil charophytes. Rao (1974) has also reviewed Indian fossil charophytes.

Singh and Mathur (1978) for the first time recorded few charophytic remains from the present locality. However, the most important contribution to the geology of Papro (*loc. cit.*) area, has been undertaken by Kumar, Singh and Singh (1978).

SYSTEMATIC DESCRIPTION

Classification and terminology for defining the shape and measurements of charophyte gyrogonites is after Grambast (1962) and Horn of Rantzien (1958) respectively.

Repository: All the figured specimens have been

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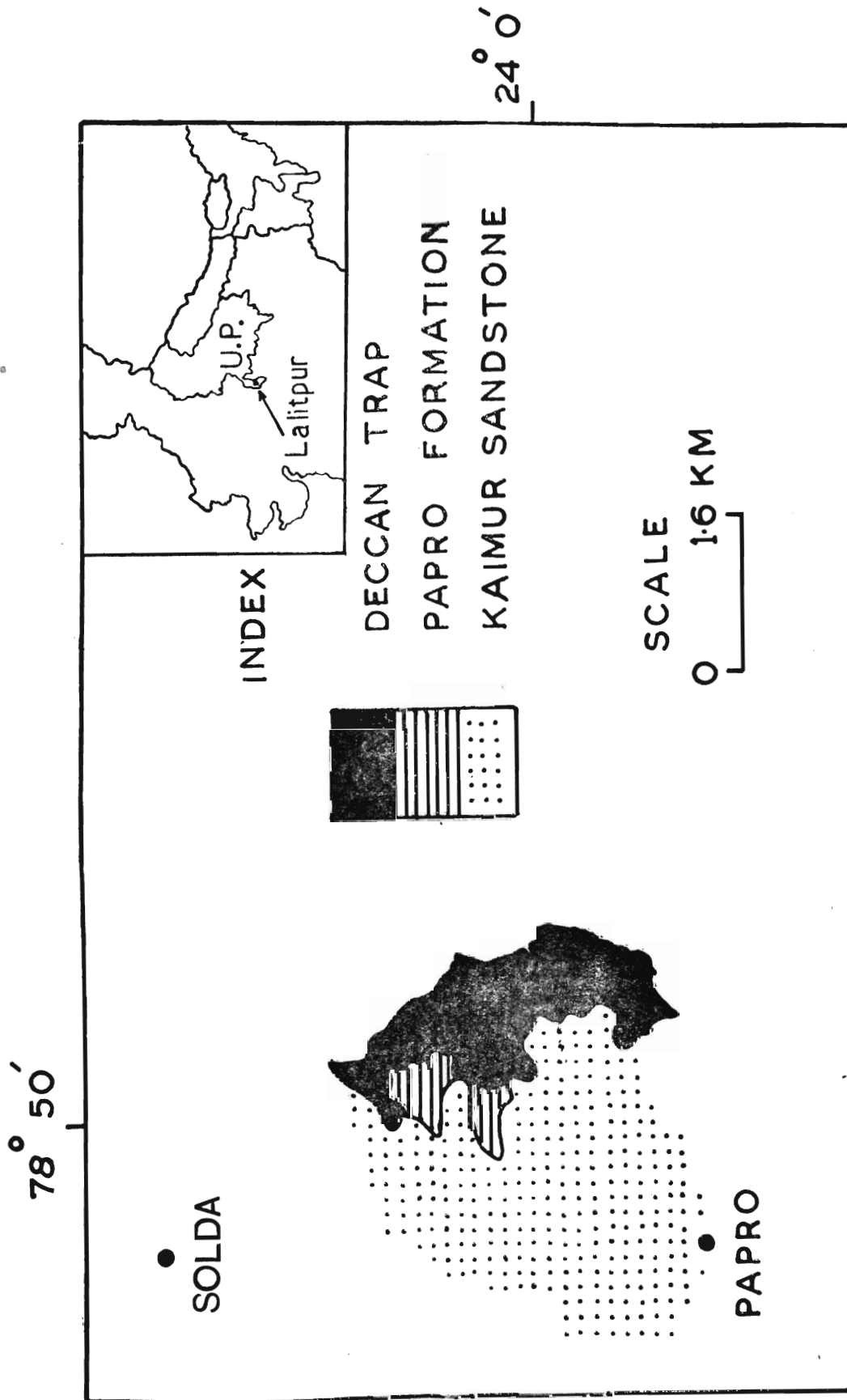


Fig. 1.

deposited in the Museum of the Geology Department, Lucknow University, Lucknow under the catalogue no. GLUMF 1256 to 1280.

Order	Charales
Family	Characeae RICHARD, 1815
Subfamily	Charoideae BRAUN in MITGULA, 1897
Tribe	Chareae LEONHARDI, 1863
Genus	<i>Chara</i> LANNAEUS, 1753

Charites of HORN AF RANTZIEN (1959)

Chara lalitpurensis SINGH sp. nov.

(Pl. I—1a-c)

Description : Lime shell terete, prolate (ISI 133—146) ellipsoidal (ANI 47—52) rounded apically, conically prolonged basally, greatest diameter above mid-height ; lime spirals five, sinistrally coiled, making two turns and a little more ; ten to eleven concave convolutions, sharp and distinct intercellular ridges, spirals about 33-66 μ wide at EA ; equatorial angle about 15° ; apical poles rounded, lime spirals at apical periphery becomes slightly narrow and turn towards centre with considerable increase in width, these widths exceed those of equator ; apical junction occurs along a moderately zigzag line ; basal poles conically prolonged and protruding with rounded tips ; basal pore outer opening regularly pentagonal, 25 to 33 μ wide.

Dimensions : LPA : 633-666 μ ; LED : 433-500 μ ; ISI : 133-146 ; NC : 10-11. (See also Table 2)

Remarks : Since taxonomic system proposed by Grambast (1972) is being followed in this paper, *Charites* of Horn af Rantzien (1959) has been considered under genus *Chara*.

Chara lalitpurensis closely resembles *Charites molassica* (Straub) reported by Horn af Rantzien (1959) from the Tortonian beds of Germany. The degree of concavity of spirals, larger size of gyrogonites and nature of apical poles of the former, differentiate it from the latter. *Charites molassica* (Straub) has been reported from India from Lower Siwalik (Miocene) beds of Uttar Pradesh by Lakhanpal et al. (1974) from which it can be distinguished in having higher number of convolutions.

It can also be distinguished from *Chara strobilicarpa* Reid & Groves by its smaller size and less protruding basal pole and different ISI value. Present form also differs from *Charites surajpurica* Tewari & Sharma (1972 a) described from Siwalik formation (Upper Pliocene) of Surajpur—Panchkula (Near Chandigarh) in dimensions specially ISI value.

Holotype : No. GLUMF 1256 (Plate 1, Figures 1a-c).

Type Locality : About 3 km NNE of Papro village, Lalitpur, Uttar Pradesh.

Type Horizon : Ash grey to greyish black tuff 2-4 metre thick, Infratrappean, Eocene.

Chara bitruncata (REID and GROVES)

(Pl. I—2a-c)

Chara strobilicarpa var. *bitruncata* Reid and Groves 1921, p. 187, pl. V, fig. 13.

Charites bitruncata (Reid and Groves) Horn af Rantzien 1959, p. 67, pl. III, fig. 1-4.

Dimensions : LPA : 520-645 μ ; LED : 400-466 μ ; AND : 266-366 μ ; ISI : 130-193 (See Table 3).

Remarks : Horn af Rantzien (1959) established this species as *Charites bitruncata* to accommodate a form, originally described as *Chara strobilicarpa* var. *bitruncata* by Reid and Groves (1921) from Eocene of England.

Three well preserved gyrogonites of this species have been recorded from present material. The Lalitpur specimens are smaller in size but agree well in other characters like apical and basal pores, dimensions, with the figured specimen of Reid and Groves (*Supra. cit.*) However it has broader basal poles than species figured by Horn af Rantzien (1959).

Genus *Grambastichara* HORN AF RANTZIEN, 1959

Grambasrichara tornata (REID AND GROVES)

(Pl. I—3a-c ; Pl. II—1a-c)

Chara tornata Reid and Groves, 1921, p. 187, pl. V, fig. 1-3.

Groves 1924, p. 37.

Horn af Rantzien 1954, p. 25.

Madler 1955, p. 294.

L. Grambast 1956, p. 113.

Gyrogonites tornata Pia 1927, p. 90.

Tectochara tornata Madler, 1955, p. 296.

Grambastichara tornata Horn af Rantzien 1959 p. 68.

Grambastichara cf. *tornata* (Reid & Groves) Tewari and Sharma 1972b p. 55.

Dimensions : LPA : 633-700 μ ; LED : 433-500 μ ; AND : 300-366 μ ; ISI : 136-146 NC : 10-12 (See Table 4).

Remarks : A few specimens belonging to this species have been recorded from the present material. Originally this species has been described by Reid and Groves from Eocene of England, as *Chara tornata*. Tewari and Sharma (*Op. cit.*) compared a form with this species from Wakha River Formation (Oligo-Miocene) near Kargil Ladakh. They also reported this genus from Upper Siwaliks (Pliocene) near, Chandigarh.

Present organ species closely resembles figured specimen of Horn af Rantzien (1959). Moreover measurements given in Table 4 further confirm their identity with this species.

Genus *Microchara* GRAMBAST, 1959

Microchara sp. indet.

(Pl. II—2a-c, 3a-c)

Description : Gyrogonite moderate in size, longer than wide (LPA 533-633 μ) and LED 433 to 500 μ , subprolate ellipsoidal (ISI 120-146 and ANI 39-53), rounded apically, gradually tapering basally, distinctly projected below the base ; apical cells indistinct, five spiral cells sinis-

Table 2. Dimensions of *Chara lalitpurientes* sp. nov.

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
Holotype GLUMF 1256	645	466	333	138	52	10	33	25	Prolate Ellipsoidal
Paratype GLUMF 1257	633	433	300	146	47	10	45	33	
Paratype GLUMF 1258	666	500	345	133	52	11	66	33	
Range	633— 666	433— 500	300— 345	133— 146	47— 52	10— 11	33— 66	25— 33	
Average	649	466	326	139	50	10	48	30	

Table 3. Dimensions of *Chara bitruncata* (Reid and Groves)

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
GLUMF 1259	520	400	266	130	51	10	33	66	Subprolate
GLUMF 1260	645	466	366	139	57	10	66	60	Prolate
GLUMF 1261	525	420	270	132	51	10	45	66	Subprolate
Range	520— 645	266— 466	266— 366	130— 139	51— 57	10	33— 45	60— 66	
Average	563	428	300	133	53	10	48	64	

Table 4. Dimensions of *Grambastichara tornata* (Reid and Groves)

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
GLUMF 1262	700	500	366	140	52	10	66	Not visible	Prolate ellipsoidal
„ 1263	633	433	333	146	53	10	60	33	
„ 1264	533	466	333	136	53	10	66	33	
„ 1265	633	466	300	136	47	10	64	45	
„ 1266	600	433	300	139	50	10	50	40	
„ 1267	666	433	333	146	50	12	45	45	
Range	633— 700	433— 500	300— 366	136— 146	47— 53	10— 12	45— 66	33— 45	

trally coiled, make little more than two turns ; narrow intercellular ridges present ; 11 to 12 concave to flat convolutions, spirals about 66 μ wide at EA ; equatorial angle 10-15 degrees ; basal opening 33 to 66 μ wide, pentagonal to circular.

Dimensions : LPA : 533-633 μ ; LED 433-500 μ ; AND 233-333 μ ; ISI : 120-146 ; NC : 11-12 (See Table 5).

Remarks : The present species is close to *Microchara* sp. indet. described and illustrated by Bhatia (1976) from Deccan intertrappean Beds of Nagpur. However, it is

slightly larger in size as is evident from measurements (Table 5). Lalitpur forms do not seem to resemble any known species of *Microchara*. More well preserved specimens are required before a definite specific name can be assigned.

Tribe Gyrogonae GRAMBAST, 1956
Genus *Gyrogona* LAMARCK, 1804 ex LAMARCK 1822, emend. GRAMBAST, 1956.

Gyrogonites Lamarck, 1804, non Pia, 1927.

Brachychara Grambast, 1954

Brevichara Horn of Rantzien, 1956

Gyrogona bundelkhandensis SINGH sp. nov.

(Pl. III—1a-c)

Holotype : No. GLUMF 1271 (Plate 3, figures 1a-c).

Description : Medium sized gyrogonites, with LPA-600-700 μ , LED 666-766 μ , AND 300-400 μ , terete, oblate spheroidal (ISI 90-95), and mostly ellipsoidal (ANI 45-57), apically rounded; apical rosette not well developed and present in depression, basally very broadly rounded; five cellular spirals, sinistrally coiled, making slightly more than one turn, seven to nine flat or convex convolutions; intercellular suture distinct; equatorial angle about 10° or less; basal pore opening 33 to 45 μ , circular in outline, not lower than surrounding surface.

Dimensions : LPA : 600-700 μ , LED : 666-766 μ , AND : 300-400 μ , ISI : 90-95; NC : 7-9 (See Table 6 also).

Remarks : *Gyrogona bundelkhandensis* sp. nov. has superficial resemblance to English species, originally described by Horn af Rantzien (1959) as *Brevichara hordlensis* from Eocene of Hampshire but can be distinguished from it, in having depressed rounded apical rosette, rather than

protruding. Moreover, higher number of convolutions, smaller size and general shape are other characters which separate this from *B. hordlensis* and other known species.

Type Locality : In a Nala cutting about 3 km NNE of Papro village, Lalitpur, U. P.

Type horizon : As grey to greyish black silicified tuff 2-4 metre thick. Infratrappean, Eocene.

Gyrogona coelata (REID and GROVES)

(Pl. II—4a-c; Pl. III—2a-c)

Chara coelata Reid and Groves 1921, p. 184*Kosmogyra coelata* Pia 1927, p. 90*Chara coelata* Reid and Groves; Rao and Rao, 1939, p. 5.*Brachychara coelata* Grambast and Grambast 1954, p. 66*Gyrogona coelata* Grambast 1956, p. 280*Brevichara coelata* Horn af Rantzien 1959, p. 119

Dimensions : LPA 600-633 μ , LED 666-733 μ , AND 266-400 μ , ISI 86-90, NC 7-8. (See Table 7).

Remarks : Originally this species has been reported from Upper Eocene Beds of England by Reid and Groves (1921) as *Chara coelata*. However from India, Rao and Rao (1939) described and illustrated from Deccan Inter-

Table 5. Dimensions of *Microchara* sp. indet.

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
GLUMF 1268	633	433	333	146	53	12	66	33	Prolate ellipsoidal
„ 1269	600	500	233	120	39	11	66	66	Subprolate Subovoidal
„ 1270	533	433	333	125	50	11	60	66	Subprolate ellipsoidal
Range	533— 633	433— 500	233— 333	120— 146	39— 53	12— 12	60— 66	33— 66	
Average	588	455	299	130	47	11	64	65	

Table 6. Dimensions of *Gyrogona bundelkhandensis* sp. nov.

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
Holotype No. GLUMF 1271	700	766	400	91	57	9	60	33	} Oblate Spheroidal ellipsoidal
Paratype No. GLUMF 1272	633	666	300	95	47	8	66	40	
„ „ 1273	666	733	366	91	55	7	80	45	
„ „ 1274	633	700	333	90	53	8	60	33	
„ „ 1275	666	700	300	95	45	9	60	33	
„ „ 1276	600	666	333	90	55	8	66	40	
Range	600— 700	666— 766	300— 400	90— 95	45— 57	7— 9	60— 80	33— 45	
Average	649	705	355	92	52	8	65	37	

Table 7. Dimensions of *Gyrogona coelata* (Reid and Groves)

S.N.	LPA μ	LED μ	AND μ	ISI	ANI	NC	WCE μ	BPOO μ	Shape
GLUMF 1277	633	733	400	86	63	8	80	33	Oblate spheroidal
„ 1278	633	700	400	90	73	7	90	33	
„ 1279	600	666	333	90	55	8	66	36	
„ 1280	600	666	766	90	44	8	100	33	
Range	600— 633	666— 733	266— 400	86— 90	44— 63	7— 8	66— 100	33— 36	
Average	616	691	349	89	56	8	84	33	

trappeans, near Rajahmundry. The present form has fewer tubercles which are more or less pointed and more convolute than the figured specimens of Rao and Rao (*op. cit.*).

Table 8. Stratigraphical distribution of charophytes

Charophytes	AGE		
	Cretaceous (Maestrichtian)	Palaeocene	Eocene
<i>Chara lalitpurensis</i>			× ×
<i>C. bitruncata</i>			× ×
<i>Grambastichara tornata</i>			× ×
<i>Gyrogona bundelkhandensis</i>			
<i>G. coelata</i>			× ×
<i>Microchara</i> sp.	× × ×	× ×	× ×

gyrogonites is thus *Gyrogonites* Lamarck and the name *Brachychara* should be considered illegitimate.....”

Mädler (1955) stated that *Gyrogonites medicaginula* Lamarck permits no detailed comparison with now recognised organ genera, and probably it included gyrogonites of *Sphaerochara* Madley.

Moreover it was difficult to prove *Gyrogonites medicaginula* of Lamarck and *Brachychara medicaginula* of Grambast and Grambast are same species of gyrogonites, and therefore *Gyrogonites* and *Brachychara* are synonyms nomenclaturally. Consequently Horn af Rantzien (1959) proposed new name *Brevichara* for *Brachychara*. He also put *Chara wrightii* Reid and Groves 1921, *Aclistochara wrightii* Grambast and Grambast (*op. cit.*), *Brachychara wrightii* Grambast and Grambast (1954) as synonym of type species of *Brevichara*—*Brevichara hordlensis*.

Grambast (1962) while proposing an exhaustive classification of fossil charophytes again reviewed position of this genus and finally reverted it back to *Gyrogona* Lamarck including *Gyrogonites* Lamarck 1822 *Brachychara* Grambast and Grambast (1954) and *Brevichara* Horn af Rantzien (1955) as its synonym.

From the foregoing discussion, the present author is of the view that old name *Gyrogona* as proposed by Lamarck (1804 ex Lamarck 1822) amended by Grambast (1956) should be retained rather than giving new names.

CONCLUSION

On the basis of the charophytic flora, it can be safely assumed that fossiliferous beds of ‘Papro Formation’ cannot be older than Maestrichtian. However, author is more inclined to favour Eocene age, as indicated by *Grambastichara* and *Gyrogona*. Stratigraphical distribution of charophytes of these beds, is given in the Table 8.

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FEW REMARKS ON THE GENERIC STATUS OF GYROGONA

(Lamarck 1804, ex Lamarck 1822 amend, Grambast 1956.)

In the past, the generic status of *Gyrogona* Lamarck 1808 ex Lamarck 1822, has generated considerable controversy. It is therefore felt that a review of the observations made by different authors would help in clarifying its position.

Lamarck (1804) erected originally this genus with the type species *Gyrogona medicaginula* from tertiary of France. Later on Lamarck (1822) transferred this genus to *Gyrogonites* with *Gyrogonites medicaginula* as its type species. Grambast and Grambast (1954) typified their new genus *Brachychara* by *Brachychara medicaginula* which nomenclaturally remains the same as *Gyrogonites medicaginula* Lamarck. Not agreeing with this arrangement Horn af Rantzien (1956) observed “Being typified by the same species, these genera are nomenclatural synonyms, the older one of which has priority. The valid name of this principally Lower Tertiary organ-genus of charophyte

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EXPLANATION OF PLATES

All figures $\times 32$ unless otherwise stated.

PLATE I

- 1-3. *Chara lalitpurensis* sp. nov. a, lateral view; b, apical view; c, basal view. Holotype No. GLUMF 1256.
- 4-6. *Chara bitruncata* (Reid and Groves), a, lateral view; b, apical view; c, basal view. No. GLUMF 1259. $\times 50$.
- 7-9. *Grambastichara tornata* (Reid and Groves), a, lateral view; b, apical view; c, basal view. No. GLUMF 1265.

Table 9

DISTRIBUTION OF FOSSIL CH

AGE	CHAROPHYTE TAXA		LOCALITY
		GRAMBASTICHARA CE TORNATA (REID & GROVES)	1,5
		GRAMBASTICHARA CE CYLINDRICA (MADLER)	1
		GRAMBASTICHARA SP.	2
		GRAMBASTICHARA RANTZII (TEWARI & SHARMA)	3
		CHARA CONTRARIA BHARTAI (TEWARI & SHARMA)	3
		CHARA LALITPURENSIS (REID & GROVES)	2
		CHARA BITRUNCATA (REID & GROVES)	3
		CHARA SAUSARI SAHNI & SOWERBY	5
		CHARA WRIGHTI HISLOP	5
		CHARA VESIFORMIS	6,7,11,12
		CHARA STROBILICARPA (REID & GROVES)	8
		CHARA FOETIDA A. B.	9
		CHARA MICRO CERAS	10,13
		CHARA HELICTERAS GRAMBASTI	10,13
		CHARA COELATA (REID & GROVES)	10,13
		CHARA TURBINATA (REID & GROVES)	10
		CHARA SUBGLOBOSA (REID & GROVES)	10
		CHARA OBLIQUATA (DELL'US)	13
		CHARA SAMPATHI (RAO & RAO)	13
		CHARA SAMMI (RAO & RAO)	11,13
		CHARA INDICA (RAO & RAO)	13
		HARRISCHARA SP.	13
		MICROCHARA SP.	13
		TECTOCHARA SP.	13
		TECTOCHARA PINORICA	13
		TECTOCHARA CF. DILLI	13
		TECTOCHARA	2
PLIO-PLIESTOCENE			
MIDDLE MIOCENE			
OLIGO-MIOCENE			
E - UPPER OCEAN			
E - MIDDLE OCEAN			
E - LOWER OCEAN			
PALEOCENE TO EOCENE			
PALEOCENE			
JURASSIC			

DIATOMS IN INDIA

Species Name	Locality	Reference
ACTINOCYCLUS B. SHARMA	1	5,9
ACTINOCYCLUS (MÄDLER)	2	2
ACTINOCYCLUS MERIANI (PAPP) GRAMBAST	3	3
ACTINOCYCLUS SAHNII BHATIA AND MATHUR	2	3
ACTINOCYCLUS BUNDELKHANDENSIS SINGH	2	2
ACTINOCYCLUS COELATA (REID & GROVES)	9,13	9,13
ACTINOCYCLUS CHARITES SIWALIKUS LAKHAMPAL et al	5	5
ACTINOCYCLUS CHARA SURAJPURICA (STRAUB)	5	5
ACTINOCYCLUS NITELLITES SP.	10	10
ACTINOCYCLUS NITELLITES (TEWARI & SHARMA)	4	4
ACTINOCYCLUS PLATYCHARA SAHNII HORN AF RANTZJEN	4	4
ACTINOCYCLUS PLATYCHARA RAOI BHATIA & MANNIKERI	3,2	3,2
ACTINOCYCLUS SPHAEROCHARA SAHNII (RAO & RAO)	14	14
ACTINOCYCLUS SPHAEROCHARA TEWARI BHATIA & MATHUR	14	14
ACTINOCYCLUS SPHAEROCHARA PECKI BHATIA & MATHUR	9	9
ACTINOCYCLUS SPHAEROCHARA SP.	9	9
ACTINOCYCLUS STELLATOCHARA ROLLETI (UNGER)	2	2
ACTINOCYCLUS STELLATOCHARA RAOI BHATIA & MANNIKERI	3	3
ACTINOCYCLUS STELLATOCHARA SAHNII BHATIA & MANNIKERI	3	3
ACTINOCYCLUS HORNICHTARA JAISALMERENSIS BHATIA & MANNIKERI	4	4
ACTINOCYCLUS ACLISTOCHARA MASLOVI BHATIA & MATHUR	15	15
ACTINOCYCLUS ACLISTOCHARA INDICA BHATIA & MATHUR	15	15
ACTINOCYCLUS ACLISTOCHARA INDICA BHATIA & MATHUR	15	15
ACTINOCYCLUS RASKYAECHARA PRZEMAEGLERI BHATIA & MANNIKERI	3	3
ACTINOCYCLUS RASKYAECHARA CF. LATA PECK	15	15
ACTINOCYCLUS RASKYAECHARA PURNAGIRIENSIS LAKHAMPAL et al.	15	15
	4	4

LOCALITY INDEX															
●															1. WAKKA RIVER FORMATION KARGIL, LADAKH
	●														2. PINJORE, HARYANA
		●													3. CHANDIGARH
			●												4. NAINITAL (U.P.)
				●											5. LALITPUR (U.P.)
					●										6. SAGAR (M.P.)
						●									7. JABALPUR (M.P.)
							●								8. SAUSAR, CHINDWARA (M.P.)
								●							9. NAGPUR (MAHARASHTRA)
									●						10. GULBARGA (KARNATAK)
										●					11. YELLUR BELGAUM (KARNATAK)
											●				12. VICARABAD (A.P.)
												●			13. KATERU RAJAHMUNDRI (A.P.)
													●		14. RAJMAHAL (BIHAR)
														●	15. RAJASTHAN



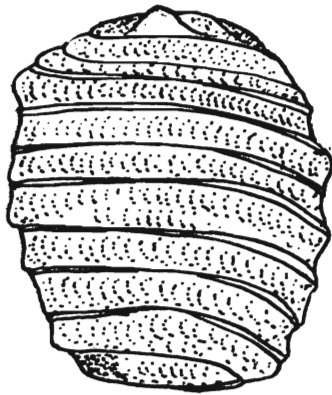
1 a



1 b



1 c



2 a



2 b



2 c



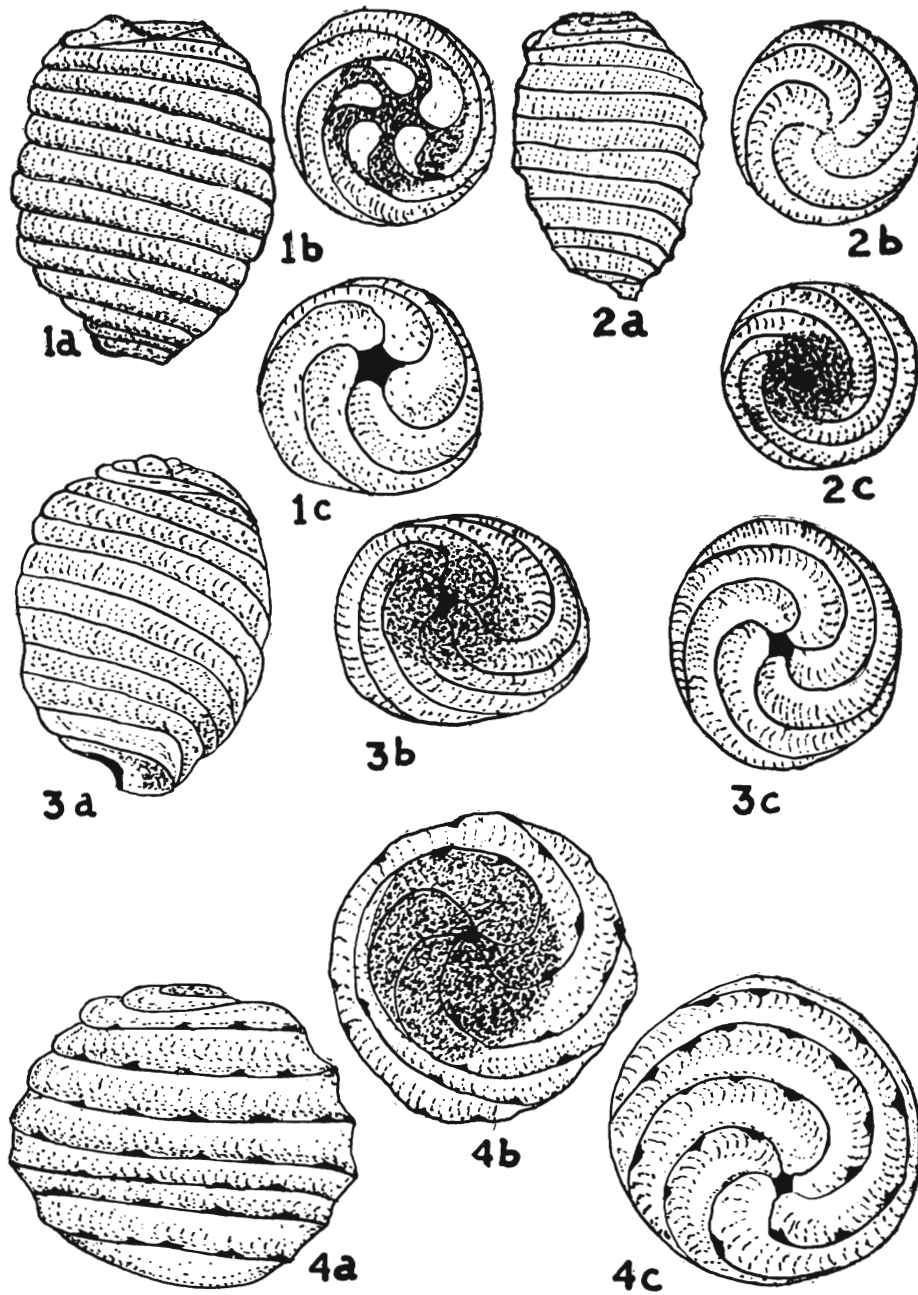
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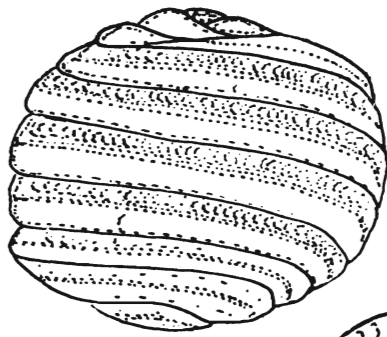


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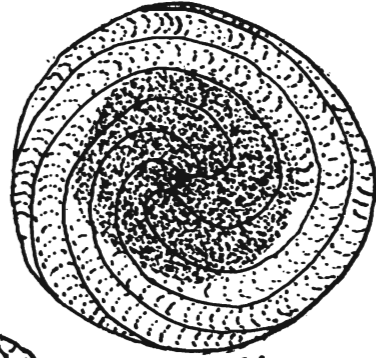


3 c

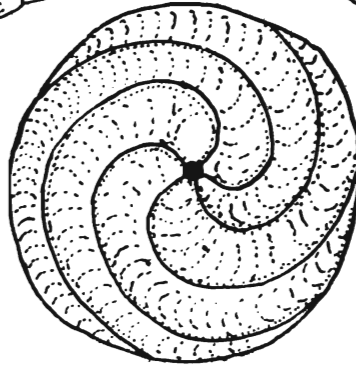




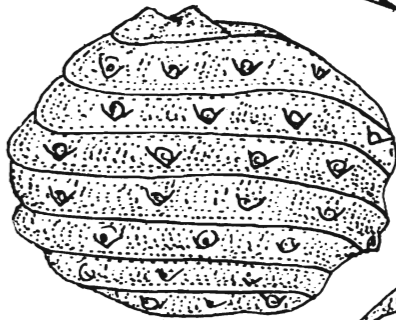
1a



1b



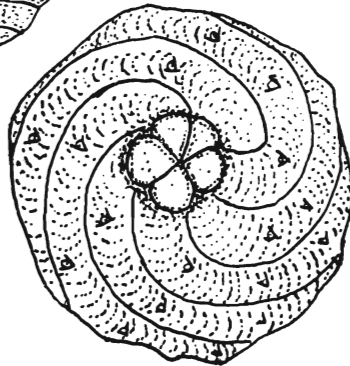
1c



2a



2c



2b

PLATE II

- 1-3. *Grambastichara tornata* (Reid and Groves), a, lateral view; b, apical view; c, basal view. No. GLUMF 1262.
4-9. *Microchara* sp. a, lateral views b, apical views; c, basal views. No. GLUMF 1270, GLUMF 1268.
10-12. *Gyrogona coelata* (Reid and Groves), a, lateral view; b, apical view; c, basal view. No. GLUMF 1278.

PLATE III

- 1-3. *Gyrogona bundelkhandensis* sp. nov., a, lateral view; b, apical view; c, basal view. Holotype No. GLUMF 1271.
4-6. *Gyrogona coelata* (Reid and Groves), a, lateral view; b, apical view; c, basal view. No. GLUMF 1280.