Metaphyte and metazoan remains from the Indian Proterozoic successions

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Evidences for the metaphyte and metazoan remains from the Indian Proterozoic are discussed. Two distinct macroscopic biota assemblages are described. The older macroscopic biota is from Middle Proterozoic and consists of planktonic and benthic metaphytes belonging to Chuarid, Tawuid, Krishnanid, Vendotaenid, and Frondoid forms. Uptil now distinct metazoan evidence from Middle Proterozoic (800-1,000 Ma) was doubtful. The previous records of jelly fishes are debated and considered here to be the encystment structures. The younger macrobiota, the Ediacaran fauna, are being reported for the first time from the youngest bed of the Vindhyan sequence. The remains of coelenterates and annelids are morphologically alike to the Lower Palaeozoic forms. The records of macroscopic biota indicate that the morphological diversification had started right from the Middle Proterozoic time.

Key-words—Morphology, Macrobiota, Metaphyte-metazoan remains, Proterozoic (India).

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सारांश

भारतीय प्राग्जीवी अनुक्रमों से मेटाफ़ाइटी एवं मेटाजीवी अवशेष

प्रभात कुमार माइती

भारतीय प्राग्जीवी कल्प से मेटाफ़ाइटी एवं मेटाजीवी अवशेषों के प्रमाणों की विवेचना की गई है। दो विभिन्न गुरुजीविता समुच्चयों का वर्णन किया गया है। प्राचीनतर गुरुजीविता मध्य प्राग्जीवी कल्प से है तथा इसमें **चुआरिड, तवुइड, कृष्णानिड, वेन्डोटीनिड** एवं **फ्रोन्डॉयडी** प्ररूपों से सम्बन्धित प्लवकीय एवं बेन्थीय मेटाफ़ाइटी अवशेष विद्यमान हैं। अभी तक मध्य प्राग्जीवी कल्प (800-1,000 एम-ए०) से मेटीजीवीयों का प्रमाण सन्देहास्पद था। इस शोध-पत्र में जेली-फिशों के पहले अभिलेखों पर भी प्रकाश डाला गया है तथा इन्हें पुटीयन संरचनायें प्रस्तावित किया गया है। विन्ध्य अनुक्रम की संस्तर से पहली बार अल्पतर आयु का सूक्ष्मजीविता, ऐडियाकरन जन्तुजात वर्णित किया जा रहा है। सीलॅनट्रेटा एवं ऍनॅलिडा समूह के अवशेष आकारिकीय दृष्टि से एक जैसे हैं। गुरुजीविता के अभिलेखों से व्यक्त होता है कि आकारिकीय विभिन्नता मध्य प्राग्जीवी से ही प्रारम्भ हुई हैं।

METAPHYTE and metazoan remains are well known world wide towards the close of Late Precambrian. The soft-bodied marine metazoan fauna—the Ediacarans, existed in many parts of the world during Eocambrian time (Glaessner, 1984; Hofmann, 1987). This fauna is older and different from the fauna traditionally called as Tommotian of Cambrian, yet its elements have attained a grade of morphologic organisation and size comparable to that exhibited in Palaeozoic fossils. This fauna is devoid of shelly fossils of Tommotian of the Lower Cambrian. It is presumed that the widespread Late Precambrian glaciation has helped in the rapid organic evolution (Schopf *et al.*, 1973). The occurrence of tillites at approximately the same stratigraphic level in different parts of the world appears to provide operational limit for correlation, though this evidence is still lacking in the Indian Precambrian sediments.

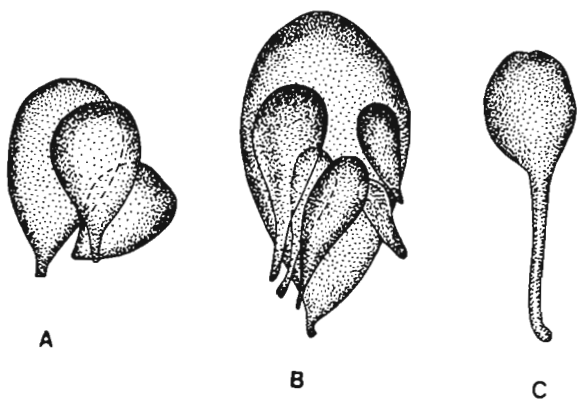
Below this stratigraphical limit, i.e., between 800-1,000 Ma diversified assemblages of carbonaceous films, including metaphytes and microbial colonies are well known. They are associated with *Chuaria* Walcott 1902. They include remains with regular rounded outlines, ribbon-like films, rounded structures with protrusion and frond-like forms. All are usually preserved on bedding planes and mostly showing wrinkling due to compaction. This assemblage had several forms of enigmatic nature which may find their placement

both in the metaphytes and metazoans. Hofmann (1972, p. 22) has categorically emphasized—"At the present time no unquestionable metazoans are known from levels below the widespread terminal Precambrian glaciation". This view has also been supported by Cloud (1968). Therefore, this fact calls for a critical assessment of the known Precambrian Indian forms, claimed especially to be the remanents of metazoans from 800-1,000 Ma. Several such records have earlier been reported from the close of Middle Proterozoic succession of Vindhyan. The present paper deals with a re-assessment of these Middle Proterozoic remains based on new material and also records a new find of Ediacaran remains from the Late Proterozoic.

PREVIOUS RECORDS OF MACROBIOTA FROM INDIA

The macroscopic biological remains were first recorded as discinoid discs by Jones (1909, in: Holland, 1909) from Suket Shales, Lower Vindhyan of Rampura. These remains attracted the attention of palaeontologists and geologists who considered them to be either the remains of brachiopods (Chapman, 1935) or algae (Sahni & Shrivastava, 1954). Contrary to this, Misra and Dubey (1952) considered them to be abiogenic structures. Maithy and Shukla (1984a) opined that these are the encystment structures of plankton resembling *Chuaria*.

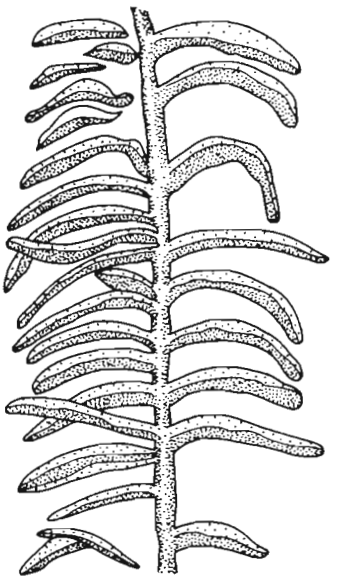
Beer (1919) recorded 'spiral impression' from Rohtas Limestone Formation. Mathur (1983) transfered this form to a new genus *Spiroichnus*. However, Hofmann (1985a) considered it to be a carbonaceous megafossil—*Grypania spiralis*. Rode (1946) recorded the presence of shell-like structures from the topmost bed of the Rohtas Limestone of Ramdehra Village, Bihar; these are of different sizes, ranging from half an inch to nearly two inches in length, conical in shape, broad at one end and gradually tapering at the other. The body of the specimen is transversely striate. These forms, according to Rode (1946), are referable to Pteropod genus *Hyolithes* Eichwald 1840. Besides, from the same bed Rode (1946, p. 248) recorded a number of discoidal remains which he opined to have resemblance with *Orthis*-type brachiopods.



Text-figure 1—A, *Krishnania acuminata* Sahni & Shrivastava; **B,** *Vindhyavasnia* Tandon & Kumar; **C,** *Vindhyania* Mathur (redrawn from published figures of specimens to show details).

From Suket Shale Formation (Neemuch District, central India) Sahni and Shrivastava (1954) reported *Fermoria* Chapman 1935 attached to apparently convergent filaments showing funnel-shaped ends. These are possibly the algal remains. They also reported a new genus *Krishnania* from the same formation. This fossil is acuminately ovate in shape narrowing abruptly at one end but evenly rounded at the other; the specimen shows superficial resemblance with *Lingula* Bruguiére 1797.

Misra (1949) claimed the finding of a dasycladous alga from carbonaceous limestone of Rohtas Formation at Banjari. The specimen has a verticillate, slender stalk terminated by globular head. Volgdin (1957, see also Balkrishnan, 1974, p. 9) commented that this form was not an alga but an early primitive form of Archaeocyatha; thus transfered it to a new form *Misracyathus vindhyanus*. Misra and Bhatnagar (1950) reported 'carbonaceous disc-like bodies' from Rohtas Limestone Formation of Banjari quarries. Prakash (1966) claimed the finding of broken cast of branchiopod remain from the Kajrahat Limestone Formation in Chopan area. Tandon and Kumar (1977) have recorded the impression of an annelid—*Katania singhii*, and an arthropod—*Vindhyavasnia misrae* from the Rohtas Limestone Formation of Katni. Maithy and Gupta (1981) reported archaeocyathid from the Vindhyan Supergroup. However, its identification has been questioned by Zhuravlev (1986). Presence of jelly fish-like remains from the Rohtas or its equivalent formations have earlier been reported by Sisodiya (1982) and Maithy (1984). Maithy and Shukla (1984a) recorded a new form *Ramapuraea*. Maithy, Narain and Sarkar (1986) reported a probable coelenterate *Sekwia* Hofmann 1981 from the Rohtas Limestone Formation of Amjhore. Maithy and Babu (1986) reported *Misraea*, a body fossil of uncertain affinity, from the Chopan Porcellanite Formation of Vindhyan in Mirzapur District. Recently, Maithy and Babu (1988) found algal encystment structure, viz., *Tawuia, Chuaria*, cf. *Sekwia, Longfengsahnia* and ichnofossils from the Semri and Kaimur groups of Vindhyan in Chopan area.



Text-figure 2—Frondoid form. × 1

DESCRIPTION

Carbonaceous megafossils

Several schemes for the suprageneric classification of carbonaceous megafossils recorded from Precambrian sequence (800-1,000 Ma) have been proposed. For example, *Chuaria* and its synonyms have been considered belonging to diverse groups, such as brachiopods, gastropods, foraminifera, plants, parasinophytes, acritarchs, or even inorganic structures (Maithy & Shukla, 1984a). A number of family-level taxa have been errected; *Fermoriidae* (Sahni, 1936), Chuariidae (Wenz, 1938), Megasphaeromorphida (Timofeev, 1970), Chuariamorphida (Soklov, 1965) and Chuariaceae (Wenz *nom. trans.* emend. Duan, 1982). The affinities of these forms are uncertain. Therefore, these carbonaceous compressions and moulds are considered as the orphans of palaeontology. Many are described as "unrecognised and unrecognisable genera" in the Treatise (Hantzschel, 1975). On the basis of external morphology, it is difficult to assign most of the taxa to major groups, but for the sake of convenience broad morphological groups have been proposed as under :

Chuarid remains—The forms are sphaeroids or compressed sphaeroids (discs); surface with concentric wrinkles, or with a distinct circular area indicating inner body or central opening. *Chuaria* is the best known form of this group (Pl. 1, figs 1, 2). They are simple in organisation, platyspermic carbonaceous discs, commonly circular, solitary, measuring 2.5 mm, surface smooth or with concentric wrinkles. In some specimens, Maithy and Babu (1988) found a small central area indicating a possible opening point. Isolated specimens found on the sediments support their being the encystment structures (Maithy & Shukla, 1984a).

Misra and Bhatnagar (1950) reported large, 26 mm diameter, carbonaceous spheroids from Rohtas Formation. Externally the forms are similar to *Chuaria*, except for their large size. In a recently recorded specimen (Pl. 1, fig. 3) one finds several, fine surface-thickenings and raised portion in the centre. Sokolov (1965) introduced the name *Beltanelloides* for such forms. However, Ford and Breed (1973) questioned the separation of *Beltanelloides* from *Chuaria* which is based only on the larger size of the former; however, Hofmann (1985) favoured its distinct identity on the same basis. The morphology supports for the encystment structures, like *Chuaria*.

Spheroids (discs) with distinct central area have been reported under *Sekwia* Hofmann 1981 by Maithy *et al.* (1987), *Ramapuraea* Maithy & Shukla 1984 and *Rohtasea* Singh & Chandra 1987. These forms were considered to be the relics of jelly fishes. A critical re-assessment raises doubt regarding their medusoid affinity, particularly because of their small size (3-8 mm) and the presence of recognisable organisation of coelenterate. Probably all of them are allied forms of *Chuaria*, with a distinct circular inner body.

The genus *Ramapuraea* is a small circular form, measuring 3-6 mm in diameter with a distinct central

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PLATE 1

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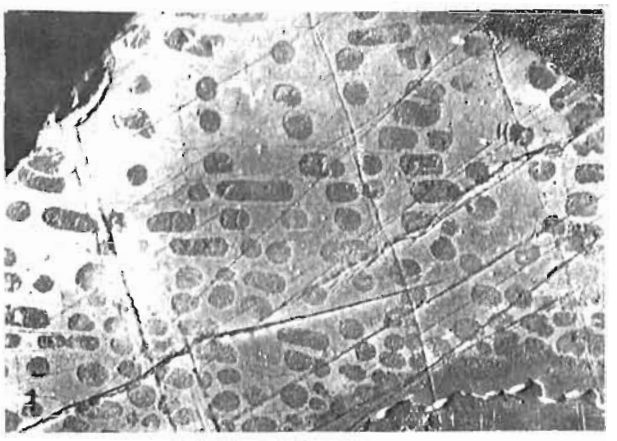
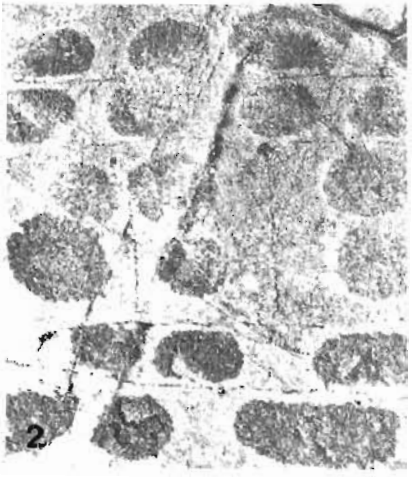
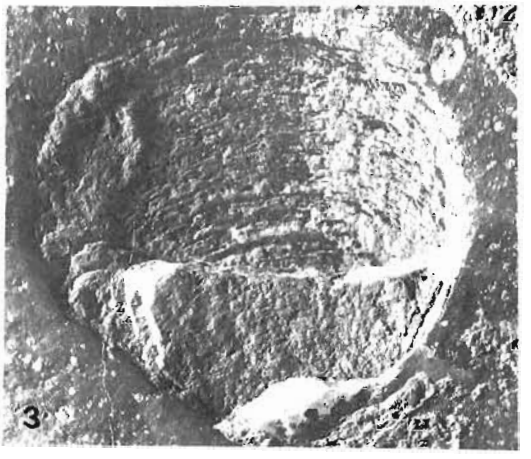
1. *Chuaria* Walcott & *Tawuia* Hofmann. × 1; Specimen no. BSIP 36105.
2. *Chuaria* and *Tawuia*, a portion of fig. 1 enlarged showing a circular area in the centre of *Chuaria*.
3. *Beltanelloides* Sokolov showing fine thickenings on surface. × 3; Specimen no. BSIP 35956.
4. *Sekwia excentrica* Hofmann, specimen showing presence of globular structures in central area. × 4; Specimen no. BSIP 35857
5. *Sekwia excentrica* Hofmann under SEM showing compactly arranged globular structures in central area.
6. *Ramapuraea* Maithy & Shukla showing globular structure in central area and fine radial thickenings. × 8; Specimen no. BSIP 27341
7. *Rohtasia tandonii* Singh & Chandra. × 8; Specimen no. BSIP 35960.
8. Vendotaenid remain.







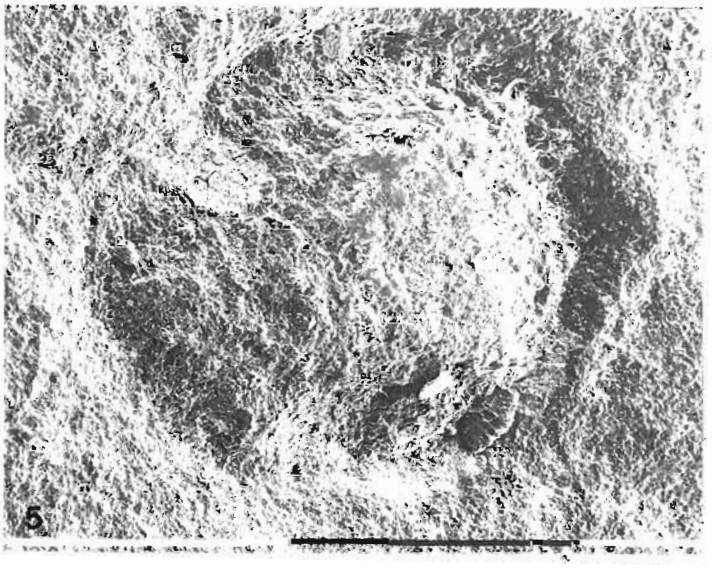


PLATE 1

area from where the thickenings radiate out up to the margin, thus resulting into a fimbriated margin. A re-examination of the specimen figured by Maithy and Shukla (1984a, pl. 1, fig.1) shows that the central area has several small globular structures, which are compactly packed together (Pl 1, fig. 4). This character raises doubts about its metazoan affinity. In all probabilities, they are vesicles with inner body similar to the encystment structures recorded by Butterfield, Knoll and Swett (1988) from the Upper Proterozoic shales of Svanbergfjellet. Similarly, the specimens of *Sekwia* described by Maithy, Narain and Sarkar (1986, fig. 1) from the Rohtas Formation of Amjhore and later by Maithy and Babu (1988, pl. 1, figs 7, 8; pl. 2, fig. 1) from Chopan, are sphaeroidal in outline, measuring 7-35 mm in diameter In all the specimens, a distinct thick central area is marked which has a number of small, closely adpressed globular structures representing the remanents of algal cells, or a large inner body (Pl 1, figs 4, 5). If it is so, then the forms in their gross organisation compare well with the large encystment structures of *Nucellosphaeridium* Timofeev 1965 obtained after digesting the rocks in acid. Another form—*Rohtasea* Singh & Chandra 1987, recently reported from the Rohtas Formation of Katni was claimed to be the remain of jelly fish. Similar looking forms have recently been collected from the Rohtas Formation of Baulia, Bihar (Pl. 1, fig. 7). The specimens show prominent concentric thickenings alongwith fine radial thickenings but no oral opening. Hence, their assignment to jelly fish is questionable; rather it converges to support for large encystment structures.

Tawuid remains—The forms are sausage-shaped, straight or bent with rounded extremities, surface with or without wrinkles (Pl. 1, figs 1, 2). This form in India is represented by *Tawuia dalaensis* Hofmann 1979 (Maithy & Shukla, 1984b; Maithy & Babu, 1988). The specimens of *T. dalaensis* did not show any structural details. Therefore, its biological affinity is enigmatic, though the consensus of opinion is that they might represent eucaryotic algae.

Sahni and Shrivastava (1954) and Sahni (1975) reported 'filament-like structure' associated with *Chuaria* from the Middle Proterozoic, belonging to Suket Shale Formation of Ramapura, Madhya Pradesh. These structures are sausage-shaped with rounded ends, smooth surface, measuring 5-14 mm in length and 2-5 mm in breadth. On re-examination of photographs it could be ascertained that the specimens are in no way different from that of *Tawuia dalaensis*. Similarly, Maithy (1984, pl. 1, fig. 5) reported a form from the Suket Shale Formation, Ramapura which is also identical to *Tawuia dalaensis*.

The association of *Chuaria* and *Tawuia* on the same rock has earlier been noted by Hofmann (1985a) from the Mid-Proterozoic of Little Dal, Canada, and were also recorded by Maithy and Babu (1988) from the Middle-Proterozoic of Rohtas Formation, Vindhyan Supergroup exposed at Chopan. On the basis of such *Chuaria-Tawuia* association, Hofmann (1985) speculated genetic relationship between *Chuaria* and *Tawuia* but till date it is not established.

Vendotaenid remains—Slender filamentous structures, generally unbranched, twisted or untwisted, smooth with striate or speckled pattern are assigned to this group. Beer (1919) reported linear, spiral impression with fine transverse partitions and rounded ends, from Rohtas Formation of Saridaner Village, Bihar. Mathur (1983) proposed a new generic name—*Spiroichnus* for the above mentioned forms and considered it to be a ichnofossil. Contrary to this, Hofmann (1985, p. 349) considered it to be slender algal filament and transferred it to *Grypania spiralis* Walter *et al.* 1976. Similar looking linear, elongate forms with fine transverse partitions were also described by Tandon and Kumar (1977, fig. 1) from the Rohtas Formation of Katni under a new name *Katnia* and considered it to be an annelid remain. Glaessner (1987) expressed doubts about the affinity of *Katnia*. He opined that they might be very large oscillatorean cyanobacteria. However, the other possibility is that they may be episodic remains of plankton-blooms or mass encystment structures or algal in nature. This view is supported by the findings of recent specimens from the Ghurma Shale, Kaimur, Upper Vindhyan of Chopan and Rohtas Limestone Formation of Murlipahar. The forms of Ghurma shales are either clustered or solitary, linear, measuring up to 50 mm in length and 2-4 mm in width with distinct transverse thickenings (Pl. 1, fig. 8). The other form from the Rohtas Formation of Murlipahar (Pl. 2, figs 1, 2) includes narrow, linear structures preserved compactly parallel to one another, measuring 30 mm in length and 3 mm in width, with rounded ends and fine transverse thickenings.

Krishnanid remains—The forms are oval to oblong in shape with single stipe or appendage. The genus *Krishnania* Sahni & Shrivastava 1954 was first reported from Suket Shale, Ramapura. In a recent collection, several specimens of *Krishnania* have been collected from the Rohtas Formation (Middle

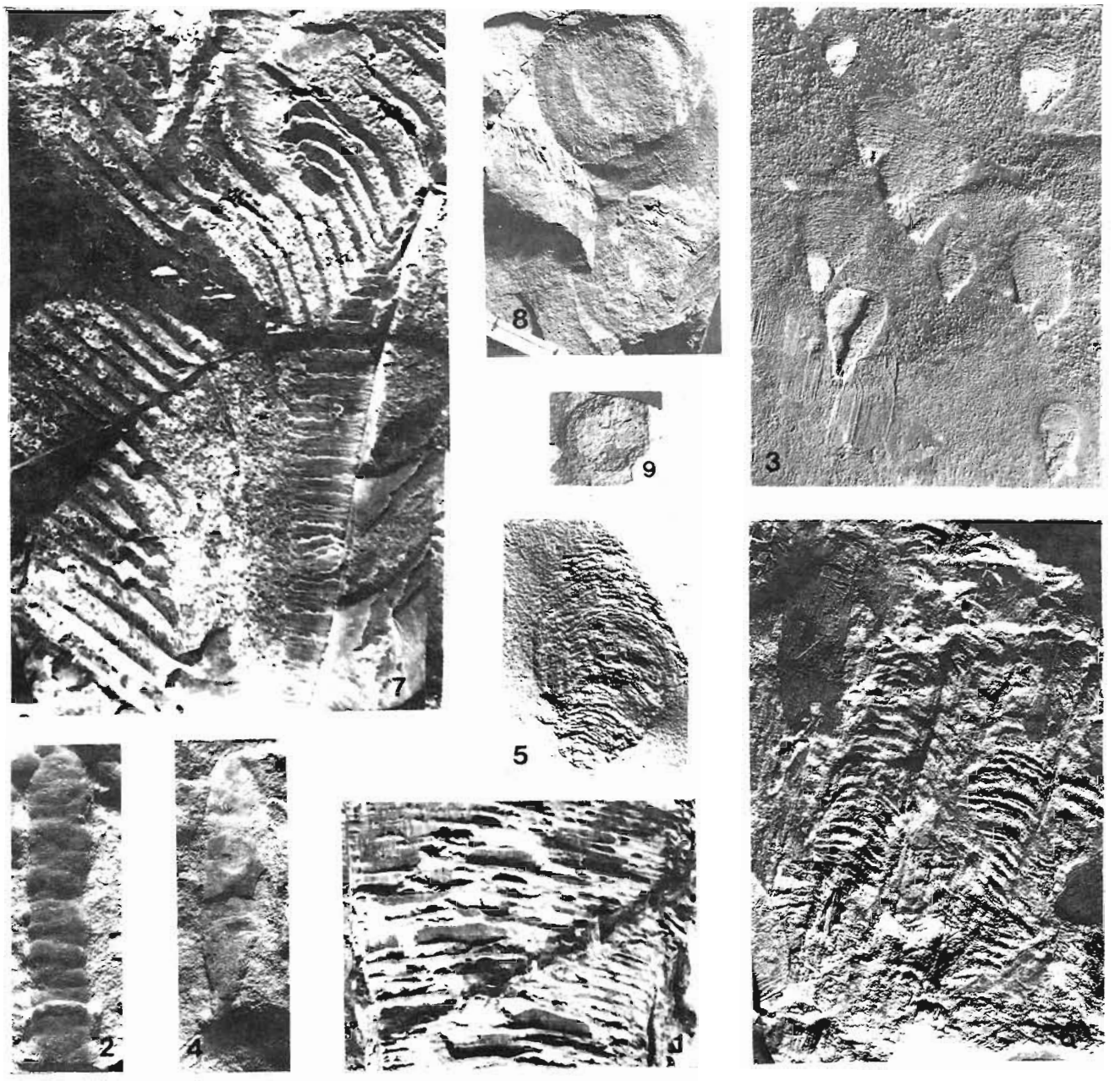


PLATE 2

1, 2 Vendotaenid forms (fig. 1 × 1, Specimen no. BSIP 35959, fig. 2 × 4, Specimen no. BSIP 35961)

3-5 Krishnanid forms (fig. 3 × 1, Specimen no. BSIP 36109, fig. 4 × 1, Specimen no. BSIP 35919 fig. 5 × 1, Specimen no. BSIP 36576)

6, 7 Frondoid forms (fig. 6, × 1 Specimen no. BSIP 36226, fig. 7 × 4)

8 *Cyclomedusa* Sprigg × 1 Specimen no. BSIP 10256

9 *Medusinites* Glaessner & Wade × 1 Specimen no. BSIP 10258

Proterozoic) which add new information. The body is distinctly divisible into two parts (Pl. 2, figs. 4, 5). The distal structure is foliate, circular-oval or elongate-oval, occasionally with a distinct border on the margin. Surface of the specimens may be smooth (Pl. 2, fig. 4) or with thickenings (Pl. 2, figs. 4, 5). Narrow stalk-like structures emerge out from the contracted point of the foliate structure. When the stalk gets detached, it leaves a rounded scar on the proximal end of the foliate part indicating the point

of attachment. The length of the stalk is variable, either shorter or longer than the body size. Sometimes, they are even ten times longer than the foliate part. Small rounded structures with raised borders are preserved alongwith body fossils on the rock denoting a holding-point of the stalk with the rock.

Du (1982) proposed a new generic name *Longfengsahnia* for the forms which appear to be similar to *Krishnania* from the Proterozoic of China; probably he overlooked the earlier record of similar form. The diagnosis of *Krishnania* given by Sahni and Shrivastava (1954, p. 40) agrees in all respects with that of *Longfengsahnia*. According to Sahni and Shrivastava (1954) the fossil is accuminately ovate in shape. Its longest axis measures 7.5 mm and has maximum width of 4 mm. It narrows somewhat abruptly at one end but evenly rounded at the other. A characteristic feature of the genus is a deep marginal furrow more prominent on one side and apparently continuous all around. The figured specimens of *Krishnania* have been redrawn here in proper orientation from the photograph given by Sahni and Shrivastava (Text-fig. 1A). It is established now that three specimens are preserved overlapping each other, the middle one has a short stalk-like structure. *Krishnania* resembles *Longfengsahnia ovalis* Du & Duan 1985 in all aspects.

A 'filament showing funnel-shaped end' described by Sahni and Shrivastava (1954, p. 39, fig. 2) is 1.85 cm long and 3 mm wide which widens appreciably (6 mm across) towards one end becoming nearly funnel-shaped. The specimen shows morphological characters similar to *Longfengsahnia longipetiolata* from the Proterozoic of China. From the above discussion, it is clear that the genus *Krishnania* and *Longfengsahnia* are identical; the former name has a priority over the latter.

Rode (1946) reported *Hyolithes rohitaswei* from the Rohtas Formation of Vindhyan near Banjari. This species is identical to *Krishnania acuminata* Sahni & Shrivastava 1954. Similarly, the genera *Vindhyavasinia* Tandon & Kumar 1977 and *Vindhyania* Mathur 1982, both from the Rohtas Formation of Vindhyan, are morphologically similar to *Krishnania*. *Vindhyavasinia* was assigned to class 'Insecta' by Tandon and Kumar (1977). From a critical examination of the photograph of *Vindhyavasinia* (Tandon & Kumar, 1977; figs 2, 3) it can be concluded that it is in no way different from *Krishnania*. The figured specimen has five overlapping forms as redrawn here in Text-figure IB.

While proposing *Vindhyania*, Mathur (1982) did not provide any description except for a photograph; therefore, the proposition is invalid. However, from the photograph it can be marked that in its morphology the specimen is similar to *Krishnania (Longfengsahnia) longipetiolata* Du & Tian 1985 emended herein. Thus, *Vindhyavasinia* Tandon & Kumar, *Longfengsahnia* Du and *Vindhyania* Mathur are the junior synonyms of *Krishnania* Sahni & Shrivastava 1954.

Sahni and Shrivastava (1954) opined that *Krishnania* in its general outline resembles *Lingula*. But they considered this similarity to be a superficial one. Further, they opined that the 'Filaments showing funnel-shaped end' found associated with *Krishnania* were the remanant of plants, possibly algae. This has been supported by the recent collection in which all specimens are preserved in unidirectional position alongwith the attachment point of stalk. *Krishnania* also resembles Devonian algae *Drydenia* reported from the marine sediment of New York by Fry and Banks (1955). *Drydenia* has elliptical laminae (8.5 cm long) attached to a narrow stipe and terminating to a branching holdfast. *Krishnania* differs only in being smaller in size. *Drydenia* has been described by Taylor (1981) under Rhodophyta whereas Stewart (1981) considered it to be a member of Phaeophyta. *Krishnania* has been considered by Du and Tian (1985) to be algal in nature, either belonging to Phaeophyta or Chlorophyta. According to them, the apical foliate-part was used for photosynthesis and the basal part, the parastem, for the support attached to rhizome. Because of its clustered appearance Hofmann (1985) opined that it could be a colony of complex organisms, possibly algae of phaeophytic or rhodophytic affinity. Recent collections from Vindhyan support the view putforth by Hofmann (1985) that they were photosynthetic carbonaceous organisms possibly belonging to Phaeophyta or Rhodophyta. They were probably growing in a shallow, shelf-like marine setting and were attached to the soil by narrow stalk-like endings. Concomitant with the attainment of this level of organisation, i.e., the development of holdfasts, the anchoring devices that enabled the organisms to resist the wave action made them suitable to remain in favourable habitat. Further, the bilateral symmetry for standing upright from the ground was advantageous for absorbing the sunlight and gaseous exchange in open atmosphere. This organisation is more advance than the free-floating ones where the absorption of sunlight is only on one exposed surface. The organisms have also developed well-oriented anterior and posterior sides.

Frondoid remains—From the beds of Rohtas

Formation (Middle Proterozoic) several specimens have been recorded with a median stalk and alternately attached, finely segmented lateral structures (Pl. 2, figs 6, 7; Text-fig. 2) These structures, however, in their overall morphology are similar to the Petalonamid form—*Pteridinium* Gürich 1930 recorded from Vendian. However, in these forms the presence of characteristic structure of Petalonameae, i.e., autozoids and scyphozoids are not marked. Therefore, their coelenterate nature remains doubtful. The possibility of their being algae seems to be more justifiable. The forms show resemblance to the members of Rhodophyceae, viz., Rhodomelaceae, Ceramiaceae and Chlorophyceae—(*Caulerpa*).

EDIACARAN MEGAFOSSILS (± 600 Ma)

A distinct, soft-bodied, marine metazoan fauna—the Ediacaran fauna, exists below the Tommotian Stage and above the Infra-Cambrian glaciation in many parts of the world, viz., Australia, South Africa, Brazil, China, Russia, Sweden, United Kingdom and Canada. This fauna is characterised by the absence of shelly fossils of the Cambrian, and is represented by coelenterates, annelids and arthropods. Uptill now, the Ediacaran fauna was not known from India. During a recent field work, Ediacaran remains have been found for the first time in India from the Dholpur Shales, Bhander Group representing the youngest bed of the Vindhyan. The recorded forms are *Ediacaria flindersi* Sprigg 1947, *Cyclomedusa davidi* Sprigg 1947 (Pl. 2, fig. 8), *Medusinites* Glaessner & Wade 1966 (Pl 2, fig. 9) and *Dickinsonia elongata* Glaessner & Wade 1966. The assemblage has forms belonging to medusoids and bottom-dweller annelids.

MICROBIOTA

Maithy *et al.* (1983, pl. 1, fig. 18; pl. 2, fig. 25) reported '?fungal body' as large bulbous structures attenuated to a particular point which is further drawn to a aseptate filamentous structure. These organic-walled structures because of their marked asymmetry and pliant walls resemble germinating zoospores of filamentous protists. Modern analogous to this are known among Xanthophycean algae *Protosiphon* Klebs 1896 or *Vaucheria* Heidiniger 1908.

The thick-walled vasiform microfossils (Melanocyrillids) ranging in size from 30-200 μm are known from Vindhyan Supergroup (Salujha *et al.*, 1971a, 1971b; Maithy & Babu, 1989), Kurnools (Salujha *et al.*, 1972) and Satpuli (Nautiyal, 1982). Although, vase-shaped microfossils are considered as encystment stages of algae (Bloesser, 1985), they resemble Tintinnids and Chitinozoans, therefore, possibly they are protozoans and early protistan heterotrophs.

CONCLUSION

From the analysis of the known biological records from Proterozoic successions of India, it is evident that well-known metazoan forms are recorded towards the close of Late Proterozoic. The claim for the finds of metazoan during 800-1,000 Ma is doubtful. In all probability, the ?Coelenterates (jelly fishes) are large carbonaceous discs with an inner body. However, the fossil record indicates that the biological remains had attained different morphological configuration as well as habitat. Both planktonic and benthic forms are known In benthic forms, epibiont habitat has been exhibited in 'Krishnanid forms' and flat floating habitat prevailed in 'Frondoid forms'. The planktonic remains are radial in symmetry while the benthic ones show bilateral symmetry. The benthic metaphytes would have occurred in shallow shelf-like, presumably marine, setting. The development of hold-fast, an anchoring device, enabled metaphytes to resist dislodgement by wave action, and the group remained in favourable habitat. It can be concluded from the known data that the seas before the Precambrian glaciation were well-populated by diverse assemblages of relatively advanced metaphytes which were well-adapted to the agitated shallow-water environment. This environment was favourable and thus helped the evolution of metazoan during Late Proterozoic times.

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