



# A new Bryophytic sporogonium *Marchanatiites intertrappea* gen. et sp. nov from the Deccan Intertrappean beds of Singhpur, Madhya Pradesh

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**Abstract:** - In this article, is a Study of well-preserved bryophytic sporogonium collected from Deccan Intertrappean beds of Singhpur, Madhya Pradesh, India. The sporogonium shows very well preserved and bears foot, seta, and capsule measures about **13.30 mm** in length and **10.50 mm** in width, and has a complete diameter is **10.90 mm**. Foot and seta are not very distinct. The foot is single-layered and measures **20 µm**. Seta is very short and measures **2 mm** in length. The capsule is ovoid in shape and measures about **10.50 mm** in diameter, **12.20 mm** in length, and **8.50 mm** in width. Inside the capsule, spores are also seen and measure about **1.32 mm** in diameter. The capsule is devoid of operculum and annulus. No columella is observed in the capsule.

**Key-words:** Bryophytic sporogonium, well preserved, *Marchanatiites*.

## 1. INTRODUCTION:

The Deccan Intertrappean flora is one of the oldest fossil floras. The Bryophytic remains are of rare occurrence in Indian beds due to their fragile nature. Present fossil specimen which deals with the internal structure of a new fossil Bryophytic Sporogonium from a very famous locality of Singhpur, M.P. India. Many Bryophytic Sporogonium & Capsules have been reported from different fossiliferous localities of Central India. The earlier report of *Notothylas-like* sporogonium was made by Gupta (1956) from the Deccan Intertrappean Series. Singhai (1963) reported another Sporogonium under the name *Shuklanites deccanii* showing affinities with Anthocerotales and Marchantiales. Before this investigation, **Jarzen D.M.** (1979) investigated the spore morphology of some *Anthocerotaceae* and the occurrence of *phaceocera* spores in the cretaceous of North America. Bryophytic remains from the Early Permian sediments of India. It is for the first time a good assemblage of bryophytes has been recovered from the Early Permian sediments of India as impressions along with the typical Glossopleris. Both the groups Hepaticae and Musci are represented by newly designated form genera and species, **Chandra S 1995. A Synthesis of hornwort diversity: Patterns, causes and future work** **Juan Carlos Villarreal1, D. Christine Cargill, Anders Hagborg, Lars Söderström & Karen Sue Renzaglia (2010).** After this many Bryophytic Sporogonium have been investigated like *Notothylites nirulaii* (Chitale & Yawale, 1980), *Nagpurites jungermanii* & *Andreaites ramanujami* (Kapgate, 1986), *Mohgaonites indica* (Karanjekar, 1985), *Nagpurites chitaleyi* (Chawhan, 1986), Bryophytic Sporogonium *Riccia chitaleyi* (Sheikh & Kapgate, 1982) and *Riccia eocenium* (Chudiwale, 1990), *Andreosporogonites deccanii* (Kapgate, 2005), *Targioniaites heartii* (Narkhede and Qureshi, 2005). *Pelliaites deccanii* (Narkhede and Bhowal, 2009) and Present bryophytic sporogonium is another new addition to the knowledge of bryophytic sporogonium.

## 2. MATERIAL AND METHOD:

A petrified Bryophytic Sporogonium which is described in this chapter was collected from a fossiliferous locality of Singhpur M.P. India. The collected fossil specimen was preserved in a piece of chert, which is broken into parts and counterparts and exposed in a longitudinal plane. The anatomical details were studied by etching the chert with hydrofluoric acid. The important stages of the sporogonium were photographed and camera Lucida sketches were also drawn.



### 3. DESCRIPTION:

After breaking the chert it is exposed in a longitudinal plane. The sporogonium shows very well preserved and bears foot, seta, and capsule (Text Figs., 1,2; Plate Figs.1, 2) and measures about **13.30 mm** in length and **10.50 mm** in width, and a complete diameter is **10.90 mm**. Foot and seta are not very distinct. The foot is single-layered and measures **20 µm**. Seta is very short and measures **2 mm** in length. The capsule is ovoid (Text Figs.,1, 2, 3, and 4; Plate, Figs.1, 2) in shape and measures about **10.50 mm** in diameter, **12.20 mm** in length, and **8.50 mm** in width. Inside the capsule, spores are also seen and measure about **1.32 mm** in diameter (Text Figs. 1, 2, 3, and 4; Plate, Figs.1, 2). The capsule is devoid of operculum and annulus. No columella is observed in the capsule. Anatomical details of the sporogonium are studied under the following heads.

**Foot:** The foot is present at the base of the seta and cannot be differentiated from the seta. The foot is a mass of parenchymatous cells and appears conical in shape. The foot wall is single-layered (Text Figs.3 and 4; Plate Figs., 4). The foot measures **20 µm** in length.

**Seta:** Seta is a very short stalk connecting the foot and capsule (Text Figs. 2, 3; Plate, Figs.1, 2, 5). It measures about **2 mm** in length. Seta has very ill preservation of parenchymatous cells. The cells of this region are more or less round. It measures about **0.29 mm** in diameter

**Capsule:** The capsule is ovoid in shape and measures about **12.20 mm** in length, **8.50 mm** in breadth, and the complete structure of the capsule measures about **10.50 mm** in diameter. The capsule has a single-layered wall. Inside the capsule, there appear masses of sterile sporogenous tissue as well as fertile spores (Text Figs. 1, 2, 3, and 4; Plate, Figs.4, 6). The spores are spherical and are very few. The capsule is devoid of operculum and annulus. No columella is observed in the present specimen. The wall of the capsule measures **µm** in thickness.

**Spores:** Spores are ovoid and round with smooth and simple walls without a triradiate mark. Some are irregular in shape which might represent pseudo elaters. Each spore is round in shape and measures about **0.95 to 1.32 mm** in diameter. The spore possesses a two-layered wall. The outer is thick and smooth without any ornamentation. The inner wall is thin and smooth. There are no elaters found. The spores are associated with rounded sterile cells that might be functioning as a nutritive element (Text Figs. 1, 2, 3, and 4; Plate Figs.1, 2, 4, 6).

**4. IDENTIFICATION:** From the above-mentioned description the important characters used for identification are.....

1. Sporogonium is more or less an ovoid.
2. The sporogonium is differentiated into foot, seta, and capsule
3. Capsule wall is single layered
4. Foot is very small indistinct, seta-short stalked; capsule oval in Shape.
5. Few fertile spores are present inside the capsule
6. Sterile sporogenous tissue present along with spores (Pseudo-elaters)
7. Absence of columella
8. Absence of calyptra
9. Absence of Operculum and Annulus.

From the above, it is clear that it is bryophytic sporogonium. The present specimen possesses a foot, seta, and capsule. It lacks a basal apophysis region and terminal operculum region. No columella, wall single layered absence of stomata on the capsule wall. Due to its simple organization, it restricts us to place the present specimen under Hepaticopsida (Campbell, 1936). The Hepaticopsida into four orders i.e. Marchantiales, Sphaerocaraples, and Calobryales Jungermanniales. So it is compared with the different orders of Hepaticopsida distinctive character of the following important orders. **A) Marchantiales** shows sporogonium variation, it may consist of capsule only or may be differentiated into foot, seta & capsule. The capsule wall is unistratose. The sporogenous tissue becomes differentiated into two types of cells, spores, and sterile cells. Stomata or any gap is absent. **B) Sphaerocaraples** shows similarity in having spherical capsules with a single-layered wall without fibrous bands but differs in having spore tetrad, which remains united permanently in tetrads. **C) Calobryales** possess distinct foot, seta, and capsule. The wall of the capsule



consists of a single layer of cubical cells. The capsule in the *calobryales* is oblong and usually open by two or three valves. It differs from the present specimen in possessing spores that possess numerous, short blunt papillae. *DJ Jungermanniales* differs from the present specimen in having an 8 to 9 cells thick wall, the sporogonium is surrounded by calyptra and shows the presence of monospiral flattened elaters. An attempt has been made for further comparison of the present specimen with different genera of different families of Marchantiales. *Riccia* differs entirely from the present specimen in having a spore surface usually marked by a triradiate ridge and equatorial rim. In the same species of *Riccia*, a pore usually occurs at the junction of the equatorial arm with the arm of the triradiate ridge. In the case of *Marchantia*, the capsule has both foot and seta but it is characterized by calyptra, perigynium, and perichaetium the three protective layers, *Targionia* shows lots of resemblances in having foot, seta, and oval capsule, columella absent, though capsule wall is single-layered, it possesses ring like thickening. The present fossil sporogonium under consideration compared with other fossil Bryophytic sporogonia investigated from the intertrappean series of central India.

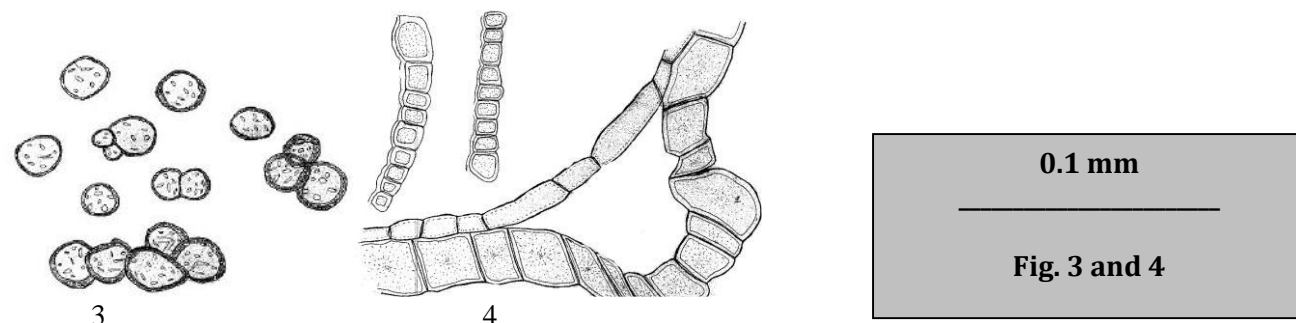
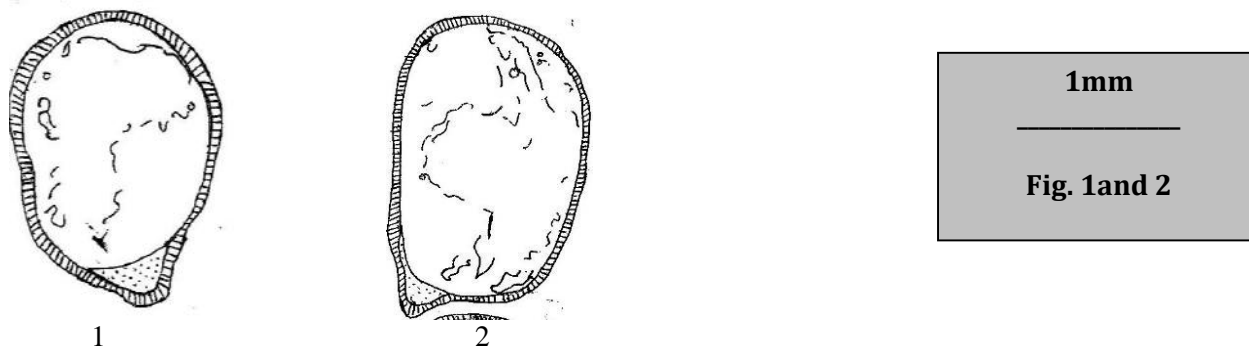
*Shuklanites deccanii* (Singhai, 1964) differs in having pear-shaped sporogonium without foot and seta. Another petrified sporogonium *Notothylites nirulai* (Chitale & Yawale, 1980) bears a massive capsule wall of 8-15 cells in thickness and with stomatal gaps. Sporogenous mass enclosed by the capsule consists of very few spores but a large no. of elaters. Another Bryophytic Capsule *Bharadwajia mohgaense* (Yawale, 1975) differs from the present specimen in having seven chambered sporogonium with spirally twisted bracts. *Andreaites ramanujami* (Kapgate, 1981) is different from a present specimen in having a multilayered capsule with air spaces, central club-like Columella, and dome shaped spore sac surrounding the columella. Another Bryophytic capsule *Nagpurites jungermanii* (Sheikh and Kapgate, 1986) differs by the presence of a multilayered wall of the capsule, and sterile sporogenous tissue. Seta is moderately long **12 mm** in length. *Mohgaonites indica* (Karanjekar, 1982) shows a multilayered capsule wall, sporogonium surrounded by involucre. Another Bryophytic capsule *Nagpurites chitaleyi* (Chawhan, 1987) shows some similar characteristics, like smooth walled spores without a triradiate mark. Capsule without columella, operculum, and annulus. But capsule wall is multilayered with massive elongated columnar cells. So it is different from the present fossil specimen. Again Bryophytic sporogonium *Pelliaites deccanii* (Narkhede and Bhowal, 2009) is erect, distinguished into foot seta and capsule, Calyptra surrounded by involucre, foot squarish, moderately long seta, round capsule with spore and elaters like cells. The Wall of the sporogonium is multilayered. By this character present fossil specimen is different from this present fossil specimen. Long elaters, spores with triradiate mark, calyptra multilayered of the brick shaped cell, which is not seen in the present specimen. *Andreosporogonites deccanii* (Kapgate, 2005) differs from the present sporogonium in having a multilayered capsule wall, foot with pseudopodium forming vaginula, and perichaetial leaf. This sporogonium is completely different from the present fossil specimen. Another fossil specimen *Targioniaites heartii* (Narkhede and Qureshi, 2005) shows heart shaped sporogonium is differentiated into foot seta and capsule. Foot & seta -short-stalked but it is heart-shaped.

From the above, it can be said that the fossil sporogonium resembles Marchantiales only. Further comparison to the generic level will be possible only if one gets the specimen with a well-preserved gametophyte. Thus based on the given character the fossil sporogonium may be the extinct genera of *Marchantiales*, hence named *Marchanatiaites intertrappea gen. et sp. nov.* The generic name is after the order Marchantiales and the specific name is after the locality from where it is collected.

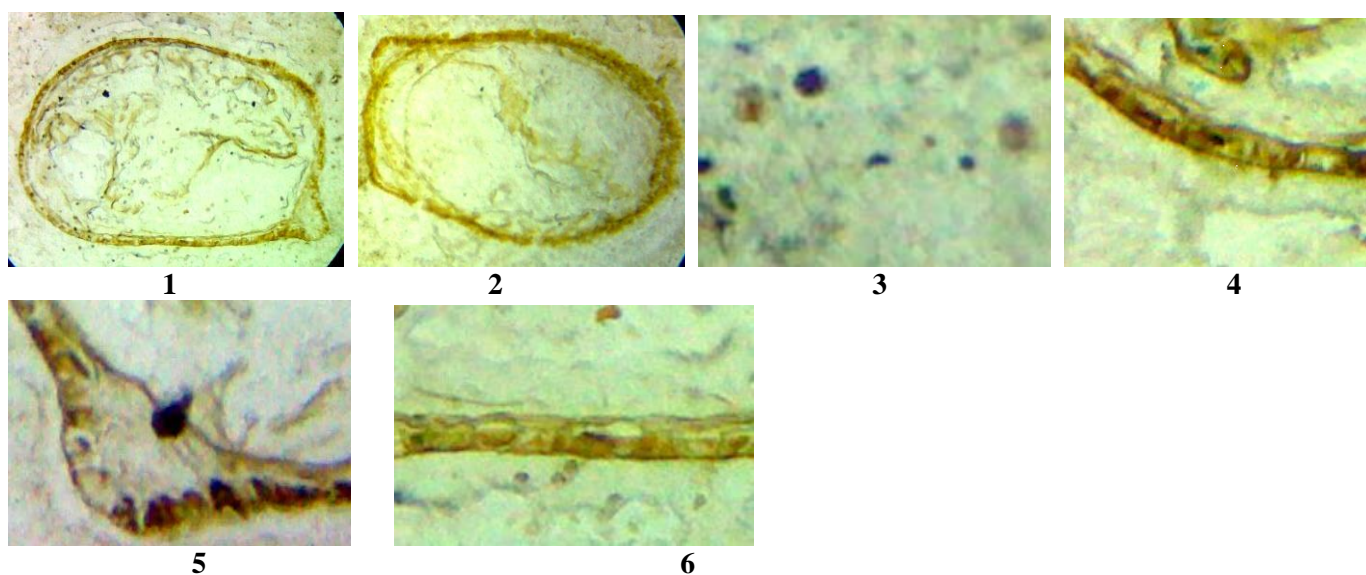
## 5. DIAGNOSIS:

Bryophytic sporogonium is more or less ovoid differentiated into foot, seta, and capsule. Capsule wall single layered. Absence of apophysis, operculum, and calyptra. Spores and sporogenous tissue in the capsule. *Marchanatiaites intertrappea gen. et sp. nov.* sporogonium is more or less ovoid; **2 mm** in length. Sporogonium differentiates into the foot, seta, and capsule. The foot is long and broad. Seta short long and broad. Capsule ovoid **12.20 mm** long and **8.80 mm** broad. Capsular wall thick, single-layered. Spores small spherical **0.95 mm** to **1.32 mm**, wall smooth without any ornamentation and triradiate mark, elaters absent. Pseudo elaters present.

Explanation of Text Figs. 1 and 2: show the complete structure of sporogonium bearing foot, seta, capsule, and spores in the serial section of the part, counterpart, and 3 and 4 show the opening of sporangia.



Explanation of Plate I, Figs. 1 to 6: showing part of the material with the foot, seta, and capsule, showing counterpart of material with the foot, seta, and capsule, showing spore. showing pseudocraters and capsule wall, showing foot and capsule, showing capsule wall with cellular details.



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