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## ***Pterula bambusicola* sp. nov.: A clavarioid bambusicolous macro-fungal species from North Eastern region of India**

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### **ABSTRACT**

A clavarioid bambusicolous fungus *Pterula bambusicola* sp. nov. from North Eastern region of India is described, illustrated and discussed with closely allied species. This fungal species is a new species characterized by the white basidiomes, polychotomously unbranched, dichotomously white to milky white at the apex with acute apices and having cylindrical, smooth basidiospores and hyphoid to dextrinoid cylindrical cystidia with short mucornulate apex.

**Key words:** *Basidiomes*, clavarioid fungi, fungal diversity, macrofungi, taxonomy.

### **INTRODUCTION**

The Pterulaceae is a fungal family in the order Agaricales under Basidiomycota. The history of Pterulaceae begins with the diffident proposal of the genus *Pterula* in the early 19th century by Fries (1830). According to an estimate during 2008, the family contained 99 species previously distributed among 12 genera (Kirk et al. 2008a, b). Members of this family have resupinate to coralliform basidiocarps, monomictic to dimictic hyphal structure, pleural basidia in some genera and globose, fusiform, hyaline, thin to slightly thick walled, smooth, indextrinoid, acyanophilous basidiospores (Donk 1964). The typification of this genus was described by Lloyd (1919). Lloyd (1919) had written a chapter to discuss the taxonomy of the genus. However, the major contribution to the genus was made by E. J. H. Corner who added at least 45 new taxa (Corner 1950). In India, Thind (1961) made significant contribution to the study of Indian clavarioid fungi by compiling a monograph entitled "The Clavariaceae of India". The species included were collected mostly in the

Himalayas, with a few exceptions in West Bengal, India. However, only two species have been described from India: *Pterula decumbens* Corner, Thind & Dev (Corner et al. 1957) and *Pterula penicillata* Lloyd (Thind 1961). Thind (1961) stated that the identity of *Pterulla penicillata* collected by P.L. Day is uncertain and no description was provided by him. The diversity of clavarioid fungi from the Western Ghats of southern India is also poorly worked out. Only, Senthilarasu (2013) collected two species of clavarioid fungi e.g. *Pterula indica* sp. nov. and *P. verticillata* from Pune, Maharashtra, India which were described, illustrated and discussed with closely allied species.

The ecological roles of Pterulaceae are unstated. Most of the members are being classified as saprotrophs, which grow on wood or leaf litter. While many species are found inhabiting soil or litter. Two species are reported to be associated with living plants, namely *Pterula* cf. *tenuissima*, endophytic in asymptomatic leaves of *Magnolia grandiflora*, and *Pterulicium xylogenum*, causal agent of culm rot disease of bamboo (Munkacsı et al. 2004; Villesen et

al. 2004; Harsh et al. 2005). There are some members that play an important role in carbon cycle (Floudas et al. 2012), and some are used in biomedical engineering and biodegradation (Lang et al. 2006; Floudas et al. 2015). Recently, Pterulaceae has attracted attention as a result of two distinct symbionts of fungus-farming ants in the genus, *Apterostigma*. (Matheny et al. 2006; Hibbett 2007; Binder et al. 2010; Leal-Dutra 2015; Leal-Dutra et al. 2018, 2020).

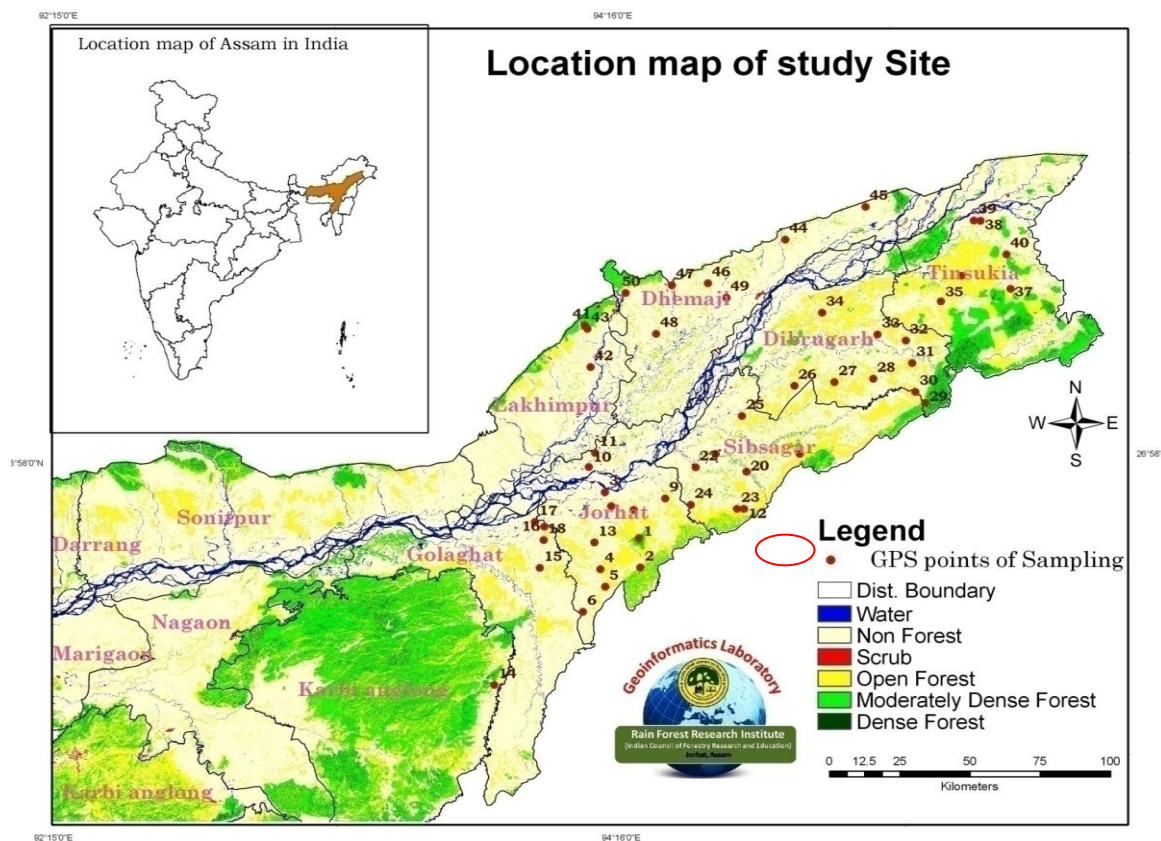
As per literature review, there are no reports on the natural distribution of clavarioid fungi from the North Eastern region of India. Hence, this paper illustrates the new bambusicolous fungal species and natural distribution of *Pterula bambusicola* sp. nov. V. Park. which is found on standing and decaying culms of bamboo species (*Bambusa bambos*) in Geleky Reserve Forest, Sibsagar, Assam, India.

**MATERIAL AND METHODS**

**Collection of fungal samples and observations**

Collection of the fungal specimens was done during one of the surveys under the project no. RFRI/2015-16/SFM-1 funded by Indian Council Forestry Research & Education, Dehradun, Uttarakhand, India from April, 2015 to September, 2017 from upper

Assam, India (Fig. 1). The specimens were photographed with SONY DSC-H9 camera in their habitat during the survey period. various identifying characters viz. Shape, colour, odour, texture, substratum, size of the whole fruit body were noted in the field. The macro-morphological features were studied under the stereo-trinocular microscope in the laboratory. Micro-morphological features were studied from the collected samples mounted on the slides in the DPX fixative (a mixture of distyrene (a polystyrene), a plasticizer (tricresyl phosphate) and xylene). Spore dimensions were calculated under BIOXL (Labovision trinocular microscope) and the basidiospores were microphotographed as per standardized method (Gogoi & Parkash 2015). Colour codes and terms for basidiomata and hyphae were used and followed as per Kornerup & Wanscher (1978). The minimum and maximum values for length and width were measured with mean/average values among the twenty basidiospores to calculate the quotient(length – width ratio) ( $Q = L/W$ ) (Das & Zhao 2013). The specimens were assigned accession numbers and deposited and preserved at the Mycology laboratory of Rain Forest Research Institute, Jorhat, Assam.



**Fig. 1.** Collection site at Geleky Reserve Forest, Sibsagar, Assam, India.

## RESULTS

### Taxonomic treatment

*Pterula bambusicola* sp. nov. V. Parkash  
(RFRI/BF/46), (RFRI/BF/86) (RFRI/BF/101),

Figs. 2 A-I and Fig. 3 A-F.

Mycobank no.: MB 833227

**Type:** India: The Holotypes were collected from Geleky Reserve Forest, Sibsagar (Sib.-23), (Lat. 26°47'40.66"N), (long. 94°41'35.71"E), Assam, India. The fungus is growing on decayed bamboo material, collected during October, 2015, May, 2016, RFRI/BF/46 (Holotype), RFRI/BF/86, and 101 (Paratypes), BF/Ptrl/46 and 86 (ex Holotypes) (Fig. 2&3).

**Etymology:** The species of fungus is named after the word *Bambusicolus*; *i.e.* bamboo loving- growing on bamboos.

**Description:** The clavarioid fungus having white to buff white (2.5Y 8/2) basidiomata, branched polychotomous (broom/frond like) apex (white coloured) and jellylike stipe are mostly present on nodal parts of the bamboo culm. This fungal species was observed on *Bambusa bambos* and collected from Geleky Reserve Forest, Sibsagar, Assam. *Pterula bambusicola* sp. nov. has pteruloid/ basidiome borne by slender mycelial cords, as curved intercalary swirl of mycelium with interspersed dextrinoid cystidia (18–20 × 4–5 μm), hyphoid to cylindrical with short mucronate apex, hyaline, thin-walled and hyphal system is dimitic, papillate skeletal hyphae in basidiomes. Spores are 5–7 × 3–4 μm, cylindrical, hyaline, smooth, thin-walled and guttulate in nature. The mean quotient value amongst the measured spores was found to be 1.66, and 1.75 respectively.



**Fig. 2:** Sexual morph of *Pterula bambusicola* sp. nov. (A- Holotype RFRI/BF/46; B-D Paratypes- RFRI/BF/86 and 101 Basidiomata; E-Basidiomes; Microscopic characteristics of *Pterula bambusicola* ex-holotype cultures ( F-I Fungal colonies on PDA medium producing slender and skinny mycelia with hyphal branching and bearing sporulating bodies ) (A-I Bar = 1cm).

## DISCUSSION

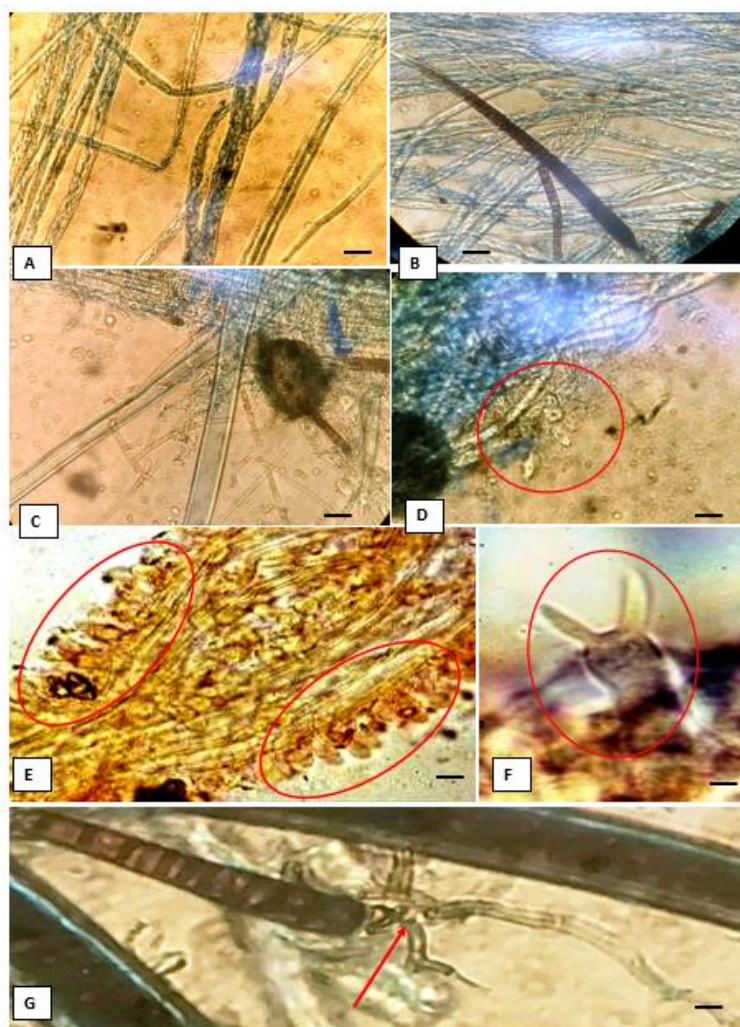
The Pterulaceae's type genus, *Pterula* has grown to be one of the most populous among clavarioid fungi with

the vast majority of them found in the tropics (Corner 1970; Kirk et al. 2008b). In India, only few species of this genus have been described. All of the species which have been described grow primarily on soil or



substratum and are attached to it by numerous rhizoidal branches. But *Pterula bambusicola* sp. nov. was found growing on host plant e.g. *Bambusa bambos* in Assam, North Eastern region of India. The *Pterula* species are very similar to one another but also have distinct differences based on basidiomes. *Pterula verticillata* is very similar to *Pterula decumbens* (Corner et al. 1957), which was described from India. However, *P. decumbens* distinguishes itself from *P. verticillata* by having decumbent, brown basidiomes and being composed of a main axis that

gives off lateral branches. *P. verticillata* on the other hand, has erect, pale orange to peach basidiomata and the main axis produces verticillate to irregular, shiny and luscious branches (Senthilarasu 2013). Similarly, *Pterula indica* is easily recognized by the reddish - brown to dark- brown basidiomes which are branched polychotomously at the bottom and dichotomously at the apex. Whereas, *Pterula gracilis* (Desm. & Berk.) Corner (Corner 1950) has basidiomes which are white, shiny, translucent, slightly hairy, simple and un-branched.



**Fig. 3:** Microscopic characteristics of the sexual morph of *Pterula bambusicola* holotype (A skeletal mycelium network in basidiomes; B Setae like septate dextrinoid cystidium; C Long aseptate lanceolate cystidium ; D-E basidium in rows on intercalary position on basidiomes (red circle); F single basidium bearing long strigatae (red circles); G papillate skeletal hyphae (red arrow)(A-G Bar =5  $\mu$ m).

In this study, *Pterula bambusicola* sp. nov. was found to be a new report of clavarioid fungus having white to buff white basidiomata with broom like branches at the apex (white coloured) and jelly like stipe with dextrinoid cystidia, dimitic and papillate skeletal hyphal system with cylindrical, hyaline, smooth, thin-walled and guttulate spores. The dimitic hyphal system of *Pterula* species is distinguished by unbranched, hyaline to pale

yellowish-brown skeletal hyphae. This bambusicolous macro-fungal species is described in this study solely on the basis of morphological and physiological characteristics. Further, molecular studies on characterization will be required for more specification which will help in establishing phylogenetic relationships with among other Pterulaceae members.

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