DIVERSITY OF WOOD ROTTING FUNGI IN PROTECTED FOREST AREAS OF MIZORAM

By

Josiah MC Vabeikhokhei

Department of Environmental Science

Supervisor: Dr. John Zothanzama

Submitted

In partial fulfilment of the requirements for the Degree of Doctor of Philosophy in Environmental Science of Mizoram University, Aizawl, Mizoram

MIZORAM UNIVERSITY

Department of Environmental Science

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DECLARATION

I, Mr. Josiah MC Vabeikhokhei, hereby declare that the subject matter of this thesis entitled**"Diversity of Wood Rotting Fungi in Protected Forest Areas of Mizoram"** is the original record of the work done by me, that the contents of this thesis did not form basis of award of any previous degree to me or to the best of my knowledge, to anybody else and that the thesis has not been submitted by me for any research degree to any other University or Institute.

This is being submitted to the Mizoram University for the award of the Degree of Doctor of Philosophy in the Department of Environmental Science.

(JOSIAH MC VABEIKHOKHEI)

Candidate

(Dr. JOHN ZOTHANZAMA)

Supervisor

(Prof. B.P. MISHRA)

Head

Dr. John Zothanzama
Associate Professor

MIZORAM UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL SCIENCES
Mizoram University, Aizawl -796004
Email: john_zza@yahoo.co.in

CERTIFICATE

This is to certify that Mr. Josiah MC Vabeikhokhei has submitted the Ph.D Thesis entitled "**Diversity of Wood Rotting Fungi in protected forest areas of Mizoram**" under my supervision, for the requirement of the award of the Degree of Doctor of Philosophy in the Department of Environmental Science, Mizoram University, Aizawl. The work is authentic, the content of the thesis is the original work of the Research Scholar and the nature and presentation of the work are the first of its kind in Mizoram. It is further certified that no portion(s) or parts of the content of the thesis has been submitted for any degree in Mizoram University or any other University or Institute. He is allowed to submit the thesis for examination and for the award of the Doctor of Philosophy in Environmental Science.

22/10/2020

(Dr. JOHN ZOTHANZAMA)
Supervisor
Department of Environmental Science
Mizoram University

(Dr. JOHN ZOTHANZAMA)
Associate Professor
Department of Environmental Science
Mizoram University, Aizawl

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TABLE OF CONTENTS

LIST OF FIGURES

Figures **Page No.**

LIST OF TABLES

CHAPTER – 1

GENERAL INTRODUCTION

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1. INTRODUCTION

Fungi are achlorophyllus, heterotrophic (saprophytic, parasitic, symbiotic or hyper-parasitic), eukaryotic and spore-bearing organisms surrounded by a well-defined cell wall made up of chitin, with or without fungal cellulose, along with many other complex organic molecules. Fungi usually obtain food by absorption, except a few lower groups where the take in food by ingestion (Sharma, 2006). Fungi hold key roles in nutrient dynamics, soil health, species mutualisms and interactions, and over all ecosystem processes (Angelini *et al*., 2006, Pagiotti *et al*., 2011, Picco *et al*. 2011, Perotto *et al*,. 2013). Fungi are an important part of ecosystem cycles, without which the food web would be incomplete. Though some elements, like nitrogen and phosphorus, are required in large quantities by biological systems, they are not abundant in the environment. The action of fungi releases these elements from decaying matter, making them available to other living organisms. Some bracket fungi growing on tree trunks are the fruiting structures of basidiomycetes. They receive their nutrients through their hyphae, which invade and decay the tree trunks. Some fungi grow on trees in a stack, called Shelf fungi which attack and digest the trunk or branches of a tree (Donk, 1962; Burdsall, 1985; Gilbertson & Ryvarden, 1987; Hjortstam & Ryvarden, 1990; Ryvarden & Gilbertson, 1994).

The fungal kingdom is mega-diverse, with a range of vital ecological roles and a high degree of interdependency with other organisms. Fungi are classified as a separate kingdom of the natural world, distinguished by the production of spores, heterotrophic (non-photosynthetic) nutrition and the presence of chitin in cell walls. A few organisms traditionally included in Fungi belong in other kingdoms—slime moulds in Protozoa and Oomycetes (e.g. *Phytophthora*) in Chromista. The main phyla of true Fungi are

Ascomycota, Basidiomycota, Chytridiomycota and Glomeromycota. Lichenised fungi (lichens) occur mainly within the Ascomycota; they form a symbiotic relationship with a photosynthetic photobiont (cyanobacteria or green algae). The terms 'macrofungi' and 'microfungi' are used for convenience to distinguish fungi with readily visible fruit-bodies from those without. Familiar examples of macrofungi include agarics (mushrooms), puffballs, coral fungi, bracket fungi and cup fungi. Microfungi include mildews, moulds and rust and smut fungi. Microfungi are often only visible in the field when their hosts develop symptoms such as wounds, lesions, leaf spots and cankers (Fisher *et al*., 1994). The term macrofungi (mushrooms) or macromycetes has been variously defined by several authors. All the definitions lay emphasis on the production of fruiting bodies that are visible to the unaided eye (Da Silva, 2005; Lodge *et al.*, 2004; Redhead, 1997; Seen-Irlet *et al.*, 2007). According to Da Silva, (2005), mushrooms are fleshy conspicuous fungi that have provided food for millennia and are in many cases associated with potentates and royalty because of their pleasant taste and flavour.

Fungi most associated with wood decay are the filamentous species of Basidiomycota and Ascomycota (Arnstadt *et al.,* 2016, Swift, 1982). "Wood-rotting fungi" are eukaryotic and carbon-heterotrophic (free from chlorophyll) organisms with chitin in the cell wall, reproduce asexually and/or sexually by non-flagellate spores, filamentous, immovable and mostly land inhabiting (Schmidt, 2006). Fungal wood rot occurs in three types – brown rot, white rot and soft rot. White-rot and brown-rot are mostly caused by members of the Basidiomycotina and some members of the Ascomycotina, whereas the soft-rot is mainly caused by members of the Ascomycotina and Deuteromycotina (Dix & Webster, 1995).

Dead wood is one of the most important components of the forests, on which many different organisms like insects, birds, small mammals and fungi depend (Harmon *et al.,* 1986, Rayner & Boddy, 1988). Wood-rotting fungi are among the major wood decaying organisms involved in the wood decay process and they play an important role in the nutrient cycle in forest ecosystems (Nicolas, 2005) due to their ability to

decompose lignified cells of coarse woody materials using enzymatic and non-enzymatic reactions (Cui *et al.,* 2006; Blanchette, 1991).

Wood is formed of three main constituents, cellulose, hemicelluloses and lignin. Lignins constitute the second most abundant group of biopolymers in the biosphere (Karthikeyan *et al.,* 2005). Lignin is highly resistant towards chemical and biological degradation, and confers mechanical resistance to wood (Matrinez *et al.,* 2005; Ralph *et al*., 2005). The plant material contains 25-30% of lignin, which gives plants their structural integrity and provides protection from pests and pathogens (Orth *et al*., 1993). Wood rotting fungi are an important component of forest ecosystems (Wang *et al*., 2011). White rot fungi belong to the order basidomycetes that participates in the biodegradation of lignin in nature, which is essential for global carbon recycling (Siripong, 2009).White rot fungi can degrade lignin and a range of environmental pollutants by many of their extra cellular ligninolytic enzymes (Selvam *et al*., 2011).

Wood-inhabiting fungal communities are typically species-rich, and include multiple decomposer species in the same wood substrate. Throughout the decomposition of a fallen tree, fungal species interact with each other as community composition develops over time. The resident fungi must either defend an occupied domain or replace the mycelia of primary established species (Ottosson, 2013). As the main agents of wood decay, fungi can be considered as ecosystem engineers (Lonsdale *et al.,* 2008).

Fungi are also an extremely taxonomically diverse group of organisms and ecologically important group of eukaryotes with the majority occurring in terrestrial habitats. (Hawksworth, 1991; May & Pascoe, 1996). Even though fewer numbers have been isolated from freshwater habitats, fungi growing on submerged substrates exhibit great diversity, belonging to widely differing lineages (Vijaykrishna *et al*., 2006). They form a large share of the species richness and are key-players in ecosystem processes (Keizer, 1998; Seen-Irlet *et al*., 2007).

The Ascomycetes and Basidiomycetes consist most of the mushroom species and are known as higher fungi. The spores and spore bearing structures of mushrooms are large and are included in the class Ascomycotina and Basidiomycotina. They are borne

on the gills or pores below the cap and the stipe raises the fruit body above the ground for the spore to dispersed by air currents. The spores are borne on specialized cells termed basidia in the Basidiomycetes or in sac like structures called ascus in Ascomycetes (Carlilie *et al*., 2001). The Ascomycota is the largest phylum of the Kingdom Fungi, with approximately 32,000 species (Hawksworth *et al*., 1995). Three major groups or classes of Ascomycota, including Euascomycetes (mostly filamentous, sporocarp producing as well as mitosporic or conidial forms), Saccharomycetes (the true yeasts), and Archiascomycetes (a paraphyletic assemblage of basal taxa) generally are recognized (Taylor *et al*., 1994).

The interplay between trees and wood-inhabiting fungi is a key process in forest ecosystems. As trees grow, woody biomass accumulates; when trees die, fungi recycle the carbon and minerals that were fixed during the growth of the trees (Schwarze, 2007). White rot fungi have been widely studied for their ability to degrade variety of environmental soil pollutants (Akhtar *et al.*,1992).

The evolution of woody plants led to the formation of the world's first forests. Fungi have depended upon plants as their main source of energy throughout their evolutionary history, during which time some fungi developed parasitic abilities in order to access the energy captured in the living tree. Fungi enter the woody tissue of plants either through wounds or by infection of the roots. Even though the tree can resist fungal attack for some time, it will eventually drop its branches and ultimately die. This process can significantly contribute to the small scale disturbance dynamics in a forest stand (Edman *et al.*, 2007). For fungi that are not able to overcome the defense mechanisms of the living tree, a recently fallen log presents an open resource with large carbon sources. By being present as microscopic spores in the air or as filaments in the soil, fungi are never far away from a recently fallen tree. Equipped with powerful enzymes, fungi penetrate the wood with their hyphae and modify the wood structure. Not only does the decay release the nutrients locked up in the wood; the decomposition process also opens up different niches, promoting the establishment of a range of other dead wood-

dependent organisms, including other fungi, insects and hole-nesting birds (Stokland *et al.*, 2012).

Traditional taxonomy of major fungal groups is mainly based on gross morphology of the fruiting body. There has been convergent evolution in fruiting body (basidiocarp) morphology in mushroom forming fungi indicated with anatomical and molecular evidence (Oberwinkler, 1985; Hibbett and Thorn, 2001; Kirk *et al*., 2001; Hibbett and Binder, 2002), and recognition of form groups sometimes does not reflect the real evolutionary relationships among these fungi (Bodensteiner *et al*., 2004). Polypores are characterized by producing basidiospores on inner surface of pipe-like structures, which open as many pores on the lower surface of the basidiocarp. Polypores have been intensively studied as major wood decomposers on earth, and two principal modes of wood decay are recognized in the polypores: white rot and brown rot (Rayner & Boddy, 1988). Recent molecular phylogenies suggested that polypores are morphologically diverse and include fungi with resupinate, teeth- or leaf-like basidiocarps in addition to poroid fruiting bodies, while some poroid fungi, such as *Fistulina* and *Lentinula* species, do not belong to polypores as they were traditionally treated (Hibbett & Thorn, 2001; Bodensteiner *et al*., 2004).

The correct identification of fungi is of great practical importance not only in the clinical setting but also in plant pathology, biodeterioration, biotechnology, and environmental studies. An enormous number of species of fungi are already known, and so taxonomists are being kept very busy with recognizing and describing new species and grouping taxa. Hence, most species have received only limited study, so that classification has been mainly traditional rather than numerical and has been based on readily observable morphological features. However, some groups of fungi, because of their economical or pathological importance, have been studied more extensively (Guarro *et al*., 1999).

Edman and Jonsson, (2009) and Edman *et al.*, (2007) reported that the spatial distribution of down logs and wood-decaying fungi are influenced by wind and gap - phase dynamics in forests of old-growth. They also found that rare fungi species have

specific substrate associations and that temporal variations in the patterns of canopy gaps and down wood abundance can affect fungi biodiversity.

Many researchers studied wood decaying resupinate fungi in India (Bose 1934; Banerjee 1947; Bagchee & Bakshi 1951; Bakshi 1971; Thind & Dhanda 1978; Roy & De, 1996). In central India, these fungi have been studied from Sagar, Harda, Mandla and Jhabua (Saksena & Vyas, 1964; Verma *et al*,. 2008).

Systematic studies are really helpful while compare two or more sites of fixed area or having different environmental conditions (O'Dell *et al*., 2004). The present study was planned to get baseline information of wood rotting fungi of protected forests areas of Mizoram. There is no such record of how many wood rotting fungi are present. Whatever the knowledge we have about this region is from the works of Zothanzama (2011b, 2015, 2016, 2017) and the contribution made by Bisht, (2011). These earlier studies were based on random collection of fungi from various parts of Mizoram. Very few systematic diversity studies have been found so far done in India for some soil macro-fungi (Karun & Sridhar, 2014; Pradhan *et al*., 2016) but systematic diversity studies are nearly absent for wood rotting fungi. As per Mizoram, only one systematic study on soil macro-fungi has been done so far by (Lalrinawmi, 2019). The present study was hence conducted with the following objectives -

OBJECTIVES

1. To study the taxon identity through macro and micro-morphological characteristics of the samples collected.
2. To study the diversity of wood rotting fungi within the study sites.
3. Comparative study of wood rotting fungi in disturbed and undisturbed forests.

CHAPTER – 2

REVIEW OF LITERATURE

The idea that fungi form a kingdom distinct from plants and animals gradually became accepted only after Whittaker (1969). Presently, the "fungi" as a mega-diverse group span three kingdoms, most belonging to the Fungi (Eumycota), while others are classified in the Protozoa and Chromista (Straminipila) (Cavalier-Smith 1998, James *et al*., 2006). The word "fungi" is commonly used as a collective term for organisms traditionally studied by mycologists from all three kingdoms (Hawksworth, 1991). The myxomycetes have also been traditionally studied by mycologists (Everhart & Keller 2008, Rojas & Stephenson, 2008). Estimates for the number of fungi in the world range up to ca. 13.5 million species (McNeely *et al*., 1990; Hawksworth, 1991; 2001, Hawksworth & Kalin-Arroyo, 1995; Hyde, 1996; Hyde *et al*., 1997; Tangley 1997; Groombridge & Jenkins 2002; Brusca & Brusca 2003; Rossman 2003; Crous *et al*., 2006; Adl *et al*., 2007; Kirk *et al*., 2008). It might be expected that the predicted numbers of fungi on Earth would have been considerably greater than the 1.5 M suggested by Hawksworth (1991), which is currently accepted as a working figure although recognized as conservative (Hawksworth, 2001).

The 10th edition of Ainsworth & Bisby's Dictionary of the Fungi (Kirk *et al*. 2008) provided a total of 98,998 for the number of fungal species accepted to date excluding taxa treated under Chromista and Protozoa. Kirk *et al*., (2008) reported 1039 species chromistan fungal analogues and 1165 as protozoan in which 1038 are regarded as protozoan fungal analogues: Percolozoa (Acrasida), Amoebozoa (Dictyostelia, Myxogastria, Protostelia), Cercozoa (Plasmodiophorida) which were previously treated as Myxomycota and Plasmodiophoromycota.

Linneaus in *Species Plantarum***,** (1753), which is considered the starting point of all botanical and now also fungal nomenclature (Staflue and Cowan, 1983) used *Boletus*

for all fungi with tubes or pores. He described 12 species belonging to the family Polyporaceae. Persoon (1801) was the first to segregate the lamellate and poroid fungi.

Fries (1821) in his *Systema Mycologicum* accepted two genera for the polypores. His concepts were based on the type of hymenophore (basidiocarps). Fries created the sub-order Pileati, which included the genera such as *Agaricus*, *Schizophyllum*, *Daedalea*, *Merulius*, *Favolus* as the sub-genera of the genus *Polyporus*, Later, *Favolus* was raised by him (Fries, 1828) to the generic status.

Berkeley (1839) was probably the best amongst the old masters who did his observations without the microscopic aids, which were available to his successors. Karsten (1881 & 1889) and Bresadola (1897) have used microscopic characters in their description of the fungi.

Up to the end of the 19th Century, all classifications were based on macro morphological features of the sporophore. Patouillard (1900) was a pioneer worker to bring about a change in this trend of research by introducing microscopical characters in taxonomic study. In his *Essai Taxonomique*, Patouillard made groupings in polypores on the basis of such characters as detailed hyphal morphology, structure of the pileus and characters of basidia, spores and cystidia.

Aphyllophorales order was proposed by (Rea, 1922) after Patouillard, for basidiomycetes having macroscopic basidiocarps in which the hymenophore is flattened (Thelephoraceae), club-like (Clavariaceae), tooth-like (Hydnaceae) or has the hymenium lining tubes (Polyporaceae) or some times on lamellae.

Lowe monographed the American species of *Fomes* (1957), *Poria* (1966), *Tyromyces* (1975). Reid (1965) monographed the stipitate steroid fungi of the world. Mass-Geesteranus (1971) revised many of the hydnoid fungi of the Eastern old world. The monographs by Eriksson (1950) of the genus *Peniophora*, of *Aleurodiscus* by Parmastos (1968). Systematic Survey of the Corticiaceae together with the voluminous work of Eriksson and Ryvarden (1973, 1975, 1976) on the Corticiaceae of North Europe were important contributions to our knowledge of this group of Basidiomycetes.

In recent years, morphological techniques have been influenced by modern procedures, which allow more reliable phenotypic studies to be performed (Guarro, 1999). Numerical taxonomy, effective statistical packages, and the application of computer facilities to the development of identification keys offer some solutions and the possibility of a renaissance of morphological studies. Automated image analyzers, electronic particle sizing, and fractal geometry may have a lot to offer in the analysis of fungal morphology (Chapela, 1988; Seifert, *et al*., 1995). Since the distinguishing morphological characteristics of a fungus are frequently too limited to allow its identification, physiological and biochemical techniques are applied, as has been routinely done for the yeasts. However, for poorly differentiated filamentous fungi, these methods are laborious, time consuming, and somewhat variable and provide insufficient taxonomic resolution. In contrast, molecular methods are universally applicable. Comprehensive and detailed reviews of the use of molecular techniques in fungal systematics have been provided by (Bruns *et al*., 1990; Hibbett, 1992; Kohn, 1992; Kurtzman, 1994; Maresca and Kobayashi, 1994; Weising *et al.,* 1995).

The study of polypores causing diseases and decays in forest trees gained momentum by the middle of the 20th century. In India, Bagchee and Bakshi studied extensively the polypores causing diseases of oaks and other economically important forest trees (Bagchee and Bakshi, 1950; 1951; Bagchee, 1950; 1961).

Jamaluddin *et al.,* (2004) studied the occurrence and distribution of wood decaying fungi in Lower Assam, North East India. Study on the wood rotting fungi of Meghalaya was done by Zothanzama (2011a). Studies on fungal and polypore diversity have also been carried out in various parts of Arunachal Pradesh (Bisht and Harsh, 2001; Majumder and Shukla, 2012; Taka *et al.,* 2018). Parveen *et al*., (2017) studied the diversity and habitat specifity of macrofungi both growing on soil and wood from different parts of Assam. Debnath *et al.,* (2018) reported newdistribution record of five species of *Xylaria* from Tripura, Northeast India. Chuzho and Dkhar (2019) reported 26 Ascomycetous wood-rotting fungi from Nagaland.

In Mizoram, macro fungal or study of mushroom especially with regard to their taxonomy has not yet been done much except for those that are wood decaying (Bisht, 2011; Zothanzama, 2011b). Little information about the soil mushrooms of Mizoram were reported by Bisht (2011). An investigation has been done on mushrooms and only few mushrooms have so far been known and named (Zothanzama, 2011b; Bisht, 2011; Zothanzama and Lalrinawmi, 2015; Zothanzama *et al.,* 2016; Lalrinawmi *et al.,* 2017, Zothanmawia *et al.,* 2016; Lalrinawmi, 2019).

Defining the exact number of fungi on the earth has always been a point of discussion and several studies have been focused on enumerating the world's fungaldiversity (Crous, 2006). The world's ecosystems are sustained and kept in balance by a rich variety of fungi. The *Dictionary of Fungi* (Kirk *et al*., 2008) reported 97 330 species of described fungi at the "numbers of fungi" entry. The addition of 1300 micro-sporidians brings the total of all described fungi to about 99 000 species. The Dictionary's estimate of known species has almost tripled in the period between the first edition in 1943 (38 000 described species) and now, amounting to an increase of more than 60 000 described species over the 65-yr period. Factors such as difficulty of isolation and failure to apply molecular methods may contribute to lower numbers of species in certain groups, but there cannot be any doubt that ascomycetes and basidiomycetes comprise the vast majority of fungal diversity. More recent estimates based on high-throughput sequencing method suggest that as many as 5.1 million fungal species exist (Meredith, 2011).

The number of fungi recorded in India exceeds 27,000 species, the largest biotic community after insects. About 205 new genera have been described from India, of which 32% were discovered by C. V. Subramanian of the University of Madras (Sarbhoy *et al.,* 1996). Ranadive (2013) listed over 190 genera of 52 families and total 1175 species from poroid and non-poroid Aphyllophorales fungi from India. Prashar and Lalita (2013) in their checklist listed over 200 species of wood rotting non-gilled Agaricomycotina spreading over 100 genera and 27 families from the state of

Uttarakhand. Tiwari *et al*., (2012) recorded a new and rare species of *Phlyctaeniella* from central India.

The species-richness of wood-rotting fungi tends to increase with the amount of substrate (Sippola & Renvall 1999; Allen *et al.,* 2000; Humphrey *et al.,* 2000; Berglund & Jonsson 2005; Schmidt, 2005). On the basis of the species-area relationship, a 90% reduction in deadwood substrate could be followed by the extinction of 50% of wood-inhabiting species (Siitonen, 2001). A positive relationship also exists between Coarse Wood Debri size and the number of fruiting fungal species (Bader *et al*., 1995; Renvall 1995; Lindblad 1997; Lindhe *et al*. 2004)

Work done in northern Europe suggests that the harvesting of trees at various levels of intensity can affect the diversity of wood-inhabiting fungi (Bader *et al.,* 1995; Hoiland and Bendiksen, 1997; Ohlson *et al.,* 1997; Lindblad, 1998; Zothazama, 2011a).

It was also reported that the species richness gradient was inversely related to the rainfall gradient (Lindblad, 2001). Lindblad (2000) supported the assumption that most wood-rotting fungi have broad host ranges in tropical areas. Perennials and rare species tended to occur on large logs in the dry forest, while all species tended to occur on large logs in the moist forest, but not in the wet forest. The role of temperature and altitude as a factor in the distribution of the wood rotting fungi were also studied by many workers (Sehgal *et al.,* 1966; Bakshi, 1971; Harsh and Bisht, 1982) in the Himalayas.

Hedawoo and Mohite (2008) from Melghat and Amravati region of Maharashtra have reported wild edible mushroom genera like, *Auricularia, Calocybe, Calvatia, Coprinus, Lycoperdon, Macrolepiota, Termitomyces* and *Podaxis*. Manoharachary and Gopal (1991) reported many *Agaricus* from Andhra Pradesh. From several biogeographical regions of India at least 2000 macrofungi were reported. But, the central India region has not been investigated extensively for mushroom flora (Kaul, 1999).

Diverse landscapes of the Western Ghats and west coast of India (e.g. grasslands; forests: shola, deciduous, moist-dry deciduous, evergreen, semi-evergreen,

lateritic scrub jungles, mangroves; coastal sand dunes) provide suitable climatic conditions as well as substrates for growth and perpetuation of macrofungi. Checklists of the Western Ghats region of India include 616 species and 178 species of agarics in Kerala and Maharashtra states, respectively (Farook *et al*. 2013; Senthilarasu, 2014). Mohanan (2011) has described up to 550 species of macrofungi from different regions of the Kerala state. Surveys in semi-evergreen and moist-deciduous forests of Karnataka yielded up to 315 species of macrofungi (Swapna *et al*. 2008). Checklist from the Western Ghats region of Maharashtra State documented 256 species of Aphyllophorales (Ranadive *et al*. 2011). On the other hand, Karun and Sridhar (2016) recorded 157 species of macrofungi from different forests of the Western Ghats of Karnataka. Up to 79 macrofungi (range 15-36 species) were recovered from the plantations, botanical garden and arboretum of the lateritic region of southwest Karnataka (Karun and Sridhar, 2014; Pavithra *et al*., 2016). The coastal sand dunes and mangroves of Karnataka also consist of 64 and 46 macrofungi, respectively (Ghate and Sridhar, 2016).

Tiwari *et al.,* (2010) added three wood rotting fungi of India viz., *Australohydnum dregeanum, Hjortstamia friesii* and *Schizopora flavipora*from Raipur, Jagdalpur and Kanker districts of Chhattisgarh. Pani, (2011) observed the growth of milky mushroom, *Calocybe indica* on straw of ten popular paddy varieties of Orissa. Patil (2012) studied capacity of *Pleurotus sajor-caju* to grow on different agro wastes viz. soybean straw, paddy straw, wheat straw, groundnut straw, sunflower stalk and pigeon pea stalk to determine the suitability of these agro waste. Thulasinathan *et al.*, (2018) studied the diversity of macrofungi growing both on soil and wood from Kodaikanal region of Western Ghats, Tamil Nadu, India and reported about 100 species.

Lyngdoh and Dkhar (2014) reported a rare species of wood-rotting fungus, *Heterobasidion perplexa* which has been reported only from Nepal, was found growing on stumps and logs of *Pinus kesiya* from Meghalaya which is new to India. Virdi (1990) under the DST Project in Eastern Himalayas and neighboring hills collected many interesting species of polypores. This communication gives an account of two species new to India viz. *Theleporus calcicolor* and *Grammothele fuligo.* Thirty species of

lignicolous fungi belonging to Ascomycetes and Basidiomycete are reported from the Ratanmahal Wildlife Sanctuary, Gujarat, India by Praveen and Arya (2014).

The knowledge on the wild mushroom and their edibility by the Mizos is not very vast. Only few wild edible mushrooms have so far been known and named (Zothanzama, 2011b; Bisht, 2011, Lalrinawmi, 2019; Lalrinawmi *et al*., 2017). The wild edible mushrooms are found in Mizoram especially during the onset of Monsoon rain from May/June to August/September. About 22 species of wild edible fungi are known and consumed by the people of Mizoram growing both on soil and decayed wood (Zothanzama and Lalrinawmi, 2015). Zothanzama (2011b) has reported 53 species of wood rotting fungi from different forest stands in the districts of Aizawl, Mamit, Kolasib, Champhai and Saiha of Mizoram during the period of 2006 – 2010. Bisht (2011) in his book Wood Decaying Fungi of Mizoram also reported 52 species collected from different parts of the state.

Many standardized investigations have been conducted on terrestrial macro-fungi and only few have been conducted on wood rotting fungi. There is yet no permanent technique for sampling wood rotting fungi. Mueller *et al*., (2004) has given in great detail about the sampling of macrofungi. Basically, there are two recommended protocols for sampling macrofungi: Opportunistic, which means carefully walking through a study site and collecting sporocarps of selected taxa. Mycologists traditionally have sampled sites by this method. However, it does not allow for rigorous comparisons of different sites, which requires that sampling intensity be standardized at each site. Fixed plot method**,** where data of different sites are compared that has same area, same fruiting season and other parameters can also be taken into consideration if plots are very distantly related like vegetation type, rain precipitation, slope elevation etc. Collection of all fungi within a series of plots or transects ensures that all taxa fruiting at the time are scrutinized and reduces the likelihood that cryptic (morphologically similar) species will be overlooked. Often with such an approach many specimens are identifiable initially only to genus. If the same plots or transects are sampled repeatedly for several years, most taxa eventually will be identified (O'Dell *et al.*, 2004). To

maximize the documentation of macrofungal diversity of a site, combination of opportunistic and plot-based sampling should be employed (Mueller *et al.,* 2004). Transect-based method is also applied to determine how populations vary along environmental gradient and for the purpose of identifying dispersion patterns. For example: Instruments such as meter tape are used to measure a 10 x 15 meter strip for each group, four groups for the total of 50 meters long. Plastic straw are also used to measure a 1.262 circular in every 5 meters to determine the boundaries to collect. Pegs or wooden pole are also used in marking the measured boundaries (Ostry *et al*., 2011; Labilles *et al*., 2016). The difficulty of doing this in the field has been one of the arguments used against the application of this method in routine field surveys (Engeman *et al*., 1994)

Systematic studies are really helpful while comparing two or more sites of fixed area or having different environmental conditions. Low number of wood-rotting fungi in disturbed forests is due to several reasons such as encroachment and disturbances from villagers, removal of fallen dead wood and decrease in under storey vegetation (Zothanzama, 2011a). The range of fungal distribution is controlled to a large extent by the distribution of their hosts rather than the climatic factors (Bisby, 1933). Brown *et al*., (2006) also opined that the degradation of habitat is a major threat for diversity of macrofungi than the habitat fragmentation. The correlation of the distribution of pore fungi with the geographical location of the area that ultimately governs its vegetation shows that there is less number of polypores in high altitude forest having low temperature during summer and less rainfall in the area (Bondartsev, 1953). The high species diversity at high altitude was due to low temperature, high relative humidity and soil moisture which in turn affected the type of vegetation found on the mountain slope (Payton, 1993).

In a study of the relationship between the diversity and structure of assemblages of fungi and their plant hosts in a tropical rain forest, a transect-based study by Gilbert *et al.* (2007) showed that high tree species diversity supports an even higher diversity of polypore fungi. A recent study on the macrofungal diversity in fragmented and disturbed

forests of the Western Ghats of India has also shown that sacred groves are important for fungal conservation because they provide unique types of habitat that sustain a distinct fungal assemblage (Brown *et al.*, 2006; Zothanzama, 2011a).

Differences in the species compositions between the forest site types can perhaps best be explained by the micro-climatical characteristics of the sites. However, the differences are evidently also due to the size variation of the trunks between the site types (Renvall, 1995). In general, most studies on fungal diversity have shown that fungal species richness is lower in disturbed forests than in undisturbed sites (Albrecht, 1991; Hagerman *et al*., 1999; Byrd *et al*., 2000).

CHAPTER – 3

MATERIALS AND METHODS

3.1. STUDY SITES

Mizoram is one of the seven sister States in North East India. It lies in the extreme eastern corner of the country and shares its borders with Assam, Manipur and Tripura and has very long international borders with Myanmar and Bangladesh. The state has a geographical area of 21,087sq.km. and lies between 21˚56’ and 24˚35’ N Latitudes and 92˚16’ and 93˚26’ E Longitudes. The Tropic of Cancer passes through the State at 23˚30’N latitude. For carrying out for the study of wood rotting fungi one National Park and three Wildlife Sancturies were selected namely Murlen National Park, Dampa Tiger Reserved Forest, Thorang Wildlife Sanctuary and Tokalo Wlidlife Sanctuary.

3.1. a. Murlen National Park

Murlen National Park is located in Champhai district of Mizoram with a geographical coordinates of 23˚37’01’’N and 93˚18’0” E. The size of the area is 200 sq. km. and is situated about 245 km east of Aizawl and is close to the Chin Hills.The tropical, semi-evergreen and sub-montane forest of Murlen is home to a rich variety of flora and fauna.

3.1. b. Dampa Tiger Reserve Forest

Dampa Tiger Reserve is the largest wildlife sanctuary in Mizoram. It was notified in 1985 and was declared a tiger Reserve in 1994. It is situated in the western part of the state, at the International border with Bangladesh and about 127km from the capital city Aizawl. It covers an area of approximately 550 sq.km with a geographical coordinates of 23˚25’N and 92˚20’E. The Tropical Forest of Dampa supports variety of flora and fauna. It consists of forest interpolated with steep precipitous hills, deep valleys and natural salt licks with an altitudinal range of 200-800 meters.

3.1. c. Thorang Wildlife Sanctuary

Thorang wildlife Sanctuary is located between Kawnpui West and Thenhlum Village in the Western part of Lunglei district, Mizoram. It is situated in It is situated in geographical coordinates of 23º15 - 23º17' North Latitude and 92º35' - 92º36' East longitude at about 230 km from Aizawl via Thenzawl. The sanctuary falls under tropical semi-evergreen forest.

3.1. d. Tokalo Wildlife Sanctuary

Tokalo Wildlife Sanctuary is situated on the southern part of Mizoram in Mara Autonomous District, 390 km from the capital city Aizawl and 97 km from the district capital Saiha. It is located at geographical coordinates of 92˚52' and 92˚55' E longitude and between 22˚10' and 22˚13' N latitude. The Tokalo Wildlife Sanctuary is characterized by the presence of the Palak Lake one of the wetlands of Mizoram. The catchment area is approximately 18.5 sq. km and the total water body is around 1.5sq.km. The Mara community called the lake as "Pala Tipo". It is fairly rich in flora and fauna.

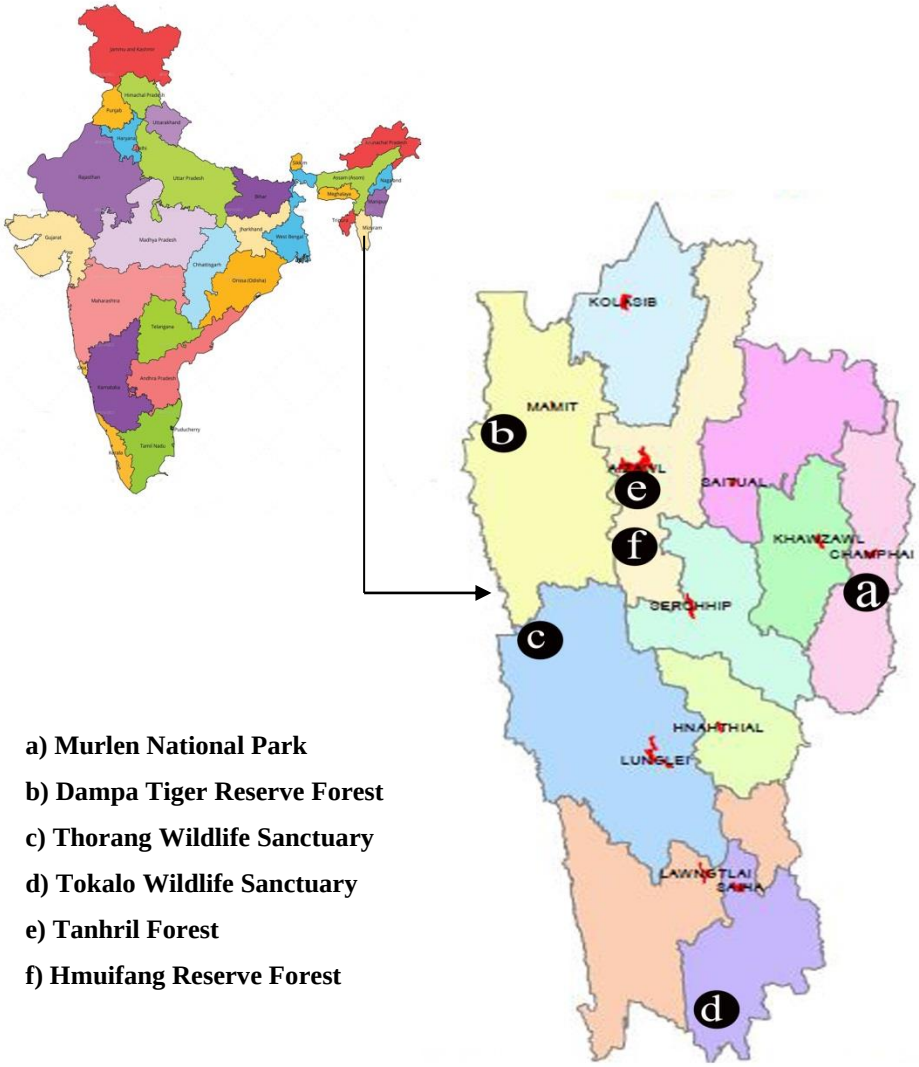
3.1. e. Tanhril Forest

Tanhril Forest within Mizoram University Campus located on the south-western part of Aizawl city, the Capital of Mizoram which is 15 kms away from the capital and lies in the geographical coordinates between 23°42' to 23°46' N latitude and 92°38' to 92°42' E longitude and located at an altitude of 850 metres amsl with an average rainfall of 230 mm. (Source: State Meteorological Centre, DST, Mizoram).

3.1. f. Hmuifang Reserve Forest

Hmuifang is situated in the southern part of Aizawl. It is about 50 km away from the state capital Aizawl with an average elevation of 1619 amsl. The survey area lies between the geographical coordinates 23°27′22′′ N - 23°27′31′′ N latitudes and 92°45′19′′ E - 92°45′24′′ E longitudes. The mountain area is still covered with virgin forests. The vegetations of the study area fall under Tropical semi-evergreen forests. The average annual rainfall is about 267.13 mm. The temperature ranges from 20°C - 29°C

during summer and winter temperature ranges from 7°C - 21°C (Source: State Meteorological Centre, DST, Mizoram).



a) Murlen National Park
b) Dampa Tiger Reserve Forest
c) Thorang Wildlife Sanctuary
d) Tokalo Wildlife Sanctuary
e) Tanhril Forest
f) Hmuifang Reserve Forest

Fig: 1. Map of Mizoram showing the study sites

3.2. TAXONOMY AND IDENTIFICATION

3.2. a. Collection of specimens

The samples were collected or isolated from its substrates or host(dried wood/branches) with the help of knife or other sharp materials and sometimes simply plucked with bare hand(in case of soft samples).Samples collected were kept in air-tight container or plastics bags which are labeled after collection. Photograph of each sample collected weretaken in the field and in the laboratory with scales (Wang & Zabel 1990; Huckfeldt & Schmidt 2006; Prasher, 2015).

3.2. b. Preservation of specimens

The specimens are preserved by air drying and liquid preservation (Ryvarden and Gilbertson 1993; Meenakshisundaram and Bharathiraja, 2013). Voucher numbers weregiven to the specimens and stored in the Department of Environmental Science, Mizoram University

3.2. c. Identification of specimens

The collected specimens were identified according to standard macroscopic and microscopic characteristics through consultation with appropriate literature (Gilbertson & Ryvarden, 1986; Núñez & Ryvarden, 2000). The morphology or the macro-charateristics *i.e.* the outward appearance (fruiting body) were studied carefully and compared or expressed through photographs and literatures from books and journals.

For microscopic study, thin sections of dried specimens were taken with the help of a sharp razor blade and were mounted in 3% KOH solution and stained in 2% aqueous phloxine. Sections were mounted in Lactophenol or 60% lactic acid + cotton blue. Phloxine and Cotton-blue stain was also be routinely used. Spore print of the collected specimenswere obtained by cutting off the cap and placing it in a piece of white paper/glass slides (Surcek, 1988; Barnett *et al*,. 1990; Ryvarden and Gilbertson 1993; Roy and De, 1996).

3.3. SPECIES DIVERSITY

Sampling

The sampling period were divided into two seasons (Wet season - April to September and Dry season - October to March). A Classical method in Diversity Assessment was used and under this method are the Opportunistic and the Transect-based method which is used to collect the necessary data for the analysis of the fungal diversity.

Transect-based Method: This method is applied to determine how populations vary along environmental gradient and for the purpose of identifying dispersion patterns. The fungal specimens were collected randomly by laying out line transects of size 500 x 40 m three times in each study sites following the methods by (O'Dell *et al.*, 2004) with modifications. Each fruiting body was taken as one sample. Each site was visited two times for each season. Pegs or wooden pole was also used in marking the measured boundaries.

Opportunistic Method: This method involve collection of fungi along trails that are not found within the established subplots, this method is rapid and convenient, however it has the tendency to overlook other fungi species in inconspicuous habitat. (Labilles *et al*., 2016)

Shannon's diversity Index (H_s)

The index assumes that individuals are randomly sampled from an infinitely large community (Shannon, 1948) and that all species are represented in the sample. The Shannon Index is calculated from the equation -

$$H_s = -\sum p_i l_n p_i$$

Where p_i = the proportion of individuals found in the i^{th} species

$$\text{Or} \qquad p_i = n_i/N$$

Where n_i =the abundance of the individual in the i^{th} species.

N = the abundance of all the species.

Simpson Index of Dominance (D_S)

Simpson (1949) gave the probability of any two individuals drawn at random from an infinitely large community belonging to the same species.

The form of the index appropriate for a finite community is represented by -

$$D_s = \sum [\{ni\ (ni-1)\}/\{N(N-1)\}]$$

Where, n_i =No. of individuals of the i^{th} species

N= total no. of individual

As the Simpson's index values increases, diversity decreases. Simpson index is therefore usually expressed as "1- D" or "1/D".

Species Evenness:

The evenness of a community can be represented byPielou's evenness index (Pielou, 1975)

J' = H'/H'max

Where, H' is the number derived from the Shannon diversity index and H'max is the maximum possible value of H' (if every species was equally as likely) equal to -

$$H'_{\max} = -\sum_{i=1}^{S} \frac{1}{S} \ln \frac{1}{S} = \ln S.$$

Margalef's Diversity Index

The Margalef's diversity index (Margalef, 1958) expressed as 'd' can be calculated in a spreadsheet by using the formula -

$d = (S - 1)/ \ln N$

Where S is the number of species, and N is the total number of individuals in the sample.

Percentage of Occcurrence

The percentage of species occurrence was also calculated following (Zothazanma, 2011a) with modifications.

The percentage of occurrence (%) of each fungal species was calculated as follows:

$$\text{Percentage of Occcurence (\%)} = \frac{\text{No. of sites in which species is present}}{\text{Total No. of Sites}} \times 100$$

CHAPTER – 4
RESULTS AND DISCUSSIONS

4.1. TAXONOMY AND SPECIES IDENTIFICATION

Key to Genera

1. Cap applanate to centrally depressed, but usually strongly irregular, strongly zoned in different shades of brown with a cream outer ring, texture irregular, woody. Stipecentral or eccentric, cylindrical but irregular and usually attenuated towards the base, dark brown, velvety to felty. Poresdecurrent to subdecurrent. Habitat single specimens found growing on buried wood and roots, often appearing to be growing in soil.....***Amauroderma***
2. Basidiocarp typically tough gelatinous, yellow to reddish brown, sessile to substipitate ear-shaped and marked with vein-like ridges, grayish velvety with a powdery appearance .....***Auricularia***
3. Growing on ground, dung, manure, straw, wood-chips, wood. Cap bell – shaped or conical, white or pallid with white to pale gray powdery or mealy scales, partial veil forming a distinct annulus on stallk, gills well – shaped or fairly close but not crowded.....***Coprinus, coprinellus***
4. Perennial or annual, bracketlike to shelflike, several layers of tubes; usually very hard and woody..... ***Fomes, Fomitopsis***
5. Pores hexagonal, arranged in rows radiating out from stem, stemmed or slightly so .....***Favolaschia***
6. Basidiocarps medium sized to very large, often perennial but sometimes annual, sessile, woody, hard and corky, substemmed or stemmed, typically with a varnishlike crust on the cap and stem, pore surface white when fresh but turning brown when bruised (in old age) and brown spores, spores are usually double walled.....***Ganoderma***
7. Cap medium size to gigantic, usually tinged or variegated with reddish to blueish- green when young,stalk stout and thick, often hollow, veil membranous

or fibrillose, often forming annulus on the stalk, usually growing in clusters (but occasionally solitary).....***Gymnopilus***

8. Basidiocarps centrally to eccentrically stipitate, tough and coriaceous, annulus seen in some species (*Lentinus sajor-caju*), pileus usually covered with finely minute scales or hairs. Gills decurrent and closed, whitish to creamy, hyphal construction dimitic with either skeletal or binding hyphae along with generative hyphae…….....***Lentinus***, ***Panus***
9. Fruiting body small to medium sized, tough and leathery or sometimes woody, usually annual (but often perennial in ***Daedalea***), growing shelflike or bracketlike on wood. Cap zoned or unzoned, variously colored, hairy to smooth. Pore surface usually mazelike, sinous or meandering, or formi9ng platelike gills. Stalk absent or rudimentary. Spore print whitish to brown, but difficult to obtain. Spores usually ellipsoidal to cylindrical and smooth..... ***Lenzites, Daedalea***
10. Cap conical or bell shaped when young, often reddish or vinaceous- tinged, stalk thin, more or less rooting, and hairy over lower portion, gills adnate to decurrent.....***Marasmius, Micromphale***
11. Fruiting body typically small to medium sized, tough, leathery, thin or flat, funnel shaped to bracketlike. Pileus surface dry, shiny with velvety texture, sometimes covered with minute hairs. Pore surface white to fawn, and finely pored. Stalk short, central or slightly eccentric, usually widening towards the base. Spore print white(when obtainable). Spores variously shaped and smoothe.....***Microporus***
12. Mainly found growing on fallen twigs and branches, fruiting body usually minute with thin, fragile and cartilaginous stalk and bell-shaped to conical (atleast when young).....***Mycena***
13. Fruiting body usually tough, leathery woody to gelatinous, knoblike, hooflike, bracketlike, shelflike, or crustlike, rudimentary, or attached to side or top of cap, with a layer of tubes (usually on underside of cap), tube mouths (pores) large and

sinous to small or very minute,often decurrent on the stalk. Stalk central to off – center or sometimes lateral, usually well - developed but sometimes stubby .....***Polyporus***

14. Basidiocarps pleurotoid, usually growing shelflike, white to creamy, soft and fleshy when fresh, sometimes rubbery and tough, cap smooth or hairy, dry or viscid. hyphal system monomitic, veil present when young but disappearing in age, sometimes forming annulus on stalk…….....***Pleurotus***
15. Fruiting body soft and spongy to thin and tough, resupinate, bracketlike, shelflike, or occasionally stalked, usually clusters sometimes solitary. Cap present or absent, when present usually small. Pore surface smoothe to wrinkled, veined or warty. Stalk usually absent but occasionally present. Spore print white to yellow or brown, but often not obtainable. Spores variously shaped.....***Stereum***
16. Fruiting body small to medium sized, usually annual but persistent, tough and leathery even when fresh, growing shelflike or bracketlike often in masses. Cap often hairy or velvety and zoned concentrically, usually thin.pore surface variously colored, often minute and barely visible, round to angular to becoming toothlike or rarely gilled.Stalk absent or rudimentary. Spore print whitish to yellow(when obtainable). Spores typically oblong to cylindrical or sausage-shaped and smooth .....***Trametes***
17. Fruiting body typically gelatinous (jellylike) or rubbery when fresh, variously shaped, but most often lobed, convulated, or bloblike, brightly colored (white, yellow, orange, pink, red, or greenish) when fresh, but sometimes losing its color in rainy weather or old age, Spore print white to yellowish, but difficult to obtain. Spores smooth, sometimes septate. Basidia septate or forky.....***Tremella***
18. Fruiting body typically very tough to hard, charcoal like, erect and club-shaped or branched in *Xylaria*, or stalkless and hemispherical in *Daldinia concentrica*, usually black when mature, but sometimes covered with a white or grayish or

brown powdery coating of asexual spores(conidia). Stalk present in *Xylaria* absent in *Daldinia*. Spores dark brown to black, usually spindle shaped or elliptical, smooth. Asci borne in flasklike structure(perithecia) imbedded in the fruiting body(usually upper porton).....***Xylaria, Daldinia***

Taxonomic Descriptions

1. *Amauroderma rude* (Berk.) Torrend.1920 **(Photo Plate. 1)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Ganodermataceae
Genus	-	*Amauroderma*
Species	-	*A. rude*

Synonyms - *Ganoderma rude* Patouillard(1889), *Scindalma rude* (Berk.) Kuntze (1898), *Amauroderma rudis* (Berk.) G. Cunn. (1950), *Phellinus rudis* (Berk.) X.L. Zeng (1987), *Polyporus rugiceps* Lloyd (1924).

Description of the specimen

Pileus: Applanate to centrally depressed, but usually strongly irregular, 6 - 12 cm diameter, strongly zoned in different shades of brown with a cream outer ring, texture irregular, woody. **Stipe:** Central or eccentric, cylindrical but irregular and usually attenuated towards the base, dark brown, velvety to felty.Pores decurrent to sub-decurrent, white to cream turned brown by the spores. Fleshthick and woody, pale brown staining vinaceous on bruising then slowly black. Spore print brown, hard to obtain. **Basidiopores:** Ellipsoidal to subglobose 8 - 12 × 4 –6 μm, thick walled. Habitat single specimens found growing on buried wood and roots, often appearing to be growing in soil.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park.

Specimen Examined: MZU/WRF/2016/028; MZU/WRF/2017/113

Comments: Saprophytic, growing solitary on buried roots or woods. Ranadive (2013) mentioned its presence in the state of Maharastra, India.

2. *Amauroderma rugosum* (Blume et Nees ex Fr.) Torrend, 1920. **(Photo Plate. 2)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Ganodermataceae
Genus	-	*Amauroderma*
Species	-	*A. rugosum*

Synonyms - *Fomes rugosus* (Blume & T. Nees) Cooke, (1885), *Ganoderma rugosum* (Blume & T. Nees) Pat., (1889), *Polyporus rugosus* Blume & T. Nees, (1826), *Scindalma rugosum* (Blume & T. Nees) Kuntze, (1898),

Description of the specimen

Fruitbody:Annual, single or in groups from a common base, pileate with a lateral stipe, more rarely central and then because the pileus becomes fused behind the stipe attachment, flat or convex with deflexed margin, up to 10 cm wide and about 1 cm thick, woody hard when dry. Pileus deep brown to black, concentrically zoned and slightly sulcate, in dry specimens also somewhat radially wrinkled. Stipe up to 12 cm high, 3-8 mm thick, pore surface whitish when actively growing and then darkening when touched brown with age and on drying.Basidia bladder-like, 20-30 x 12-14 µm with 4 sterigmata. **Basidiospores**: Ellipsoidal to subglobose, 11.5-13 x 10-11 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/029; MZU/WRF/2016/061; MZU/WRF/2017/083; MZU/WRF/2018/159

Comments: *Amauroderma rugosum* has been reported earlier from India by Banerjee, (1947); Bose, (1937); Bakshi, (1971) and Ganesh, (1988).

3. *Aporpium strigosum* Sotome & T. Hatt., (2014). **(Photo Plate. 3)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Tremellomycetes,
Sub Class	-	Tremellomycetidae
Order	-	Tremellales,
Family	-	Aporpiaceae
Genus	-	*Aporpium*
Species	-	*A. strigosum*
Synonyms	-	NA

Description of the specimen

Basidiocarps annual, sessile to effused-reflexed, occasionally almost resupinate, solitary or imbricate.Pileus flabelliform to dimidiate, applanate to convex, 1.8–5 cm from the base to margin, 2.3–7.5 cm wide, up to 5.5 mm thick, surface at first almost glabrous, pink to pinkish ochraceous, later becoming strigose to aculeate with stiff hairs or spines, hairs usually dense near the base, azonate, pale ochraceous to straw. Context fleshy-tough to leathery in fresh condition, drying corky. Pore surface at first pink to pinkish ochraceous becoming pale ochraceous to straw drying cream to brownish orange pores angular to radially elongated. Tubes concolorous with pore surface, up to 15 mm deep. Basidia tetra-sterigmatoid. **Basidiospores**: Oblong ellipsoid to shortly cylindrical, thin-walled, smooth, hyaline, 9 – 14 × 6 –7.5 μm

Collection Site: Dampa Tiger Reserve Forest.

Specimen Examined: MZU/WRF/2018/002

Comments: Widely distributed in cool temperate to warm temperate areas in Japan (Sotome *et al.,* 2014).

4. *Auricularia auricula-judae* (Bull.) J. Schröt., (1888). **(Photo Plate. 4)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Auriculariales
Family	-	Auriculariaceae
Genus	-	*Auricularia*
Species	-	*A. auricular-judae*

Synonyms - *Tremella auricula-judae* (Bull.)Bull(1789), *Peziza auricula-judae* (Bull.) Bull.(1791), *Hirneola auricula-judae* (Bull.) Berk.(1860),

Description of the specimen

Fruiting body: Tough gelatinous, yellow to reddish brown, sessile to substipitate, up to 120 mm diameter by 1 - 2 mm thick, pileus minutely tomentose with hyaline hairs, hymenium smooth, growing in gregarious or caespitose groups, occasionally solitary, pileus made up of densely compacted gelatinised hyphae with cuticular hairs 85 - 100 × 5 - 6 μm, with rounded tips. Basidia 50 - 60 × 5 - 6 μm, cylindrical, with transverse septa. **Basidiopores**: Allantoid, 13 - 15 × 5 - 6 μm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/030; MZU/WRF/2016/062; MZU/WRF/2017/084; MZU/WRF/2017/126; MZU/WRF/2018/208

Comments: Distributed worldwide. Europe (United Kingdom), North America, Asia (in India semi-evergreen to evergreen and wet evergreen shoal forests of Western Ghats, Madhya Pradesh,Kerela, Northeast states), Australia, South America, and Africa(Verma, R.K., and Verma P., 2017). In India it has been reported from Meghalaya (Zothanzama, 2011a), Tripura (Debnath *et al*., 2019), Nagaland (Bhaben *et al*., 2011) and Mizoram by

Zothanzama and Lalrinawmi, (2015) and Lalrinawmi *et al*., (2017). Commonly known as the Jew's ear, wood ear or jelly ear, it is a species of edible Auriculariales fungus found worldwide. *Auricularia auricula-judae* has been used as a medicinal mushroom by many herbalists. It was used as a poultice to treat inflammations of the eye (Mabey, 1984) as well as apalliative for throat problems. It is an edible fungus. **Local Name**: Pu Vana beng/Pu Thiala beng.

5. *Auricularia cornea* Ehrenb. (1820) **(Photo Plate. 5)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Auriculariales
Family	-	Auriculariaceae
Genus	-	*Auricularia*
Species	-	*A. cornea*

Synonyms - *Exidia cornea* (Ehrenb.) Fr.(1822), *Hirneola cornea* (Ehrenb.) Fr., (1849)

Description of the specimen

Fruitings body: Tough cartilaginous, gelatinous, mouse grey to olive brown; substipitate; up to 100 mm diameter by 1 - 2 mm thick. Pileus pilose, densely covered with hyaline hairs, some in tufts; hymenium smooth, growing in gregarious or caespitose groups, occasionally solitary, pileus made up of densely compacted gelatinised hyphae with cuticular hairs upto 450 µm long, on average 185 - 200 × 5 - 7 µm, with rounded tips. Basidia 45 - 55 × 4 - 5 µm, cylindrical, with 3 transverse septa. **Basidiopores:** Allantoid, kidney shaped, 14 - 16 × 5 - 6 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/031; MZU/WRF/2017/054; MZU/WRF/2017/127; MZU/WRF/2018/162

Comments: Commonly known as hairy wood ear or the Pacific Cloud Ear. Distributed worldwide. It is an edible fungus. Rajendra and Rajesh, (2014) reported it from India.

6. *Auricularia delicata* (Mont.) Henn., (1893) **(Photo Plate. 6)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Auriculariales
Family	-	Auriculariaceae
Genus	-	*Auricularia*
Species	-	*A. delicata*

Synonyms - *Laschia delicata* Fr.(1830), *Auricula delicata* (Fr.) Kuntze (1898), *Auricularia auricula-judae* var. delicata (Mont.) Rick (1958).

Description of the specimen

Fruiting body: Soft rubbery gelatinous, reddish brown, sessile to substipitate,reniform to semicircular, up to 8cm diameter by 1 - 2 mm thick, pileus minutely tomentose to almost glabrous, with fine hyaline hairs, hymenium conspicuously meruloid to porose reticulate, with veins a pale cream reddish to pinkish colour and the hymenium surface reddish to pinkish cream, whole fungus transluscent when held up to the light. Pileus made up of densely compacted gelatinised hyphae with cuticular hairs 60 - 175 × 5 - 6 μm, with rounded tips; basidia 40 - 45 × 4 - 5 μm, cylindrical. **Basidiopores:** Allantoids,

sausage shaped, 10 - 13 × 5 - 6 μm. Habitat growing in gregarious or caespitose groups, occasionally solitary.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimenexamined: MZU/WRF/2016/032; MZU/WRF/2017/086; MZU/WRF/2017/128; MZU/WRF/2018/160

Comments: It is an edible fungus. In India, it was reported by Bhaben *et al*., (2011) from Nagaland and Lalrinawmi *et al*., (2017) reported from Mizoram.

7. *Auricularia mesenterica* (Dicks.) Pers., (1822) **(Photo Plate. 7)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Auriculariales
Family	-	Auriculariaceae
Genus	-	*Auricularia*
Species	-	*A. mesenterica*

Synonyms - *Helvella mesenterica* Dicks.(1785), *Merulius mesentericus* (Dicks.) Schrad.(1794), *Phlebia mesenterica* (Dicks.) Fr.(1828), *Patila mesenterica* (Dicks.) Kuntze(1891), *Helvella corrugata* (1776), *Tremella violacea* Relhan, (1785), *Auricularia tremelloides* Bull.(1787), *Thaelaephora mesenterica* J.F. Gmel., (1792), *Helvella mesenterica* Bolton,(1792)

Description of the specimen

Fruiting body: Rubbery gelatinous, pale grey to olive brown, resupinate and commonly lobed, up to 6cm diameter by 15 - 20 mm thick, pileus conspicuously zoned, margin undulating often pale from spore hymenium purplish brown, conspicuously veined,

wrinkle, growing in gregarious, tiered or caespitose groups, occasionally solitary. Pileus made up of densely compacted with cuticular hairs 60 - 175 × 5 - 6 μm, with rounded tips. Basidia 45 - 70 × 3 - 4 μm, cylindrical. **Basidiopores:** Allantoid, sausage shaped, 15 - 18 × 6 - 7 μm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/033; MZU/WRF/2016/064; MZU/WRF/2017/114; MZU/WRF/2018/184

Comments: Saprobic, on deciduous hardwoods particularly dead and decaying branches and twigs, very occasionally on living trees. Distributed worldwide. It is an edible fungus. Rajput *et al.,* (2015) reported *Auricularia mesenterica* from Gujarat, India.

8. *Auricularia polytricha* (Mont.) Sacc. (1885) **(Photo Plate. 8)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Auriculariales
Family	-	Auriculariaceae
Genus	-	*Auricularia*
Species	-	*A. polytricha*

Synonyms - *Exidia polytricha* Mont., (1834), *Hirneola polytricha* (Mont.) Fr., (1849), *Auricularia auricula-judae var. polytricha* (Mont.) Rick, (1958).

Description of the specimen

Fruit body: Gelatinous, gregarious in nature. It occurs in clusters growing on tree trunk and dead branches. Pileus measures upto 4 cm in diameter, convex, dark brown to dark lilac in color and densely pilose. Hymenium is smooth and dark lilac in color. Stipe 5-20

x 4-10 mm, cylindrical, becoming compressed and is concolorous with pileus. **Basidiospore:** Ellipsoidal, smooth, 5.6 - 8 x 2 - 3.7.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/034; MZU/WRF/2017/115; MZU/WRF/2018/161

Comments: Commonly known as the cloud ear fungus. *Auricularia polytricha* was earlier reported by Rajput *et al.*, (2015) from Gujarat. Sarma *et al*., (2010) also reported it from Assam, India. It is an edible fungus.

9. *Bisporella citrina* (Batsch) Korf & S.E. Carp., (1974) **(Photo Plate. 9)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Leotiomycetes
Sub Class	-	Leotiomycetidae
Order	-	Helotiales
Family	-	Helotiaceae
Genus	-	*Bisporella*
Species	-	*B. citrina*

Synonyms - *Peziza citrina* Batsch, (1789), *Calycella citrina* (Batsch) Boud.,(1885)

Description of the species

Fruiting body: Lemon or bright yellow, paler at margin, flat-topped or saucer-shaped disc with a tiny tapering stem or nearly without a stem normally in swarms, gelatinous; individual fruitbodies upto 3mm across and 2mm tall. **Ascospores:** Ellipsoidal, smooth, 9-14×3-5µm, when fully mature they develop one cross wall (termed becoming septate).

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/035; MZU/WRF/2016/063; MZU/WRF/2017/087

Comments: Although individually tiny, these fungi often occur in such large numbers that they become quite conspicuous. Lyngdoh and Dkhar, (2014) reported *Bisporella citrina* from Meghalaya, India.

10. *Coprinellus disseminatus* Pers. (1938). **(Photo Plate. 11)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Psathyrellaceae
Genus	-	*Coprinellus*
Species	-	*C. disseminatus*

Synonyms - *Agaricus pallescens* Schaeff.(1774), *Agaricus disseminatus* Pers., Comm. Schaeff. (1800), *Agaricus disseminatus* var. *digitaliformis* (Bull.) Pers.(1801), *Coprinus disseminatus* (Pers.) Gray,(1821), *Agaricus disseminatus f. digitaliformis* (Bull.) Fr.(1821), *Coprinus petasiformis* Corda (1837), *Agaricus gyroflexus* Fr.(1838), *Coprinarius disseminatus* (Pers.) P. Kumm.(1871), *Psathyra gyroflexa* (Fr.) P. Kumm.(1871), *Coprinus digitaliformis* (Bull.) P. Kumm.(1871), *Psathyrella disseminata* (Pers.) Quél.(1872), *Drosophila gyroflexa* (Fr.) Quél.(1886), *Pilosace pallescens* (Schaeff.) Kuntze(1898), *Pseudocoprinus disseminatus* (Pers.) Kühner.(1928), *Psathyrella gyroflexa* (Fr.) Konrad & Maubl.(1949)

Description of the specimen

Pileus: Parabolic to blunt, becoming convex to hemispherical, 5 – 12 cm diameter; young specimens white to pale lemon becoming pale grey and finally dark grey, somewhat translucent dry and distinctly plicate (pleated) with radial grooves arranged around a central disc. **Stipe**: Central, cylindrical, 30-50 × 1-2 mm, off-white to pale yellow-brown at base, dry and smooth. **Gills:** Adnexed, close, straw yellossw, maturing to dark grey but do not liquify. Spore print black. **Basidiopores:** Ellipsoid to almond shaped, 7.2 -9.7 × 4.1-5.4 μm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/036; MZU/WRF/2017/116
MZU/WRF/2018/163; MZU/WRF/2018/205

Comments: Commonly known as Fairy Incap. Saprobic, growing in clusters, often by the hundreds on decaying wood, especially near the bases of stumps, spring, summer, and fall, distributed worldwide. In India, it was reported from Maharastra (Senthilarasu and Kumaresan, 2016) and West Bengal (Chakraborty, 2019).

11. *Cookeina tricholoma* (Mont.) Kuntze, (1891) **(Photo Plate. 10)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Pezizomycetes
Sub Class	-	Pezizomycetidae
Order	-	Pezizales
Family	-	Sarcoscyphaceae
Genus	-	*Cookeina*
Species	-	*C. tricholoma*

Synonyms - *Pilocratera tricholoma* (Mont.) Henn. (?), *Peziza tricholoma* Mont., (1834), *Trichoscypha tricholoma (*Mont.) Cooke,(1889), *Lachnea tricholoma* (Mont.) Pat. & Gaillard, (1889).

Description of the specimen

Fruiting body: Goblet to funnel-shaped with an enroled margin, 1-4 cm in diameter, light orange, pale to pink to pale orange, with 1-3cm tall cylindrical stipe, conspicuously hairy. Hairs stiff, bristle-like, fasciculate, and usually 2-3 mm long. **Asci:** Sub-operculated apical apex, cylindrical, long, 8-spored, measuring 250 – 300 X 10 – 20 µm. **Ascospore:** Pointed-ellipsooidal, smoothwalled, 21-35 X 8-12 µm.

Collection Site: Dampa Tiger Reserve Forest,

Specimen examined: MZU/WRF/2017/080

Comments: Verma *et al*., (2018) described *Cookeina tricholoma* from Central India

12. *Coriolopsis aspera* (Jungh.) Teng, 1964. **(Photo Plate. 12)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Coriolopsis*
Species	-	*C. aspera*

Synonyms - *Polyporus asper* Jungh.,(1838), *Polystictus asper* (Jungh.) Fr., (1851), *Microporus asper* (Jungh.) Kuntze,(1898), *Trametes aspera* (Jungh.) Bres.,(1912), *Hexagonia aspera* (Jungh.) Imazeki, (1952), *Scenidium asperum* (Jungh.) Jülich, 12 (2): 116 (1984), *Funalia aspera* (Jungh.) Zmitr.& V. Malysheva, (2013), *Polyporus heteroporus* Mont., (1841), *Trametes badia* Berk., (1842), *Polyporus koenigii*

Berk., (1843), *Polyporus confertus* Lév.,(1844), *Polyporus cohaerens* Lév., (1846), *Polyporus strigatus* Berk., (1847), *Polyporus fuscellus* Lév.,(1854), *Trametes pyrrhocreas* Berk., (1872), *Polyporuslineatoscaber* Berk. & Broome, (1882), *Polyporus arenosus* Cooke, (1884), *Polyporus curreyi* Berk.ex Cooke,(1886), *Fomes curreyi* Berk. ex Cooke, (1886), *Polystictus konigii* (Berk.) Cooke (1886), *Polyporus olivaceus* Rostr.,(1902), *Polyporus rugososporus* Lloyd, of the (1915), *Polyporus zebra* Lloyd,(1915), *Hexagonia lignosa* Lloyd, (1919), *Polyporus fijii* Lloyd,(1922).

Description of the specimen

Basidiocarp: Annual, solitary or imbricate, up to 8.0 cm broad, 5.5 cm wide and 2.0 cm thick, consistency hard when dry. **Pileus**: Dimidiate to flabelliform with a tapering base, flat to slightly convex, color dark fulvous, chestnut to reddish brown, usually with a distinct reddish tint, concentrically sulcate and ridged, radially striate with warts, and scrupose tuft of agglutinated hairs, most erect near the base. Pore surface fulvous to rusty brown often with an ashy grey tint, pores round, entire, 1-3 per mm, tubes concolorous, up to 7 mm long, margin often sterile. Context fulvous, rusty brown to umber, up to 10 mm thick. **Basidiospores**: Not obtained

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/037; MZU/WRF/2018/152

Comments: *Coriolopsis aspera* has been reported in India by various workers from Himachal Pradesh (Kaur and Dhingra, 2012), Gujarat (Nagadesi and Arya, 2014), and Uttarakhand (Prasher & Lalita, 2013).

13. *Cyclomyces tabacinus* (Mont.) Pat., (1900). **(Photo Plate. 14)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales

Family - Polyporaceae
Genus - *Cyclomyces*
Species - *C. tabacinus*

Synonyms - *Polyporus tabacinus* Mont.,(1835), *Polystictus tabacinus* (Mont.) Fr., (1851),*Mucronoporus tabacinus* (Mont.) Ellis & Everh., (1889), *Microporus tabacinus* (Mont.) Kuntze,(1898), *Inonotus tabacinus* (Mont.) G. Cunn., (1948), *Hymenochaete porioides* T. Wagner & M. Fisch.,(2002), *Polyporus spadiceus* Jungh., (1838), *Polyporus microcyclus* Zipp. ex Lév.,(1844), *Cycloporellus barbatus* Murrill,(1908) *Coriolopsis fumosa* Murrill, 1912), *Polyporus gilvorigidus* Lloyd,(1925).

Description of the specimen

Basidiocarp: Annual to perennial, up to 8 cm wide and long, 1-3 mm thick, solitary to densely imbricate or in rows, sessile or more usually fanshaped to flabelliform with lateral tapering base, more seldom orbiculate with central stipelike base, brittle when dry. **Pileus**: Dark brown to bay or reddish-brown, narrowly concentrically zoned in different shades, almost black when old. Upper surface velvety, tomentose to hirsute, with age glabrous in concentric zones, finely radiately striate, silky and shining, margin acute, often sterile below and fulvous in young specimens. Pore layer fulvous to dark brown sometimes with a greyish tint. **Basidiospore**: Ellipsoidal 2.5-3.5 x 1.5-2 µm, smooth and inamyloid.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/039; MZU/WRF/2016/065; MZU/WRF/2017/081; MZU/WRF/2018/185

Comments: *Cyclomyces tabacinus* has been reported from Meghalaya, India by Zothanzama, (2011a) and Lyngdoh and Dkhar (2014).

14. *Cyathus striatus* (Huds.) Willd. (1787) **(Photo Plate. 13)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Agaricaceae
Genus	-	*Cyathus*
Species	-	*C. striatus*

Synonyms - *Peziza lentifera* L., (1753), *Peziza hirsuta* Schaeff., (1774), *Pezizastriata* Huds., (1778), *Cyathus laevis* Willd.,(1787), *Nidularia striata* (Huds.) Bull.(1791), *Cyathella striata* (Huds.) Brot., (1804), *Cyathia hirsuta* (Schaeff.) V.S. White, (1902) *Cyathialentifera* (L.) V.S. White, (1902), *Cyathus hirsutus* (Schaeff.) Sacc., (1905), *Peziza hirsuta* Schrank, (1789).

Description of the specimen

Fruiting body: Obconical (bucket like), narrower at base and wider at rim, 7 – 10 × 6 – 8 mm; external surface covered in shaggy scales, tomentose, inner surface glabbrous and strongly plicate; greyish buff to brown on the outer surface, paler internally with vertical bands of darker brown enhancing the striate appearance. Epiphram with a distinct and persistant cap over the fruiting body (epiphram), often remaining attached to one edge of the fruiting body rim; cream or white. **Stipe**: absent, attached directly to substrate. Peridioles rounded to triangular, dark grey with a paler center, 2 mm diameter; smooth. **Basidiopores:** Ellipsoid; 18 – 20 × 8 – 10 µm; thick walled, smooth. **Collection Site:** Dampa Tiger Reserved Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/038; MZU/WRF/2017/117; MZU/WRF/2018/185

Comments: Substrate attached to twigs, mulch and small logs in leaf litter. Commonly known as Bird Nest Fungi. In India, Patel *et al.,* (2018) reported it from Gujarat and Chuzho and Dkhar, (2018) reported it from Nagaland. **Local Name:** Tualvungi Em.

15. *Cymatoderma dendriticum* (Pers.) D.A. Reid,(1959) **(Photo Plate. 15)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Psathyrellaceae
Genus	-	*Cymatoderma*
Species	-	*C. dendriticum*

Synonyms - *Thelephora dendritica* Pers.,(1827) *Cladoderris dendritica* (Pers.) Berk.,(1842), *Actinostroma crassum* Klotzsch, (1843) *Cladoderris candolleana* Lév.,(1846), *Cladoderris australis* Kalchbr., (1878), *spongipes Stereum* Berk. (1881),*Stereum spongiipes* Berk.,(1881) *Stereum spongiaepes* Berk. (1881), *Stereum amphirhytes* Sacc. & Berl.,(1889), *Beccariella trailii* Cooke.,(1891), *Stereum fenixii* Lloyd, (1922).

Description of the specimen

Cap: deeply funnel-shaped; 50–250 mm; finely tomentose, radially folded, velvety to hairy when young, but may become almost smooth and wrinkled with age, margin wavy and scalloped to ragged; buff, tan, grey, to lilac, often becoming paler towards edge, lilac tints common in fresh fungi particularly at edge. **Stipe**: Cylindrical and centrally attached, 50–200 × 5– 30 mm, finely velvety to hairy, may become nearly smooth with

age, buff or tan, very young specimens may have a very thick stem that merges into the flesh of the upper-surface. Lower irregular, cream, grey to ochre, sometimes with a lilac tint. **Flesh:** Tough and leathery, pale brown. **Spore print:** hard to obtain. **Basidiopores:** not observed.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park

Specimen Examined: MZU/WRF/2016/074; MZU/WRF/2017/121

Comments: In India, *Cymatoderma dendriticum* has been reported by Ranadive *et al*., (2013) from Pune, Maharastra.

16. *Dacryopinax spathularia* (Schwein.), (1948). **(Photo Plate. 16)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Dacrymycetes,
Sub Class	-	Dacrymycetidae
Order	-	Dacrymycetales
Family	-	Dacrymycetaceae
Genus	-	*Dacryopinax*
Species	-	*D. spathularia*

Synonyms - *Merulius spathularius* Schwein., (1822), *Guepinia spathularia* (Schwein.) Fr., (1828), *Cantharellus spathularius* (Schwein.) Schwein., (1832), *Guepiniopsis spathularia* (Schwein.) Pat., (1900).

Description of the specimen

Basidiocarp: Gelatinous jelly like yellow-orange to orange, have rounded stalks at the base, are flattened upward, and have an overall fan-shaped to spatula-shaped appearance,0.5 - 2.5 cm tall. Hymenium distinctly folded with the folds resembling gills.

Basidiospores: Colourless, curved, 2-celled, 19 x 4 µm.

Collection Site: Murlen National Park

Specimen Examined: MZU/WRF/2017/082

Comments: Nutritive potential and antioxidant activity of the species has been done on this species by Kumar *et al*., (2018). Ao *et al*., (2016) also reported the species to be edible from Nagaland, India.

17. *Daedalea circularis* B.K. Cui & Hai J. Li,(2013) **(Photo Plate. 17)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Fomitopsidaceae
Genus	-	*Daedalea*
Species	-	*D. circularis*
Synonyms	-	N/A

Description of the specimen

Basidiocarps: Perennial, pileate, sessile, single or imbricate, without odor or taste when fresh, hard corky to woody hard and light in weight upon drying. Pileal surface bluish gray to peach, irregular white to cream outgrowth and fuscous to black patches spreading from the base with age, glabrous and smooth when young, finely tuberculate near the base when old. Pileal margin cream to buff, distinctly paler than the pileus, obtuse. Pore surface cream to buff, sterile margin distinct, white to cream, up to 3 mm wide. Pores round, 4–6 per mm. **Basidiospores**: Cylindrical, hyaline, thin-walled, smooth, 2.1-2.3 x 2.7(–2.8) µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/040; MZU/WRF/2016/075; MZU/WRF/2017/088; MZU/WRF/2018/164

Comments: In India, Prasher & Lalita, (2013) has reported *Daedalea circularis* from Uttarakhand. Rathod, (2016) also reported the species from Maharastra.

18. *Daedalea confrogosa* (Bolton) Pers., (1801) **(Photo Plate. 18)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Fomitopsidaceae
Genus	-	*Daedalea*
Species	-	*D. confrogosa*

Synonyms - *Daedaleopsis confragosa* (Bolton) J. Schröt., (1888), *Boletus confragosus* Bolton, (1791), *Trametes confragosa* (Bolton) Rabenh., (1844), *Polyporus confragosus* (Bolton) P. Kumm., (1871),*Striglia confragosa* (Bolton) Kuntze, (1891), *Lenzites confragosa* (Bolton) Pat., (1900),*Agaricus confragosus* (Bolton) Murrill, (1905),*Daedalea confragosa f. bulliardii* (Fr.) Domanski, Orlos & Skirg., (1967), *Ischnoderma confragosum* (Bolton) Zmitr., (2001), *Ischnoderma confragosa* (Bolton) Zmitr. (2001), *Daedaleopsis confragosa var. confragosa* (?), *Boletus suaveolens* Bull., (1787), *Boletus angustatus* Sowerby, (1799),*Daedalea rubescens* Alb. & Schwein., (1805), *Daedalea corrugata* Klotzsch, (1833), *Daedalea discolor* Klotzsch, (1833), *Lenzites crataegi* Berk., (1847), *Lenzites ungulaeformis* Berk. & M.A. Curtis, (1849), *Lenzites unguliformis* Berk.& M.A. Curtis, (1849), *Daedalea pruinata* Secr., (1855),*Lenzites atropurpurea* Sacc., (1873), *Lenzites cookei* Berk., (1876), *Lenzites proxima* Berk. (1876), *Trametes purpurascens* Berk.& Broome, (1879), *Polyporus*

purpurascens Berk.& M.A. Curtis, (1879),*Trametes erubescens* Schulzer, (1882), *Trametes zonata* Wettst., (1885), *Lenzites sinensis* Cooke, (1889), *Lenzites sibirica* P. Karst., (1904), *Daedalea favoloides* Murrill, (1912), *Daedalea ochracea* Velen., (1922), *Lenzites queletii var. jappii* Velen., (1930),*Tyromyces subradiatus* Corner, (1989).

Description of the specimen

Basidiocarps: Usually kidney - fan shaped, 5 to 20cm across and 1 to 4cm thick at maturity, but occasionally they form attractive horizontal rosettes(circular). Blackened old fruitbodies can sometimes persist for several years. Pore Surface white, becoming dingy brownish in age, typically with elongated, maze-like pores and fairly thin walls between the pores, but sometimes with more or less round pores, or even with the pores elongated so much that they appear like gills, often bruising when handled. **Basidiospores:** Cylindrical to elliptical, smooth, 6.5 - 10 x 1.6 - 3 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/041; MZU/WRF/2017/120; MZU/WRF/2018/153; MZU/WRF/2018/206

Comments: *Daedalea confragosa* has been reported from India by various workers Zothanzama (2011a) reported it from Meghalaya. Ranadive *et al*., (2011) reported from Maharastra; Nagadesi and Arya, (2016) and Vasava *et al*., (2018) reported from Gujarat; Meenakshi and Selvam, (2020) also reported from Tamil Nadu, India.

19. *Daedalea quercina* (L.) Pers. (1801). **(Photo Plate. 19)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Fomitopsidaceae

Genus - *Daedalea*
Species - *D. quercina*

Synonyms - *Agaricus quercinus* L., (1753), *Agaricus labyrinthiformis* Bull.,(1788), *Merulius quercinus* (L.) J.F. Gmel.,(1792), *Lenzites quercina* (L.) P. Karst., (1882), *Striglia quercina* (L.) Kuntze,(1891), *Daedaleites quercinus* (L.) Mesch.(1892), *Trametes quercina* (L.) Pilát,(1939), *Agaricus dubius Schaeff.,(*1774), *Agaricus antiquus* Willd.,(1787), *Agaricus labyrinthiformis* Hoffm.,(1789), *Agarico-suber daedaleum* Paulet, (1793), *Daedalea nigricans* Pers., (1801), *Daedalea inzengae* Fr., (1869), *Hexagonia minor* Lázaro Ibiza,(1916).

Description of the specimen

Basidiocarp: Perennial, single or a few specimens fused laterally, broadly sessile to dimidiate, semicircular, up to 12 cm wide, 10 cm broad and 8 cm thick, strongly attached to the substrate, corky rigid to woody hard. Pileus flat to slightly convex often with a slightly raised base, smooth to finely velutinate, often concentrically zoned. Pore surface flat to oblique, especially close to the substrate, along the margin elongated poroid. Context up to 1.5 cm thick, ochraceous to brown with indistinct annual zones. **Basidiopores**: Ellipsoidal to cylindrical, hyaline, thin-walled, smooth , 5 - 7 x 2.5 - 3.6 µm, difficult to obtain in most specimens.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/042; MZU/WRF/2016/066; MZU/WRF/2017/119; MZU/WRF/2018/177

Comments: In India, Rathod, (2016) described *Daedalea quercina* from from western Maharastra.

20. *Daldinia concentrica* (Bolton) Ces. & De Not.,(1863) **(Photo Plate. 20)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Sordariomycetes
Sub Class	-	Xylariomycetidae
Order	-	Xylariales
Family	-	Hypoxylaceae
Genus	-	*Daldinia*
Species	-	*D. concentrica*

Synonyms - *Hemisphaeria concentrica* (Bolton) Klotzsch (?), *Sphaeria concentrica* Bolton,(1792), *Peripherostoma concentricum* (Bolton) Gray,(1821), *Peripherostomavar. concentricum* (Bolton) Gray,(1821), *Hypoxylon concentricum* (Bolton) Grev.,(1828), *Stromatosphaeria concentrica* (Bolton) Grev.,(1828), *Hemisphaeria concentrica* (Bolton) Klotzsch,(1843).

Description of the specimen

Fruiting body: Cushion like to hemispherical, 50 × 40 × 30mm, hard, smooth, a rich vinaceous brown. **Stipe**: Not stipitate, broadly and firmly attached to substrate. Flesh hard, becoming brittle when old; revealing a number of concentric rings when cut vertically, normally alternating between thicker black rings and finer white ones. **Spore print**: Black. **Basidiopores:** Ellipsoid, but somewhat flattened on one side, 14.5 - 17.5 × 6.5 - 8.5 µm. Each asci contain 8 spores and they are held in tube like structures just below the surface.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/043; MZU/WRF/2016/076; MZU/WRF/2017/118; MZU/WRF/2018/165

Comments: Commonly referred to as King Alfred's Cakes. They are also referred to as Cramp Balls. *Daldinia concentrica* is reported from India in Madhya Pradesh by (Gond *et. al,.*2013), and northeastern states by (Gogoi and Parkash, 2016). Nagadesi and Arya, (2017) from Gujarat. Thangaraj *et al.*, (2017) studied the wound healing effect of *Daldinia concentrica*) used by tribes of Sirumalai Hills, Tamil Nadu, India.

21. *Favolaschia pustulosa* (Jungh.) Kuntze (1898) **(Photo Plate. 21)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Marasmiaceae
Genus	-	*Favolaschia*
Species	-	*F. pustulosa*

Synonyms - *Favolus pustulosus* Jungh., (1838); *Laschia pustulosa* (Jungh.) Sacc., (1888).

Description of the specimen

Cap: Applanate to slightly convex, often kidney shaped in outline, 10 – 30 mm diameter, an unmistakable bright orange colour. Stipe cylindrical, eccentric or attached laterally, 50 × 1-2 mm, often curved, bright orange like the cap.Pores deep, mostly pentagonal, if held up to the light one is able see the pattern of the pores as the flesh is translucent. Flesh thin, orange. Spore print white. **Basidiopores:** Ellipsoid to lacrymoid (tear shaped), 10 – 12.5 × 8 – 9 µm; smooth, amyloid.

Collection Site: Dampa Tiger Reserve Forest,

Specimen Examined: MZU/WRF/2018/154

Comments: Acharya *et al*., (2014) reported for the first time in eastern India.

22. *Filoboletus manipularis* (Berk.) Singer (1945) **(Photo Plate. 22)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Tricholomataceae
Genus	-	*Filoboletus*
Species	-	*manipularis*

Synonyms - *Favolus manipularis* Berk.,(1854), *Mycena manipularis* (Berk.) Sacc.(1887), *Laschia manipularis* (Berk.) Sacc.(1888), *Laschia caespitosavar. manipularis* (Berk.) Sacc.(1888), *Poromycena manipularis* (Berk.) R. Heim,(1945) *Favolaschia manipularis* (Berk.) Teng, Zhong Guo De Zhen Jun ,(1963).

Description of the specimen

Cap: Often bell shaped or convex and umbonate, 5 - 30 mm diameter. White to cream attached directly to the wood, 10 – 60 × 1 – 2.5 mm. **Stipe**: Centrally attached to the cap but often emerge from the side of logs and are sometimes in small groups joined at the base. Same colour as cap and smooth to slightly hairy. Pores a network of symmetrical white pores which range from 1-3 pores per mm. Flesh thin, creamy white. **Basidiopores:** White, ellipsoid, smooth, 5.5 – 7 × 2.5 – 3.7 μm. Basidia clavate, 15 – 20 × 5 – 6 μm, four spored.

Collection Site: Murlen National Park.

Specimen Examined: MZU/WRF/2018/186

Comments: Karun & Sridhar, (2017) reported *Filoboletus manipularis* as edible from Western Ghats region of India.

23. *Fistulina hepatica* (Schaeff.)With., (1792) **(Photo Plate. 23)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agagricales
Family	-	Fistulinaceae
Genus	-	*Fistulina*
Species	-	*F. hepatica*

Synonyms - *Boletus hepaticus* Schaeff., (1774), *Fistulina buglossoides* Bull., (1790), *Boletus hepaticus* Vent., (1812). *Hypodrys hepaticus* (Schaeff.) Pers.,(1825), *Boletus buglossum* Retz., (1769), *Boletus esculentus* With., (1776), *Boletus bulliardii* J.F. Gmel.,(1792), *Agarico-carnis lingua-bovis* Paulet, (1793), *Fistulina sarcoides* St.-Amans, (1821), *Buglossus quercinis* Wahlenb. (1826), *Fistulina endoxantha* Speg., (1921).

Description of the specimen

Basidiocarp: Upto 30 cm across, irregular in shape but often fan-shaped or tongue-like, sometimes fused laterally with other caps, velvety, or fairly smooth, the margin lobed, red, reddish orange, or liver colored. Pore Surface whitish or pale - pinkish, becoming reddish brown in age, bruis-ing reddish brown. Flesh streaked with reddish areas, thick, soft, watery, exuding a reddish juice when squeezed. Odor not distinctive, taste sour or acidic. Spore print pinkish to pinkish brown. **Basidiospores**: 3.5-4.5 x 2.5-3 μ, smooth, ovoid.

Collection Site: Murlen National Park

Specimen Examined: MZU/WRF/2017/097

Comments: *Fistulina hepatica* is commonly called as the Beaf Steak Fungi. Lalrinawmi *et al,.* (2017) mentioned its presence in the forests of Mizoram. Zothanzama, (2011a) also reported it from Meghalaya. It is an edible fungus distributed worldwide.

24. *Fomitopsis dochmia* (Berk. & Broome), (1972) **(Photo Plate. 24)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Fomitopsidaceae
Genus	-	*Fomitopsis*
Species	-	*F. dochmia*

Synonyms - *Polyporus dochmius* Berk. & Broome, (1875), *Fomes dochmius* (Berk. & Broome) Cooke,(1885), *Scindalma dochmium* (Berk. & Broome) Kuntze, (1898), *Ungulina dochmia* (Berk. & Broome) Pat.,(1928), *Osmoporus dochmius* (Berk. & Broome) G. Cunn.,(1965), *Trametes dochmia* (Berk. & Broome) Corner, (1989), *Daedalea dochmia* (Berk. & Broome) T. Hatt.,(2005), *Polyporus ferreus* Berk.,(1847), *Fomes ferreus* Berk. ex Cooke, Grevillea 14 (69): 21 (1885), *Fomes philippinensis* Murrill, (1907), *Fomes subferreus* Murrill,(1908), *Trametes elevata* Corner,(1989), *Trametes fulvidochmia* Corner,(1989)

Description of the specimen

Basidiocarp: Perennial, solitary or imbricate, pileate, more rarely effused reflexed, commonly applanate, more rarely convex, broadly sessile to dimidiate, up to 12 cm wide, 20 cm long and 3 cm thick at the base, corky to woody hard when dry. Pileus first brownish-grey, then greyish-black and finally black with a distinct crust, with numerous characteristic radial cracks, margin sharp to slightly rounded. Pore surface ochraceous, buff to wood colour, when fresh with a tint of pinkish, pores small, entire, round. **Basidiospores**: Oblong to ellipsoidal, 5 - 7 x 1.5 - 2.2 µm.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary,

Specimen examined: MZU/WRF/2016/044; MZU/WRF/2018/187

Comments: Adarsh *et al*., (2018) and Chander *et al*., (2017) reported and described *Fomitopsis dochmia* from Kerala, India.

25. *Ganoderma applanatum* (Pers.) Pat.,(1889) **(Photo Plate. 25)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Ganodermataceae,
Genus	-	*Ganoderma*
Species	-	*G. applanatum*

Synonyms - *Boletus applanatus* Pers.,(1799), *Boletus fomentarius* var. *applanatus* (Pers.) Pers., (1801), *Polyporus applanatus* (Pers.) Wallr., (1833), *Fomes applanatus* (Pers.) Gillet, (1878), *Placodes applanatus* (Pers.) Quél., (1886), *Phaeoporusapplanatus* (Pers.) J. Schröt.,(1888), *Elfvingia applanata* (Pers.) P. Karst., (1889), *Friesiaapplanata* (Pers.) Lázaro Ibiza, (1916), Boletus lipsiensis Batsch,(1786), *Polyporus merismoides* Corda, (1837), *Polyporus stevenii* Lév., (1844), *Polyporus leucophaeus* Mont., (1856), *Polyporus leucophaeum* Mont. (1856), *Polyporus incrassatus* Berk., (1877), *Polyporus concentricus* Cooke, (1880), *Fomes gelsicola* Berl.,(1889), *Fomes nigriporus* Lázaro Ibiza,(1916), *Ungularia subganodermica* Lázaro Ibiza, (1916*), Fomes longoporus* Lloyd,(1920).

Description of the specimen

Basidiocarp: Perennial, mostly sessile, corky to woody, upto 65cm broad, 4-12 cm thick, fan-shaped to slightly convex, usually solitary, margin rounded early, becoming narrowed at maturity, solitary or sometimes found in small group. Upper-surface hard crust, reddish-brown to brown, irregular, often zonate, frequently dusted with brown

spores. Flesh up to 6-7 cm thick, brown,rigid and tough, corky. Pores surface white, instant bruising when injured, fading to pale yellowish-buff when dried, 4-12 mm long, brown, each layer separated by a thin layer of tissue. **Basidiospores**: Broadly elliptical, 6 – 9.4 x 3 – 5 µm, double-walled. Sporeprint brown.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/045; MZU/WRF/2016/077; MZU/WRF/2018/188; MZU/WRF/2018/207

Comments: Commonly known as The Artist's Conk. Bhosle *et al*,. (2010) and Nagadesi *et al*,.(2016) reported it from Maharastra, and Western Ghats,India respectively. In Northeast India, Zothanzama, (2011a) reported the species from Meghalaya, and Chuzho and Dkhar, (2018) reported it from Nagaland.

26. *Ganoderma lucidum* (Curtis) P. Karst., (1881) **(Photo Plate. 26)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Ganodermataceae,
Genus	-	*Ganoderma*
Species	-	*G. lucidum*

Synonyms - *Boletus rugosus* Jacq., (1774), *Boletus lucidus* Curtis, (1781), *Polyporus lucidus* (Curtis) Fr.,(1821), *Grifola lucida* (Curtis) Gray,(1821), *Fomes* lucidus (Curtis) Cooke,(1885), *Placodes lucidus* (Curtis) Quél.,(1886), *Phaeoporus lucidus* (Curtis) J. Schröt.,(1888), *Boletus flabelliformis* Leyss.,(1761), *Boletus obliquatus* Bull.,(1781), *Boletus vernicosus* Bergeret,(1783), *Agaricus lignosus*

Lam.,(1783), *Boletus dimidiatus* Thunb.,(1784), *Boletus castaneus* Weber,(1787), *Boletus laccatus* Timm, (1788), *Boletuscrustatus* J.J. Planer, (1788), *Agarico-igniarium trulla* Paulet,(1793), *Boletus verniceus*Brot.,(1804), *Ganoderma ostreatum* Lázaro Ibiza,(1916), *Ganoderma nitens* Lázaro Ibiza, (1916).

Description of the specimen

Basidiocarp: Sessile, annual, rigid, corky to woody, crustose, dark brownish to blackish brown, irregular, rugose 4 - 8 cm wide, sometimes shows erect slender finger like projection. Pore surface smooth, creamy when fresh and becomes pale brown when aged or bruised, pores circular to somewhat ovoidal, 1.5 - 2.5 mm. **Basidiopores:** 1.8 - 2.5 x 2.6 - 3.9 µm, more or less ellipsoidal, sometimes with truncate end, double walled. Basidia 2.4 - 2.9x 3.4 - 4.6 µm, elongated, broadly clavated,4- sterigmatic.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/046; MZU/WRF/2017/089; MZU/WRF/2018/189; MZU/WRF/2018/214

Comments: Studies on various aspects of *Ganoderma lucidum* has been done by certain workers from India (Rony *et al*., 2011; Rawat, 2018; Bhardwaj *et al*., 2016; Nahata, 2013). In Northeast India, it was reported from Mizoram (Zothanzama, 2011a), Meghalaya (Lyngdoh and Dkhar, 2014) and Assam (Nath and Sarma, 2018).

27. *Ganoderma mastoporum* (Lev.) Pat.,(1889) **(Photo Plate. 27)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota,
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Ganodermataceae,
Genus	-	*Ganoderma*

Species - *G. mastoporum*

Synonyms - *Polyporus mastoporus* Lév.,(1844), *Fomes mastoporus* (Lév.) Cooke,(1885), *Ganoderma malosporum* (Lév.) Pat., (1894), *Scindalma mastoporum* (Lév.) Kuntze, (1898), *Elfvingia mastopora* (Lév.) Imazeki, (1952), *Elfvingia flabellata* Imazeki, (1952).

Description of the specimen

Basidiocarp: Perennial, sessile, rigid, corky to woody, crustose, dark brownish to blackish brown, irregular, rugose 4 - 8 cm wide, sometimes shows erect slender finger like projection. Stipe absent. Pore surface smooth, creamy when fresh and becomes pale brown when aged or bruised, pores circular to somewhat ovoidal, 1.5 - 2.5 mm. **Basidiopores:** 1.4 - 2.2 x 2.5 -2.9 µm, more or less ellipsoidal, sometimes with truncate end, double walled. Basidia 2.24 - 2.91 x 3.41-4.6 µm, elongated, broadly clavated, tetrasterigmatic.

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2016/047

Comments: Zohmangaiha *et al*., (2019) described *Ganoderma mastoporum* from Mizoram.

28. *Ganoderma mizoramense* Zothanzama, Blanchette, Held, C.W. Barnes, sp. Nov (2017) **(Photo Plate 28)**

Classification

Domain - Eukaryota
Kingdom - Fungi
Division - Basidiomycota,
Sub Division - Agaricomycotina
Class - Agaricomycetes
Sub Class - Agaricomycetidae
Order - Polyporales
Family - Ganodermataceae,
Genus - *Ganoderma*

Species - *G. mizoramense*

Synonyms - N/A

Description of the species

Fruiting body: Annual, pileate, stipitate, applanate, soft and leathery when fresh and woody to corky when dried, more or less flabelliform, semi-circular, irregular surface; absence of any 'growing zones'; dark brownish to dark reddish brown, homogenous context structure 2–20 mm. Pileus upper surface reddish brown when fresh, liver brown when dry, surface hard and glabrous, margin white, rounded, thickened, lower surface white when fresh, pale brown when dry. Context uniformly ochraceous or cinnamon, firm; tubes 1–12 mm long, dark brown, not stratified. Stipe sometimes absent, but more commonly present and often prominent; twisted and irregular; varnished and coloured like the cap; often bearing pores. Pore surface smooth, creamy to snuff brown when dry, pores 4–5 per mm, round to somewhat slightly oval, 187–278 × 134–228 µm, dissepiments 33–88 µm. Hyphal system trimitic, generative hyphae hyaline, slightly thicker than skeletal hyphae with clamp connections at very few places, no branching observed; skeletal hyphae most prevalent in the basidiocarp, 1.5–7 µm; binding hyphae hyaline and highly branched, 2–5.5 µm. Basidia tetrasterigmatic basidium. **Basidiospores**: Brown, ellipsoid with a truncate base, bitunicate, verruculose, 10–12.5 × 6–9. Chlamydospores not observed.

Comments: This is a new species which is collected from Tanhril, Aizawl. (Zothanzama *et al.*, 2017).

29. *Gymnopilus spectabilis* (Weinm.) A.H. Sm (1949) **(Photo Plate. 29)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Strophareaceae
Genus	-	*Gymnopilus*
Species	-	*G. spectabilis*

Synonyms - *Agaricus crociphyllus* Cooke & Massee, (1887), *Agaricus crocophyllus* Cooke & Massee (1887), *Flammula crocophylla* Sacc., (1891), *Flammula crociphylla* Sacc.(1891), *Gymnopilus crocophyllus* (Sacc.) Pegler (1965).

Description of the specimen

Cap: Broadly convex, 3 – 6 cm diameter, matt with minute squamules, light orange to deep red, squamules at cap centre russet with fleeting velar remains. **Stipe**: More or less cylindrical, sometimes stretched at apex 20 – 40 × 3 - 6 mm,vertically striate, pale at apex becoming olivaceous brown towards base, firmly attached. Gills adnexed, moderately crowded, bright orange with a single series of lamellulae. Flesh thin, orange. **Spore print:** Rusty brown. **Basidiopores:** Ellipsoid, 6.5 – 7.6 × 4.1 – 5.4 µm, 4 spored.

Collection Site: Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/048; MZU/WRF/2018/190

Comments: Kaur *et al.*,(2015) has reported *Gymnopilus spectabilis* for the first time from North India.

30. *Hexagonia tenuis* (Hook.) Fr.,(1838) **(Photo Plate. 30)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Hexagonia*
Species	-	*H. tenuis*

Synonyms - *Boletus tenuis* Hook.,(1822), *Favolus tenuis* (Hook.) Fr.,(1825), *Polyporus tenuis* (Hook.),(1833), *Polyporus tenuis* (Hook.) Berk., (1839), *Scenidium tenue* (Hook.) Kuntze, (1898), *Daedaleopsis tenuis* (Hook.) Imazeki, (1943), *Pseudofavolus tenuis* (Hook.) G. Cunn.,(1965), *Trametes tenuis* (Hook.) Corner,(1989) *Polyporus bivalvis* Pers.,(1827) *Polyporus polygrammus* Mont., (1837), *Hexagonia orbiculata* Fr., (1837), *Hexagonia polygramma* Fr., (1838), *Polyporus cervinoplumbeus* Jungh., (1838), *Polyporus aculeatus* Mont., (1840), *Hexagonia pulchella* Lév., (1844), *Hexagonia blumei* Lév.,(1844), *Hexagonia similis* Berk., (1846), *Hexagonia cyclophora* Lév., (1846), *Hexagonia dregeana* Lév.,(1846),*Hexagonia brevis* Berk., (1854), *Hexagonia thwaitesii* Berk., (1858), *Hexagonia muelleri* Berk., (1872), *Hexagonia rigida* Berk., (1877), *Hexagonia tenuis* var. *natalensis* Sacc.,(1888), *Hexagonia concinna* Pat. & Har.,(1893), *Hexagonia discopoda* Pat. & Har.,(1893), *Hexagonia casuarinae* Pat., (1901), *Polyporus changensis* Rostr., (1902), *Hexagonia phaeopora* Pat.,(1907), *Hexagonia burchellii* Lloyd, (1910), Hexagonia cuprea Bres.,(1911) *Hexagonia rhodopora* Pat., (1912), *Hexagonia tenuiformis* Murrill, (1912), *Hexagonia angulata* Lloyd, (64): 1003 (1920), *Hexagonia umbrosa* Lloyd,(1920), *Hexagonia caliginosa* Lloyd, (1922).

Description of the specimen

Basidiocarp: Annual to perennial, solitary or in clusters, pileate, broadly, narrowly attached to almost stipitate, upto 10 cm broad and wide and 1 - 3.5 cm thick, mostly papery thin, flexible and coriaceous when dry. Pileus flabelliform to semicircular, flat when fresh, often bent when dry, upper surface glabrous, usually strongly concentrically zoned in shades of brown from ochraceous to pale brown. Margin paper-thin, acute, slightly depressed, wavy, entire to lobed. Pore surface brown, hazel, often with a greyish to ashy-bluish tint, pores angular to hexagonal, tubes up to 2 mm long, with or without hyphal pegs. **Basidiospore:** Cylindrical, hyaline, thick-walled, non-amyloid, 12-17 x 3-4.6 µm. Sporeprint not obtained.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/049; MZU/WRF/2017/123; MZU/WRF/2018/166; MZU/WRF/2018/191

Comments: *Hexagonia tenuis* has been studied reported from India by (De AB, 2018; Arya *et al*., 2008; Ranadive, 2013; Prasher and lalita, 2013). It was also reported from Northeast India by Zothanzama, (2011a); Majumdar and Shukla, (2012); Chuzho and Dkhar, (2018); Lyngdoh and Dkhar, (2014); Nath and Sarma, (2018).

31. *Hymenochaete villosa* (Lév.) Bres., (1910) **(Photo Plate. 31)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Hymenochaetales
Family	-	Hymenochaetaceae
Genus	-	*Hymenochaete*
Species	-	*H. villosa*

Synonyms - *Stereum villosum* Lév., (1844), *Thelephora nigricans* Lév., Voy. (?), *Stereum phaeum* Berk.,(1855), *Hymenochaete strigosa* Berk. & Broome,(1875), *Hymenochaete spadicea* Berk. & Broome,(1875), *Stereum semilugens* Kalchbr. & Cooke,(1880)

Description of the specimen

Fruiting body: Applanate, semi circular, sometimes effused-reflexed, often over-lapping or fused together, 3 – 7cm long, concentrically banded, orange brown, rusty brown, umber or sepia. **Upper surface:** Attached laterally or dorsally to substrate, zoned, bands of various shades of brown, surface coarsely tomentose, strigose, with hairs falling off with age, margin often lobed. **Lower surface**: Smooth with indentations and a few irregularities, dentate, with small regular teeth extending downwards visible under ×10 lens. **Flesh:** Thin and leathery, orange brown. **Spores:** Ellipsoid, 3.5 – 4 × 2 – 2.5 μm, smooth, thin walled.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park,.

Specimen Examined: MZU/WRF/2018/157; MZU/WRF/2018/219

Comments: In India, Baruah and Gogoi, (2012) reported *Hymenochaete villosa* from Maharastra, Prasher & Lalita, (2013) has also reported the species from Uttarakhand.

32. *Laetiporus sulphureus* (Bull.) Murrill, (1920) **(Photo Plate. 32)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Fomitopsidaceae
Genus	-	*Laetiporus*
Species	-	*L. sulphureus*

Synonyms - *Boletus sulphureus* Bull., (1789), *Sistotrema sulphureum* (Bull.) Rebent., (1804), *Polyporus sulphureus (*Bull.) Fr., (1821), *Merisma sulphureus* (Bull.) Gillet, (1878), *Merisma sulphureum* (Bull.) Gillet, (1878), *Polypilus sulphureus* (Bull.) P. Karst., (1881), *Cladomeris sulphurea* (Bull.) Quél., (1886),*Leptoporus sulphureus* (Bull.) Quél., (1888), *Tyromyces sulphureus* (Bull.) Donk, (1933), *Grifola sulphurea* (Bull.) Pilát, Beih. (1934), *Cladoporus sulphureus* (Bull.) Teixeira, (1986), *Agaricus speciosus* Battarra, (1755), *Boletus caudicinus* Schaeff., (1763), *Boletus caudicinus* Schaeff. ex Scop., (1772), *Boletus citrinus* J.J. Planer, (1788), *Boletus tenax* Bolton, (1788), *Boletus ramosus* Bull.,(1789), *Boletus lingua-cervina* Schrank, (1789),*Boletus citrinus* Lumn., (1791), *Agarico-carnis flammula* Paulet, (1793), *Agarico-pulpa styptica* Paulet, (1793), *Polyporus casearius* Fr.,(1838), *Polyporus rubricus* Berk., (1851),*Polyporus ceratoniae* Risso ex Barla, (1859), *Polyporus todari* Inzenga, Giorn. (1866), *Stereum speciosum* Fr., Giorn. (1871), *Polyporus cincinnatus* Morgan, (1885),*Polyporus candicinus* (Scop.) J. Schröt. (1888), *Polyporus rostafinskii* Blonski,(1889), *Laetiporus speciosus* Battarra ex Murrill, (1904).

Description of the specimen

Basidiocarp: Fan-shaped to semicircular or irregular, more or less plano-convex, smooth to finely wrinkled, bright yellow to bright orange when young, frequently fading in maturity and with direct sunlight up to 60 cm across usually consisting of several to many individual caps arranged in a shelving formation or a rosette. Cap 5-30 cm across and up to 20 cm deep, up to 3 cm thick. Pore surface yellow. Flesh thick, soft and watery when young, becoming tough, eventually crumbling away and white to pale yellow. Spore print white. **Basidiospore**: 5.5-7 x 3.5-5 µ, smooth, elliptical to ovoid, inamyloid.

Collection Site: Murlen National Park,

Specimen Examined: MZU/WRF/2018/156

Comments: Commonly known as Chicken of the woods. *Laetiporus sulphureus* has been reported from India by Zothanzama, (2011a) from Meghalaya, Lalrinawmi *et al*,.

(2017) from Mizoram. Verma *et al.*,(2017) and Verma *et al.*,(2019a) from Central India; Khatua *et al.*,(2017) from West Bengal. It is an edible fungi.

33. *Lentinula edodes* (Berk.) Pegler, (1976) **(Photo Plate. 33)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Omphalotaceae,
Genus	-	*Lentinula*
Species	-	*L. edodes*

Synonyms - *Cortinellus edodes* (Berk.) S. Ito & S. Imai (?), *Agaricus edodes* Berk., (1877), *Armillaria edodes* (Berk.) Sacc., (1887), *Mastoleucomyces edodes* (Berk.) Kuntze, (1891), *Lentinus edodes* (Berk.) Singer, (1941), *Collybia shiitake* J. Schröt., (1886), *Lentinus tonkinensis* Pat., (1890), *Lentinus mellianus* Lohwag, Pl. (1918), *Cortinellus berkeleyanus* S. Ito & S. Imai, (1925).

Description of the specimen

Cap: 5 - 25 cm broad, black when young, dark brown to light brown with age and hemispheric, expanding to convex and planar at maturity and covered with white specs. **Gills**: White and even at first, serrated with age. **Stalk**: Fibrous and tough, 2-5 cm long. Veil absent, mycelium white at first, becoming longitudinally linear and cottony-aerial in age, rarely rhizomorphic. With age or in response to damage, the mycelium becomes dark brown. Spore print white. **Basidiospores** 5 - 6.5 x 3 - 3.5 µ, ovoid to oblong ellipsoid.

Collection Site: Murlen National Park

Specimen Examined: MZU/WRF/2017/124; MZU/WRF/2018/209

Comments: *Lentinula edodes* has been studied, cultivativated and reported from India by various workers(Bisen *et al*., 2010; Acharya *et al*.,2015; Singh *et al*.,2008; Kumar *et al*.,2019). Lalrinawmi *et al*., (2017) also reported from Mizoram. It is an edible and widely cultivated mushroom worldwide. Commonly known as Shiitake mushroom. **Local Name**: Pa pal

34. *Lentinula lateritia* (Berk.) Pegler, Sydowia,(1983) **(Photo Plate. 34)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Omphalotaceae
Genus	-	*Lentinula*
Species	-	*L. lateritia*

Synonyms - *Lentinus lateritius* Berk., (1881), *Pocillaria lateritia* (Berk.) Kuntze, (1891)

Description of the specimen

Cap: Fleshy and soft, tan to reddish brown, margin slightly in rolled or wavy,umblicate, 2 – 5 cm wide. Flesh white to cream. Gills slightly decurrent towards the stalk, free and white. Stalk eccentric, fibrous, tan to reddish brown covered with scales when mature. Spore print white to cream. **Basidiospores**: 3.34 × 5.86.5µ, subglobose to ellipsoid.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary

Specimen Examined: MZU/WRF/2016/067; MZU/WRF/2017/102; MZU/WRF/2018/192

Comments: Lalrinawmi *et al*,.(2017) mentioned its presence in Mizoram,India. It is an edible fungi. **Local Name**: Pa Pal.

35. *Lentinus badius* (Berk.) Berk., 1847 **(Photo Plate. 35)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. badius*

Synonyms - *Panus badius* Berk., (1842),*Pocillaria badia* (Berk.) Kuntze, (1891), *Agaricus verrucarius* Berk., (1850), *Lentinus inquinans* Berk., (1854), *Lentinus brevipes* Cooke, (1885), *Lentinus inverse-conicus* Pat. (1923), *Lentinus inverseconicus* Pat., (1923).

Description of the specimen

Fruiting body: Extremely tough/rigid, brown to dark-brown, pileus covered with hairs, and small round dark-brownish spots present on the cuticle. Cap 6 – 18 cm wide sometimes more than 20 cm, umblicate and funnel shaped in some cases, margin of the cap in-rolled when mature. Stalk stout, 3- 5 cm long, mostly centre and hardly off-center(eccentric) and covered with tiny hairs. Gills dark-brown, tough, decurrent. Spore print hard to obtain, mostly obtained through section cuttings. **Basidiopores:**2.1-3 x 5-6 µm, inamyloid, ellipsoid to kidney shape, tetrasterigmatic basidium.

Collection Site: Dampa Tiger Reserved Forest, Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/050; MZU/WRF/2018/193

Comments: Sharma & Atri, (2015) reported the species from Himchal Pradesh, India.

36. *Lentinus concavus* (Berk.) Henn (1900) **(Photo Plate. 36)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. concavus*

Synonyms - *Panus concavus* Berk., (1852),*Pocillaria concava* (Berk.) Kuntze, (1898),*Lentodiellum concavum* (Berk.) Murrill, (1915), *Pleurotus concavus* (Berk.) Singer, (1955), *Agaricus putredinis* Berk. & M.A. Curtis (1868), *Agaricus putredinus* Berk. & M.A. Curtis, (1869), *Pleurotus putredinis* (Berk. & M.A. Curtis) Sacc. (1887),

Description of the specimen

Fruiting body: Small white to pale creamy, glabrous, mostly growing in cluster sometimes seen to grow solitary. Cap smooth upto 4 cm wide, fleshy when fresh becomes leathery when aged, cyathiform. **Gills**: Decurrent, close, creamy to offwhite. **Stipe**: Slender and elongated, connate at the base, upto 8 cm long. Spore print white creamy. **Basidiopores:** Ellipsoidal to cylindrical, 2-3 X 4-8 µm. Basidia tetra sterigmata. Cheilocystidia present.

Collection Site: Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2018/158

Comments: Sharma & Atri, (2015) reported *Lentinus concavus* from Nothern India. Natarajan & Raman, (1981) also reported from South India. It is an edible wood fungi.

Local Name: Kangtek Pa

37. *Lentinus crinitus* (L.) Fr.,(1825) **(Photo Plate. 37)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. crinitus*

Synonyms - *Agaricus crinitus* L., (1763),*Pocillaria crinita* (L.) Kuntze, (1891),*Panus crinitus* (L.) Singer, (1951), *Polyporus phyllostipes* D. Krüger, (2004), *Agaricus essequeboensis* G. Mey., (1818),*Lentinus chaetoloma* Fr., (1851), *Lentinus wrightii* Berk. & M.A. Curtis, 300 (1869), *Lentinus rigidulus* Berk. & M.A. Curtis, (1869), *Lentinus subcervinus* Berk. & M.A. Curtis, (1869),*Lentinus microloma* Pat. & R. Heim, (1928).

Description of the specimen

Fruiting body: Growing mostly in solitary, extremely tough and solid, brown to yellowish brown. Cap 4-6 cm broad, funnel shaped, covered with enormous tiny hairs, margin of the cap rolled under when mature. Gills brown, close, tough, decurrent towards the stipe. Stalk slender, elongated, 5-8 cm long and hairy. Spore print hard to obtain, mostly obtained from section cuttings. **Basidiopores:** 2-3 x 4-6 µ, ellipsoid to kidney shaped, inamyloid.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/052; MZU/WRF/2017/099; MZU/WRF/2018/194

Comments: Natarajan & Raman, (1981) and Senthilaru, (2015) reported *Lentinus crinitus* from South India and Western Ghats, India respectively. It is an edible fungi. **Local Name:** Ar Changkawm Pa.

38. *Lentinus polychrous* Lev., (1844) **(Photo Plate. 38)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. polychrous*

Synonyms - *Pocillaria polychroa* (Lév.) Kuntze, (1891), *Lentinus sajor-caju var. polychrous* (Lév.) Pilát, (1936),*Panus polychrous* (Lév.) Singer, (1962), *Panus polychrous* (Lév.) Singer ex Balf.-Browne, (1968), *Lentinus praerigidus* Berk., (1854), *Lentinus eximius* Berk. & Broome, (1875),*Lentinus estriatus* Berk. & Broome, (1875), *Lentinus kurzianus* Curr., (1876).

Description of the specimen

Fruiting body: White to creamy, fleshy. Cap funnel shaped 3 – 7cm wide, soft and fragile when young and rubbery/rigid when old, margin of the cap torn(serrated) when dry. Cuticle smooth. Gills close, creamy white and decurrent towards the stalk. Stalk central, rarely eccentric,slender and 2 – 4 cm long. Spore print white. **Basidiopores:** 2.5 - 3 x 4.6 – 6.1µm, ellipsoidal and some what kidney shaped.

Collection Site: Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen Examined: MZU/WRF/2016/051; MZU/WRF/2018/195.

Comments: In India, Senthilarasu, (2015); Manimohan *et al*., (2004) reported *Lentinus polychrous* from South India and Kerala respectively. It is an edible fungi. The remote local people of Mizoram widely collect *Lentinus polychrous* during July to September. **Local Name:** Pa Changhang.

39. *Lentinus roseus* (Karun., K.D.Hyde & Zhu L.Yang.) 2011 **(Photo Plate. 39)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. roseus*
Synonyms	-	N/A

Description of the specimen

Fruiting body: Relatively small, pale yellow cream at centre, darker towards margin, not changing on bruising or when aged. Cap 5–8 cm in diameter, leathery, deeply cyathiform, when seen from above rounded flabelliform, eroded towards the edge/margin, neither striate nor zonate. Gills deeply decurrent, pale yellow cream, close to pileus margin. Stipe short,upto 3cm, central, leathery, solid, with white cottony context. Spore print white. **Basidiopores:** 3.2-4 X 5-9 µm, ellipsoidal to elongate. Basidia tetresterigmata, Cheilocystidia present.

Collection Site: Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2018/002

Comments: *Lentinus roseus* was a recently discovered new species from Thailand by Karunarathna *et al*., (2011).

40. *Lentinus sajor-caju* (Fr.) Fries.,1838 **(Photo Plate. 40)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. sajor-caju*

Synonyms - *Agaricus sajor-caju* Fr., (1821), *Pocillaria sajor-caju* (Fr.) Kuntze, (1891), *Pleurotus sajor- caju* (Fr.) Singer, (1951), *Lentinus exilis* Klotzsch ex Fr., (1836), *Lentinus dactyliophorus* Lev., (1844), *Lentinus tanghiniae* Lév., (1846), *Lentinus stenophyllus* Reichardt, (1866), *Lentinus nicobarensis* Reichardt, (1870), *Lentinus irregularis* Curr., (1876), *Lentinus glandulosus* Ces., (1879), *Lentinus murrayi* Kalchbr. & MacOwan, (1881), *Lentinus woodii* Kalchbr., (1881), *Lentinus tenuipes* Sacc. & Paol., (1888), *Pocillaria dactylophora* (Lev.) Kuntze (1891),*Lentinus bonii* Pat., (1892), *Lentinus bukobensis* Henn., (1893), *Lentinus annulifer* De Seynes, (1897)

Description of the specimen

Fruiting body: Small to medium size, extremely tough and solid with a well-developed stout central stalk, lamellate gills on lower surface. There may be a fleshy collar at the base, it gets lost with age. Cap 5 - 12 cm convex with deeply umblicate centre, infundibuliform, or excentric and flabelliform, surface very variable in colour, at first whitish and often mottled grey, cream color serrated, margins of cap rolled under when old and dry, dark squamules present especially towards the centre, annulus present, attached towards apex of the stipe. Sporeprint white. **Basidiopores:** 5-7 x 2-3 µm ellipisoid to cylindrical.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/053; MZU/WRF/2016/078; MZU/WRF/2017/090; MZU/WRF/2018/196

Comments: Singdevsachan *et al*., (2013) studied the nutritional and bioactive potential of *Lentinus sajor-caju* from Similipal Biosphere Reserve, India. Senthilarasu, (2014) also reported it from the Western Ghats, India. It is an edible fungi. **Local Name:** Pa Chang.

41. *Lentinus strigosus* Fr., (1825). **(Photo Plate. 41)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. strigosus*

Synonyms - *Agaricus strigosus* Schwein., (1822), *Pocillaria frieseana* Kuntze, (1891), *Agaricus crinitus* Schwein., (1822), *Agaricus strigopus* Pers., (1827), *Agaricus hirtus* Secr., (1833), *Agaricus macrosporus* Mont., (1837), *Panus rudis* Fr., (1838), *Lentinus capronatus* Fr., (1838), *Agaricus sainsonii* Lév., (1842), *Lentinus chaetophorus* Lév., (1844), *Panus lamyanus* Mont., (1856), *Panus hoffmannii* Fr., (1865), *Lentinus sparsibarbis* Berk. & M.A. Curtis, (1869), *Lentinus substrigosus* Henn. & Shirai, (1900), *Panus fragilis* O.K. Mill., (1965).

Description of the specimen

Fruitingbody: Growing mostly in cluster and sometime solitary on logs and stumps. Caps 2 – 6.5 cm wide, pinkish – tan to pale brown, dry, densely hairy, funnel shaped, convex with a tightly inrolled margin at first, becoming depressed with age. Stipe stout 1 – 3 cm long, upto 1 cm thick, pinkish-brown to tan, densely hairy, lateral to off-center. Gills white to tan eventually pale brown, decurrent running down the stipe, close or crowded. Flesh whitish, tough and stringy. Spore print white. **Basidiopores:** 2.8 x 5.9 µ, cylindrical to ellipsoid, smooth, inamyloid. Pleurocytidia present 20 – 25 µm long.

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2018/416

Comments: In India, Manimohan *et al*,. (2004) and Mohanan, (2011) reported the species from Kerela.

42. *Lentinus squarrosulus* Mont. (1842). **(Photo Plate. 42)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lentinus*
Species	-	*L. squarrosulus*

Synonyms - *Pocillaria squarrosula* (Mont.) Kuntze, (1891), *Lentinus tigrinus f. squarrosulus* (Mont.) Pilát, (1936), *Pleurotus squarrosulus* (Mont.) Singer, (1962), *Pleurotus squarrosulus* (Mont.) Singer ex Pegler, (1969), *Lentinus leucochrous* Lév., (1844), *Lentinus pergameneus* Lév., (1846), *Lentinus subnudus* Berk., (1847), *Lentinus inconspicuus* Berk., (1847), *Lentinus coadunatus* Hook. f., (1851), *Lentinus*

wilkesii Berk. & M.A. Curtis, (1851), *Lentinus molliceps* Fr., (1851), *Lentinus multiformis* Berk. & Broome, (1875), *Lentinus manipularis* Berk. & Broome, (1875), *Lentinus lobatus* Berk. & Broome, (1875), *Lentinus cretaceus* Berk. & Broome, (1875), *Lentinus caespitosus* Curr., (1876), *Lentinus hygrometricus* Berk., (1877), *Lentinus curreyanus* Sacc. & Cub., (1887), *Lentinus bavianus* Pat., (1890), *Lentinus melanopus* Pat., (1892), *Lentinus rivae* Bres., (1896), *Lentinus subtigrinus* Henn., (1898), *Lentinus crenulatus* Massee, (1898)

Description of the specimen

Fruiting body: Relatively small growing in cluster. Pileus 3 -12cm wide, convex then plane and umbilicate to infundibuliform, dry, squamulose often with small scales, varying appressedly subsquamulose, margin often becoming scrape.Stipe 1.5-6 cm, more or less excentric, rarely lateral, fibrous, scurfy - squamulose downwards to the abrupt and often blackish base. Gills deeply decurrent, crowded. Spore print white. **Basidiopores:**6 - 9 x 1.8 - 3µm, smooth, sub-cylindric, inamyloid. Basidia with tetra-sterigmata.

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2018/415

Comments: *Lentinus squarrosulus* has been reported from different parts of Kerala, India (Sharma *et al.* 1985; Florence & Yesodharan, 2000; Florence, 2004; Manimohan *et al,*. 2004; Pradeep & Vrinda, 2007; Varghese *et al,*. 2010; Mohanan, 2011)

43. *Lentinus tigrinus* (Bull.)Fr.,(1825) **(Photo Plate. 43)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae

Genus - *Lentinus*
Species - *L. tigrinus*

Synonyms - *Agaricus tigrinus* Bull.,(1782), *Omphalia tigrina* (Bull.) Gray,(1821), *Clitocybe tigrina* (Buliard) P. Kumm.,(1871), *Pocillaria tigrina* (Bull.) Kuntze,(1891), *Lentodium tigrinum* (Bull.) Earle, (1909), *Panus tigrinus* (Bull.) Singer,(1951), *Pleurotus tigrinus* (Bull.) Kühner,(1980), *Polyporus gerdai* D. Krüger,(2004) *Agaricus dunalii* DC., (1815), *Agaricus denticulatus* Schwein, (1822), *Lentinus schweinitzii* Fr.,(1825), *Lentinus contortus* Fr., (1836), *Lentinus ravenelii* Berk. & M.A. Curtis, (1849), *Lentinus fimbriatus* Curr., (1863), *Lentodium squamulosum* Morgan,(1895), *Lentinus ghattasensis* Henn.,(1898).

Description of the specimen

Fruiting body: Convex and then depressed to infundibuliform and with recurved margin. Cuticle covered scale, more brown to brownish blackish and tighter in the center. Cap 4 – 6.5cm broad. Gills decurrent, creamy white. Stalk 3 - 4 cm slender, cylindrical and slightly attenuated stent at base, central, whitish and covered with scales. Flesh fruity and slightly bitter taste. Sporeprint white. **Basidiopores:**6.6-8.3 x 3.4 - 4.1 µ, ellipsoidal,somewhat kidney shapes, smooth.

Collection Site: Murlen National Park

Specimen examined: MZU/WRF/2018/417

Comments: Lloyd (1904–1919) listed the occurrence of *Lentinus tigrinus* from India. Senthilarasu,(2015) mentioned its presence in the Western Ghats, India. It is **e**dible and widely collected by the local people in remote areas of the Mizoram.

Local Name: Pa Hnahkhar.

44. *Lenzites acuta* Berk. (1842) **(Photo Plate. 44)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lenzites*
Species	-	*L. acuta*

Synonyms - *Lenzites acutus* Berk., (1842), *Cellularia acuta* (Berk.) Kuntze, (1898), *Trametes acuta* (Berk.) Imazeki, (1943), *Cellulariella acuta* (Berk.) Zmitr. & V. Malysheva, (2013), *Cellulariella acuta* (Berk.) Zmitr. & V. Malysheva, (2014), *Artolenzites acuta* (Berk.) Mossebo & Ambit (2015), *Artolenzites acutus* (Berk.) Mossebo & Ambit, (2015), *Artolenzites acutus* (Berk.) Mossebo & Ambit, (2015), *Daedalea inaequabilis* Berk., (1843), *Daedalea flavida* Lév., (1844), *Trametes lobata* Berk., (1851),*Lenzites beckleri* Berk., (1873),*Daedalea isabellina* Murrill, (1908), *Lenzites adusta* Massee (1910), *Hexagonia flavofusca* Lloyd, (1922)

Description of the specimen

Fruiting body: Pileate to semi-circular, broadly attached to substrat 3 - 8 cm diameter,upper surface furrowed and with a few concentric rings, chalky white; margin acute. Stipe absent. Gill lamellate, subdecurrent, cream, 3 - 4 mm deep, forking in a regular dichotomous pattern, corky in texture.Flesh corky to wood 1 - 6 cm thick, creamy white.Spore print hyaline. **Basidiospores:** Elliptical or slightly curved 4 - 5 × 2 - 3 μm, inamyloid, thin walled.Basidia clavate, four spored.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/054; MZU/WRF/2017/108; MZU/WRF/2018/197

Comments: Ranadive, (2013) and Mohanan, (1994) studied different aspects of *Lenzites acuta* from India. Rathod and Bendre, (2015) also reported from western Maharastra, India.

45. *Lenzites betulina* (L.) Fr. (1838) **(Photo Plate. 45)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lenzites*
Species	-	*L. betulina*

Synonyms - *Agaricus betulinus* L., (1753), *Agaricus hirsutus* Schaeff., (1774), *Merulius betulinus* (L.) J.F. Gmel., (1792), *Merulius squamosus* Schrad. ex J.F. Gmel., (1792), *Daedalea betulina* (L.) Rebent., (1804), *Lenzites betulinus* (L.) Fr., (1838), *Cellularia betulina* (L.) Kuntze, (1898), *Cellularia hirsuta* (Schaeff.) Kuntze, (1898), *Gloeophyllum hirsutum* (Schaeff.) Murrill, (1903), *Sesia hirsuta* (Schaeff.) Murrill, (1903), *Trametes betulina* (L.) Pilát (1939), *Agaricus tomentosus* Lam., (1778), *Agaricus versicolor* J.J. Planer, (1788), *Agaricus coriaceus* Bull., (1789),*Daedalea variegata* Fr., (1818), *Daedalea interrupta* Fr., (1830), *Lenzites umbrina* Fr., (1838), *Lenzites junghuhnii* Lév., (1844), *Lenzites berkeleyi* Lév., (1846), *Lenzites cinnamomea* Fr., (1851), *Lenzites japonica* Berk. & M.A. Curtis (1860), *Lenzites pinastri* Kalchbr., (1874), *Lenzites sorbina* P. Karst., (1881), *Lenzites flaccida* var. *nitens* Speg., (1889), *Lenzites cyclogramma* Pat., (1907), *Lenzites betuliniformis* Murrill,(1908), *Lenzites*

subbetulina Murrill, (1912), *Lenzites connata* Lázaro Ibiza,(1916), *Lenzites hispida* Lázaro Ibiza,(1916), *Lenzites ochracea* Lloyd, (1922), *Lenzites isabellina* Lloyd, (1922), *Lenzites pertenuis* Lloyd, (1922).

Description of the specimen

Basidiocarps: Annual, single sometimes found to be in small group. Pileate, dimidiate to semicircular or broadly attached with a partly resupinate upto 10 cm wide, corky. Upper surface tomentose to hirsute (hairy) in concentric. Hymenophore with thin radial lamellae, new lamellae arising towards the margin by dichotomous splitting of old ones, but also individually between older ones. **Basidia**: Tetra-sterigmatic, 18-23 x 5-7 µm. **Basidiospores**: Cylindrical, often kidney shaped, hyaline, smooth, 5-7 x 1.6-3 µm.

Collection Site: Dampa Tiger Reserve Forest, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/055; MZU/WRF/2018/212

Comments: It is commonly known as gilled polypore. *Lenzites betulina* has been studied and reported from India by Zothanzama, (2011a) from Meghalaya, Gogoi and Sarma, (2012) from Assam. Kaur and Dhingra, (2012) from Himachal Pradesh, Karun *et al.,* (2018) from Southwest India and Rajput *et al*., (2015) from Gujarat.

46. *Lenzites elegans* (Spreng.) Pat., (1900) **(Photo Plate. 46)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Lenzites*
Species	-	*L. elegans*

Synonyms - *Daedalea elegans* Spreng., (1820), *Trametes elegans* (Spreng.) Fr.,(1838), *Whitfordia elegans* (Spreng.) Singer,(1951), *Daedaleopsis elegans* (Spreng.) (1974), *Artolenzites elegans* (Spreng.) (1986), *Daedalea amanitoides* P. Beauv., (1806), *Daedalea levis* Hook., (1822), *Boletus aesculi-flavae* Schwein., (1822), *Daedalea repanda* Pers., (1827), *Daedalea deplanata* Link ex Fr., (1830), *Daedalea polita* Fr., (1830), *Daedalea applanata* Klotzsch, (1833), *Daedalea indica* Jungh., (1838), *Lenzites pallida* Berk. (1842), *Daedalea rubicunda* Klotzsch, (1843), *Polyporus dubius* Berk., (1843), *Lenzites platypoda* Lév., (1844), *Daedalea ambigua* Berk.,(1845), *Trametes incana* Berk., (1845), *Lenzites tenuis* Lév., (1846), *Daedalea pallidofulva* Berk., (1847), *Daedalea pavonia* Berk., (1847), *Lenzites rugulosa* Berk. (1851), *Trametes centralis* Fr., (1851), *Trametes lactea* Fr., (1851), *Lenzites brasiliensis* Mont., (1856), *Lenzites myriophylla* Lév. (1863), *Lenzites cubensis* Berk. & M.A. Curtis, (1869), *Daedalea glaberrima* Berk. & M.A. Curtis, (1872), *Daedalea macowanii* Kalchbr., (1876), *Lenzites alborepanda* Lloyd, (1923), *Lenzites spegazzinii* Bres.,(1926), *Daedalea milliaui* Beeli, (1930).

Description of the specimen

Fruitbody: Annual to perennial, sessile or with a short stipelike base, attached laterally or centrallyupto 20 cm wide and long and upto 3 cm thick, corky and flexible when fresh, more rigid when dry. **Pileus**: Flabelliform or circular, upper surface white to grey or almost buff ochraceous in older specimens. Margin thin and often deflexed, even or lobed. **Stipe**: Absent or upto 2 cm long, 1.5 cm in diameter, glabrous, solid, attached to the substrate with a disc up to 3 cm wide. Pore surfacevery variable, partly poroid, round to angular, 1-2 per mm, partly sinuous-daedaloid and radially split, up to 2 mm wide, partly purely lamellate with straight to sinuous lameleae, 4-7 per cm measured tangentially. Pores or lamellae up to 6 mm deep. **Basidiopores:** Cylindric to oblong ellipsoid, hyaline, smooth and thin-walled, 2.4-3.2 x 5.2-7.6 µm, non-amyloid.

Collection Site: Dampa Tiger Reserved Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/056; MZU/WRF/2017/091; MZU/WRF/2017/125; MZU/WRF/2018/167

Comments: Various reports on *Lenzites elegans* by several workers have been made from India (Lakshmi *et al*, 2017; Prashar & Lalita, 2013). Harpreet and Dhingra, (2014) also reported *Lenzites elegans* from Himachal Pradesh.

47. *Micromphale foetidum* (Sowerby) Singer, (1951) **(Photo Plate. 47)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Marasmiaceae
Genus	-	*Micromphale*
Species	-	*M. foetidum*

Synonyms - *Merulius foetidus* Sowerby, (1797), *Agaricus foetidus* (Sowerby) Fr., (1821), *Marasmius foetidus* (Sowerby) Fr., (1838), *Chamaeceras foetidus* (Sowerby) Kuntze, (1898), *Heliomyces foetidus* (Sowerby) Maire, (1937), *Micromphale foetidum* (Sowerby) Singer, (1945), *Marasmiellus foetidus* (Sowerby) Antonín, Halling & Noordel., (1997),*Gymnopus foetidus* (Sowerby) J.L. Mata & R.H. Petersen, (2004),*Gymnopus foetidus* (Sowerby) P.M. Kirk, (2014).

Description of the specimen

Cap: Usually with a reddish-brown, sunken navel-like center and reddish-brown striations extending to the pleated margin; color fading to tan with age, upto 3 cm wide, stipes 1.5 -3 cm long and 1- 2.3mm thick. **Gills:** Attached to a collar; yellowish at first, becoming reddish-tinged. **Stipe:** Brown, covered with minute hair, velvety, cottony at the base.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/057; MZU/WRF/2017/092; MZU/WRF/2018/168; MZU/WRF/2018/198

Comments: Borthakur and Joshi, (2016) studied and reported *Micromphale foetidum* from Meghalaya, India.

48. *Microporus affinis* Blume & T. Nees) Kuntze (1898) **(Photo Plate. 48)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Microporus*
Species	-	*M. affinis*
Synonyms	-	N/A

Description of the specimen

Fruiting body: Thin 1 to 5 cm leathery bracket, but up to10cm on occasion. Upper surface dry with a velvety texture due to an irregular covering of fine hairs, multiple, approximately parallel, bands of purple, brown, cream, grey, or black, of varying widths with the outer margin white.Lower surface white to fawn and finely pored. Stipe attached to substrate (dead wood) at the edge by a short narrow flattened horizontal stipe, 6 – 30 × 4 mm, attachment to substrate forms a small disc, brown and grey, disc often black. Pores under surface of fine pore 7 to 9 per mmthick walled, squarish to oval shaped, white or very pale pink. Flesh: tough, leathery, white. **Basidiospores:** Not observed.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen sexamined: MZU/WRF/2016/058; MZU/WRF/2017/093; MZU/WRF/2018/169; MZU/WRF/2018/199

Comments: Reports on *Microporus affinis* has been done from different parts of India, Nagadesi & Arya, (2012) from Gujarat; Vasava *et al,*. (2018) from western India; Lyngdoh and Dkhar, (2014) from Meghalaya.

49. *Microporus ochrotinctus* (Berk. & Curtis) Kuntze, (1898) **(Photo Plate. 49)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Microporus*
Species	-	*M. ochrotinctus*

Synonyms - *Polyporus ochrotinctus* Berk. & M.A. Curtis, (1858) *Polystictus ochrotinctus* (Berk. & M.A. Curtis) Cooke, (1886*), Leucoporus ochrotinctus* (Berk.) Pat., (1900).

Description of the specimen

Annual, solitary or in small groups, laterally stipitate, pileus semicircular, often with the rear parts grown backwards so they almost meet over the stipe, or flabelliform to spathulate, up to 10 cm wide, thin and tough, rarely upto 3 mm thick. **Pileus**: Ochraceous, smooth to strongly veined radially. **Stipe:** Short and lateral, upto 2 cm long, often almost absent. **Basidiospore:** Cylindrical, hyaline, smooth 4 - 6 x 2-3 µm.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/059; MZU/WRF/2017/109

Comments: Bhatt *et al.*, (2018) reported *Microporus ochrotinctus* from Gujarat, India.

50. *Microporus vernicipes* (Berk.), Imazeki, (1943) **(Photo Plate. 50)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Marasmiaceae
Genus	-	*Microporus*
Species	-	*M. vernicipes*

Synonyms - *Polyporus vernicipes* Berk., (1877), *Polystictus vernicipes* (Berk.) Cooke, (1886),*Coriolus vernicipes* (Berk.) Murrill, (1907),*Leucoporus vernicipes* (Berk.) Pat., (1915),*Trametes vernicipes* (Berkeley) Zmitrovich, Wasser & Ezhov, (2012) *Polystictus makuensis* Cooke, (1887), *Microporellus subdealbatus* Murrill, (1907),*Coriolus subvernicipes* Murrill, (1908),*Coriolus langbianensis* Har. & Pat., (1914).

Description of the specimen

Fruiting body: Annual, solitary or in small groups, laterally stipitate, pileus semicircular, often with the rear parts grown backwards so they almost meet over the stipe, or flabelliform to spathulate, up to 10 cm wide, thin, flexible and tough, rarely more than 1-2 mm thick. **Pileus**: Light brown to chestnut or bay, glabrous, smooth to strongly veined radially or even slightly undulated in old specimens, narrowly concentrically zoned. **Stipe:** Short and lateral, upto 3 cm long, 2-7 mm in diameter, often almost absent. **Pore surface**: Creamy to light brown, often discoloured by dark

spots, lighter towards the margin, very narrow and white, pore round. **Basidiospore:** Cylindrical, hyaline, smooth and inamyloid 5 - 7.3 x 2 - 3.5 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/060; MZU/WRF/2016/079; MZU/WRF/2017/094; MZU/WRF/2018/170

Comments: Vasava *et al.,* (2018) reported from Western India and Saha *et al.,* (2018) mentioned its presence in West Bengal, India.

51. *Microporus xanthopus* (Fr.) Kuntze, (1898) **(Photo Plate. 51)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Microporus*
Species	-	*M. xanthopus*

Synonyms - *Polyporus xanthopus* Fr., (1818), *Polystictus xanthopus* (Fr.) Fr., (1851),*Coriolus xanthopus* (Fr.) G. Cunn., (1950), *Trametes xanthopus* (Fr.) Corner, 1989), *Polyporus saccatus* Pers., (1827), *Polyporus pterygodes* Fr., (1838), *Polyporus florideus* Berk., (1854), *Polyporus cupreonitens* Kalchbr., (1881).

Description of the specimen

Fruit body: Flat to broadly funnel shaped, 2 – 6 cm diameter, tough and leathery. Upper surface dry, shiny, strongly banded in shades of buff and rich brown with the outer edge of the cap cream to white. Lower surface cream to white. Poresdecurrent, white, pores minute, Stipe central to slightly eccentric, broadly cylindrical but usually

widening towards the base, 10 – 45 × 2 – 8mm, tough, attached to the substrate by a disc, cream or pale buff, but may be banded like the upper surface and the basal disc is yellow Flesh: very thin, 1–3 mm. Spore print white. **Basidiospore:** Ellipsoid; 3.5–4 × 2–2.5µm, smooth. Substrate wood, including branches and logs.

Collection Site: Dampa Tiger Reserved Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen studied: MZU/WRF/2016/001; MZU/WRF/2016/068; MZU/WRF/2017/095; MZU/WRF/2018/180

Comments: Commonly known as the yellow-footed polypore. Growing solitary and often in small groups on fallen twigs and branches. In India, Zothanzama, (2011a) and Lyngdoh and Dkhar, (2014) reported from Meghalaya. Chuzho and Dkhar, (2018) also reported from Nagaland. Vasava *et al*.,(2018) reported from Gujarat. Chittaragi and Meghalatha, (2014) has also studied the phytochemical and anthelmintic activity of *Microporus xanthopus.*

52. *Panus fasciatus* (Berk.) Singer, (1962) **(Photo Plate. 52)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Panus*
Species	-	*P. fasciatus*

Synonyms - *Lentinus fasciatus* Berk., (1840) *Lentinus dealbatus* Fr., (1847), *Lentinus fuscopurpureus* Kalchbr., (1880), *Lentinus holopogonius* Berk. ex Cooke, (1881), *Pocillaria fasciata* (Berk.) Kuntze, (1891).

Description of the specimen

Fruiting body: Convex becoming deeply infundibuliform (funnel shaped), to 5cm diameter,densely hairy, brown, with hairs darker brown and cap paler, margin inrolled. Stipe cylindrical; 25 – 30 × 3 – 5 mm; densly hairy, brown with hairs darker brown than background.Gills decurrent, moderately crowded, often forked, brown, sometimes with a faint-purple tint, lamellulae present. **Sporeprint:**white. **Basidiospores:** Ellipsoidal, 6 – 9 × 3.5 – 4.5 μm, smooth, inamyloid. **Basidia:** Clavate, 18 – 30 ×6 – 10 μm, four spored.

Collection Site: Dampa Tiger Reserve Forest, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/002; MZU/WRF/2017/110; MZU/WRF/2018/200

Comments: Commonly known as the hairy trumpet mushroom. Senthilaru, (2015) reported *Panus fasciatus* from the Western Ghats, India.

53. *Pleurotus djamor* (Rumph. ex Fr.) Boedijn, (1959) **(Photo Plate. 53)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Pleurotaceae
Genus	-	*Pleurotus*
Species	-	*P. djamor*

Synonyms - *Agaricus djamor* Rumph., 1750), *Agaricus djamor* Rumph. ex Fr., (1821), *Lentinus djamor* (Rumph. ex Fr.) Fr., (1836), *Pocillaria djamor* (Rumph. ex Fr.) Kuntze, (1891), *Crepidopus djamor* (Rumph. ex Fr.) Overeem, (1927),

Agaricus pacificus Berk., (1842), *Agaricus eous* Berk. (1850), *Agaricus ninguidus* Berk., (1850), *Agaricus ëous* Berk. (1850), *Agaricus eöus* Berk., (1850), *Agaricus placentodes* Berk., (1852), *Agaricus prometheus* Berk. & M.A. Curtis, (1860), *Agaricus flabellatus* Berk. & Broome, (1871), *Agaricus leptogramme* Berk. & Broome, (1871), *Agaricus scabriusculus* Berk., 157 (1872), *Agaricus caryophylleus* Berk., (1872), *Agaricus moselei* Berk., (1875),*Agaricus emerici* Berk., Gard. Chron.: 240 (1880), *Pleurotus eous* (Berk.) Sacc. (1887), *Pleurotus leptogrammus* (Berk. & Broome) Sacc. (1887), *Pleurotus ëous* (Berk.) Sacc. (1887), *Dendrosarcus eous (*Berk.) Kuntze (1898), *Agaricus luteoalbus* Beeli, (1928), *Pleurotus ostreatoroseus* Singer, 1961), *Pleurotus incarnatus* Hongo, (1973), *Pleurotus salmoneostramineus* Lj.N. Vassiljeva, (1973).

Description of the specimen

Fruiting body: 2 - 7 cm broad, convex, expanding with age to broadly convex to plane, laterally attached to the substrate, spatulate to bell-shaped, margin inrolled at first, then incurved, and even-tually flattening and upturning at maturity, white to bright reddish pink, developing a dull to light pinkish cinnamon in age. Gills deeply decurrent and somewhat crowded, strongly pigmented pinkish when young and fade to creamy white-beige at maturity. When over mature all parts of the mushroom lose pigmentation and fade to beige-white to straw colored extremely short. Spore print white to beige to pink.

Basidiospores: 7.0 -10.5 x 3 -3.5 µ, smooth, cylindrical.

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2016/003

Comments: The genus of *Pleurotus* are commonly known as the Pink oyester mushrooms. It is distributed worldwide. *Pleurotus djamor* exhibits a wide range of color morphology for spores as well as fruit bodies, the color of the fruit body directly influences the color of the spores. Different aspect of *Pleurotus djamor* has been studied and reported from India by various workers (Srivastava, 2001; Acharya *et al*., 2017; Saha *et al*., 2012; Singh *et al*., 2017). Lalrinawmi *et al.,* (2017) has also reported it from Mizoram. It is an edible mushroom.

54. *Pleurotus ostreatus* (Jacq.) P. Kumm., (1871) **(Photo Plate. 54)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Pleurotaceae
Genus	-	*Pleurotus*
Species	-	*P. ostreatus*

Synonyms - *Agaricus ostreatus* Jacq., (1774),*Crepidopus ostreatus* (Jacq.) Gray, (1821), *Dendrosarcus ostreatus* (Jacq.) Kuntze, (1898),*Agaricus ochraceus* Pers., (1793), *Pleurotus columbinus* Quél., (1881), *Pleurotus floridanus* Singer, (1948).

Description of the specimen

Fruiting body: 4 - 15 cm broad, convex, becoming flat or somewhat depressed, kidney-shaped to fan-shaped, or nearly circular if growing on the tops of logs, somewhat greasy when young and fresh, smooth, pale brown to dark brown. Gills whitish or with a gray tinge, sometimes yellowish in age. Stalk usually rudimentary and lateral or absent when the mushroom is growing from the side of a log or tree. Spore print whitish to grayish. **Basidiospores:** 8 - 10.5 x 3 - 3.5 μ, smooth, cylindrical to narrowly kidney-shaped.

Collection Site: Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2018/204

Comments: It is distributed worldwide. Zothanzama, (2011a) has reported and described *Pleurotus ostreatus* from Meghalaya. Lalrinawmi *et al*., (2017) has also reported it from Mizoram. Singh *et al*., (2018) studied *Pleurotus ostreatus* from India with potential to kill plant parasitic nematodes. It is an edible mushroom and widely cultivated. **Local Name:** Pa Khawi

55. *Pleurotus sajor-caju* (Fr.) Singer, (1951) **(Photo Plate. 55)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	Pleurotaceae
Genus	-	*Pleurotus*
Species	-	*P. sajor-caju*

Synonyms - *Agaricus sajor-caju* Fr., (1821), *Lentinus sajor-caju* (Fr.) Fr., (1838), *Pocillaria sajor- caju* (Fr.) Kuntze, (1891), *Lentinus exilis* Klotzsch ex Fr., (1836), *Lentinus dactyliophorus* Lév ., (1844), *Lentinus tanghiniae* Lév., (1846), *Lentinus stenophyllus* Reichardt, (1866), *Lentinus nicobarensis* Reichardt, (1870), *Lentinus irregularis* Curr., (1876), *Lentinus glandulosus* Ces., (1879), *Lentinus murrayi* Kalchbr. & MacOwan, (1881), *Lentinus woodii* Kalchbr., (1881), *Lentinus tenuipes* Sacc. & Paol., (1888), *Pocillaria dactylophora* (Lev.) Kuntze (1891), *Lentinus bonii* Pat., (1892), *Lentinus bukobensis* Henn., (1893), *Lentinus annulifer* De Seynes, (1897).

Description of the species

Fruiting body: Upto 40 cm wide, convex with umbilicate centre, then infundibuliform or excentric and flabelliform, dry, smooth or often with small appressed squamules in the centre, often minutely and innately streaked, white, cream-colour, pale ochraceous, more or less fuliginous, or brownish, very variable in colour; margin incurved, then straight, smooth. Gills deeply decurrent, crowded, narrow, 0.3-2 mm wide darker fuscous towards the entire edge. Flesh thin, tough, pliant. **Basidiopores**: Ellipsoidal to sub-cylindric 5.5 – 9 x 1.7 - 3.4 white, smooth, inamyloid.

Collection Site: Murlen National Park.

Specimen examined: MZU/WRF/2018/111

Comments: It is distributed worldwide. It is an edible mushroom and widely cultivated. Studies on nutritional, cultivation, pharmaceutical, and distribution of *Pleurotus sajor-caju* has been done in different parts of India (Patrabhans and Madan, 1997; Patel and Trivedi, 2016; Khatoon and Sharma, 2017; Randhawa and Shri, 2017).

56. *Polyporus alveolaris* (DC.) Bondartsev & Singer, (1941) **(Photo Plate. 56)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Polyporus*
Species	-	*P. alveolaris*

Synonyms - *Merulius alveolaris* DC., (1815),*Cantharellus alveolaris* (DC.) Fr., (1821),*Favolus extratropicus* Fr., (1825), *Favolus europaeus* Fr., (1838), *Favolus alveolaris* (DC.) Quél., (1883), *Hexagonia alveolaris* (DC.) Murrill, (1904),*Polyporellus alveolaris* (DC.) Pilát, (1936),*Neofavolus alveolaris* (DC.) Sotome & T. Hatt., (2012),*Hexagonia mori* Pollini, (1816),*Daedalea broussonetiae* Cappelli, (1821),*Favolus canadensis* Klotzsch, (1832), *Favolus ohioensis* Mont., (1856), *Polyporus favoloides* Doass. & Pat., (1880), *Favolus striatulus* Ellis & Everh., (1897),*Hexagonia micropora* Murrill, (1904),*Favolus microsporus* (Murrill) Sacc. & D. Sacc. (1905),*Favolus kauffmanii* Lloyd, (1916), *Favolus whetstonei* Lloyd, (1916), *Favolus peponinus* Lloyd, (1917), *Polyporus tenuiparies* Laferr. & Gilb., (1990)

Description of the specimen

Fruiting body: Circular to fan shaped, 2.5 – 6 cm diameter, upper surface pale reddish yellow with age becoming ivory to pale buff, fibrillose to squamose with flattened,

triangular squamules, azonate, glabrous, smooth, margin concolourous. **Stipe:** Central to lateral, up to 1.5 cm long and 0.5 cm thick, glabrous. Pores decurrent down stipe, surface white to tan, the pores diamond shaped, radially elongated, 1 - 2 per mm tangentially, with thin dissepiments that become lacerate with age. Flesh corky, up to 1 mm thick, tube layer continuous with the context, up to 5 mmthick. Spore print white. **Basidiospore**: Cylindrical, 9 - 13 × 3 - 5 µm, hyaline, smooth.

Collection Site: Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/004; MZU/WRF/2017/096

Comments: In India, Iqbal *et al,*. (2016) and Adarsh *et al,*. (2018) reported *Polyporus alveolaris* from Kerala. Nath and Sarma, (2018) also reported from the state of Assam, Northeast India.

57. *Polyporus arcularius* (Batsch) Fr., (1821) **(Photo Plate. 57)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Polyporus*
Species	-	*P. arcularius*

Synonyms - *Boletus arcularius* Batsch, (1783), *Favolus arcularius* (Batsch) Lév., (1844), *Polyporellus arcularius* (Batsch) P. Karst., (1879), *Leucoporus arcularius* (Batsch) Quél., E (1886), *Heteroporus arcularius* (Batsch) Lázaro Ibiza, (1916), *Lentinus arcularius* (Batsch) Zmitr., (2010),*Boletus exasperatus* Schrad. ex J.F. Gmel., (1792), *Boletus alveolarius* Bosc, (1811), *Polyporus rhombiporus* Pers., (1825), *Favolus alveolaris* (Bosc) Fr. (1825), *Polyporus intermedius* Rostk., (1837), *Polyporus*

umbilicatus Jungh., (1838), *Polyporus calaber* F. Brig., (1840), *Polyporus agariceus* Berk., (1843),*Favolus ciliaris* Mont., (1843), *Polyporus anisoporus* Delastre & Mont., (1845),*Polyporus nanus* Durieu & Mont., (1856), *Favolus squamiger* Berk., (1872), *Favolus curtisii* Berk., (1872), *Polyporus orbicularis* Saut., (1876), *Polyporus penningtonii* Speg., (1902), *Polyporus arculariformis* Murrill, (1904), *Hexagonia hondurensis* Murrill, (1904), *Hexagonia portoricensis* Murrill, (1904), *Polyporus arculariellus* Murrill, (1904), *Polyporus vanderystii* Lloyd, (1918), *Polyporus handelii* Lohwag, (1937)

Description of the specimen

Cap: Circular, 2 - 5cm diameter, sometimes rather indented laterally, low convex to slightly depressed in the center, upper surface finely squamose, glabrous in age, yellow-brown, ochre-brown, light brown, often darker toward the center, margin slightly inrolled, sharp, fringed-bristly. **Stipe:** Central to somewhat eccentric, cylindrical, 15 - 40 × 3 - 7 mm, finely squamose, light brown, solid, base somewhat thickened. Pores honey-comblike, whitish, cream-colored, pores elongated and polygonal, smaller toward the margin, slightly decurrent. **Flesh:** Tough, leathery, cream-colored, 1-2 mm thick. **Basidiospores:** Cylindrical to elliptical, smooth, hyaline, 5.5-8 x 2-3 μm.

Collection Site: Murlen National Park, Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/005; MZU/WRF/2017/002

Comments: Work on *Polyporus arcularius* has been reported from various parts of India .Vasava *et al*,. (2018) reported from Western India, Iqbal *et al*,. (2016) reported from Western Ghats; Adarsh *et al*,. (2018) from Kerala.

58. *Polyporus badius* (Pers.) Schwein., (1832) **(Photo Plate. 58)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Polyporus*
Species	-	*P. badius*

Synonyms - *Boletus perennis* Batsch, (1783),*Boletus durus* Timm, (1788), *Boletus batschii* J.F. Gmel., (1792), *Boletus badius* Pers., (1801),*Grifola badia* (Pers.) Gray,(1821),*Grifola badia var. badia* (Pers.) Gray,. (1821), *Polyporus durus* (Timm) Kreisel, (1984), *Polyporellus badius* (Pers.) Imazeki, (1989), *Royoporus badius* (Pers.) A.B. De, (1997),*Picipes badius* (Pers.) Zmitr. & Kovalenko, (2016),*Polyporus picipes* Fr., (1838), *Polyporus trachypus* Berk. & Mont., (1856), *Favolus trachypus* Berk. & Mont., (1856), *Polyporus dibaphus* Berk. & M.A. Curtis, (1872)

Description of the specimen

Cap: Circular or flabelliform, up to 15cm diameter, azonate, glabrous, smooth or rugose on drying, upper surface light chestnut brown to dark blackish brown, often darker in the center. **Stipe:** Centrally or laterally stipitate; black and minutely tomentose at base, chestnut brown and glabrous at apex, up to 50 mm thick. **Pores:** Decurrent on stipe,pore surface white to pale buff, circular to angular, 5 – 8 per mm; context pale buff, azonate. Flesh tough, leathery to corky, up to 15 mm thick, tube layer white when young, becoming slightly darker than context, up to 1 mm thick.Spore print white. **Basidiospores:** Cylindricaal, 7.5 - 9 × 3.3 – 5.2 μm, hyaline, smooth.

Collection Site: Murlen National Park

Specimen examined: MZU/WRF/2016/005; MZU/WRF/2017/002

Comments: In India, Soosairaj *et al,*. (2012) and Ranadive, (2013) mentioned *Polyporus badius* in their Checklists of Indian *Aphyllophorales.*

59. *Polyporus dictyopus* Mont., (1835) **(Photo Plate. 59)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Polyporus*
Species	-	*P. dictyopus*

Synonyms - *Melanopus dictyopus* (Mont.) Pat., (1900),*Neodictyopus dictyopus* (Mont.) Palacio, (2017), *Polyporus parvomarginatus* Speg. (?), *Polyporus rhizomorphus* Mont., (1840), *Polyporus columbiensis* Berk., (1842), *Polyporus infernalis* Berk., (1843), *Polyporus blanchettianus* Berk. & Mont., (1849), *Polyporus versiformis* Berk., (1854), *Polyporus xerophyllus* Berk., (1855), *Polyporus nephridis* Berk., (1856), *Polyporus vernicosus* Berk., (1856), *Polyporus diabolicus* Berk., (1856), *Polyporus atroumbrinus* Berk., (1856),*Polyporus decolor* Berk., (1856), *Polyporus rufoatratus* Berk., (1856), *Polyporus nephridius* Berk., (1856), *Polyporus hydniceps* Berk. & M.A. Curtis, (1869), *Polyporus parvimarginatus* Speg., 280 (1883), *Polyporus holomelanus* Berk. ex Cooke, (1886), *Polystictus nephridius* (Berk.) Cooke (1886), *Fomes holomelanus* Berk. ex Cooke, (1886), *Polyporus pancheri* Pat., (1887), *Melanopus pancheri* Pat.,(1887), *Polystictus puiggarii* Speg., (1889), *Microporus nephridius* (Berk.) Kuntze (1898), *Melanopus scabellus* Pat., (1901), *Leucoporus turbinatus* Pat. & Har., (1906), *Microporus mollis* Pat., (1909), *Leucoporus velutipes*

Pat., (1909), *Polyporus malnominus* Lloyd, (1912), *Polyporus obniger* Lloyd (1917), *Polyporus burkillii* Lloyd, (1920), *Polyporus trametoides* Corner, (1984).

Description of the specimen

Cap: Fan-shaped to 1 - 5 cm, smooth, faintly zoned or striate; surface at first ochraceous, darker basally, becoming reddish-brown, finally black. **Stipe:** Lateral, inflated, to 2cm long, 15 mm wide, fuscous, rugulose, finely velutinate. **Pores:** Decurrent, round or angular; 0.5 mm. deep; very small, 7 - 8 per mm. **Flesh:** Leathery, corky Spore print white. **Basidiospores**: Elliptical to oblong, 7 - 9 × 2.5 - 3 μm, smooth, hyaline.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/006; MZU/WRF/2016/069; MZU/WRF/2017/171; MZU/WRF/2018/208

Comments: In India, Adarsh *et al*,. (2019) reported Polyporus dictyopus from Silent Valley National Park, southern Western Ghats. Adarsh *et al*,. (2018) reported from the state of Kerala. It was also reported from Meghalaya (Lyngdoh and Dkhar, 2014).

60. *Polyporus tenuiculus* (P. Beauv.) Fr.,(1821) **(Photo Plate. 60)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Polyporus*
Species	-	*P. tenuiculus*

Synonyms - *Favolus tenuiculus* P. Beauv., (1806), *Merulius daedaleus* Link, (1809), *Polyporus dermoporus* Pers., (1827), *Favolus flaccidus* Fr., (1830),

Favolus hepaticus Klotzsch, (1832), *Favolus tessellatus* Mont., (1843), *Favolus tessulatus* Mont., (1843), *Favolus fissus* Lév., (1844),*Favolus peltatus* Lév., (1844),*Favolus alutaceus* Berk. & Mont., (1849), *Favolus lacerus* Fr. (1851), *Favolus sundaicus* Fr., (1851),*Favolus lacer* Fr., 104 (1851), *Favolus giganteus* Mont., (1854), *Hexagonia rhombipora* Mont.,(1869), *Favolus scaber* Berk. & Broome, (1880),*Favolus fimbriatus* Speg., (1884), *Favolus paraguayensis* Speg., (1884), *Favolus speciosus* Speg., (1884), *Favolus guarapiensis* Roum., (1887), *Favolus saltensis* Speg., (1898), *Hexagonia wilsonii* Murrill, (1904), *Hexagonia floridana* Murrill, (1904), *Hexagonia fragilis* Murrill, (1904), *Hexagonia subpurpurascens* Murrill, (1907), *Hexagonia subcaperata* Murrill, (1907), *Hexagonia maxonii* Murrill, (1907), *Polyporus palensis* Murrill, (1907), *Hexagonia reniformis* Murrill, (1907), *Hexagonia daedaleiformis* Murrill, (1912), *Hexagonia motzorongensis* Murrill, (1912), *Hexagonia sulphurea* Murrill, (1912), *Hexagonia sulfurea* Murrill, (1912), *Favolus caespitosus* Lloyd, (1919), *Polyporus spegazzinianus* Bres., (1920), *Favolus roseus* Lloyd, (1922), *Favolus mollis* Lloyd, (1924), *Favolus lutescens* Lloyd, (1924), *Favolus balansae* Bres., (1926), *Favolus bresadolianus* Speg., (1926), *Favolus bresadolanus* Speg., (1926), *Polyporus arcularioides* A. David & Rajchenb., (1985), *Polyporus bresadolianus* (Speg.) Popoff & J.E. Wright (1998).

Description of the specimen

Basidiocarps: Annual, solitary, imbricate, centrally to laterally stipitate, pileus flabelliform or infundibuliform, 2 - 7 cm in diameter, up to 5 mm thick at the base and thinning towards the margin. Upper surface white when fresh, glabrous except for the basal part of the pileus, smooth, radiate, or distinctly tessellate reflecting the pores below, light and brittle when dry, pore surface concolorous, pores hexagonal to radially elongated, 1 - 2 per mm, rather shallow, decurrent along the whole stipe; context white to pale ochraceous, up to 2 mm thick; stipe up to l cm long and 5 mm thick, concolorous with the pileus. Basidia clavate, 4-sterigmatoid, 18 - 35 x 4 - 7 µm. **Basidiospores**: Cylindrical, 7 - 12 x 2.6 - 4.2 µm.

Collection Site: Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/007

Comments: In India, Mohanan, (2002) reported *Polyporus tenuiculus* as a pathogen for bamboos from Kerala. Zothanzama (2011a) has also reported the species from Meghalaya.

61. *Pycnoporus cinnabarinus* (Jacq.) P. Karst, (1881) **(Photo Plate. 61)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Pycnoporus*
Species	-	*P. cinnabarinus*

Synonyms - *Boletus cinnabarinus* Jacq.,(1776), *Polyporus cinnabarinus* (Jacq.) Fr., (1821), *Polyporus cinnabarrinus (*Jacq.) Fr., (1821), *Trametes cinnabarina* (Jacq.) Fr., 323 (1849), *Trametes cinnabarinus* (Jacq.) Fr., (1849), *Polystictus cinnabarinus* (Jacq.) Cooke, (1886), *Leptoporus cinnabarinus* (Jacq.) Quél., (1886), *Phellinus cinnabarinus* (Jacq.) Quél., (1888), *Hapalopilus cinnabarinus (*Jacq.) P. Karst., (1899), *Coriolus cinnabarinus* (Jacq.) G. Cunn., (1948), *Fabisporus cinnabarinus* (Jacq.) Zmitr., (2001).

Description of the specimen

Fruiting body: 2 - 12 cm across, 3 - 8 cm wide, upto 2 cm thick, kidney or fan-shaped, leathery, becoming corky,rigid, hard when dried, upper surface covered in fine soft hairs when young, giving them a pruinose appearance, later smooth and wrinkled, cinnabar - red or orange-red, color decreasing in intensity with age. Tubes: 2-6 mm long, cinnabar

red. Pores: 2-4 per mm, round or angular, cinnabar-red. Spore print white. **Basidiopores:** White, oblong-ellipsoidal, non-amyloid, 4.5-6 x 2-3 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Tokalo Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/008; MZU/WRF/2017/098; MZU/WRF/2018/178

Comments: In India, Sharma & Jaitley, (2017); Iqbal *et al.*, (2016) has reported *Pycnoporus cinnabarinus* from Uttarakhand and Kerala respectively.

62. *Pycnoporus sanguineus* (L.) Murrill, (1904) **(Photo Plate. 62)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Pycnoporus*
Species	-	*P. sanguineus*

Synonyms - *Boletus sanguineus* L., (1763), *Boletus nitens* Batsch, (1783), *Polyporus sanguineus* (L.) G. Mey., (1818),*Polystictus sanguineus* (L.) Fr., (1851), *Microporus sanguineus* (L.) Kuntze, 1898), *Trametes sanguinea* (L.) Lloyd, (1924), *Trametes cinnabarina var. sanguinea* (L.) Pilát, (1940), *Trametes sanguinea* (L.) Imazeki, (1943), *Coriolus sanguineus* (L.) G. Cunn., (1949), *Fabisporus sanguineus* (L.) Zmitr., (2001), *Boletus ruber* Lam., (1783), *Polyporus cristula* Klotzsch ex Berk., (1839).

Description of the specimen

Fruitbody: Annual or reviving, solitary or in groups, flabelliform, narrowly attached to the substrate, sometimes semi-stipitate or contracted into a stemlike base. Consistency

coriaceous when fresh, quite hard when dry. **Pileus:**1-10 cm in diameter and 1 - 4 mm thick, with lighter and darker zones, initially orange then red to cinnabar, later often intensively red-orange. Margin acute, entire or somewhat incised, often lighter than the rest of the pileus. Stipe rarely present, up to 2 cm long and 4 mm thick, concolorous with the lateral pileus. Pore layer red-orange to cinnabar. Pores circular, tubes in one layer, 0.5-2 mm long, dissepiments initially rather thick, with age gradually becoming thinner. Context 1- 4 mm thick cottony. **Basidiopores:** Cylindrical to ovate with smooth, hyaline and non-amyloid walls, 4 - 4.5 x 2 - 2.3 µm.

Collection site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/009; MZU/WRF/2016/073; MZU/WRF/2017/130; MZU/WRF/2018/172

Comments: In India, Zothanzama (2011a) and Lyngdoh and Dkhar, (2014) reported the species from Meghalaya. Sharma & Jaitley, (2017) also reported *Pycnoporus sanguineus* from Uttarakhand.

63. *Schizophylum commune* Fr., (1821) **(Photo Plate. 63)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales
Family	-	*Schizophylaceae*
Genus	-	*Schizophylum*
Species	-	*S. commune*

Synonyms - *Schizonia vulgaris* Pers., (1828), *Daedalea commune* (Fr.) P. Kumm., (1871), *Merulius communis* (Fr.) Spirin & Zmitr., (2004), *Agaricus alneus*

L., (1753), *Scaphophoeum agaricoides* Ehrenb. (1820), *Schizophyllum alneus* (L.) Kuntze, (1898)

Description of the specimen

Fruiting body: Usually shell or fan shaped, with a radius of 1 – 3 cm and a narrow point of attachment to the wood which can be lateral (on the side) or dorsal (on the upper surface). It is more or less hairy, zoned and white to grey to grey brown on its upper surface and often furrowed and with a toothed irregular margin. **Stipe:**absent. **Gills:** Lower surface consists of radiating pinkish gills with a split edge. Flesh tough, fibrous and somewhat ochraceous. **Spore print:** Ochraceous. **Basidiospores:** Cylindrical, 6 – 7 × 2 – 2.5 μm. Basidia tetrasterigmatoid,narrowly clavate, 15 – 50 × 4 – 6 μm, four spored.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/010;MZU/WRF/2016/074; MZU/WRF/2017/131; MZU/WRF/2018/211

Comments: Study on the diversity and different aspects and biological activities of *Schizophyllum commune* has been done from various parts of India (Swain *et al,*. 2011; Debnath *et al,*. 2017; Premamalini *et al,*. 2011). In Northeast India, Zothanzama, (2011a); Lalrinawmi *et al,*.(2017); Chuzho and Dkhar,(2018) reported it from Meghalaya, Mizoram and Nagaland respectively. It is an edible wood inhabiting fungi.

Local Name: Pasi

64. *Scutellinia scutellata* (L.) Lambotte, (1887) **(Photo Plate. 64)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Pezizomycetes
Sub Class	-	Pezizomycetidae
Order	-	Pezizales
Family	-	Pyronemataceae
Genus	-	*Scutellinia*
Species	-	*S. scutellata*

Synonyms - *Peziza scutellata* L., (1753),*Helvella ciliata* Scop., (1772),*Elvela ciliata* Scop., (1772), *Peziza ciliata* (Scop.) Hoffm., (1790), *Peziza scutellata*Schumach., (1803), *Peziza aurantiaca* Vent., (1812),*Humaria scutellata* (L.) Fuckel, (1870), *Lachnea scutellata* (L.) Sacc., (1879), *Humariella scutellata* (L.) J. Schröt., (1893), *Patella scutellata* (L.) Morgan, (1902), *Ciliaria scutellata* (L.) Quél. ex Boud., (1907).

Description of the specimen

Fruiting body: Solitary or clustered, saucer-shaped cups are 3-12 mm wide. Orange or pale brown, covered by long, stiff brown to black hairs which form a fringe on the rim of the cup. Usually, at least some of these marginal hairs are longer than 1 mm. **Ascospore:** Elliptical, smooth, 17-23 x 10.5-14 µm.

Collection Site: Murlen National Park

Specimen examined: MZU/WRF/2018/217

Comments: *Scutellinia scutellata* has been previously reported from India (Kaushal *et al*.,1983). Zothanzama, (2011a) has also reported the species from Meghalaya.

65. *Stereum hirsutum* (Willd.) Pers.,(1800) **(Photo Plate. 65)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Russulales
Family	-	Stereaceae
Genus	-	*Stereum*
Species	-	*S. hirsutum*

Synonyms - *Thelephora hirsuta* Willd., (1787), *Thelephora papyracea* Vahl, (1797), *Thelephora* ramealis Schwein., (1822),*Stereum aratae* Speg., (1880),*Stereum amoenum* Kalchbr. & MacOwan, (1881),*Stereum sarmienti* Speg., (1888),*Stereum persoonianum* Britzelm., (1897), *Stereum variicolor* Lloyd, (1914), *Stereum azonum* Velen., (1922) *Stereum cinericium* Lloyd, (1922),*Stereum ochraceum* Lloyd, (1923),*Stereum bombycinum* Lloyd, (1925), *Stereum necator* Viala, (1926), *Stereum leoninum* Skovst., (1956).

Description of the specimen

Fruiting body: Fan shaped and funnel shaped, may be sessile or have a broad or occasionally a narrow attachment to the substrate, projecting up to 30 mm from substrate with a diameter of up to 6 cm, thin, often only 1 - 2 mm thick. Upper surface is hirsute (hairy), zoned, with alternating bands of yellowish orange and greyish white hairs; fades to pale dull greyish ochre on drying,usually wavy. Lower surface smooth with neither pores nor gills nor teeth, shows concentric zones, bright yellow orange to orange brown when fresh, fading to grey. Flesh thin and of a tough but elastic consistency, like leather. Not changing colour on bruising. Spore print very seldom seen, white. **Basidiospores**: Ellipsoid, 5.5 - 6.5 × 2 - 3 μm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/011; MZU/WRF/2017/100; MZU/WRF/2017/132; MZU/WRF/2018/173

Comments: Report on *Stereum hirsutum* has been done by various workers in India. Dhingra, (2014) reported the species from the Himalaya and its adjoining areas; Krishna *et al*., (2015) also reported from Telengana; Patil, (2019) reported from Maharastra. In Northeast India, Zothanzama, (2011a) and Lyngdoh and Dkhar,(2014) reported it from Meghalaya State, and Chuzho and Dkhar, (2018) has also reported it from Nagaland.

66. *Stereum ostrea* (Blume & T. Nees) Fr., (1838) **(Photo Plate. 66)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes,
Sub Class	-	Agaricomycetidae
Order	-	Russulales
Family	-	Stereaceae
Genus	-	*Stereum*
Species	-	*S. ostrea*

Synonyms - *Thelephora ostrea* Blume & T. Nees, (1826),*Thelephora fasciata* Schwein., (1822), *Thelephora lobata* Kunze ex Fr., Linnaea 5: 527 (1830), *Thelephora boryana* Fr., Linnaea 5: 528 (1830), *Stereum fasciatum* (Schwein.) Fr., (1838), *Stereum perlatum* Berk., (1842), *helephora leichhardtiana* Lév., (1846), *Thelephora leichkardtiana* Lév. (1846), *Stereum concolor* Berk., (1860), *Stereum sprucei* Berk., (1869), *Stereum leichkardtianum* (Lév.) Sacc. (1888), *Stereum pictum* Berk. ex Massee, (1889), *Stereum australe* Lloyd, (1913), *Stereum zebra* R. Heim & Malençon, (1928), *Stereum transvaalium* Byl, (1929).

Description of the specimen

Fruiting Body: 2 - 9 cm across, usually shaped like a funnel that has been sliced down one side, but often fan-shaped, semicircular, or irregularly kidney-shaped, densely velvety or hairy at first, but often smoother by maturity, with concentric zones of red, orange, yellowish, brown, and buff shades, sometimes developing greenish shades in old age as a result of algae, without a stem. Undersurface smooth, whitish to grayish or pale reddish brown. **Basidiopores**: 5 – 7 x 1.8 - 3 µ, smooth and cylindrical. Pseudoacanthohyphidia (thin-walled elements with 2-5 very small apical projections).

Collection Site: Dampa Tiger Reserved Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/012; MZU/WRF/2017/140; MZU/WRF/2017/129; MZU/WRF/2018/201

Comments: Commonly known as the False-Turkey's Tail. One of the most commonly found and well distributed in the forests of Mizoram. *Stereum ostrea* has been studied and reported from various parts of India (Prusty *et al*., 2014; Praveen *et al*.,2011; Usha *et al.*,2014). Zothanzama, (2011a) reported it from Meghalaya. Manoharachary and Nagaraju, (2017) also reported the species from Telengana.

67. *Stereum rugosum* Pers., (1794) **(Photo Plate. 67)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Russulales
Family	-	Stereaceae
Genus	-	*Stereum*
Species	-	*S. rugosum*

Synonyms - *Thelephora rugosa* (Pers.) Pers., (1801),*Gymnoderma rugosum* (Pers.) Hoffm., (1811), *Haematostereum rugosum* (Pers.) Pouzar, (1959),*Corticium boltonii* Fr., (1838), *Corticium triviale* Speg., (1888).

Description of the specimen

Fruiting body: Resupinate to effuse-reflexed, up to 1 mm thick, upper sterile surface tomentose at first then glabrous, greyish to brown, hymenophore smooth to tuberculate, yellowish to cream, excreting a reddish liquid when touched or cut, context ochraceous, thin. **Basidiospore:** Not obtained

Collection Site: Dampa Tiger Reserve Forest, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/013; MZU/WRF/2018/210

Comments: In India, *Stereum rugosum* was reported from Uttarakhand (Prasher and Lalita, 2013). Lyngdoh and Dkhar, (2014) has also reported the species from Meghalaya.

68. *Terana caerulea* (Schrad. ex Lam.) Kuntze (1891) **(Photo Plate. 68)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Phanerochaetaceae
Genus	-	*Terana*
Species	-	*T. caerulea*

Synonyms - *Byssus caerulea* Lam. (1779), *Terana coerulea* (Lam.) Kuntze (1891), *Corticium caeruleum* (Lam.) Fr. (1938), *Pulcherricium caeruleum (*Lam.) Parmasto (1968).

Description of the species

Fruiting body: Annual, resupinate, effused, at first orbicular and then confluent, hymenophore smooth to slightly tuberculate, with a characteristical iridiscent bluish colour. Cystidia absent. Basidia clavate, 30-40 x 5-6 µm, sometimes with lateral branches, with 4-sterigmata and a basal clamp. **Basidiospores**: Not obtained

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2016/014

Comments: It is rare and commonly known as the Cobalt Crust, which is also known as "velvet blue spread". Krieglsteiner, (1983) has reported its occurrence in Europe.

69. *Trametes gibbosa* (Pers.) Fr., (1838) **(Photo Plate. 69)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Trametes*
Species	-	*T. gibbosa*

Synonyms - *Merulius gibbosus* Pers., (1795), *Daedalea gibbosa* (Pers.) Pers., (1801),*Polyporus gibbosus* (Pers.) P. Kumm., (1871), *Lenzites gibbosa* (Pers.) Hemmi, (1939), *Pseudotrametes gibbosa* (Pers.), Bondartsev & Singer ex Singer, (1944), *Agarico-suber scalptum* Paulet, (1793), *Trametes crenulata* Berk, (1854), *Trametes kalchbrenneri* Fr., Mat. (1868), *Trametes nigrescens* Lázaro Ibiza, (1916), *Bulliardia virescens* Lázaro Ibiza, (1916).

Description of the specimen

Fruiting body: Semicircular or reniform, laterally attached, 6 – 15 cm diameter, finelyvelutinose or glabrous, with concentric low ridges and uneven, usually white butbecoming ochraceous with age and often with a covering of green algae. Common on rotten logs and tree stumps in a variety of forest types.Stipe absent, caps attached laterally, sometimes merged in to a shelf.Poressmall cream to white, radially elongated, especially near themargin. Flesh soft and corky, up to 50 mm thick, cream. Spore print white. **Basidiospores**: Ellipsoid to cylindric, 4 – 5.5 × 2 – 2.5 μm, hyaline. Basidiaclavate, tetra-sterigmatoid ,15 – 30× 3 – 7 μm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/015; MZU/WRF/2017/101
MZU/WRF/2017/151; MZU/WRF/2018/202

Comments: In India, *Trametes gibbosa* was reported by Arya *et al*., (2008) from the state of Gujarat and Krishna *et al.*, (2015) has also added *Trametes gibbosa* to the checklist of wood rotting fungi of Telengana.

70. *Trametes hirsuta* (Wulfen) Lloyd. (1924). **(Photo Plate. 70)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Trametes*
Species	-	*T. hirsuta*

Synonyms - *Boletus hirsutus* Wulfen, (1791), *Boletus wulfenii* Humb., (1793), *Polyporus hirsutus* (Wulfen) Fr., (1821), *Polystictus hirsutus* (Wulfen) Fr., (1851), *Hansenia hirsuta* (Wulfen) P. Karst., (1879), *Coriolus hirsutus* (Wulfen) Quél., (1886), *Microporus hirsutus* (Wulfen) Kuntze, (1898), *Polystictoides hirsutus* (Wulfen) Lázaro Ibiza, (1916), *Boletus velutinus* J.J. Planer, (1788), *Boletus fibula* Sowerby, (1803), *Boletus nigromarginatus* Schwein., (1822), *Polyporus vellereus* Berk., (1842), *Polyporus aureus* Berk., 373 (1843), *Polyporus galbanatus* Berk., (1843), *Polyporus cinerascens* Lév., (1844), *Polyporus cinerescens* Lév., (1844), *Polyporus cinereus* Lév., (1846), *Polystictus hirtellus* Fr., (1851),*Polyporus gourliei* Berk., (1860), *Polystictus cinerescens* (Lév.) Sacc., (1888), *Coriolus velutinus* P. Karst., (1906), *Trametes porioides* Lázaro Ibiza, (1917).

Description of the specimen

Fruiting body: Annual, effused-reflexed or rarely resupinate, coriaceous when fresh, pilei dimidiate, applanate to thick, upper surface hirsute, gray, zonate or concentrically sulcate, margin often yellowish-brown, tomentose. Pore surface white to tan, context duplex, the upper layer gray, soft-fibrous, up to 3 mm thick, at least at the base separated by a thin black line from the lower part, the latter ivory white, corky, up to 15 mm thick; tube layer concolorous with lower context, up to 6 mm thick. Cystidia absent, fusoid cystidioles present, 12-18 x 3-5 pm; hyphal pegs occasionally present. Basidia clavate, 4-sterigmate. **Basidiospores**: Cylindric, hyaline, smooth, 6 - 9 x 2 - 2.5 µm.

Collection Site: Dampa Tiger Reserved Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/016; MZU/WRF/2016/069
MZU/WRF/2017/106; MZU/WRF/2018/203

Comments: *Trametes hirsuta* is one of the commonly found wood rooting fungi in Indian forest. Sivaprakasam *et al*., (2011) has studied the antimicrobial activity of whole fruiting bodies of the fungus. Kaviyarasan and Shenbagaraman, (2014) also reported the antiangiogenesis effect of *Trametes hirsuta* extract. In Northeast India, Zothanzama,

(2011a) and Chuzho and Dkhar, (2014) has reported *Trametes hirsuta* from Meghalaya and Nagaland respectively

71. *Trametes modesta* (Kunze ex Fr.) Ryvarden, (1972) **(Photo Plate. 71)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Trametes*
Species	-	*T. modesta*

Synonyms - *Polyporus modestus* Kunze ex Fr., (1830), *Polystictus modestus* (Kunze ex Fr.) Fr., (1851), *Microporus modestus* (Kunze ex Fr.) Kuntze, (1898) *Daedalea modesta* (Kunze ex Fr.) Aoshima, (1967), *Ranadivia modesta* (Kunze ex Fr.) Zmitr., (2018), *Polyporus detonsus* Fr., Linnaea 5: 519 (1830), *Polyporus monochrous* Mont., (1841), *Polyporus atypus* Lév., (1844), *Polyporus notopus* Lév., (1844), *Polyporus sordidus* Lév., (1844), *Polyporus splendens* Lév., (1844), *Polyporus nothopus* Lév. (1844), *Polyporus aculeatus* Lév., (1846), *Polyporus dorcas* Berk., (1852), *Polyporus cervinonitens* Schwein. ex Berk. & M.A. Curtis, 433 (1853), *Polyporus leiodermus* Mont., (1854), *Polyporus albocervinus* Berk., (1856), *Polyporus deglubens* Berk., (1856), *Polystictus nothopus* (Lév.) Sacc., (1888), *Polystictus lejodermus* (Mont.) Sacc., (1888), *Microporus nothopus* (Lév.) Kuntze (1898), *Microporus leiodermis* (Mont.) Kuntze (1898), *Trametes caespitosa* Murrill, (1907), *Coriolus cuneatiformis* Murrill, (1907), *Trametes luzonensis* Murrill, (1907), *Coriolus substipitatus* Murrill, (1907), *Coriolus clemensiae* Murrill, (1908), *Coriolus perpusillus*

Murrill, (1908), *Coriolus parthenius* Har. & Pat., (1909), *Coriolus subcalvus* Pat., (1914), *Polyporus praetervisus* Speg., (1926)

Description of the specimen

Fruiting body: Annual, semi-circular or reniform, laterally attached, 2 – 7 cm diameter, finely tomentose or glabrous, zoned in alternate bands of mid and pale pinkish brown with awhite outer zone. Pore surface cream or white when fresh become pale when aged. Flesh thin, 5 mm, cream, strongly dextrinoid. **Basidiopores:** Not obtained

Collection Site: Dampa Tiger Reserve Forest

Specimen examined: MZU/WRF/2016/017

Comments: In India, Lyngdoh & Dkhar (2014) has reported the species from Meghalaya. Adarsh *et al*., (2018) has also added *Trametes modesta* to the checklist of Polyporales of Kerala.

72. *Trametes trogii* Berk., (1850) **Photo Plate. 72)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes,
Sub Class	-	Agaricomycetidae, ,
Order	-	Polyporales,
Family	-	Polyporaceae,
Genus	-	*Trametes*
Species	-	*T. trogii*

Synonyms - *Trametes lutescens f. trogii* (Berk.) Bres., (1897), *Trametes favus var. trogii* (Berk.) Bres., (1908), *Trametes hispida subsp. trogii* (Berk.) Bourdot & Galzin, (1925), *Trametes gallica var. trogii* (Berk.) Sacc., (1925), *Trametes gallica f. trogii* (Berk.) Pilát, (1939), *Funalia trogii* (Berk.) Bondartsev & Singer,

(1941), *Trametella trogii* (Berk.) Domanski, (1968), *Cerrena trogii* (Berk.) Zmitr., (2001), *Polyporus hausmanni* Fr. (?), *Polyporus ozonoides* Berk., (1851), *Polyporus ozonioides* Berk., (1851), *Polyporus hausmannii* Fr. ex Kalchbr., (1868), *Daedalea trametes* Speg., (1880),*Inodermus maritimus* Quél., (1887), *Trametes hispida var. rhodostoma* Forq. ex Quél., (1888), *Trametes tucumanensis* Speg., (1898), *Microporus ozoniodes* (Berk.) Kuntze (1898).

Description of the specimen

Basidiocarps: Annual, sessile, effused-reflexed or rarely resupinate, tough-corky, pilei up to 6 cm wide, upper surface of pileus coarsely hispid(covered with stiff hairs), cream-buff to ochraceous-buff, azonate or faintly zonate, margin sharp.Pore surface ochraceous buff, the pores angular to labyrinthiform, 1- 2 per mm.Tube layer concolorous and continuous with lower layer of context, up to 9 mm deep.

Basidiospores: Not obtained

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/018; MZU/WRF/2016/070
MZU/WRF/2017/107; MZU/WRF/2018/179

Comments: Different activities and aspect of *Trametes trogii* have been reported from India. Chaturvedi, (2019) has reported the species from the state of Haryana. Bhatt *et al.*, (2018) has also reported the species from Gujarat.

73. *Trametes versicolor* (L.) Lloyd, 1920 **(Photo Plate.73)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae

Genus - *Trametes*
Species - *T. versicolor*

Synonyms - *Boletus versicolor* L., (1753), *Poria versicolor* (L.) Scop., (1772),*Agaricus versicolor* (L.) Lam., (1783),*Boletus suberosus* Batsch (1783), *Agarico-suber versicolor* (L.) Paulet, (1793), *Sistotrema versicolor* (L.) Tratt., (1804*), Polyporus versicolor* (L.) Fr., (1821),*Polystictus versicolor* (L.) Fr., (1851), *Hansenia versicolor* (L.) P. Karst., (1879), *Bjerkandera versicolor* (L.) P. Karst., (1881), *Coriolus versicolor* (L.) Quél., (1886), *Microporus versicolor* (L.) Kuntze, (1898), *Boletus atrofuscus* Schaeff., (1774), *Cellularia cyathiformis* Bull., (1789), *Boletus cyaneus* Pers., (1794), *Polyporus fuscatus* Fr., (1818),*Polyporus nummularius* Pers., (1827*), Polyporus hirsutulus* Schwein., (1832), *Polyporus pectunculus* Lév., (1846), *Polyporus subflavus* Lév., (1846),*Polyporus apophysatus* Rostk., (1848),*Polystictus azureus* Fr., (1851),*Polyporus pictilis* Berk., (1854), *Polyporus nigricans* Lasch, (1859), *Polyporus cristulatus* Speg., (1880),*Polyporus caesioglaucus* Cooke, (1882*), Polystictus neaniscus* Berk. ex Cooke, (1886), *Polyporus antarcticus* Speg., (1888), *Polystictoides castaneicola* Lázaro Ibiza, (1916), *Polystictus corylicola* Lázaro Ibiza, (1916), *Polystictus inversus* Lázaro Ibiza, (1916), *Polystictoides castanicola* Lázaro Ibiza, (1916), *Polyporus luteovelutinus* Bres., (1920), *Polyporus carpineus* Velen., (1922), *Polyporus irpiciformis* Velen., (1922), *Polyporus picicola* Velen., (1922), *Polyporus reisneri* Velen., (1922), *Polyporus rohlenae* Velen., (1922), *Polyporus vitellinus* Velen., (1922), *Polyporus versicolor* var. cyaneus Velen., (1922), *Polyporus versicolor* var. *productus* Velen., (1922), *Polyporus versicolor var. rosiphilus* Velen., (1922), *Polystictus doidgeae* Lloyd, (1924), *Polystictus doidgei* Lloyd, (1924), *Polystictus castanicola* (Lázaro Ibiza) Sacc. & Trotter (1925).

Description of the specimen

Fruiting body: Semicircular or reniform, laterally attached, 20 – 80 mm diameter, finelytomentose, zoned in alternate bands of different colours that may be brown, orange, grey, blue black, ochre, white or green, usually white at the margin. Stipe absent, caps attached laterally to substrate. Pores small cream to white pores, 4-6 per

mm.Flesh thin, 5 mm, cream, strongly dextrinoid. Spore print white. **Basidiospores:** Cylindric, allantoids, 4.5 – 6.5 × 1.5 – 2.8 µm. Basidia narrowly clavate, four spored.

Collection Site: Murlen National Park, Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/017; MZU/WRF/2017/138

Comments: *Trametes versicolor* has been widely studied and reported from different parts of India by various authors. Gautam, (2013) studied and reported *Trametes versicolor* from Himachal Pradesh. Veena and Pandey, (2012) studied the physiological and cultivation requirements of *Trametes versicolor*. Krishna *et al*,. (2015) has also studied it from Telengana and Adarsh *et al*., (2018) reported it from Kerala. Chakraborty, (2019) has also reported it from the state of West Bengal. In Northeast India, Zothanzama, (2011a) reported the species from Meghalaya and Tapwal *et al*., (2013) reported it from Assam.

74. *Tremella fuciformis* Berk., (1856) **(Photo Plate. 74)**

Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Tremellomycetes
Sub Class	-	Tremellomycetidae
Order	-	Tremellales
Family	-	Tremellalaceae
Genus	-	*Tremella*
Species	-	*T. fusciformis*
Synonyms	-	*Nakaiomyces nipponicus* Kobayasi, (1939)

Description of the specimen

Fruiting body: 3 - 15 cm diameter, this extensively lobed jelly fungus usually has a central point of attachment, the texture is soft, gelatinized and moist to touch. It is generally a transluscent white colour. Flesh gelatinous and white, it is thicker when wet. **Basidiopores**: Ovoid to ellipsoid, 10 – 16 × 7 – 8 µm.

Collection Site: Dampa Tiger Reserved Forest, Thorang Wildlife Sanctuary

Specimen examined: MZU/WRF/2016/020; MZU/WRF/2017/139

Comments: Commonly known as the Snow Fungi. *Tremella fuciformis* have been reported from various part of India by various workers. Ghosh *et al*., (2016) has reported this species from West Bengal. Bhatt *et al*., (2018) has also reported from Uttarakhand. Verma *et al*., (2019b) reported it from Kerala and Lyngdoh and Dkhar, (2014) reported it from Meghalaya. It is an edible jelly fungi.

75. *Tremella mesenterica* Retz., (1769) **(Photo Plate. 75)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Tremellomycetes
Sub Class	-	Tremellomycetidae
Order	-	Tremellales
Family	-	Tremellalaceae
Genus	-	*Tremella*
Species	-	*T. mesenterica*

Synonyms - *Helvella mesenterica* Schaeff., (1774),*Elvela mesenterica* Schaeff. (1774), *Oncomyces mesentericus* (Retz.) Klotzsch, (1843),*Tremella lutescens* Pers., (1800), *Tremella quercina* Pollini, (1816).

Description of the specimen

Fruiting body: 8 - 50 mm radius, this extensively lobed jelly fungus usually has a central point of attachment, the texture is soft, gelatinized and moist and slippery to touch, coloursvary between yellow and orange. Flesh yellow to orange, it is thicker when wet. **Basidiospores:** Ovoid to ellipsoid, 10 – 16 × 7 – 8 μm.

Collection Site: Dampa Tiger Reserve Forest, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/021; MZU/WRF/2017/136

Comments: It is commonly known as the Withch's Butter. Various reports have been done on *Tremella mesenterica* by Indian workers. Fulzele, (2013) has reported it from Maharastra. Kumar *et al*.,(2018) has also added the species to the checklist of Non-gilled Basidiomycota of Kerala. In Northeast India, Zothanzama, (2011a) has reported it from Meghalaya, Lalrinawmi, (2017) from Mizoram and Ao *et al*.,(2016) has reported the species from Nagaland.

76. *Trichaptum biforme* (Fr.) Ryvarden,(1972) **(Photo Plate. 76)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Polyporales
Family	-	Polyporaceae
Genus	-	*Trichaptum*
Species	-	*T. biforme*

Synonyms - *Polyporus biformis* Fr., (1833), *Polystictus biformis* (Fr.) Fr., (1851), *Bjerkandera biformis* (Fr.) P. Karst., (1882), *Coriolus biformis* (Fr.) Pat., (1897), *Microporus biformis* (Fr.) Kuntze, (1898), *Trametes biformis* (Fr.) Pilát, (1939), *Polyporus friesii* Klotzsch, (1833), *Polyporus pargamenus* Fr., (1838), *Polyporus pergamenus* Fr., (1838), *Polyporus prolificans* Fr., (1838), Polyporus laceratus Berk., (1839), *Polyporus elongatus* Berk., (1842), *Polyporus menandianus* Mont., 1843), *Polyporus inquinatus* Lév., (1846), *Polyporus xalapensis* Berk. & M.A. Curtis, (1849), *Polyporus evolvens* Berk., (1856), *Polystictus candicans* Lév., (1863), *Polyporus sartwellii* Berk. & M.A. Curtis, (1872), *Polyporus pseudopargamenus* Thüm., (1878), *Polystictus pergamenus* (Fr.) Cooke, (1886), *Polyporus simulans* Blonski, (1889), *Microporus pergamenus* (Fr.) Kuntze, (1898), *Polyporus ehretiae* Bres., (1926),

Coriolus sublimitatus Murrill, (1938), *Heteroporus pergamenus* (Fr.) Bondartsev & Singer, (1941), *Trametes pargamenus* (Fr.) Kotl. & Pouzar (1957), *Trametes pergamena* (Fr.) Kotl. & Pouzar (1957).

Description of the species

Fruiting body: Pileate, annual or reviving next season, partly dimidiate to broadly sessile, single or imbricate, or spathulate to flabelliform with a tapering base, applanate to weakly convex, never with a decurrent pore layer, upto 5 cm wide, 2-8 cm long, 1-5 mm thick at the base, coriaceous or tough when fresh, harder, flexible when dry. **Pileus**: First finely adpressed tomentose in numerous narrow concentric zones, white, cream to ochraceous or greyish when old, with age becoming glabrous in ochraceous to dark brown, mostly deflexed when dry. **Pore surface**: Initially light violet, drying light brown to pale straw-coloured, pores angular, when young entire and 3-5 per mm. **Basidiospore:** Cylindrical, hyaline, smooth, thin-walled and non-amyloid, 5-6.5 x 2-2.5 µm.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/022; MZU/WRF/2016/0072; MZU/WRF/2018/174

Comments: Ranadive, (2013) added the species to the checklist of Indian *Aphyllophorales*. Adarsh *et al*.,(2018) and Adarsh *et al*., (2019) also reported its occurrence from Kerala.

77. *Xylaria grammica* (Mont.) Mont.,(1855) **(Photo Plate. 77)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Agaricales

Family	-	Xylariaceae
Genus	-	*Xylaria*
Species	-	*X. grammica*

Synomyms - *Hypoxylon grammicum* Mont., (1840),*Xylaria grammicum* (Mont.) Mont. (1855), *Xylosphaera grammica* (Mont.) Dennis, (1958).

Description of the specimen

Fruiting body: Cylindrical to slightly ellipsoid with a rounded apex 35 - 60 × 4 – 8 cm, surface granular, tobacco brown, with short, mostly vertical, cracks showingblack or grey giving a distinctive patterned effect.Stipe distinct black stipe attaching fruit body to substrate, 10 - 20 × 3 - 5 cm, slightly wider attattachment. Flesh hard, but eventually dissolving internally to leave just the outer skin.Spore print tobacco brown. **Ascospores:**10 - 12 × 4 - 5 μm, ellipsoidal.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/023; MZU/WRF/2017/137; MZU/WRF/2018/180

Comments: In India, *Xylaria grammica* was reported from Southwest India by Karun and Sridhar, (2015) and Debnath, (2018) has reported it from the state of Tripura.

78. *Xylaria polymorpha* (Pers.) Grev., (1824) **(Photo Plate. 78)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Sordariomycetes
Sub Class	-	Xylariomycetidae
Order	-	Xylariales,
Family	-	Xylariaceae
Genus	-	*Xylaria*
Species	-	*X. polymorpha*

Synonyms - *Sphaeria polymorpha* Pers., (1797), *Cordyceps polymorpha* (Pers.) Fr., (1818), *Hypoxylon polymorphum* (Pers.) Gray, (1821), *Xylosphaera polymorpha* (Pers.) Dumort., (1822), *Hypoxylon var. polymorphum* (Pers.) Mont.(1840)

Description of the specimen

Fruiting Body: 3-10 cm tall sometimes up to 2.5 cm thick, tough, shaped more or less like a club or a finger but occasionally flattened, usually with a rounded tip, at first coated with a pale to bluish or purplish dust of conidia (asexual spores), except at the whitish tip, but soon blackish with a pale tip and eventually black overall, surface becoming minutely pimpled and wrinkled with maturity. Flesh whitish, tough and rigid. **Ascospores**: 5-10 x 20-31 µm, smooth, widely fusiform.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/026; MZU/WRF/2017/103; MZU/WRF/2017/134; MZU/WRF/2018/183

Comments: In India, *Xylaria polymorpha* has been reported by Zothanzama (2011a) from Meghalaya, Nagadesi and Arya, (2017) from Gujarat, Karun and Sridhar, (2015) from South Western India and Debnath *et al*.,(2018) from Tripura.

79. *Xylaria hypoxylon* (L.) Grev.,(1824) **(Photo Plate. 79)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Ascomycota
Sub Division	-	Pezizomycotina
Class	-	Sordariomycetes
Sub Class	-	Xylariomycetidae
Order	-	Xylariales,
Family	-	Xylariaceae
Genus	-	*Xylaria*

Species - *X. hypoxylon*

Synonyms - *Clavaria hypoxylon* L., (1753), *Sphaeria hypoxylon* (L.) Sowerby, (1797), *Cordyceps hypoxylon* (L.) Fr., (1818), *Xylosphaera hypoxylon* (L.) Dumort., (1822).

Description of the specimen

Fruiting bodies: Erect, tough, pliant, clavarioid in shape, usually branched near the top, occasionally simple, up to 8 cm tall by 3-5 mm broad, often flattened in cross section above, rounded below, the base dark brown to black, often tomentose, branch tips white from asexual spores (conidia) or concolorous with the base and minutely pimpled with perithecial pores. **Ascospores:** 9.7 -14 X 4-6 µm, black, smooth, kidney shaped, hyaline, smooth, elliptical to elongated. **Asci:** Typically upto 220 x 8 µm, with eight spores per ascus.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/024; MZU/WRF/2017/105; MZU/WRF/2017/129; MZU/WRF/2018/181

Comments: Studies and reports on *Xylaria hypoxylon* has been done from India by several workers. Koyani *et al*., (2016) and Nagadesi & Arya, (2017) has reported it from Gujarat. In Northeast India, it has been reported from Meghalaya Zothanzama, (2011a), Nagaland Chuzho & Dkhar, (2014) and Tripura (Debnath *et al*., 2018).

80. *Xylaria longipes* Nitschke, (1867) **(Photo Plate. 80)**

Classification

Domain - Eukaryota
Kingdom - Fungi
Division - Ascomycota
Sub Division - Pezizomycotina
Class - Sordariomycetes
Sub Class - Xylariomycetidae
Order - Xylariales,

Family - Xylariaceae
Genus - *Xylaria*
Species - *X. longipes*

Synonyms - *Xylosphaera longipes* (Nitschke) Dennis, (1958).

Description of the specimen

Fruiting Body: Erect, slender , upto 8 cm tall and 2 cm across, tough,shaped more or less like a club, with a rounded tip, grayish to brownish when young, becoming black with maturity, surface becoming cracked and scaly with maturity, stem often proportionally long, but also frequently short or nearly absent. **Ascospores:** 12–16 x 5–6 µm, fusiform, elongated.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/025; MZU/WRF/2016/071
MZU/WRF/2017/135; MZU/WRF/2018/182

Comments: *Xylaria longipes* has been reported from Southwestern India by Ghate and Sridhar, (2016). Debnath *et al*., (2018) mentioned its occurrence in the state of Tripura as well.

81. *Xylobolus subpileatus* (Berk. & M.A. Curtis) (1958) **(Photo Plate. 81)**

Classification

Domain	-	Eukaryota
Kingdom	-	Fungi
Division	-	Basidiomycota
Sub Division	-	Agaricomycotina
Class	-	Agaricomycetes
Sub Class	-	Agaricomycetidae
Order	-	Russulales, ,
Family	-	Stereaceae
Genus	-	*Xylobolus*
Species	-	*X. subpileatus*

Synonyms - *Stereum subpileatum* Berk. & M.A. Curtis, (1849), *Lloydella subpileata* (Berk. & M.A. Curtis) Höhn. & Litsch., (1907), *Stereum frustulatum var. subpileatum* (Berk. & M.A. Curtis) A.L. Welden, (1971), *Stereum scytale* Berk., (1854), *Stereum insigne* Bres., (1891), *Hymenochaete tjibodensis* Henn., (1899), *Stereum sepium* Burt, (1920), *Stereum sepiaceum* Burt, (1920),*Lloydella sepia* (Burt) S. Ito, (1955).

Description of the species

Fruiting body: Perennial, effuse-reflexed, coriaceous to corky, abhymenial surface tomentose to felty, zonate, light to dark brown, hymenophore at first smooth, then tuberculate, cracking when dry, greyish to brown. Basidia narrowly clavate, 23 - 28 x 3 - 5 µm, with 4-sterigmata, hyaline, simple-septate at the base. **Basidiospores**: Ellipsoid, 3.5 - 5. x 2.5-3 µm, smooth, thin-walled, hyaline, amyloid.

Collection Site: Dampa Tiger Reserve Forest, Murlen National Park, Tokalo Wildlife Sanctuary.

Specimen examined: MZU/WRF/2016/027; MZU/WRF/2017/104; MZU/WRF/2018/176

Comments: Chuzho & Dkhar (2019) reported this species from Nagaland, India.

4.2. DIVERSITY OF WOOD ROTTING FUNGI IN PROTECTED FORESTS

A total of 214 Species were collected during the study period (2016 – 2018) out of which 81 were identified upto species level with one new species being described and 3 upto the genus. Out of the total identified species 74 belong to the phylum Basidiomycota and 8 belong to Ascomycota, spreading across 23 families and 40 genera (Table .1).

Table:1. Family wise representation of the wood rotting fungi species

SI.No	**Family**	**Species**
1	Auriculariaceae	*Auricularia auricula-judae, A. cornea, A.delicata, A. mesenterica, A. polytricha*
2	Aporpiaceae	*Aporpium strigosum*
3	Cortinariaceae	*Gymnopilus spectabilis*
4	Dacrymycetaceae	*Dacryopinax spathularia*
5	Fistulinaceae	*Fistulina hepatica*
6	Fomitopsidaceae	*Fomitopsis dochmia, Daedalea circularis, D. quercina, D. confrogosa*
7	Ganodermataceae	*Amauroderma rugosum , A.rude,Ganoderma applanataum, G. lucidum, G. mastoporum*
8	Helotiaceae	*Bisporellus citrina*
9	Hymenochaetaceae	*Cyclomyces tabacinus, Hymenochaete villosa*
10	Marasmiaceae	*Campanella sp. Lentinula edodes, L. lateritia,Marasmius Sp.,Micromphale foetedum*
11	Meruliaceae	*Cymatodermata dendriticum*
12	Nidulariaceae	*Cyathus striatus*
13	Phanerochaetaceae	*Terana cearulea*
14	Pleurotaceae	*Pleurotus djamor, P. sajor-caju, P. ostreatus*
15	Polyporaceae	*Coriolopsis aspera, Hexagonia tenuis, Laetiporus sulphureus, Lentinus badius, L. polychrous, L. roseus, L. sajor-caju, L. tigrinus, L. concavus, L. squarrulosus, L. strigosus, L. acuta, L. betulina, L.elegans, , Microporus affinis, M. ochrotinctus, M.xanthopus, M. vernicipes, Panus fasciatus, Polyporus alveolaris, P.arcularis, P. badius, P. dictyopus, P. tennuiculus, Pynoporus sanguineus, P. cinnabarinus, Trametes gibbossa, T. hirsuta, T. modesta, T. trogii, T. versicolor, Trichaptum biforme.*
16	Psathyrellaceae	*Coprinellus dessimentus*

17	Pyronemataceae	*Scutellinia scutellata*
18	Sarcoscyphaceae	*Cookeinia tricholoma*
19	Schizophyllaceae	*Schizophyllum commune*
20	Stereaceae	*Stereum hirsutum, S. ostrea, S. rugosum, Xylobolus subpileatus*
21	Tremellaceae	*Tremella fuciformis, T. mesenterica.*
22	Xylariaceae	*Daldinia concentrica, Xylaria grammica, X. hypoxylon, X.longipes, X. polymorpha.*
23	Mycenaceae	*Favolaschia pustulosa, Mycena Sp..*

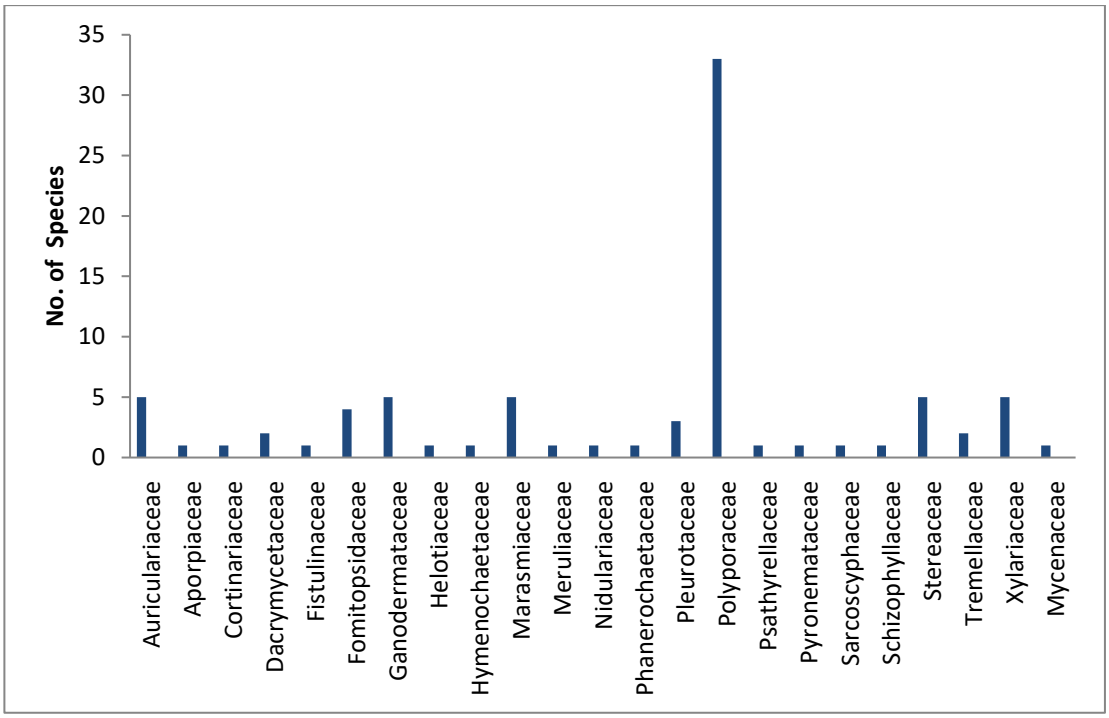


Fig: 2. Family distribution of the species

Table: 2 shows that Dampa Tiger Reserve Forest has the maximum number species identified among the study sites with a total of 65 species. This is followed by Murlen National Park with species number of 57 and then Tokalo Wildlife Sanctuary with 54 species. Thorang Wildlife Santuray accounts for the least number of species i.e. 53. Among the species identified and described Polyporaceae represents the most abundant family with a species number of 33(Fig:2).

The percentage of occurrence (Table: 2) shows that the species *Amauroderma rugosum, Auricularia auricula-judae, A.cornea, A.delicate, A. mesenterica, Coprinellus dessimentus, Cyclomyces tabacinus, Daedalea circularis, D. confragosa, D. quercina, Daldinia concentrica, Ganoderma applanatum, G. lucidum, Hexagonia tenuis, Lentinus sajor-caju, Lenzites elegans, Micromphale foetidum, Microporus affinis, M. vernicipes, M. xanthopus, Polyporus dictyopus, Pynoporus sanguineus, Schizophyllum commune, Stereum hirsutum, S. ostrea, Trametes gibbossa, T. trogii, Xylaria hypoxylon, X. longipes, X. polymorpha* are having 100 % frequency of occurrence from all the study sites. It was also observed that the species *Auricularia polytricha, Bisporellus citrina, Cyathus striatus, Lentinula lateritia, Lentinus badius, L.crinitus, Lenzites betulina, Panus fasciatus, Pycnoporus cinnabarinus, Trichaptum biforme, Xylaria grammica, Xylobolus subpileatus* are having 75% occurrence from the study sites. Species *Amauroderma rude, Coriolopsis aspera, Cymatodermata dendriticum, Fomitopsis dochmia, Gymnopilus spectabilis, Lentinus polychrous, Microporus ochrotinctus, Polyporus alveolaris, P. tennuiculus, Scutellinia scutellata, Stereum rugosum, Trametes versicolor, Tremella fuciformis, T. mesenterica* shows 50% occurrence . The species *Aporpium strigosum, Cookeinia tricholoma, Dacryopinax spathularia, Favolaschia pustulosa, Filoboletus manipularis, Fistulina hepatica, Ganoderma mastoporum, Laetiporus sulphureus, Lentinula edodes, Lentinus concavus, L. roseus, L. squarrulosus, L. strigosus, L. tigrinus, Pleurotus djamor, P. ostreatus, P. sajor-caju, Polyporus badius, Terana cearulea, Trametes modesta* shows the least occurrence with 25%.

Table: 2. Occurrence of Fungal Species

Sl.No.	Species	Dampa	Murlen	Thorang	Tokalo	Percentage of occurrence(%)
1	*Amauroderma rugosum*	+	+	+	+	100
2	*Amauroderma rude*	+	+	-	-	50
3	*Aporpium strigosum*	+	-	-	-	25
4	*Auricularia auricula-judae*	+	+	+	+	100
5	*Auricularia cornea*	+	+	+	+	100

6	*Auricularia delicata*	+	+	+	+	100
7	*Auricularia mesenterica*	+	+	+	+	100
8	*Auricularia polytricha*	+	+	-	+	75
9	*Bisporellus citrina*	+	+	-	+	75
10	*Campanella sp.*	+	-	-	+	50
11	*Coprinellus dessimentus*	+	+	+	+	100
12	*Cookeinia tricholoma*	+	-	-	-	25
13	*Coriolopsis aspera*	+	-	+	-	50
14	*Cyathus striatus*	+	-	+	+	75
15	*Cyclomyces tabacinus*	+	+	+	+	100
16	*Cymatodermata dendriticum*	+	+	-	-	50
17	*Dacryopinax spathularia*	-	+	-	-	25
18	*Daedalea circularis*	+	+	+	+	100
19	*Daedalea confrogosa*	+	+	+	+	100
20	*Daedalea quercina*	+	+	+	+	100
21	*Daldinia concentrica*	+	+	+	+	100
22	*Favolaschia pustulosa*	+	-	-	-	25
23	*Filoboletus manipularis*	-	+	-	-	25
24	*Fistulina hepatica*	-	+	-	-	25
25	*Fomitopsis dochmia*	+	-	+	-	50
26	*Ganoderma applanataum*	+	+	+	+	100
27	*Ganoderma lucidum*	+	+	+	+	100
28	*Ganoderma mastoporum*	+	-	-	-	25
29	*Gymnopilus spectabilis*	-	+	-	+	50
30	*Hexagonia tenuis*	+	+	+	+	100
31	*Hymenochate villosa*	+	+	-	-	50
32	*Laetiporussulphureus*	-	+	-	-	25
33	*Lentinula edodes*	-	+	-	-	25
34	*Lentinula lateritia*	+	-	+	+	75

35	*Lentinus badius*	+	+	+	-	75
36	*Lentinus concavus*	-	-	-	+	25
37	*Lentinus crinitus*	+	-	+	+	75
38	*Lentinus polychrous*	-	+	-	+	50
39	*Lentinus roseus*	-	-	-	+	25
40	*Lentinus sajor-caju*	+	+	+	+	100
41	*Lentinus squarrulosus*	+	-	-	-	25
42	*Lentinus strigosus*	+	-	-	-	25
43	*Lentinus tigrinus*	-	+	-	-	25
44	*Lenzites acuta*	+	+	+	-	75
45	*Lenzites betulina*	+	+	-	+	75
46	*Lenzites elegans*	+	+	+	+	100
47	*Marasmius* sp.	+	+	+	+	100
48	*Micromphale foetidum*	+	+	+	+	100
49	*Microporus affinis*	+	+	+	+	100
50	*Microporus ochrotinctus*	+	-	+	-	50
51	*Microporus vernicipes*	+	+	+	+	100
52	*Microporus xanthopus*	+	+	+	+	100
53	*Mycena Sp.*	+		+		50
54	*Panus fasciatus*	+		+	+	75
55	*Pleurotus djamor*	+	-	-	-	25
56	*Pleurotus ostreatus*	-	-	+	-	25
57	*Pleurotus sajor-caju*	-	+	-	-	25
58	*Polyporus alveolaris*	-	-	+	+	50
59	*Polyporus arcularis*	-	+	+	-	50
60	*Polyporus badius*	-	+	-	-	25
61	*Polyporus dictyopus*	+	+	+	+	100
62	*Polyporus tennuiculus*	-	-	+	+	50
63	*Pycnoporus cinnabarinus*	+	+	-	+	75

64	*Pynoporus sanguineus*	+	+	+	+	100
65	*Schizophyllum commune*	+	+	+	+	100
66	*Scutellinia scutellata*	-	+	+	-	50
67	*Stereum hirsutum*	+	+	+	+	100
68	*Stereum ostrea*	+	+	+	+	100
69	*Stereum rugosum*	+	-	-	+	50
70	*Terana cearulea*	+	-	-	-	25
71	*Trametes gibbossa*	+	+	+	+	100
72	*Trametes hirsuta*	+	+	+	+	100
73	*Trametes modesta*	+	-	-	-	25
74	*Trametes trogii*	+	+	+	+	100
75	*Trametes versicolor*	-	+	+	-	50
76	*Tremella fuciformis*	+	-	+	-	50
77	*Tremella mesenterica*	+	-	-	+	50
78	*Trichaptum biforme*	+	+	+	-	75
79	*Xylaria grammica*	+	+	-	+	75
80	*Xylaria hypoxylon*	+	+	+	+	100
81	*Xylaria longipes*	+	+	+	+	100
82	*Xylaria polymorpha*	+	+	+	+	100
83	*Xylobolus subpileatus*	+	+	-	+	75
Total		67	57	53	54	

The Percentage of occurrence of fungal specimen varies from 25%, 50%, 75% and 100% from all the study sites. Percentage of occurrence characterised by 25% are the singleton species which means they were encountered or collected only once irrespective of the study sites such as *Aporpium strigosum, Cookeinia tricholoma, Dacryopinax spathularia, Favolaschia pustulosa, Filoboletus manipularis, Fistulina hepatica, Ganoderma mastoporum, Laetiporus sulphureus, Lentinula edodes, Lentinus concavus, L. roseus, L. squarrulosus, L. strigosus, L. tigrinus, Pleurotus djamor, P.*

ostreatus, P. sajor-caju, Polyporus badius, Terana cearulea, Trametes modesta. 50% frequency were the characteristics of the doubleton species which means fungal specimen were present in two sites *vis*. *Amauroderma rude, Coriolopsis aspera, Cymatodermata dendriticum, Fomitopsis dochmia, Gymnopilus spectabilis, Hymenochate villosa, Lentinus polychrous, Polyporus alveolaris, P. arcularis, P. tennuiculus, Scutellinia scutellata, Stereum rugosum, Trametes versicolor, Tremella fuciformis, T. mesenterica.* 75% percentage of occurrence were the species present in three sites *vis*. *Auricularia polytricha, Bisporellus citrine, Cyathus striatus, Lentinula lateritia, Lentinus badius, L. crinitus, Lenzites betulina, L. acuta, Panus fasciatus, Pycnoporus cinnabarinus, Trichaptum biforme, Xylaria grammica, Xylobolus subpileatus.* Percentage of occurrence with 100% were the species which were present in all the sites *viz*. *Amauroderma rugosum, Auricularia auricula-judae, A. cornea, A. delicate, A. mesenterica, Coprinellus dessimentus, Cyclomyces tabacinus, Daedalea circularis, D. confrogosa, D. quercina, Daldinia concentrica, Ganoderma applanataum, G. lucidum, Hexagonia tenuis, Lentinus sajor-caju, Lenzites elegans, Micromphale foetidum, Microporus vernicipes, M. xanthopus, Pynoporus sanguineus, Schizophyllum commune, Stereum hirsutum, S. ostrea, Trametes gibbossa, T. hirsute, T. trogii, Xylaria hypoxylon, X. longipes, X. polymorpha* (Table: 2). Study of populations and communities describe patterns of species occurrence or abundance. They rely on the collection of presence-absence or frequency of occurrence data for a suite of species (Zak & Willig, 2004).

It was observed that the Shannon diversity index (Hs) in Dampa Tiger Reserve Forest shows highest value of 3.80 in the wet season during 2016-2017 and lowest value of 3.47 in the dry season during 2017 – 2018. In Murlen National park it shows highest value of 3.60 during 2016 – 2017 in the wet season and lowest in the dry season with a value of 3.13 during 2017 – 2018. In Thorang Wildlife Sanctuary, it shows highest value of 3.12 in the wet season during 2017 – 2018 and lowest during 2016-2017 in the dry season with a value of 2.05. In Tokalo Wildlife Sanctuary, Shannon diversity index holds the highest value of 3.54 in the wet season during 2017- 2018(Fig: 3).

It was observed that the Simpsons reciprocal index (1/D), i.e., Simpson index of Dominance (Ds) in Dampa Tiger Reserve Forest shows the highest value of 0.98 in the wet season during 2017-2018 and shows the lowest value of 0.81 in the dry season during 2016-2017. In Murlen National Park, it shows the highest value of 0.95 in the wet season during 2016- 2017 and the lowest value account for 0.73 in the dry season during 2017-2018. In Thorang Wildlife Sanctuary, it shows the highest value of 0.93 during 2017-2018 in the wet season and the lowest value was 0.81 in the dry season during 2016-2017. In Tokalo wildlife Sanctuary, it shows the highest value of 0.97 in the wet season during 2017-2018 and the lowest value of 0.82 in the dry season during 2016-2017 (Fig: 4).

It was observed that the Pielou's Eveness Index (J') in Dampa Tiger Reserve Forest shows highest value in the wet season during 2017-2018 i.e 0.89 and lowest value of 0.55 in the dry season during 2016-2017. In Murlen N.P., it shows the highest value of 0.93 in the wet season during 2017-2018 and the lowest value in the dry season during 2017-2018 i.e. 0.82. In Thorang W.S., it shows the highest value of 0.89 in the wet season during 2016-2017 and accounts for the lowest value of 0.81 in the dry season during the period of 2016 – 2017. In Tokalo W.S., it shows the highest value of 0.87 in the wet season during 2017-2018 and it shows similar values for both of the dry season for 2016-2017 and 2017-2018 i.e. 0.80(Fig: 5).

It was observed that the Margalef's Diversity Index of Species Richness (DMg) in Dampa T.R.F. shows the highest value of 13.35 in the wet season during 2017 – 2018 and the lowest value of 7.77 in the dry season during 2016 – 2017. In Murlen N.P. it shows highest value of 9.44 in the wet season during 2016 – 2017 and the lowest value of 6.28 in the dry season during 2017 – 2018. In Thorang W.L.S. it shows the highest value of 8.60 in the wet season during 2017 – 2018 and the lowest value of 6.74 in the dry season during 2017 – 2018. In Tokalo W.L.S it shows the highest value of 8.26 in the wet season during 2016 – 2017 and the lowest value of 5.32 in the dry season during 2017 – 2018 (Fig:6).

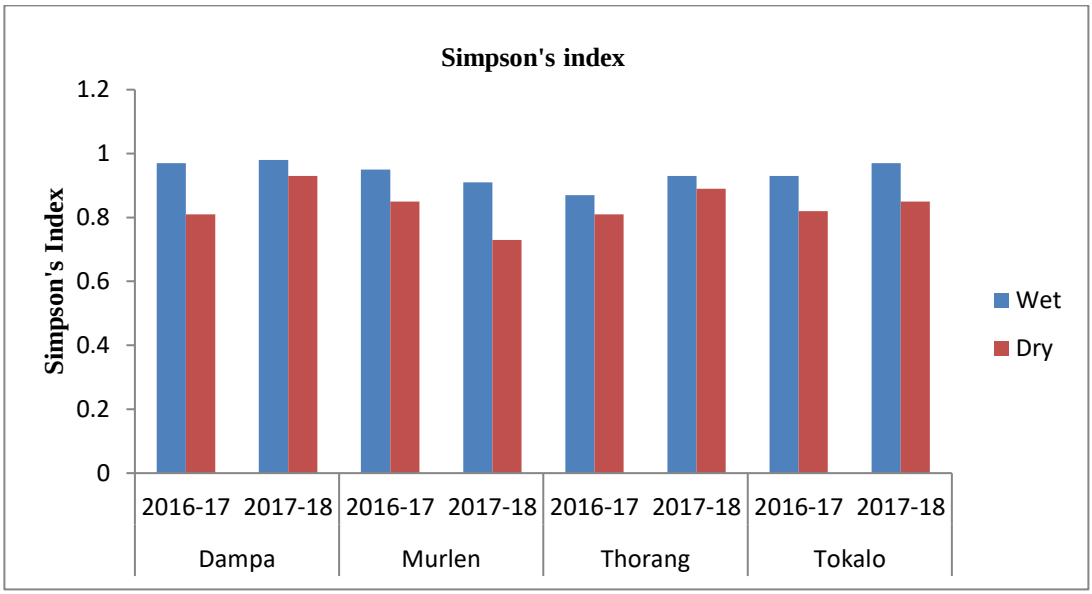


FIG: 3. Simpson's Reciprocal index

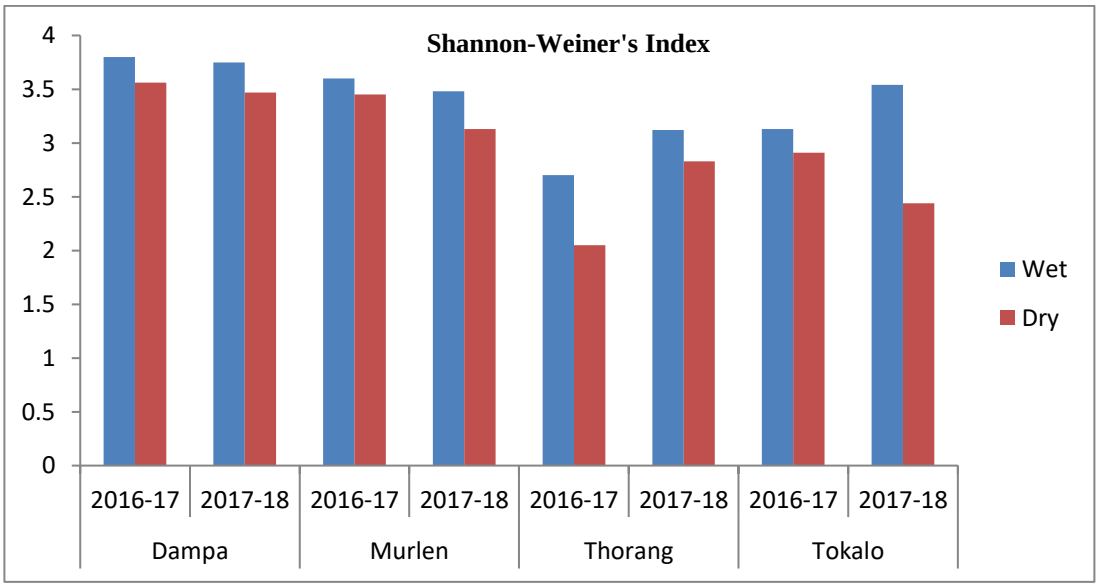


FIG: 4. Shannon-Weiner's diversity index

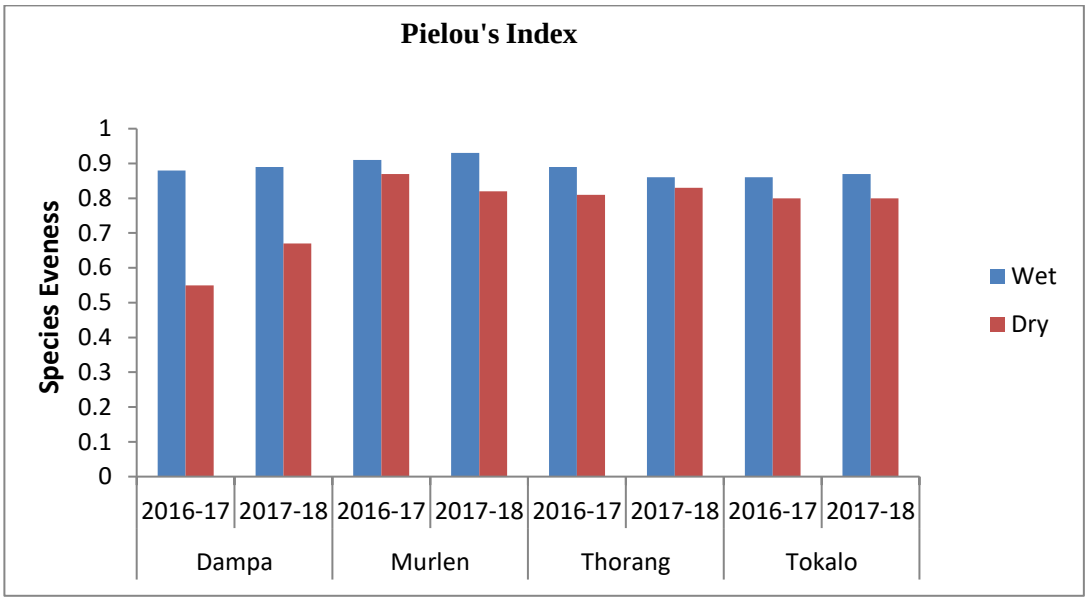


FIG: 5. Pielou's evenness index

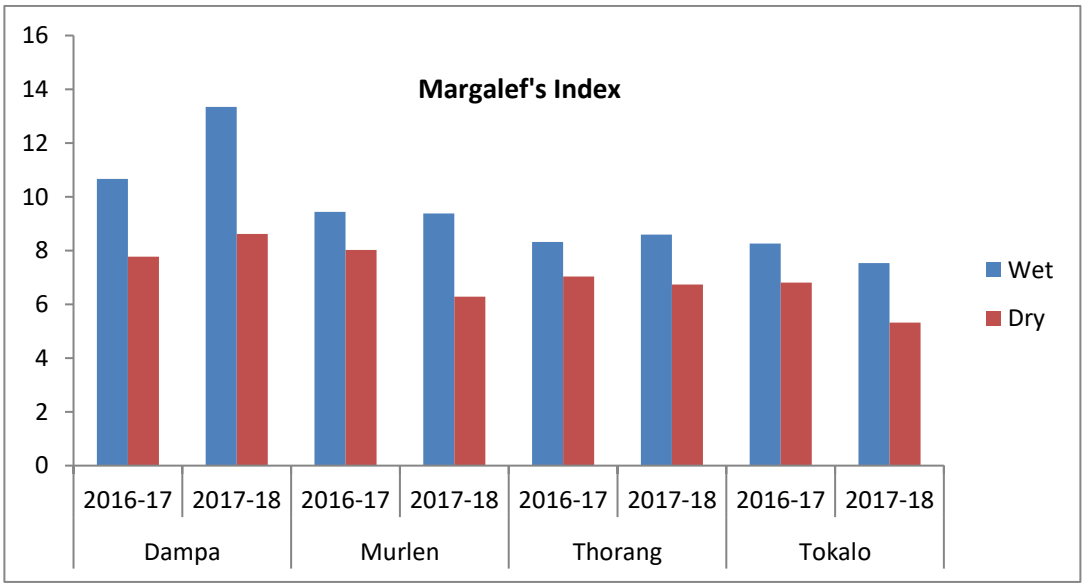


FIG: 6. Margalef's species richness index

To get the maximum richness it was necessary to conduct multiple surveys as stated by Hawksworth (2012) and Yamashita *et al.*, (2014). According to Halme and Kotiaho, (2012), one survey is sufficient for perennial polypores. Most of the wood decay fungi are annual and perennial polypores are only the fraction of the total richness of the wood decay fungi. Hence to obtain collection of maximum fungal species,

multiple surveys were done as annual species have ephemeral sporocarps and varying fruiting patterns. In the present study, some of the perennial species collected are *Fomitopsis dochmia, Daedalea circularis, D. quercina, D. confrogosa, Ganoderma applanataum, G. lucidum, G. mastoporum,* and *Xylobolus subpileatus.*

The over all highest value of Simpson's Index was recorded in Dampa Tiger Reserve Forest i.e. 0.98 in wet season during the period of 2017-2018 and the lowest value was seen in Murlen N.P. i.e. 0.73 in the dry season during the period of 2017-2018. Shannon Index was also recorded highest in Dampa Tiger Reserve Forest i.e. 3.80 in wet season during the period of 2016-2017 and the lowest value was seen in Thorang Wildlife Sanctuary i.e. 2.05 in the dry season during the period of 2016-2017. Pielou's Eveness index was recored highest in Murlen N.P. i.e. 0.93 during 2017 - 2018 in the wet season and the lowest value of 0.55 in Dampa Tiger Reserve Forest in the dry season during 2016-2017. The Margalef's Diversity Index of Species Richness (DMg) was seen in Dampa T.R.F. during 2017 – 2018 in the wet season i.e. 13.35 and the lowest value of 5.32 in Tokalo W.L.S. during 2017 – 2018 in the dry season.

The species richness, abundance and diversity were all found to be highest in Dampa Tiger Reserve Forest. Table.(2) also shows that the site Dampa Tiger Reserve Forest is having the most number of species with 67 number of species, whereas Thorang Wildlife Sanctuary is having the least number of species with 53 number of species. The present study conformed the report by (Egbe *et al.,* 2013) wherein the diversity of tree species have a great influen ce on the species richness of wood rotting fungi in a forest community. The range of fungal distribution is controlled to a large extent by the distribution of their hosts rather than the climatic factors (Bisby, 1933). Rydin *et al.* (1997) found that habitat loss and some forest management practices in Europe have led to decline in the diversity of fungi and in the presence of rare fungal species. Berg *et al*. (1994) reported that many fungal species in Swedish forests are threatened by the loss of old trees and declines in coarse woody debris. The importance of presence of old dying trees and fallen logs for presence of wood rotting fungi is recognized from studies where it was found that there is a correlation between the decay

of the wood and the species of fungi recorded as sporocarps (Hoiland & Bendiksen, 1997; Lindblad 1998; Renvall, 1994, Zothanzama, 2011a).

The results shows that all the diversity indices shows higher values in the wet season of the year in all the the study sites. Most of the fleshy, jelly and gilled wood rotting fungi like *Bisporellus citrina, Coprinellus dessimentus, Cookeinia tricholoma, Favolaschia pustulosa, Fistulina hepatica, Lentinus edodes, Tremella fuciformis and T. mesenterica,* were recorded in the rainy seasons as this period is favourable for their growth, since there is adequate amount moisture, favourable temperature and relative humidity. The dry season collection was predominated by the polypores like *Daedalea quercina, Ganoderma sps, Microporus xanthopus, Trametes hirsutum, T. trogii, Xylobolus subpileatus* etc., which may be due to their tough texture and large sized fruiting bodies, and their unique adaptations of surviving for several periods.

4.3. Comparative study of Wood rotting Fungi from Disturbed and Undisturbed forests

A total of 46 species were identified from both the study sites in which, 42 species belong to the phylum basidiomycota and 4 species belong to ascomycota, all contained within 13 families and 26 genera. It was observed that a total of 21 species were common to both the forests whereas 19 species were present only in Hmuifang forest and 6 species were present only in Tanhril forest (Table.3). The family Polyporaceae represent the dominant family in both the study sites with species number of 13 species in Hmuifang Forest(Fig: 7) and 7 species in Tanhril Forest (Fig.8) and *Microporus xanthopus* represents the most abundant species in both the study sites with species number of 56 and 76 in Hmuifang and Tanhril forests respectively (Appendix. Table: I.5).

Table: 3. Wood rotting Fungi in Hmuifang forest(Undisturbed) and Tanhril Forest(Disturbed).

S.No	Hmuifang Forest (Undisturbed)	Tanhril Forest (Disturbed)	Species common in both the Sites
1	*Auricularia cornea*	*Amauroderma rude*	*Auricularia auricula-judae*
2	*Cymatodermata dendriticum*	*Amauroderma rugosum*	*Auricularia polytricha*
3	*Daedaleopsis quercina*	*Auricularia mesenterica*	*Coprinellus dessimentus*
4	*Ganoderma lucidum*	*Ganoderma applanatum*	*Cyathus striatus*
5	*Laetiporus sulphureus*	*Ganoderma mizoramense*	*Daldinia concentrica*
6	*Lentinula edodes*	*Lenzites acuta*	*Fistulina hepatica*
7	*Lentinus sajor caju*		*Hexagonia tenuis*
8	*Lenzites elegans*		*Lentinus badius*
9	*Micromphale foetidum*		*Marasmius sp.*
10	*Pleurotus ostreatus*		*Microporus affinis*
11	*Polyporus alveolaris*		*Microporus xanthopus*
12	*Polyporus arcularius*		*Mycena sp.*
13	*Polyporus badius*		*Schizophyllum commune*
14	*Polyporus dictyopus*		*Stereum hirsutum*
15	*Polyporus tenuiculus*		*Stereum rugosum*
16	*Pycnoporus sanguineus*		*Trametes hirsuta*

16	*Trametes modesta*		*Trametes trogii*
18	*Trichaptum biforme*		*Tremella fuciformis*
19	*Xylaria grammica*		*Tremella mesenterica*
20			*Xylaria hypoxylon*
21			*Xylaria longipes*

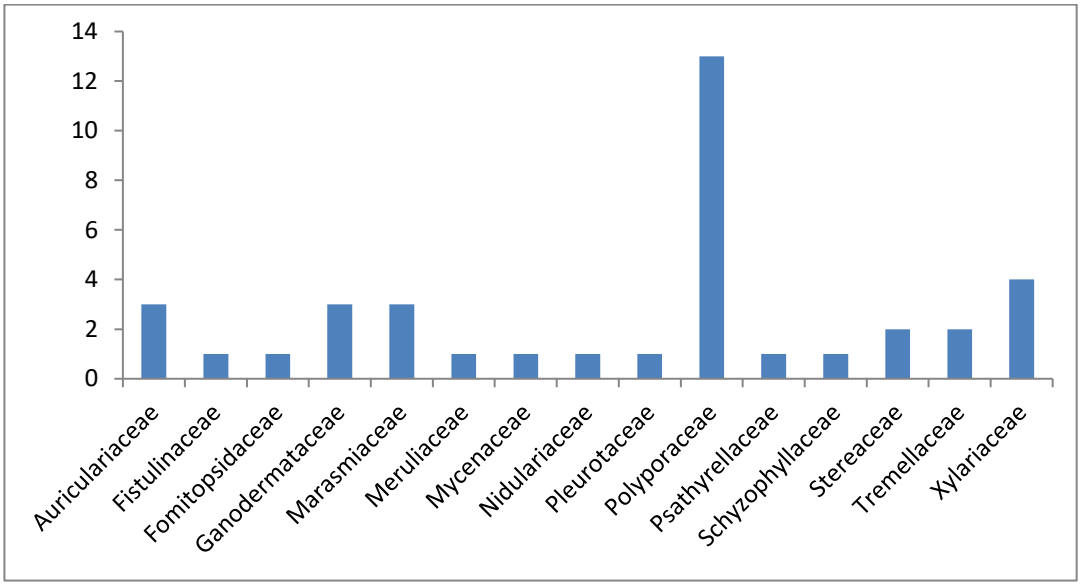


Fig: 7. Representative families and number of species present from Hmuifang Forest.

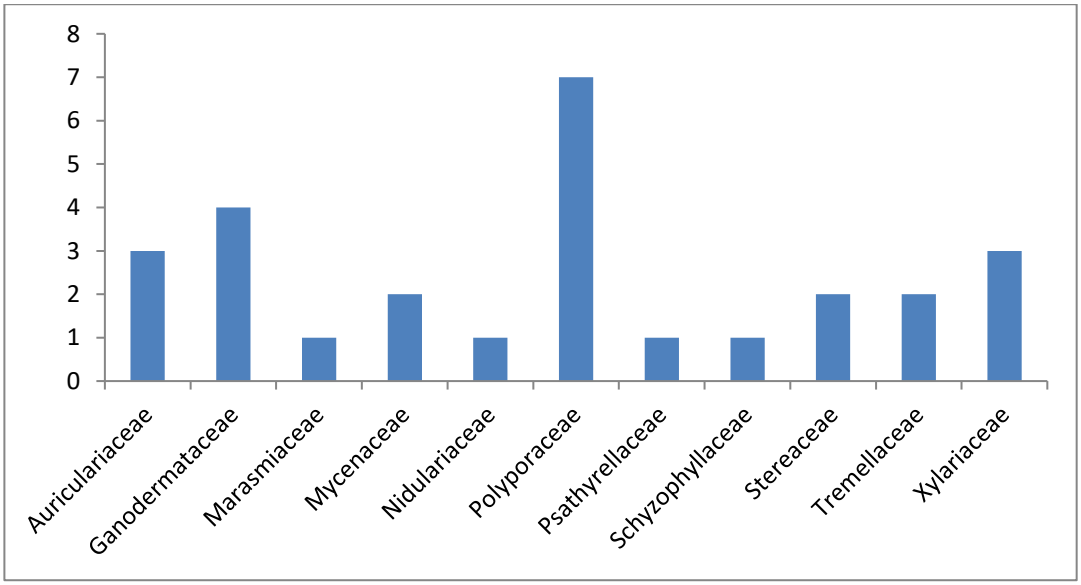


Fig: 8. Representative families and number of species present from Tanhril Forest.

The diversity indices at Hmuifang and Tanhril forest were 3.31 and 2.99 for Shannon's index, 0.95 and 0.90 for Simpson's index respectively. The species richness indices at Hmuifang and Tanhril forest were 1.91 and 1.22 for Menhinicks index, 6.41 and 3.98 for Margalef's index respectively. The Pielou's eveness index was 0.54 in Hmuifang and 0.51 in Tanhril forest (Table: 4) respectively.

Table: 4. Species diversity of wood rotting fungi from both sites.

Sites	Shannon-Weiner	Simpson	Menhinick's	Margelef's	Pielou's eveness
Hmuifang	3.31	0.95	1.91	6.41	0.54
Tanhril	2.99	0.90	1.22	3.98	0.51

Most of the fleshy, jelly and gilled wood rotting fungi like *Coprinellus dessimentus, Fistulina hepatica, Lentinus edodes, Tremella fuciformis, T. mesenterica,* were recorded in the rainy seasons as this period is favourable for their production, since there is adequate amount moisture, favourable temperature, relative humidity. While the dry season collection was predominated by the polypores like *Daedaleopsis quercina, Microporus xanthopus, Trametes hirsutum, T. trogii, etc.,* which may be due to their tough and large sized fruiting bodies, and their unique adaptations of surviving for several periods.

Table: 5. Tree species diversity of Hmuifang Forest(Sharma *et al.*, 2017) **and Tanhril forest**(Lalchhuanawma, 2008)

Paramerters	Hmuifang	Tanhril
Tree Density(Individual ha^{-1})	1500	2079
Shannon Weiner Diversity index	3.22	4.32
Simpson Index	0.94	0.98
Eveness index	0.82	--
Margelef's index D_{mn}	8.21	14.28

From reports of earlier works, the diversity of tree species indices have been determined (Table: 5). The common tree species found in Hmuifang Reserved Forest are *Calophyllum polyanthum, Dipterocarpus retusus*, *Drypetes indica, Elaeocarpus rugosus, Helicia excels, Lithocarpus xylocarpus, Olea dioica, Machilus gamblei, Quercus floribunda, Symplocos racemosa, Styrax polysperma, Tarennoidea walichii, Wedlendia grandis* (Sharma *et al.,* 2017). And the common tree species of Tanhril Forest are *Alangium chinense, Aporusa octandra, Castanopsis tribuloides, Dendrocalamus longispathus, Schima walichii* and *Wendlandia grandi* (Lalchhuanawma, 2008).

Following reports of earlier workers (Bisby, 1933; Berg *et al*., 1994; Renvall, 1995; Hoiland & Bendiksen, 1997; Lindblad 1998; Egbe *et al.*, 2013) it follows that fungal diversity are affected by plant-tree species diverstity. However, the species diversity of wood rotting fungi was higher in Hmuifang forest than compared to Tanhril forest which may be due to higher altitude, low temperature, high relative humidity, soil moisture content and experiences higher amount of rainfall annually which in turn have a great impact on the type of vegetation. Also, Hmuifang forest is a community reserved forest and is relatively free from anthropogenic activities, whereas Tanhril forest experiences various kind of anthropogenic disturbances from the on-going development activities of Mizoram University Campus and collection of the dead wood and logs for fuel-wood by the nearby villagers. Thinning and clear cutting alter the fungal community and can reduce the production of sporocarps due to lack of substrate to grow on. Rydin *et al.,* (1997) reported that habitat loss and some forest management practices in Europe have led to declines in the diversity of fungi and in the presence of rare fungal species. The influence of removal of both the live and dead substrata for the wood rotting fungal species may be the reason for the fewer number of species from Tanhril forest.

SUMMARY

The present study entitled " Diversity of Wood Rotting Fungi in protected forest areas of Mizoram" was carried out in five protected forests of Mizoram i.e. Dampa Tiger Reserve Forest, Murlen National Park, Thorang Wildlife Sanctuary, Tokalo Wildlife Sanctuary, Hmuifang Community Reserve Forest and one disturbed Tanhril Forest. Dampa Tiger Reserve Forest covers approximately 550sq.km with a geographical coordinates of 23˚25'N and 92˚20'E. and an altitudinal zone of 200-800 meters. Murlen National Park located in Champhai district of Mizoram with a geographical coordinates of 23˚37'01''N and 93˚18'0" E. The size of the park area is 200sq.km. Thorang wildlife Sanctuary is located in Lunglei District and lies within a geographical coordinates of 23º15 - 23º17' N and 92º35' - 92º36' E and altitude ranging upto 1396 m. Tokalo Wildlife Sanctuary is located in Siaha District and lies with a geographical coordinates of 92˚52' and 92˚55' E and 22˚10' and 22˚13' N with an altitudes range of 700 m – 940 aml and area of 250 sq. km.

Hmuifang Reserve Forest (Undistubed) and Tanhril Forest (Disturbed) was selected to carry out comparative diversity study of wood rotting fungi from Disturbed and Undisturbed forests. Hmuifang Reserve Forest area lies between the coordinates 23°27′22′′ N - 23°27′31′′ N and 92°45′19′′ E - 92°45′24′′ E with an average elevation of 1619 amsl. Tanhril Forest lies between 230.42' to 230.46' N and 920.38' to 920.42'E and located at an altitude of 850 metres amsl.

Wood rotting fungi have an important role in the history of man as in provides food and some are having medicinal value. Wood rotting fungi have manifold impacts on biology, ecology and economy. The interaction between trees and wood-inhabiting fungi is a key process in forest ecosystems. As trees grow, woody biomass accumulates which are recycled back by the fungi when trees aged and die. There is quite a negligible amount of knowledge and literature in the field of wood rotting fungi in Mizoram. The present study was carried out with the aim to study the detailed taxonomy and to generate a baseline data on the diversity and distribution framework of wood

rotting fungi present in Mizoram. The study was carried out with the following objectives:

4. To study the taxon identity through macro and micro-morphological characteristics of the samples collected.
5. To study the diversity of wood rotting fungi within the study sites.
6. Comparative study of wood rotting fungi from Disturbed and Undisturbed forests.

Survey and collection of wood rotting fungi was carried out in the selected sites during May 2016 to April 2018. The study period was divided into two seasons i.e. wet and dry season. Wet season represents the best collecting period which was characterized by the soft and fleshy mushroom. Dry season was mainly characterised by the corky and hard fungal specimens.

For taxonomical study, the fungal specimens were photographed in the natural habitats and also in the laboratory. The collected specimens were identified according to standard macroscopic and microscopic characteristics through consultation with appropriate literature (Gilbertson & Ryvarden, 1986; Núñez & Ryvarden, 2000; Wang and Zabel 1990; Huckfeldt and Schmidt 2006). The morphology or the macro-characteristics *i.e.* the outward appearance (fruiting body) were studied carefully and compared or expressed through photographs and literatures from books and journals. For microscopic study, thin sections of dried specimens were taken with the help of a sharp razor blade and were mounted in 3% KOH solution and stained in 2% aqueous phloxine. Sections were mounted in Lactophenol or 60% lactic acid + cotton blue. Phloxine and Cotton blue stains was also be routinely used. Spore print of the collected specimens were obtained by cutting off the cap and placing it in a piece of white paper/glass slides (Surcek, 1988; Barnett *et al*,. 1990; Ryvarden and Gilbertson 1993; Roy and De, 1996). Nomenclature, taxonomic position and author names follow the databases: Index Fungorum- IFS(http://www.indexfungorum.org), the International Plant Names Index- IPNI(http://www.ipni.org) and Mycobank (http://www.mycobank.com). The specimens are preserved by air drying and liquid preservation (Ryvarden and

Gilbertson 1993; Meenakshisundaram and Bharathiraja, 2013). Voucher numbers weregiven to the specimens and stored in the Department of Environmental Science, Mizoram University.

During the study period, a total of 81 specimens were identified upto species level and 3 specimens upto genus. The family Polyporaceae represents the most abundant family with a species number of 33 followed by Auriculariaceae, Ganodermataceae, Marasmiaceae with 5 species each, and Fomitopsidaceae and Stereaceae (4 species), Pleurotaceae (3 species), Hymenochaetaceae, Mycenaceae, Tremellaceae (2 species), and Aporpiaceae, Cortinariaceae, Dacrymycetaceae, Fistulinaceae, Helotiaceae, Meruliaceae, Nidulariaceae, Phanerochaetaceae, Psathyrellaceae, Pyronemataceae, Sarcoscyphaceae, Schizophyllaceae with 1 species each. 22 edible species were also identified which are *Auricularia auricula-judae, A. cornea, A.delicata, A. mesenterica, A. polytricha, Fistulina hepatica, Lentinula edodes, L. lateritia, Pleurotus djamor, P. sajor-caju, P. ostreatus, Lentinus concavus, L. polychrous, L.roseus, L.sajor-caju, L.tigrinus, L. squarrulosus, L.strigosus, Schizophyllum commune, Tremella fuciformis* and *T. mesenterica.*

For diversity study, the sampling period were divided into two seasons (Wet season - April to September and Dry season - October to March). The fungal specimens were collected randomly by laying out line transects of size 500 x 40 m three times in each study sites following the methods by (O'Dell *et al*., 2004) with modifications. Each fruiting body was taken as one sample. Each site was visited two times for each season. For diversity calculation, the unidentified fungal specimens were also taken into account. The diversity indices were calculated using the standard protocols, Simpson and Shannon-Weiner diversity indices were used Simpson (1949). The Pielou's measure of species evenness was estimated (Pielou, 1966). Species richness was measured using Margalef's richness index (1958). The percentage of species occurrence was also calculated following (Zothanzama, 2011a) with modifications.

The highest value of Shannon's Index was recorded in Dampa Tiger Reserve Forest i.e. 3.80 in wet season during the period of 2016-2017 and the lowest value was

seen in Thorang Wildlife Sanctuary i.e. 2.05 in the dry season during the period of 2016-2017.

The overall highest value of Simpson's Index was recorded in Dampa Tiger Reserve Forest i.e. 0.98 in wet season during the period of 2017-2018 and the lowest value was seen in Murlen National Park i.e. 0.73 in the dry season during the period of 2017-2018.

The overall highest value of Pielou's Eveness index was recorded in Murlen National Park i.e. 0.93 during 2017-2018 in the wet season and the lowest value of 0.55 in Dampa Tiger Reserve Forest in the dry season during 2016-2017.

The highest value of Margalef's Diversity Index of Species Richness (DMg) was seen in Dampa Tiger Reserve Forest during 2017 – 2018 in the wet season i.e. 13.35 and the lowest value of 5.32 in Tokalo Wildlife Sanctuary during 2017 – 2018 in the dry season.

The results shows that all the diversity indices shows higher values in the wet season of the year in all the study sites. Most of the fleshy, jelly and gilled wood rotting fungi like *Bisporellus citrina, Coprinellus dessimentus, Cookeinia tricholoma, Favolaschia pustulosa, Fistulina hepatica, Lentinus edodes, Tremella fuciformis* and *T. mesenterica* were recorded in the rainy seasons as this period is favourable for their production, since there is adequate amount moisture, favourable temperature, relative humidity. While the dry season collection was predominated by the polypores like *Daedalea quercina, Ganoderma Sps, Microporus xanthopus, Trametes hirsutum, T. trogii, Xylobolus subpileatus* etc., which may be due to their tough texture and large sized fruiting bodies, and their unique adaptations of surviving for several periods.

In the comparative study of a disturbed and undisturbed forests i.e. Tanhril forest (Disturbed) and Hmuifang Reserve Forest (Undisturbed). 46 species were identified from both the study sites, 42 belonging to the phylum Basidiomycota and 4 belong to the Ascomycota all of them falling under 13 families and 26 genera. It was observed that a total of 21 species were common to both the forests wherein 19 species were found

only found in Hmuifang forest and 6 species were present only in Tanhril forest. Polyporaceae is the dominant family and *Microporus xanthopus* represents the most abundant species in both the study sites with species number of 56 and 76 in Hmuifang and Tanhril forests respectively.

The diversity indices were found to be 3.31 and 2.99 for Shannon's index, 0.95 and 0.90 for Simpson's index at Hmuifang and Tanhril respectively. The species richness indices were 1.91 and 1.22 for Menhinick's index, 6.41 and 3.98 for Margalef's index at Hmuifang and Tanhril forest respectively. The Pielou's evenness index was 0.54 in Hmuifang and 0.51 in Tanhril forest respectively. Following reports of earlier workers it follows in general that fungal diversity are affected by plant-tree species diversity. In the present study, although the tree diversity of Tanhril Forest was higher as compared to Hmuifang Forest, however, the species diversity of wood rotting fungi was higher in Hmuifang forest as compared to Tanhril forest which may be due to higher altitude, low temperature, high relative humidity, soil moisture content and experiences higher amount of rainfall annually which in turn have a great impact on the type of vegetation. Also, Hmuifang forest is a community reserved forest and is free from anthropogenic activities, whereas Tanhril forest experiences various kind of anthropogenic disturbances from the on-going development activities of Mizoram University Campus and collection of the dead wood and logs for fuel-wood by the nearby villagers. Moreover, forest thinning and clear cutting alter the fungal community and can reduce the production of sporocarps due to lack of substrate to grow on.

CONCLUSION

The present work on the wood rotting fungi of Mizoram from selected protected areas and two selected forests sites is only a preliminary work on these species of fungi in the state. It is very evident that the study is not complete to give an exact setting for the entire state and many forests still remain unexplored. The main work is on the taxonomy and some aspects of their diversity from the selected sites.

The study highlighted the species description, composition and the diversity of the wood rotting fungi in the selected sites. The study also provides an important baseline data on the wood rotting fungi of the state as to their occurrence and diversity in the different sites and with the seasons which may be an important source for future references.

From the current findings it is observed that the diversity of the mushrooms is rich in the state which is evidently proved with an addition of a new species *Ganoderma mizoramense* into the fungal kingdom. The comparative study between disturbed and undisturbed forest on the diversity of the wood rotting fungi also gives evidence of the importance of conservation of forests and the effects of disturbances on the species richness in the selected forests.

It would be valuable to continue and maintain a long-term monitoring of these species to understand the nature of diversity and succession influenced by numerous environmental factors both biotic and abiotic, as well as the complex interactions among them.

REFERENCES

Acharya, K., Khatua, S. and Ray, S. (2017). Quality assessment and antioxidant study of *Pleurotus djamor* (Rumph. ex Fr.) Boedijn. *J App Pharm Sci*, 7 (06): 105-110.

Acharya, K., Mukherjee, S. and Mitra, P. (2015). Pharmacognostic Standardisation of *Lentinula edodes*: A Widely Explored Medicinal Mushroom. *International Journal of Pharmacognosy and Phytochemical Research*; 7(4); 866-872.

Acharya, K., Pradhan, P. and Dutta. A.K. (2014). *Favolaschia* – A New Fungal Genus Record for Eastern India. *Indian Forester*, 140 (6) : 639-640.

Adarsh, C.K., Vidyasagaran, K. and Ganesh, P.N. (2018). A checklist of polypores of Kerala state, India. *Studies in Fungi* 3(1): 202–226. Doi 10.5943/sif/3/1/21

Adarsh, C.K., Vidyasagaran, K. and Ganesh, P.N. (2019). The diversity and distribution of polypores (Basidiomycota: Aphyllophorales) in wet evergreen and shola forests of Silent Valley National Park, southern Western Ghats, India, with three new records. *Journal of Threatened Taxa* 11(7): 13886–13909 .https://doi.org/10.11609/jott.3856.11.7.13886-13909

Adl, S.M., Leander, B.S., Simpson, A.G.B. and Archibald, J.M. (2007) Diversity, nomenclature, and taxonomy of Protists. *Systematic Biology* **56**: 684–689pp.

Akhtar, M., Attrid, G.M., Myers,G. and Kirk, K. (1992). Biomechanical pulping of loblolly pine chips with different strains of the white-rot fungus *Ceriporiopsis subvermispora. Tappi J*., **75(**2): 105-109.

Albrecht, L. (1991). The importance of dead wood. *Forstw. Cbl.*, 110: 106–113pp.

Allen, R.B., Buchanan, P.K., Clinton, P.W. and Cone, A.J. (2000). Composition and diversity of fungi on decaying logs in a New Zealand temperate beech (Nothofagus) forest. *Can J For Res* 30:1025–1033.

Angelini, P., Pagiotti, R., Menghini, A. and Vianello, B. (2006). Antimicrobial activities of various essential oils against foodborne pathogenic or spoilage moulds. *Annals of Microbiology*, 56, 65-9.

Ao, T., Seb, J., Ajungla, T., and Deb, C.R. (2016). Diversity of Wild Mushrooms in Nagaland, India. *Open Journal of Forestry*, 6, 404-419. http://dx.doi.org/10.4236/ojf.2016.65032

Arnstadt, T., Hoppe, B., Kahl, T., Kellner, H., Krüger, D., Bauhus, J. and Hofrichter, M. (2016). Dynamics of fungal community composition, decomposition and resulting deadwood properties in logs of Fagus sylvatica, Picea abies and Pinus sylvestris. *Forest Ecology and Management.* 382: 129–142.

Arya, A., Albert, S. and Nagadesi, P.K. (2008). New and interesting records of basidiomycetous fungi from Ratanmahal wildlife sanctuary, Gujarat, *India. J Mycol Pl Pathol* 38(2):221-226.

Bader, P., Jansson, S. and Jonsson, B.G. (1995). Wood-inhabitingfungi and substratum decline in selectively logged boreal spruce forests. *Biol Conserv* 72:355–362

Bagchee, K.D. (1950) - The fungal disease of Sal (Shorea robusta Gaertn.) Part. I. leaf spot(Cercospora sp.) stem canker (Macrophoma shores sp. now) sooty moulds (Capnodium sp. and Meliola sp) and root and stem rot (Xylaria sp.) of sal. *Indian for. Rec*. (N. S.) I (2), 11-23.

Bagchee, K.D. (1961) - The Fungal diseases of Sal(Shorea robusta Gaertn. f.) IV. Fomes caryophylli (Rac.) Bres., a destructive heart rot of sal. *Ind. For. Rec.* (N.S.) 2 (3), 25-58.

Bagchee, K.D. and Bakshi, B.K. (1950). Some fungi as wound parasite on Indian trees. *Ind. Forest.* 76(6), 244-253.

Bagchee, K.D. and Bakshi, B.K. (1951) - Studies on Indian Thelephoraceae. Some species of *Stereum*, *Peniophora* and *Corticium*. *Ind. For Bull*, 166, pp.11.

Bakshi, B.K. (1971). Indian Polyporaceae (on trees and timber), ICAR, New Delhi, 246 p.

Banerjee, S.N. (1947). Fungus Flora of Calcutta and Suburbs I. Bull. *Bot. Soc.*. *Beng*., 1: 37-54.

Berg, A., B. Ehnström, L. Gustafsson, T. Hallingbäck, M. Jonsell, J. Weslien. (1994). Threatened plant, animal, and fungus species in Swedish forests: distribution and habitat associations. *Conservation Biology* 8:718-731.

Berglund, H. and Jonsson, B.G. (2005). Verifying an extinction debt among lichens and fungi in Northern Swedish boreal forests. *Conserv. Biol.* 19:338–348. doi:10.1111/j.1523-1739.2005.00550.x.

Berkeley, M.J. (1839). Description of exotic fungi in the collection Sir W. J. Hooker - from memoirs and notes of J. F. Klotzsch, with additions and corrections. *Annals of natural History* 3, 375 - 401.

Bhaben, T., Gurung, L. and Sarma, G.C. (2011). Wild edible fungi resources used by ethnic tribesof Nagaland, India. *Indian Journal of Traditional Knowledge*. Vol.10(3),pp. 512-515.

Bhardwaj, A., Srivastava, M., Pal, M., Sharma, S.Y., Bhattacharya, S., Tulsawani, R., Sugadev, R., and Misra, K. (2016). Screening of Indian Lingzhi or Reishi Medicinal Mushroom, *Ganoderma lucidum* (Agaricomycetes): A UPC2 -SQD-MS Approach. International *Journal of Medicinal Mushrooms,* 18(2): 177–189 (2016)

Bhatt, M., Mistri, P., Joshi, I., Ram, H., Raval, R, and Thoota S. (2018). Molecular survey of basidiomycetes and divergence time estimation: An Indian perspective. *PLoS ONE* 13(5): e0197306. https://doi.org/10.1371/journal.pone.0197306.

Bhatt, R.P., Singh, U. and Uniyal, P. (2018). Healing mushrooms of Uttarakhand Himalaya, India. *Current Research in Environmental & Applied Mycology (Journal of Fungal Biology)* 8(1), 1–23, Doi 10.5943/cream/8/1/1

Bhosle, S., Ranadive, K., Bapat, G., Garad, S., Deshpande, G. and Vaidya, J. (2010). Taxonomy and Diversity of *Ganoderma* from the Western parts of Maharashtra (India). *Mycosphere* 1(3), 249–262.

Bisby, G. R. (1933). The distribution of fungi as compared with that of phanerogams. *Am. J. Sci*.20: 246–254

Bisen, P.S., Baghel, R.K., Sanodiya, B.S.. Thakur, G.S and Prasad G.B.K.S. (2010). *Lentinus edodes*: A Macrofungus with Pharmacological Activities. *Current Medicinal Chemistry*, 17, 2419-2430

Bisht, N.S. (2011). *Wood decaying fungi of Mizoram*. Department of Environment and Forest, Govt of India. 196 pp.

Bisht, N.S. and Harsh, N.S.K. (2001). *Conservation strategies for the Fungal diversity of Arunachal Pradesh*, Arunachal Pradesh News, 19: 14-16.

Blanchette, R.A. (1991). Delignification by wood-decay fungi. *Annual Review of Phytopathology* 29:381–398.

Bodensteiner, P., Binderb, M., Moncalvoc, J.M., Agerera, R., Hibbettb, D.S. (2004). Phylogenetic relationships of Cyphelloid homobasidiomycetes; *Molecular Phylogenetics and Evolution* 33 (2004) 501–515

Bondartsev, A. S. (1953). Polyporaceae of the European part of USSR and Caucasus. – Moskow, *Leningrad*. p1106.

Borthakur, M. and Joshi, S.R. (2016). Micrographical analysis of growth deformities in common pathogens induced by voucher fungi from India, *J. Microsc. Ultrastruct.* 4(4): 203–210. doi: 10.1016/j.jmau.2016.04.001

Bose, S.R. (1937). Polyporaceae from Lokra hills (Assam). *Ann. Mycol*. 35: 119-137.

Bresadola, G. (1897). *Hymenomycetes hungarici* Kmetiani. *Atti. Imp. Regia Accad.*

Brown, N., Bhagwat, S., Watkinson, S. (2006). Macrofungal diversity in fragmented and disturbed forests of the Western Ghats of India. *Journal of Applied Ecology*. 43: 11-17.

Bruns, T.D., White, T.J. and Taylor, J.W. (1991). Fungal molecular systematics. *Annu. Rev. Ecol. Syst.* 22:525–564.

Brusca, R.C. and Brusca, G.J. (2003). Invertebrates. 2nd edn. Sinauer Associates, Sunderland, Massachusetts, USA.

Byrd, K.B., Parker, V.T., Vogler, D.R. and Cullings, K.W. (2000). The influence of clear-cutting on ectomcorrhizal fungus diversity in a lodgepole pine (*Pinus contorta*) stand, Yellowstone National Park, Wyoming and Gaallatin National Forest, Montana, *Canadian Journal of Botany*. 78:149-156.

Carlilie, M.J., Watkinson, S.C. and and Gooday, G.W. (2001). The fungi. Gulf Professional Publishing.

Cavalier-Smith, T. (1998). A revised six-kingdom system of life. *Biological Review* 73: 203–266.

Chakraborty, T.K. (2019). Macrofungi of Dakshin Dinajpur district of West Bengal, India. *NeBIO* 10(2): 66-76.

Chander, H., Thakur, S. and Sharma, S. (2017). Investigations on Diversity of Wood Inhabiting Fungi in Sarkaghat Region of District Mandi, Himachal Pradesh, North-Western Himalaya. *J. Biol. Chem. Chron.* 3(1), 41-54.

Chapela, I.H. and Boddy, L. (1988). Fungal colonization of attached beech branches. *New Phytol*, 110: 47-57.

Chaturvedi, S. (2019). Azo Dyes Decolorization Using White Rot Fungi. *Res & Rev : J Microbiol Biotechnol*. Vol. 8. Issue 1, pp 9-19.

Chittaragi, A. and Meghalatha, R. (2014). Evaluation of phytochemical and anthelmintic activity of *Microporus xanthopus* of different solvent extracts. *International Journal of Innovative and Applied Research*, Volume 2, Issue (7): 9- 13.

Chowdhary, A., Kathuria, S., Agarwal, K. and Meis, J.F. (2014). Recognizing filamentous basidiomycetes as agents of human disease: A review. *Medical Mycology*, 52, 782–797 doi: 10.1093/mmy/myu047

Chuzho, K. and Dkhar, M.S. (2018). Effects of environmental factors and host characteristics on diversity and distribution of wood-rotting fungi of Mount Puliebadze, Nagaland. *Studies in Fungi* 3(1), 241– 247. Doi 10.5943/sif/3/1/24

Chuzho, K. and Dkhar, M.S. (2019). Diversity of ascomycetous wood-rotting fungi along an altitudinal gradient in forests of Nagaland and first report of *Jackrogersella minutella* from India. *J Indian Acad Wood Sci* **16,** 36–43 https://doi.org/10.1007/s13196-019-00233-0

Crous, P.W. (2006). Taxonomy and phylogeny of the genus Mycosphaerella and its anamorphs. *Fungal Diversity* 38: 1–24.

Cui, B.K., Wei,Y.L. and Dai,Y.C. (2006). Polypores from Zijin Mountain, Jiangsu Province. *Mycosystema* 25: 9-14pp.

Da Silva, E.J. (2005). Mushroom in medicine and culture. *Int. J. Med. Mushrooms* 7:75-78

De, A.B. (2018). Record of a new host of the wood-rotting fungus Hexagonia tenuis. *Plant Pathology & Quarantine* 8(1): 58–62.

Debnath, S., Majumdar, K. and Das, P. (2018). New Distribution Record of Five Species of Xylaria from Tripura, Northeast India. *Research & Reviews: A Journal of Life Sciences*. 2018; 8(1): 1–10p.

Debnath, S., Saha, A.K. and Das, P. (2017). Biological activities of *Schizophyllum commune* Fr. : A wild edible mushroom of Tripura, North East India. *J. Mycopathol. Res*. 54(4) : ISSN 0971-3719: 469-475.

Debnath, S.,Upadhaya, R.C., Saha, A. K., and Das, P. (2019). Characterization of wild mushrooms from Tripura, Northeast India. *Indian Phytopathology*. 73, pp. 97–110

Dhingra, G.S. (2014). Diversity of resupinate, non-poroid agaricomycetous fungi in the himalaya and adjoining areas. Proceedings of the 8th International Conference on Mushroom Biology and Mushroom Products (ICMBMP8).

Dix, N.J. and Webster, J. (1995). Fungal Ecology, Chapman & Hall, London. ISBN 0-412-22960-9

Edman, M. and Jonsson, B.G., (2009). Spatial pattern of downed logs and wood-decaying fungi in an old-growth Picea abies forest. *Journal of Vegetation Science* 12(5):609 – 620. DOI: 10.2307/3236900

Edman, M., Jönsson, M.T., and Jonsson, B.G., (2007). Fungi and wind strongly influence the temporal availability of logs in an old-growth spruce forest. *Ecological Applications*, 17(2):482–490pp.

Egbe, E.A., Tonjock, R. K., Ebai, M. T., Nji, T. M. and Mih, A. M. (2013). Diversity and distribution of Macrofungi (Mushrooms) in the Mount Cameroon Region. *Journal of Ecology and the Natural Environment* 5(10): 318-334

Engeman, R.M., Sugihara, R.T., Pank, L.F. and Dusenberry. W.E. (1994). A comparison of plotless density estimators using Monte Carlo simulation. *Ecology* 75: 1769-1779.

Eriksson, J. (1950). Peniophora cke sect. Coleochatae Bourd. and Galz. A taxonomical study with special reference to the Swedish species. *Symb. Bot. Upsal*. 10, 1-76.

Eriksson, J. and Ryvarden, L. (1973). The Corticiaceae of North Europe 2, 59 -286. Aleurodiscus - Confertobasidium. Fungiflora Oslo.

Eriksson, J. and Ryvarden, L. (1975). The Corticiaceae of North Europe 3, 287- 546. Coronicium - Hyphoderma. Fungiflora Oslo.

Eriksson, J. and Ryvarden, L. (1976). The Corticiaceae of North Europe 4,547- 886. Hyphodermella - Mycoacia. Fungiflora Oslo.

Everhart, S.E., Keller, H.W. (2008). Life history strategies of corticolous myxomycetes: the life cycle, fruiting bodies, plasmodial types, and taxonomic orders. *Fungal Diversity* 29: 1–16.

Farook, V.A., Khan, S.S. and Manimohan P. (2013). A checklist of agarics (gilled mushrooms) of Kerala State. India. *Mycosphere*, 4: 97–131.

Florence, E.J.M. (2004). Biodiversity Documentation for Kerala. Part 2: Microorganisms (Fungi). [KFRI Handbook no.17.] Kerala: Kerala Forest Research Institute.

Florence, E.J.M. and Yesodharan, K. (2000), Macrofungal Flora of Peechi-Vazhani Wildlife Sanctuary. [KFRI *Research Report no*. 191.] Kerala: Kerala Forest Research Institute.

Fries, E.M. (1821). *Systema Mycologium* Vol. 1, 326- 393. Lund.

Fries, E.M. (1828) *Elenchus* Fungorum 1, pp. 238.

Fulzele, A.A. (2013). Few interesting basidiomycetes fungi from Nagpur District of Maharashtra, India. *International Journal of Researches in Biosciences, Agriculture & Technology*. Issue-1, Volume-1 ISSN No. (Online): 2347-517.

Ganesh, P.N. (1988). Studies on Wood-inhabiting Macrofungi of Kerala, Ph.D. Thesis,University of Calicut.

Gautam, A.K. (2013). Notes on wood rotting fungi from India (1): Trametes versicolor - The Turkey Tail. *Journal on New Biological Reports* 2(2): 67-70.

Ghate, S.D. and Sridhar, K.R. (2016). Spatiotemporal diversity of macrofungi in the coastal sand dunes of Southwestern India. Mycosphere 7(4), 458–472, Doi 10.5943/mycosphere/7/4/6

Gilbert, G.S., Reynolds, D.R. and Bethancourt, A. (2007). The Patchiness of Epifoliar Fungi In Tropical Forests: Host Range, Host Abundance, and Environment. *Ecology: Ecological Society of America.* 01: p.539 doi.org/10.1890/05-1170

Gilbertson, R.L. and Ryvarden, L. (1986). North American Polypores. Fungiflora, Oslo.

Gogoi, G. and Parkash, V. (2016). *Daldinia concentrica* - a new distribution record from North East India, *Current science*. 111(9):1452

Gogoi, Y. and Sarma, T. C. (2012). An Ethnomycological survey in some areas of Dhemaji district (Assam). Proceedings of International Conference on Anthropogenic Impact on Environment & Conservation Strategy (ICAIECS - 2012) November 02 - 04, 2012, Ranchi, organized by Department of Zoology, Ranchi University, Ranchi & Departments of Zoology and Botany,St. Xavier's College, Ranchi in association with National Environmentalists Association, India.

Gond, A.K., Pandey, A.K. and Jamaluddin. (2013). First Report of Daldinia concentrica on Ficus benjamia L. from India, *Journal on New Biological Reports* 2(3): 246-247.

Gosh, S.K., Mitra, S. and Mukherjee, S. (2016). Study Of Jelly Mushroom - Tremella Fuciformis In 24- Parganas (N),West Bengal, *India Aust. J. Basic & Appl. Sci*., 10(12): 457-461.

Gosh, S.K., Mitra, S. and Mukherjee, S. (2016). Study Of Jelly Mushroom - *Tremella fuciformis* In 24- Parganas (N),West Bengal, India. *Aust. J. Basic & Appl. Sci.,* 10(12): 457-461.

Groombridge, B. and Jenkins, M.D. (2002). World Atlas of Biodiversity: Earth's Living Resources in the 2P' Century. University of California Press, Los Angeles, USA.

Guarro, J, GENE´ J, And Stchigel, A.M. (1999). Developments in Fungal Taxonomy *Clinical Microbiology Reviews,* July 1999, p. 454–500.

Hagerman, S.M., Jones, M.D., Bradfield, G.E., Gillespie, M and Durall, D.M. (1999). Effects of clear-cut logging on the diversity and persistence of ectomycorrhizae at a subalpine forest. *Can J For Res* 29: 124-134.

Halme, P. and Kotiaho, J.S. (2012). The importance of timing and number of surveys in fungal biodiversity research. *Biodivers Conserv,* 21:205–219

Harmon, M.E., Franklin, J.F., Swanson, F.J., Sollins, P., Gregory, S.V., Lattin, J.D., Anderson, N.H., Cline, S.P., Aumen, N.G., Sedell, J.R., Lienkaemper, G.W., Cromack, K. and Cummins, K.W. (1986). Ecology of coarse woody debris in temperate ecosystems. *Advances in Ecological Research* 15: 133–302.

Harpreet, K. and Dhingra, G.S. (2014). Pileate Poroid Fungi of Family Polyporaceae from Himachal Pradesh. Proceeding; Agriculture: Towards a New Paradigm of Sustainability ISBN: 978-93-83083-64-0

Harsh, N.S.K. and Bisht, N.S. (1982). Relationship of Lag Phase Duration to the Texture and Occurrence of Wood-Decaying Fungi. Bulletin of the British Mycological Society. *Elsevier*. Vol. 17, (2), 105-109.

Hawksworth, D.L. (1991). The Fungal dimension of Biodiversity: magnitude, significance and conservation. *Mycological Research* 95(6):641-655 .

Hawksworth, D.L. (1995). Fungal diversity and its implications for genetic resource collections. *Studies In Mycology* 50: 9–18. 2004.

Hawksworth, D.L. (2001) The magnitude of fungal diversity: the 1.5 million species estimate revisited. *Mycological Research* 105: 1422–1432.

Hawksworth, D.L. and Kalin-Arroyo, M.T. (1995). Magnitude and Distribution of Biodiversity. In: Heywood V. (ed.), Global biodiversity assessment, 107–191. Cambridge, UK: Cambridge University Press.

Hawksworth, D.L., (2012). Global species numbers of Fungi: Are tropical studies and molecular approaches contributing to a more robust estimate?. *Biodiv. Conserv*. 21: 2425 – 2433.

Hedawoo, G.B. and Mohite, P.U. (2008). Some wild edible mushrooms from Melghat Tiger Reserve Forest and Amravati region. *Biosci. Biotech. Res. Comm*. 1(2): 163-167.

Hibbett, D.S. (1992). Ribosomal RNA and fungal systematics. *Trans. Mycol. Soc. Jpn*. 33:533–556.

Hibbett, D.S. and Binder, M. (2002). Evolution of complex fruiting-body morphologies in Homobasidiomycetes. Proceedings of the Royal Society of London Series B-Biological Sciences. 269: 1963-1969.

Hibbett, D.S. and Thorn, R.G. (2001). Basidiomycota: Homobasidiomycetes. In: The Mycota, vol. VII, part B, Systematics and evolution (eds. D.J. Mclaughlin, E.G. McLaughlin, and P.A. Lemke, eds.). *Springer Verlag*, Berlin: 121-168.

Hoiland, K. and Bendiksen, E. (1997). Biodiversity of wood-inhabiting fungi in a boreal coniferous forest in Sør-Trøndelag County, central Norway. *Nord J Bot*. 16:643–659

Huckfeldt, T. and Schmidt, O. (2006). Identification key for European strand-forming house-rot fungi. Mycologist (in press).

Humphrey, J.W, Newton ,A.C., Peace, A.J. and Holden, E. (2000). The importance of conifer plantations in northern Britain as a habitat for native fungi. *Biol Conserv* 96:241–252. doi:10.1016/S0006-3207(00)00077-X.

Hyde, K.D. (1996). Measuring biodiversity: diversity of microfungi in north Queensland. In: Measuring and Monitoring Biodiversity in Tropical and Temperate Forests (Boyle TJB, Boontawee B, eds). *CIFOR, Bogor*: 271–286.

Hyde, K.D., Fröhlich, J. and Taylor, J.E. (1997). Diversity of ascomycetes on palms in the tropics. In: Biodiversity of Tropical Microfungi (ed. KD Hyde): 141–156. Hong Kong University Press, Hong Kong.

Iqbal, A.M., Vidyasagaran, K. and Ganesh, P.N. (2016). New records of polypores (Basidiomycota: Aphyllophorales) from the southern Western Ghats with an

identification key for polypores in Peechi-Vazhani Wildlife Sanctuary, Kerala, India. *Journal of Threatened Taxa* 8(9): 9198–9207; http://dx.doi.org/10.11609/jott.2553.8.9.9198-9207

Iqbal, A.M., Vidyasagaran, K. and Ganesh, P.N. (2017). Host specificity of some wood decaying-fungi in moist deciduous forests of Kerala, India. *Journal of Threatened Taxa* 9(4): 10096–10101; http://doi.org/10.11609/jott.3168.9.4.10096-10101

Jamaluddin, S., Goswami, M.G. and Ojha, B.M. (2004). *Fungi of India* (1989-2001) Scientific Publishers, (India), Jodhpur, 326.

James, T.Y., Kauff, F. and Schoch, C.L. (2006) Reconstructing the early evolution of the fungi using a six gene phylogeny. *Nature* **443**: 818–822.

Karsten, P.A. (1881). *Eumeratia Boletinearum* et. *Polyporum fennicarm*, Systemate novo dispostorum. *Rev. Mycol*. 36, 15-23.

Karsten, P.A. (1889). Kritisk ofversigt af Finlands Basidsvampar (Basidiomycetes: Gastero and Hymenomycetes*) Bider. Kann. Finl. Nat. Och. Folk*. 48, 1 -470.

Karthikeyan, S., Ramasamy, K. and Prabhakaran, J. (2005). Conversion of industrial solid wastes to value added products by Filamentous Bacteria, *Madras Agricultural journal*, 92, 515-522pp.

Karun, N.C. and Sridhar, K.R. (2014). A preliminary study on macrofungal diversity in an arboretum and three plantations of the southwest coast of India. *Current Research in Environmental & Applied Mycology* 4(2), 173–187, Doi 10.5943/Cream/4/2/5

Karun, N.C. and Sridhar, K.R. (2017). Edible wild mushrooms of the Western Ghats: Data on the ethnic knowledge. *Elsevier: Data in Brief*. 14: 320–328.

Karun, N.C. and Sridhar, K.R., (2015) . Xylaria complex in the South Western India. *Plant Pathology & Quarantine* 5(2), 83–96, Doi 10.5943/ppq/5/2/7

Karun, N.C. and Sridhar, K.R., (2016). Spatial and temporal diversity of macrofungi in the western ghat forests of india. *Applied ecology and environmental research* 14(2): 1-21. DOI: http://dx.doi.org/10.15666/aeer/1402_001021

Karun, N.C., Bhagya, B.S., Sridhar, K.R. (2018). Biodiversity of macrofungi in Yenepoya Campus, Southwest India. *Microbial Biosystems* 3(1), 1–11.

Karunarathna, S.C., Yang, Z.L., Zhao, R., Vellinga, E.C. Bahkali, A. H., Chukeatirote, E. and Hyde, K.D. (2011). Three new species of Lentinus from northern Thailand. *Mycol Progress* (2011) 10:389–398 DOI 10.1007/s11557-010-0701-6

Kaul, T.N. (1999). *Introduction to mushroom science*. Oxford and IBH Publi. Co. Pvt. Ltd. N. Delhi, 198p.

Kaur, H. and Dhingra, G.S. (2012). Pileate Poroid Fungi of Family Polyporaceae from Himachal Pradesh. Agriculture: Towards a New Paradigm of Sustainability ISBN: 978-93-83083-64-0

Kaur, H., Kaur, M and Rather, H. (2015). Species of *Gymnopilus* P. Karst: New to India. *Mycosphere*. 6(1),165–173, Doi 10.5943/mycosphere/6/2/7

Kaushal, S.C., Kaushal, R. and Rawla, G. S. (1983). Genus Scutellinia from India, its taxonomy, 680 nomenclature and affinities. – Bibl. *Mycol*. 91: 583–608.

Kaviyarasan, V. and Shenbagaraman, R. (2014). Antiproliferative activity of bioactive compounds from mushrooms of Indian isolates. Proceedings of the 8th International Conference on Mushroom Biology and Mushroom Products (ICMBMP8).

Keizer, G.J. (1998). *The complete encyclopaedia of mushrooms*. Rebo Publishers Netherland.

Khatoon, N. and Sharma, P. (2017). Study of different grains on spawn development of *P. sajor caju* (Fr.) Singer. *Internat. J. Plant Sci.*, 12 (2): 220-222, DOI: 10.15740/HAS/IJPS/12.2/220-222.

Khatua, S., Ghosh, S. and Acharya, K. (2017). *Laetiporus sulphureus* (Bull.: Fr.) Murr. as Food as Medicine. *Pharmacog J*.; 9(6):1-15.

Kirk, P., Cannon, P.F., Minter, D.W. and Stalpers, J.A. (2008). Ainsworth & Bisby's Dictionary of the Fungi. 10th edn. CAB International, Wallingford, UK.

Kirk. P.M., Cannon, P.F., David, J.C. and Stalpers, J.A. (2001). Dictionary of the fungi, 9th edition. CAB International, Wallingford, UK.

Kohn, L.M. (1992). Developing new characters for fungal systematics: an experimental approach for determining the rank of resolution. *Mycologia* 84:139–153.

Koyani, R.D., Patel, H.R., Vasava, A.M. and Rajput, K.S. (2016). Xylariaceae: Overview and addition to fungal diversity of Gujarat state. *Studies in Fungi* 1(1), 69–79, Doi 10.5943/sif/1/1/6

Krieglsteiner, G.J. (1983). "The blue corticium Pulcherricium caeruleum and its occurrence in Europe". *Zeitschrift für Mykologie* 49(1): 61–72.

Krishna, G., Samatha, B., Hima Bindu Nidadavolu, S.V.S.S.S.L., Prasad, M.R., Rajitha,B., and Charaya, M.A.S. (2015). Macrofungi in Some Forests of Telangana State, India. *Journal of Mycology*, Volume 2015, Article ID 382476, http://dx.doi.org/10.1155/2015/382476

Kumar, A., Kumar, M., Ali, S., Lal, S. B. and Sinha, M. P. (2018). Anti-pathogenic efficacy of Indian edible macrofungi *Dacryopinax spathularia* (Schwein) and *Schizophyllum commune* (Fries) against some human pathogenic bacteriae. *Journal of Emerging Technologies and Innovative Research*. Vol. 6, Issue 1: 695-704.

Kumar, A.T.K., Thomas, A.,Kuniyil, K.,Nabu,S. and Nellipunath,V. (2018). A checklist of the Non-gilled fleshy fungi(Basidiomycota) of Kerela State, India. *Mycotaxon.* 134(1):221.

Kumar, V., Mishra, S.K., and Kaur,M. (2019). Effect of different media, temperature and pH on radial mycelial growth of *Lentinula edodes* strain Le-17-04. *Journal of Pharmacognosy and Phytochemistry*; 8(1): 345-348

Kurtzman, C.P. (1994). Molecular taxonomy of the yeasts. Yeast 10:1727 – 1740.

Labilles., Kayla, R., Lomente, Lynn, L., Oblena Ma., Jesselyn, A., Pascual, Sienna Mae R. (2016). *Classical Method of Fungi Diversity Assessment*. University of the Philippines Los Banos.

Lakshmi, K.M.S, Soumya P.S. and Shaji A,(2017). Lenzites elegans KSG32: a novel white rot fungus for synthetic dye decolourization. *J Bacteriol Mycol Open Access*. 2017;5(3):311-317. DOI: 10.15406/jbmoa.2017.05.00138

Lalchhuanawma, (2008). Ecological Studies of Plant Diversity and Productivity of Herbaceous Species in Mizoram University Campus at Tanhril, Aizawl, Mizoram University(N.E. India). Ph.D. Thesis, Mizoram University, Mizoram, India.(Unpublished).

Lalrinawmi, H. (2019). Studies on Soil Mushrooms in Aizawl District of Mizoram, India. Ph.D. Thesis, Mizoram University, Mizoram, India.(Unpublished)

Lalrinawmi, H., Zothanzama,J., Vabeikhokhei, J. and Zohmangaiha. (2017). Wild Edible Mushroom of Mizoram. *Science Vision.* 17 (4), 172-181. DOI: 10.33493/scivis.17.04.01.

Lindblad, I. (1998). Wood-inhabiting fungi on fallen logs, Norway spruce: relations to forest management andsubstrate quality. *Mycologia*. *Nord J Bot* 18:243–25

Lindblad, I. (2000). Host specificity of some wood-inhabiting fungi in a tropical forest. *Mycologia* 92:399–405.

Lindblad, I. (2001). Diversity of poroid and some corticoid wood-inhabiting fungi along the rainfall gradient in tropical forests, Costa Rica. *J. Trop. Ecol.* 17:353–369. doi:10.1017/S0266467401001249.

Linneaous, C. (1753). *Species Plantarium* ed.1. Salvius, Stockholm.

Lloyd, C.G. (1904–1919). *Mycological Letters* 1-69 each separately paged. Cincinnati, Ohio.

Lodge, D.J, Ammirati, J.F., O'Dell, T.E. and Mueller, M.G. (2004). Collecting and describing macrofungi. Pp 128–158. In Tibuhwa, D. D., (2011). Substrate specificity and phenology of macrofungi community at the University of Dar es Salaam main campus, Tanzania. *J. Appl. Biosci.* 46:3173-3184.

Lonsdale, D., Pautasso,M., and Holdenrieder,O. (2008). Wood-decaying fungi in the forest: conservation needs and management options. *European Journal of Forest Research,* 127(1):1–22pp.

Lowe, J.L. (1957). The Polyporaceae of North Amercia. The genus Fomes. Bull.State Univ. N.Y.S. Coll. *Forestry Tech Publ*. 80, 1-97.

Lowe, J.L. (1966). The Polyporaceae of North Amercia. The Genus Poria. Bull. State Univ. N.Y. Coll. *Forestry Tech. Publ.* 90, 1-183.

Lowe, J.L. (1975). Polyporaceae of North Amercia. The genus Tyromyces. *Mycotaxon* 2, 1-82.

Lyngdoh, A. and Dkhar, M.S. (2014). Wood-rotting fungi in East Khasi Hills of Meghalaya, northeast India, with special reference to *Heterobasidion perplexa* (a rare species – new to India). *Current Research in Environmental & Applied Mycology* 4 (1): 117–124 Doi 10.5943/cream/4/1/10

Mabey, R. (1984). Food for Free. Harper Collins. p. 54.

Majumder, M. and Shukla, A.K. (2012). Studies on Micro Fungal Diversity under Variable Habitats in Arunachal Pradesh, Microbes: Diversity and Biotechnology. Published by: Daya Publishing House, New Delhi.

Majumder, M. and Shukla, A.K. (2012). Studies on Micro Fungal Diversity under Variable Habitats in Arunachal Pradesh. *Microbes: Biodiversity and Biotechnology.* Daya Publishing House, New Delhi.

Manimohan, P., Divya, N., Kumar, T.K.A., Vrinda, K.B. and Pradeep, C.K. (2004) The genus Lentinus in Kerala State. *Mycotaxon* 90: 311–318

Manoharachary, C. and Gopal, K,V. (1991). Mycofloristics of Agaricales from Andhra Pradesh. *In* : Indian Mushrooms, Kerala Agriculture University, Vellanikkara, India.

Manoharachary, C. and Nagaraju, D. (2017). New additions to Macrofungi of Telangana State, India. *J. Indian bot. Soc*. e-ISSN:2455-7218, ISSN:0019-4468 Vol. 96 (1 & 2) 2017 :70-75

Maresca, B., and Kobayashi, G. S. (1994). *Molecular biology of pathogenic fungi*. Telos Press, New York, N.Y.

Margalef, R. (1958). Temporal succession and spatial heterogeneity in phytoplankton. In: Perspectives in Marine biology, Buzzati-Traverso (ed.), Univ. Calif. Press, Berkeley, pp. 323-347.

Mass – Geesteranus. (1971). Hydnaceous fungi of the eastern old world. *Verh. K. ned acad. Wet.*, 2 Reeks, 65, 127.

Matrinez, T.A., Francisco, M.S., Duenas,R.J., Ferrerira,P., Camarero,S., Guillen, F., Matrinez, M.J., Gutrierrez, A. and Rio., J.C. (2005). Biodegradtion of lignocellulosics: microbial., chemical and enzymatic aspects of fungal attack of lignin,8, 195-204.

May, T.W. and Pascoe, I.G. (1996). History of the taxonomic study of Australian fungi. In: Fungi of Australia Vol. lA. Introduction-Classification (eds. C. Grgurinovic and K. Mallett). Australian Biological Resources Study, Canberra, Australia: 171-206.

McNeely, J.A., Miller, K.R., Mittermeier, R. and Werner, T.B. (1990) Conserving the World's Biological Diversity. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland.

Meenakshi, R. and Selvam, K. (2020). Diversity And Molecular Identification Of Selected Wood Degrading Fungi From Chitteri Hills, Eastern Ghats Of Tamil Nadu, India. *International Journal of Scientific & Technology Research* Volume 9, Issue 02, ISSN 2277-8616.

Meenakshisundaram, M. and Bharathiraja, C. (2013). Isolation of wood rot fungi from Maruthamalai hills Western Ghats area of south India, *Int.J.Curr.Microbiol.App.Sci*. 2(9), 215-218.

Meredith, B. (2011). The fungi: 1, 2, 3 … 5.1 million species? *American Journal of Botany*: 98(3): 426–438.

Mohanan, C. (1994). Decay in standing trees in natural forests. KFRI Research Report No. 97, 28p.

Mohanan, C. (2002). Diseases of Bamboos in Asia: An Illustrated Manual.

Mohanan, C. (2011). Macrofungi of Kerala. [KFRI Handbook no. 27.] Kerala: Kerala Forest Research Institute.

Mueller. G.M., Bills, G.F. and Foster, M.S. (2004). *Biodiversity of fungi: inventory and monitoring methods*. Elsevier Academic Press, San Diego.

Nagadesi, P.K. and Arya, A. (2012). New records of lignicolous fungi deteriorating wood in India. *Mycosphere* 3(6), 997–1004, Doi 10.5943 /mycosphere/3/6/13

Nagadesi, P.K. and Arya, A. (2014). New records of Lignicolous fungi from Ratanmahal Wildlife Sanctuary, Gujarat, India. *International Letters of Natural Sciences* 3 (2014) 23-29

Nagadesi, P.K. and Arya, A. (2016). Lignicolous Macro Fungi from Gujarat, India. *World Scientific News* 45(2) 307-330.

Nagadesi, P.K. and Arya, A. (2017). Germplasm of xylariales fungal diversity of Gujarat, India. *World Scientific News* 66 (2017) 43-55

Nagadesi, P.K., Aravind, G. and Kannamba, B. (2016). Taxonomy and Bioactive chemicals from *Ganoderma* and *Phellinus* of India. *Biological Forum – An International Journal* 8(2): 240-246.

Nahata, A. (2013). Ganoderma lucidum: A Potent Medicinal Mushroom with Numerous Health Benefits. *Pharmaceut Anal Acta* 2013, 4:10

Natarajan, K. and Raman, N. (1981) South Indian Agaricales. Nova Hedwigia 34: 163–176.

Nath, R. K. and Sarma, T.C. (2018). Edible macrofungi of Kaliabar sub-division of Nagaon district, Assam, India. *Annals of Plants Sciences.* 7.3 (2018) pp. 2161-2165 http://dx.doi.org/10.21746/aps.2018.7.3.12

Nicolas, K.B. (2005). Diversity And Ecology Of Wood-Inhabiting Aphyllophoroid Basidiomycetes on fallen woody debris in various forest types in Switzerland. *Mycological Progress* 4(1):77-86. DOI: 10.1007/s11557-006-0110-z

Núñez, M. and Ryvarden, L. (2000). East Asian Polypores. Fungiflora, Oslo.

O'Dell, T.E., Lodge, D.J. and Mueller, G.M. (2004). Approaches to Sampling Macrofungi. *In.* Gregory M. Mueller., Gerald F. Bills. Mercedes S. Foster: *Biodiversity of Fungi: Inventory and Monitoring Methods.* Elsevier Academic Press 200. Wheeler Road, Burlington, MA 01803, USA. pp 163-168.

Oberwinkler, F. (1985). Anmerkungen zur Evolution und Systematik der basidiomyceten. *Botanische Jahrbücher für Systematik*, 107: 541-585

Ohlson, M., Soderstrom, L., Hornberg, G., Zackrisson, O. and Hermansson, J. (1997). Habitat qualities versus long-term continuity as determinants of biodiversity inboreal old-growth swamp forests. *Biol Conserv* 81:221–231

Orth, B.A., Royse, D.J. and Tien, M. (1993). Ubiquity of Lignin-Degrading Peroxidases among Various Wood-Degrading Fungi, *Applied Environmental Microbiology.* 3,4017-4023pp

Ostry, M.E., Anderson, N.A., O'Brien. And Joseph, G. (2011). *Field guide to common macrofungi in eastern forests and their ecosystem functions*. Gen. Tech. Rep. NRS-79. Revised February 2017. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 82 p.

Ottosson, E. (2013). Succession of Wood-inhabiting Fungal Communities; Diversity and Species Interactions During the Decomposition of Norway Spruce. Doctoral Thesis. Swedish University of Agricultural Sciences. Uppsala.

Pagiotti, R., Angelini, P., Rubini, A., Tirillini, B., Granetti, B. and Venanzoni, R. (2011). Identification and characterisation of Human Pathogenic Filamentous Fungi and susceptibility to Thymus Schimperi Essential Oil. Mycoses, 54, e364-76.

Pani, B.K. (2011). Evaluation of straw of some paddy varieties as substrates for cultivation of milky mushroom (Calocybe indica) in Orissa. *Bioscience Discovery*, 2 (3):341-342.

Parveen, A., Khataniar, L., Goswami, G., Hazarika, D.J., Das, P., Gautom, Barooah, T.M. and Boro, R.C. (2017). A Study on the Diversity and Habitat Specificity of Macrofungi of Assam, India. *Int.J.Curr.Microbiol.App.Sci*. 6(12): 275-297. doi: https://doi.org/10.20546/ijcmas.2017.612.034

Patel, P., and Trivedi, R. (2016). Studies on Cultivation of Oyster Mushrooms (Pleurotus Sajor-Caju) Grown on Different Agricultural Residues. *International Journal of Advances in Science Engineering and Technology*, ISSN: 2321-9009, Vol-4, Iss-2, Spl. Issue-3, pp 53-56.

Patel, R.S., Vasava, A.M. and Rajput, K.S. (2018). New distribution record of *Cyathus stercoreus* (Schwein.) De Toni (Nidulariaceae) for India from Gujarat state. *Studies in Fungi* 3(1), 227–233, Doi 10.5943/sif/3/1/22

Patil, P.D., and Yadav,G.D. (2018). Comparative Studies of White-Rot Fungal Strains (*Trametes hirsuta* MTCC-1171 and Phanerochaete chrysosporium NCIM-1106) for Effective Degradation and Bioconversion of Ferulic Acid. *ACS Omega*, 3, 14858−14868

Patil, S.Y. (2019). Diversity of Macrofungi from North Maharashtra-I. *Journal of Emerging Technologies and Innovative Research*, Volume 6, Issue 3, pp 302-308

Patil, S.S. (2012). Cultivation of Pleurotus sajor-caju on different agro wastes. *Science Research Reporter*, 2(3):225-228.

Patouillard, N. (1900). Essal taxonomique sur les families et les genres des Hymenomycetes. (These) Lonse Ie Saunier. pp.184.

Patrabhans, S. and Madan, M. (1997). Studies on Cultivation, Biological Efficiency and Chemical Analysis of Pkurotus sajor-caju (FR.) SINGER on Different Bio-Wastes. *Acta Biotechnol*. 17 (1997) 2,107-122.

Pavithra, M., Sridhar, K.R., Greeshma, A.A. and Karun, N.C. (2016). Spatial and temporal heterogeneity of macrofungi in the protected forests of Southwestern India. *Journal of Agricultural Technology*, 12: 105–124.

Payton, R.W. (1993). *Ecology, altitudinal zonation and conservation of tropical rainforest of Mount Cameroon*. Final project report R4600, ODA London, and Mount Cameroon Project. 70p.

Perotto, S., Angelini, P., Bianciotto, V., Bonfante, P., Girlanda, M., Kull, T., Mello, A., Pecoraro, L., Perini, C., Persiani, A., Saitta, A., Sarrocco, S., Vannacci, G., Venanzoni, R., Venturella, G. and Selosse, M.A. (2013) interactions of fungi with other organisms. *Plant Biosystems*, 147, 208-18.

Persoon, D.C.H. (1801). Synopsis Methodica Fungonum. Gottingae. Henricum. Dietrich (Johnson, Reprint Co. N. Y. (1952). pp. 708.

Picco, A.M., Angelini, P., Ciccarone, C., Franceschini, A., Ragazzi, A,, Rodolfi, M,, Varese, G.C. and Zotti, M. (2011). Biodiversity of emerging pathogenic and invasive fungi in plants, animals and humans in Italy. *Plant Biosystems*, 145, 988-96.

Pielou, E.C. (1975). *Ecological diversity*. John Willey & Sons.Inc. New York.

Pradeep. C.K. and Vrinda, K.B. (2007). Some noteworthy agarics from Western Ghats of Kerala. *Journal of Mycopathological Research* 1: 1–14.

Pradhan, P., Dutta, A.K., Paloi, S., Roy, A. and Acharya, K. (2016) Diversity and distribution of macrofungi in theEastern Himalayan ecosystem. *Eurasia J Biosci* 10: 1-12

Prasher, I.B. (2015). Wood-rotting non-gilled Agaricomycetes of Himalayas: Fungal Diversity Research Series, *Springer*, 67-68pp.

Prasher, I.B. and Lalita. (2013). A Checklist of Wood rotting fungi (non-gilled Agaricomycotina) of Uttarakhand. *Journal on New Biological Reports* 2(2): 108-123.

Prasher. I.B., Lalita. And Ashok, D. (2011). Polyporoid fungi of District Bilaspur (Himachal Pradesh*). J Ind Bot Soc* 90(3&4) : 268-273.

Praveen, K., Viswanath, B., Usha, K.Y., Pallavi, H., Reddy, V.S., Naveen, M., and Reddy, B.R. (2011). Lignolytic Enzymes of a Mushroom Stereum ostrea Isolated from Wood Logs. *Enzyme Research* Volume 2011, Article ID 749518, 6 pages doi:10.4061/2011/749518

Praveen, K.N. and Arun. A. (2014). New records of Lignicolous fungi from Ratanmahal Wildlife Sanctuary, Gujarat, India, *International Letters of Natural Sciences*. 8. 23-29.

Premamalini, T., Ambujavalli, S., Somu, A.L. and Kindo, A.J. (2011). *Schizophyllum Commune* a Causative Agent of Fungal Sinusitis: A Case Report. Hindawi Publishing Corporation Case Reports in Infectious Diseases Volume 2011, Article ID 821259, 4 pages doi:10.1155/2011/821259

Prusty, A.P., Samad, L., Rout, A. and Patra, A. (2014). In- Vitro Antibacterial Activity of *Stereum Ostrea* a Wood Decaying Macro Fungus. *Journal of Microbiology Research and Reviews* Vol. 2(2): 12-18.

Rajendra, B.K. and Rajesh, S.G. (2014). Diversity of wood decay fungi at Mantha, Jalna (MS) India , *International Journal of Current Research.* Vol. 7, Issue, 05, pp.16402-16406

Rajput, K.S., Koyani, R.D., Patel, H.P., Vasava, A.M., Patel, R.S., Patel, A.D., Singh, A.P. (2015). Preliminary checklist of fungi of Gujarat State, India. *Current Research in Environmental & Applied Mycology* 5(4), 285–306, Doi 10.5943/cream/5/4/1

Ralph, J., Lundquist, K., Brunow, G., Lu, F., Kim, H., Schataz, P.F., Martia, J.M., Hatfiled, R.D., Ralph,S.A., Christensen, J.H. and Boerjan,W. (2005). Natural polymers from oxidative coupling of 4-hydorxyphenylpropanoid, *Phytochem* ,3, 29-60 pp.

Ranadive, K.R. (2013). An overview of Aphyllophorales (wood rotting fungi) from India. *Int.J.Curr.Microbiol.App.Sci* (2013) 2(12): 112-139

Ranadive, K.R., Belsare, M.G., Deokule, S.S., Jagtap, N.V., Jadhav, H.K. and Vaidya, J.G., (2013). Glimpses of antimicrobial activity of fungi from World. *Journal on New Biological Reports* 2(2): 142-162.

Ranadive, K.R., Vaidya, J.G., Jite, P.K., Ranade, V.D., Bhosale, S.R., Rabba, A. S., Hakimi, M., Deshpande, G.S., Rathod, M.M., Forutan, A., Kaur, M., Naik-Vaidya, C.D., Bapat, G.S,, Lamrood, P. (2011). Checklist of Aphyllophorales from the Western Ghats of Maharashtra State, India. *Mycosphere* 2(2), 91–114.

Randhawa, K., and Shri, R. (2017). Pharmacological importance of Pleurotus sajor-caju (Fr.) Singer. *The Pharma Innovation Journal*. 6(12): 321-327

Rathod, M.M. (2016). A Study on Wood-Decaying Fungi from the Forests of Western Maharashtra, India. *Int.J.Curr.Microbiol.App.Sci.* 5(3): 520-527. doi: http://dx.doi.org/10.20546/ijcmas.2016.503.061

Rathod, M.M. and Bendre, K.B. (2015). Studies of the fungi *Lenzites acuta* Berk. from Western Maharashtra, *India, Int. J. of Life Sciences*, Special Issue, A5: 37-41.

Rawat, S. (2018). Isolation and Evaluation of *Ganoderma lucidum* from Uttarakhand, India. *Int.J.Curr.Microbiol.App.Sci* (2018) 7(3): 472-479

Rayner, A.D.M. and Boddy, L. (1988). Fungal Decomposition of Wood: Its Biology and Ecology. John Wiley Press, Chichester, New York, Brisbane, Toronto, Singapore

Rayner, A.D.M. and Boddy, L. (1988). Fungal Decomposition of Wood: Its Biology and Ecology. *Amoebae and Myxomycetes*. pp. 132-134.

Rea, C. (1922). *British Basidiomycetae: A Handbook to the Larger British Fungi*. Cambridge at the University Press.

Redhead, S. (1997). Standardized inventory methodologies for components of British Columbia's biodiversity: *Macrofungi*. Resource inventory committee, Vancouver. In: Scott T.B. (2006). A preliminary checklist of Arizona macrofungi. *CANOTIA* 2:47-78.

Reid DA. (1965). A Monograph of the Stipitate Stereoid Fungi. *Nova Hedwigia. Beih*. 18, 382.

Renvall, P. (1995). Community structure and dynamics of wood-rotting basidiomycetes on decomposing conifer trunks in northern Finland. *Karstenia* 35:1–51

Rojas, C. and Stephenson, S.L. (2008). Myxomycete ecology along an elevation gradient on Cocos Island, Costa Rica. *Fungal Diversity* 29: 117–127.

Rony, K.A., Mathew, J., Neenu, P.P. and Janardhanan, K.K. (2011). *Ganoderma lucidum*(Fr.) P. Karst occurring in South India attenuates gastric ulceration in rats. *Indian Journal of Natural Products and Resources*. Vol.2(1),pp19-27.

Rossman, A.Y. (2003). A strategy for an All Taxa Inventory of Fungal Biodiversity. In: Biodiversity and Terrestrial Ecosystems (eds Cl Peng, CH): 169–194. Taipei.

Roy, A. and De, A. (1996). Polyporaceae of India. International book distributor, Dehradun-248001, India. pp. 309.

Rydin, H., Kiekmann, M. and Hallingbäck, T. (1997). Biological characteristics, habitat associations, and distribution of macrofungi in Sweden. *Conservation Biology* 11:628-640

Ryvarden, L. and Gilbertson, R.L. (1993). European Polypores 1. Synopsis Fungorum 6:1–387

Saha, A.K., Acharya, S.S. and Roy, A. (2012). Antioxidant level of wild edible mushroom: *Pleurotus djamor* (Fr.) Boedijn, *Journal of Agricultural Technology*,Vol. 8(4): 1343-1351

Saha, R., Das, D., Tarafder, E., Roy, A.and Acharya, K. (2018). Contribution to The Macromycetes of West Bengal, India: 34–39. *Research J. Pharm. and Tech* .11(11): 5123-5129. DOI: 10.5958/0974-360X.2018.00935.6

Sapphire. J.M., McMullan-Fisher, Tom, W., May, Robinson, R.M.,Bell, T.L., Lebel, T., Catcheside, P. and York, A. (2010). Fungi and fire in Australian ecosystems: A review of current knowledge, management, implications and research gaps and solutions.

Sarbhoy, A. K., Agarwal, D. K. and Varshney, J. L.,(1996). *Fungi of India (1982–1992)*, CBS Publishers and Distributors, New Delhi, 350.

Sarma, T.C., Sarma, I. and Patiri, B.N., (2010). Wild edible mushrooms used by some ethnic tribes of western Assam. *The Bioscan*. Vol. 3; 613-625.

Schmidt, O. (2006). Wood and Tree Fungi;Biology, Damage, Protection, and Use. *Springer,Verlag.* ISBN-13 978-3-540-32138-5, Berlin Heidelberg.

Schmit, J.P. (2005). Species-richness of tropical wood-inhabiting macrofungi provides support for species-energy theory. *Mycologia.* 97:751–761.

Schwarze, F. (2007). Wood decay under the microscope. *Fungal Biology Reviews,* 21(4):133-170.

Seen-Irlet, B., Heilmann-Clausen, J., Genney, D. and Dahlberg, A. (2007). Guidance for the conservation of mushrooms in Europe. Convention on the conservation of European wildlife and natural habitats. 27th meeting, Strasbourg, 26-29 November, 34p.

Sehgal, H.S, Sen, M. and Bakshi, B.K. (1966). Temperature relation of Indian Polypores. Indian Forest Rec. (n.s.) *Forest Pathol* 2(7):131-137.

Seifert, K.A., Samson, R.A. and Chapela, I.H. (1995). Escovopsis aspergilloides, a rediscovered hyphomycete from leaf-cutting ant nest. *Mycologia*, 1, 407–413.

Selvam, K., Shanmuga P.M., and Arungandhi, K. (2011). Pretreatment of Wood Chips and Pulps with Thelephora Sp. to reduce Chemical Consumption in Paper Industries, *International Journal ChemTech.*3, 471-476pp.

Senthilarasu, G. (2014). Diversity of agarics (gilled mushrooms) of Maharashtra, India. *Current Research in Environmental & Applied Mycology* 4: 58–78.

Senthilarasu, G. (2015). The Lentinoid fungi (Lentinus and Panus) from Western Ghats, India. *IMA Fungus* 6(1): 119–128. doi:10.5598/imafungus.2015.06.01.06

Senthilarasu, G. and Kumaresan, V. (2016). Diversity of Agaric Mycota of Western Ghats of Karnataka, India. *Current Research in Environmental & Applied Mycology* 6(1), 75–101, Doi 10.5943/cream/6/2/3

Shannon, C.E. (1948). A mathematical theory of communication. *Bell System Technical Journa*l, 27, pp 379-423.

Sharma, J.K., Mohanan, C. and Florence, E.J.M. (1985). Disease survey in nurseries and plantations of forest tree species grown in Kerala. KFRI Research Report 36: 1–268

Sharma, O.P. (2006). Textbook of Fungi. Tata Mcgraw-Hill Publishing Company limited, New Delhi.

Sharma, S.B., Singh, N.S. and Lalruatfela, R. (2017). Tree diversity and carbon stocks of Hmuifang forest, Mizoram. *International Journal of Research in BioSciences.* Volume 7 Issue 1, pp.87-99.

Sharma, S.K. and Atri, N.S. (2015). The Genus Lentinus (Basidiomycetes) from India - an annotated checklist. *Journal of Threatened Taxa* 7(11): 7843–7848; http://dx.doi.org/10.11609/JoTT.o3864.7843

Sharma, V. and Jaitly, A.K. (2017). Optimization of Growth of Two Wild Species of *Pycnoporus* Collected from Foothill of Uttarakhand. *International Journal of Agriculture Innovations and Research*. Vol. 6, Issue 1, ISSN (Online) 2319-1473.

Siitonen, J. (2001). Forest management, coarse woody debris and saproxylic organisms: Fennoscandian boreal forests as an example. *Ecol. Bull*. 49:11–41.

Simpson, E.H. (1949). Measurement of diversity. *Nature*, pp 163-668.

Singdevsachan, S.K., Patra, J.K. and Thatoi, H. (2013). Nutritional and bioactive potential of two wild edible mushrooms (*Lentinus sajor-caju* and *Lentinus torulosus*) from Similipal Biosphere Reserve, India. *Food Sci Biotechnol.* 22**,** 137–145. https://doi.org/10.1007/s10068-013-0019-7

Singh, H.B., Adhikary, R.K., Sharma, R.K., Sarma, T.C. and Rao, P.G. (2008). Cultivation of Shiitake mushroom- A potential agro-industry for hilly areas of Northeastern India. *Natural Product Radiance*, Vol.7(1); pp 74-78.

Singh, R.K., Pandey, S.K., Singh, D. and Masurkar, D. (2018). First report of edible mushroom Pleurotus ostreatus from India with potential to kill plant parasitic nematodes. *Indian Phytopathology*. doi.org/10.1007/s42360-018-0093-0

Singh, S., Singh, G., Kumar, V., Kumar, B. and Kumar, A. (2017). Assessment of Different Organic Supplements (pulses flour) on Growth and Yield of Oyster Mushrooms (*Pleurotus djamor*), *Int. J. Pure App. Biosci.* 5(2): 101-106. doi: http://dx.doi.org/10.18782/2320-7051.2819

Sippola, A.L. and Renvall, P. (1999). Wood-decomposing fungi and seedtree cutting: a 40-year perspective. *For Ecol Manage* 115:183–201. doi:10.1016/S0378-1127(98)00398-3.

Siripong, P., Oraphin,B., Sanro,T. and Duanporn, P. (2009). Screening of Fungi from Natural Sources in Thailand for Degradation of Polychlorinated Hydrocarbons, *American Eurasian Journal of Agric. & Environ. Sci.*,5,466-472pp.

Sivaprakasam, E., Kavitha, D., Balakumar, R., Sridhar, S. and Kumar, S.J. (2011). Antimicrobial Activity of Whole Fruiting Bodies of *Trametes hirsute* (Wulf. Fr.) Pil. Against Some Common Pathogenic Bacteria and Fungus. *International Journal of Pharmaceutical Sciences and Drug Research* 2011; 3(3): 219-221

Soosairaj, S., Raja, P., Kala, A. and Raj, P.K. (2012) Survey of Macroscopic Fungi from a few Districts of Tamil Nadu. *The Bioscan*. 7(4): 669-671.

Sotome, K., Maekawa, N., Nakagiri, A., Lee, S.S., and Hattori, T. (2014). Taxonomic study of Asian species of Poroid Auriculariales. *Mycol Progress*; 13:987–997. DOI 10.1007/s11557-014-0984-0

Srivastava, M. (2001). A pink coloured *Pleurotus djamor* (Rumph.) Boedijn from natural habitat of north Bihar, India. *Current Science*, Vol. 80, No. 3, pp 337-338

Stafleu, F.A. and Cowan, R.S. (1983). Taxonomic literature. A selective guide to botanical publications and collections with dates, commentaries and types, Second edition, Volume IV: P-Sak. Regnum vegetabile 110, Bohn, Scheltema & Holkema, Utrecht/Antwerpen / dr. W. Junk b.v., Publishers, The Hague/Boston.

Stokland, J., Siitonen, J. and Jonsson, B.G. (2012). Biodiversity in Dead Wood. Ecology, Biodiversity and Conservation. Cambridge University Press, Cambridge.

Swain, B., Panigrahy, R. and Panigrahi, D. (2011). *Schizophyllum commune* sinusitis in an immunocompetent host. *Indian J Med Microbiol* 2011;29:439-42.

Swapna, S., Abrar, S. and Krishnappa, M. (2008). Diversity of Macrofungi in semi-evergreen and moist deciduous forest of Shimoga District, Karnataka, India. *Journal of Mycology and Plant Pathology*, 38: 21–26.

Swift, M.J. (1982). Basidiomycetes as components of forest ecosystems. *In*: Frankland, J.C.; Hedger, J.N.; Swift, M.J., eds. *Decomposer basidiomycetes: Their biology and ecology*. Cambridge, United Kingdom: Cambridge University Press: 307–338.

Taka, T., Wangpan, T., Chetry, L.B., Tesia, P., Giba, J. and Tangjang, S. (2018). Isolation of cellulolytic Fungi from the litter of *Phyllostachys bambusoides* from Ziro Valley, Arunachal Pradesh, Eastern Himalaya. *NeBIO* I Vol.9(1): 144-149.

Tangley, L. (1997). How many species are there? US News and World Report Aug. 18,1997.https://doi.org/www.usnews.com/usnews/culture/articles/970818/archive_007681.htm

Tapwal, A., Kumar, R. and Pandey, S. (2013). Diversity and frequency of macrofungi associated with wet ever green tropical forest in Assam, India. *Biodiversitas* ISSN: 1412-033X Vol. 14, Number 2, E-ISSN: 2085-4722: 73-78.

Tapwal, A., Kumar,R. and Pandey, S. (2015). Diversity and frequency of macrofungi associated with wet ever green tropical forest in Assam, India. *Biodiversitas* 14 (2): 73-78.

Taylor, R.J., Patterson, T.F. and Harrod, R.J. (1994). Systematics of Mexican Spruce - Revisited. *Systematic Botany* 19: 47-59.

Thangaraj, R., Raj, S., and Renganathan, K. (2017). Wound healing effect of king alferd's mushroom (*Daldinia concentrica*) used by tribes of Sirumalai Hills, Tamil Nadu, India. *Int J Pharm Pharm Sci.;* 9(7):161-164.

Thind, K.S. and Dhanda, R.S. (1978). The Polyporaceae of India-XI. *Ind. Phytopath*. 31, 463-472.

Thulasinathan, B., Kulanthaisamy, M.R., Nagarajan, A., Soorangkattan, S., Muthuramalingam, J.B., Jeyaraman, J. and Arun, A. (2018). Studies on the diversity of macrofungus in Kodaikanal region of Western Ghats, Tamil Nadu, India. *Biodiversitas* ISSN: 1412-033X Volume 19, Number 6, E-ISSN: 2085-4722 Pp: 2283-2293.

Tiwari, C.K., Jagrati, P. and Verma, R.K. (2012). A new and rare species of *Phlyctaeniella* from Central India. *Mycosphere* 3(4), 450–453, Doi 10.5943 /mycosphere/3/4/8.

Tiwari, C.K., Parihar,J. and Verma, R.K. (2010). Additions to wood decaying fungi of India. *Journal of Threatened Taxa*. 2(6): 970-973.

Usha, K.Y., Praveen, K. and Reddy, B. (2014). Enhanced Production of Ligninolytic Enzymes by a Mushroom *Stereum ostrea*. *Biotechnology Research International*. Volume 2014, Article ID 815495, http://dx.doi.org/10.1155/2014/815495

Varghese, S.P., Pradeep, C.K., Vrinda, K.B. (2010). Mushrooms of tribal importance in Wayanad area of Kerala. *Journal of Mycopathological Research* 48: 311–320.

Vasava, A.M., Ravi, S., Patel, R., Koyani, D. and Rajput, K.S. (2018). Distribution and diversity of Polyporaceae in Western India: An overview and addition to Mycoflora of the Gujarat state; *Plant Science Today* 5(1): 32-38 https://dx.doi.org/10.14719/pst.2018.5.1.353

Veena, S.S. and Pandey, M. (2012). Physiological and cultivation requirements of *Trametes versicolor*, a medicinal mushroom to diversify Indian mushroom industry. *Indian Journal of Agricultural Sciences* 82 (8): 672–675

Verma, R.K. Pandro, V., Raj, D., and Asaiya, A.J.K (2019b). Diversity of macro-fungi in Central India-XXI: Three members of Tremellaceae. *Van Sangyan* (ISSN 2395 - 468X) Vol. 6, No. 3.

Verma, R.K. and Verma, P. (2017). Diversity of macro-fungi in central India-IV: *Auricularia auricula-judae*, a neutraceutical jelly mushroom, *Van Sangyan* (ISSN 2395 - 468X) Vol. 4, No. 2.

Verma, R.K., Pandro, V., Raj, D., and Asaiya, A.J.K. (2019a). Diversity of macro-fungi in Central India-XXII: Diversity of *Laetiporus sulphureus* in TFRI campus. *Van Sangyan* (ISSN 2395 - 468X) Vol. 6, No. 4.

Verma, R.K., Asaiya, A.J.K., Choubey, C. and Pandro, V. (2017). Diversity of macro-fungi in central India-IX: *Laetiporus sulphurous*, *Van Sangyan* (ISSN 2395 - 468X) Vol. 4, No. 11.

Verma, R.K., Asaiya, A.J.K., Pandro, V., Raj, D. and Patel, D. (2018). Diversity of macro-fungi in Central India-XVIII: *Cookeina tricholoma*, a cup fungus from Maharashtra. *Van Sangyan* (ISSN 2395 - 468X) Vol. 5, No. 10.

Vijaykrishna, D., Jeewon, R. and Hyde, K.D. (2006). Molecular taxonomy, origins and evolution of freshwater ascomycetes. *Fungal Diversity* 23: 351-390.

Virdi, S.S. (1990). Two resupinate, wood decaying poroid fungi new to India. *Sydowia* 42: 209-210pp.

Wang, C.J.K, and Zabel, R.A. (1990). Identification manual for fungi from utility poles in the eastern United States. American Type Culture Collection, Rockville, Maryland. 356 pp.

Wang, B., Cuil, K.B., Li,H.J., Du, P. and Jia, B.S. (2011). Wood rotting fungi from eastern China.5.polypore diversity in Jiangxi province, *Ann Bot Fennici*.,48, 237-246pp.

Weising, K., H. Nybom, K. Wolff, and W. Meyer. (1995). *DNA fingerprinting in plants and fungi*. CRC Press, Inc., Boca Raton, Fla.

Whittaker, R.H. (1969). New concepts of kingdoms of organisms. Science 163: 150–160.

Yamashita, S., Hattori, T., Lee S.S. and Okabe, K. (2014). Estimating the diversity of wood-decaying polypores in tropical lowland rain forests in Malaysia: the effect of sampling strategy. *Biodiversity Conservation*, 24(2):393–406.

Zak, J.C. and Willig, M. R. (2004). Fungal Biodiversity Patterns. *In* Recommended Protocols For Sampling Macrofungi. Bidiversity of fungi Inventory and Monitoring Methods Biodiversity of Fungi: Inventory and Monitoring Methods. Gregory M. Mueller, Gerald F. Bills, and Mercedes S. Foster, eds. Elsevier Academic Press, Burlington, MA, 2004. 777 pp.

Zohmangaiha, Vabeikhokhei, J., Zothanzama J. and Lalrinawmi, H. (2019). Ganoderma Species of Mizoram, India. *Int.J.Curr.Microbiol.App.Sci.* 8(04): 2871-2879. doi: https://doi.org/10.20546/ijcmas.2019.804.335.

Zothanmawia, R., Vanlalpeka, Vanlalhruaii, R., Lalruatsanga, H., Thapa, H.S., Vanlalhluna, P.C. (2016). *Diversity of wood decaying fungi in Pacchunga University College Campus, Aizawl, Mizoram*. ENVIS Centre: Mizoram; Status of Environment and Related Issues, Biological Diversity in Mizoram.

Zothanzama, J. (2011a). Studies on the Wood Rotting Fungi of Meghalaya. Ph.D. Thesis, North Eastern Hill University, Shillong, India. (Unpublished).

Zothanzama, J., (2011b). Wood Rotting Fungi of Mizoram. *In* H.Lalramnghinglova and F. Lalnunmawia(eds). *Forest Resources of Mizoram:Conservation and Management*. Department of Environmental Science, Mizoram University and Regional Centre,National Afforestation and Eco-development Board ; North Eastern Hill University.345p:326-345pp

Zothanzama, J., and Lalrinawmi, (2015). Wild Edible Mushroom of Mizoram . *In* Karlyn Eckman and Laltanpuii Ralte; *Integrated Land Use Management in the Eastern Himalayas*. Akansha Publishing House, New Delhi – 110002.171-181pp.

Zothanzama, J., Blanchette, R., Redford, S., Zohmangaiha and Vabeikhokhei, J. (2016). Using molecular characterization as a tool for identification of fungi of Mizoram. *In*. K. Eckman and L. Ralte; *Integrated Land Use Management in the Eastern Himalayas*. Akansha Publishing House, New Delhi, pp. 165–177

Zothanzama, J., Vabeikhokhei, J., Robert, A.B., and Benjamin, W.H. (2017). *Ganoderma mizoramense*, Persoonia – Volume 38, pp 326-327.

BIO-DATA

1. NAME	:	JOSIAH MC VABEIKHOKHEI
2. FATHER'S NAME	:	M. LALHMUAKA
3. DATE OF BIRTH	:	05.11.1990
4. RELIGION	:	CHRISTIANITY
5. NATIONALITY	:	INDIAN
6. MARITAL STATUS	:	SINGLE
7. SEX	:	MALE
8. CATEGORY	:	SCHEDULED TRIBE
9. LANGUAGE KNOWN	:	MIZO, ENGLISH, HINDI, ASSSAMESE
10. PERMANENT ADDRESS	:	TUIPANG 'V', MIZORAM
11. CURRENT ADDRESS	:	ZONUAM, AIZAWL, MIZORAM, 796009
12. CONTACT NO.	:	9774475164
13. EMAIL	:	mcjosiahmathipy@gmail.com

13. EDUCATIONAL QUALIFICATION:

EXAMINATION	PASSING YEAR	INSTITUTE	BOARD/UNIVERSITY	PERCENTAGE
H.S.L.C.	2006	New Life School	SEBA	64
H.S.S.L.C.	2008	Synod College	MBOSE	49
T.D.C.	2012	B. Borooah College	Gauhati University	50
M.Sc.	2014	Mizoram University	Mizoram University	73

PARTICULARS OF THE CANDIDATE

NAME OF CANDIDATE	:	Josiah MC Vabeikhokhei
DEGREE	:	Master of Science (Environmental Science)
DEPARTMENT	:	Department of Environmental science, Mizoram University
TITLE OF THESIS	:	Diversity of Wood Rotting Fungi in Protected Forest Areas of Mizoram
DATE OF ADMISSION	:	12.08.2015

APPROVAL OF RESEARCH PROPOSAL

1. D.R.C.	:	31.03.2016
2. B.O.S.	:	07.04.2016
3. SCHOOL BOARD	:	13.04.2016
MZU REGISTRATION NO	:	198 of 2013
Ph. D. REGISTRATION NO & DATE	:	MZU/Ph.D/895 0F 13.04.2016
EXTENSION (IF ANY)	:	

Head

Department of Environmental Science

Appendix I. Average values of Diversity Indices

1. Average values of Simpson's index of diversity for all the sites

Seasons	Dampa		Murlen		Thorang		Tokalo	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Wet	0.97	0.98	0.95	0.91	0.87	0.93	0.93	0.97
Dry	0.81	0.93	0.85	0.73	0.81	0.89	0.82	0.85

2. Average values of Shannon's index of diversity for all the sites

Seasons	Dampa		Murlen		Thorang		Tokalo	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Wet	3.8	3.75	3.6	3.48	2.7	3.12	3.13	3.54
Dry	3.56	3.47	3.45	3.13	2.05	2.83	2.91	2.44

3. Average values of Pielou's evenness index for all the sites

Seasons	Dampa		Murlen		Thorang		Tokalo	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Wet	0.88	0.89	0.91	0.93	0.89	0.86	0.86	0.87
Dry	0.55	0.67	0.87	0.82	0.81	0.83	0.8	0.8

4. Average values of Margalef's index for all the sites

Seasons	Dampa		Murlen		Thorang		Tokalo	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Wet	10.67	13.35	9.44	9.38	8.32	8.6	8.26	7.53
Dry	7.77	8.62	8.02	6.28	7.04	6.74	6.81	5.32

5. Occurrence of species in both the sites and collecting season					
Hmuifang Reserve Forest(Undisturbed)			Tanhril forest(Disturbed)		
Species	No. of Species	Season	Species	No. of Species	season
Auricularia auricula-judae	12	Rainy	*Amauroderma rude*	8	Rainy and dry
Auricularia cornea	1	Rainy	*Amauroderma rugosum*	6	Rainy and dry
Auricularia polytricha	8	Rainy	*Auricularia auricular-judae*	26	Rainy
Coprinellus dessimentus	25	Rainy	*Auricularia mesenterica*	5	Rainy
Cyathus striatus	3	Rainy	*Auricularia polytricha*	13	Rainy
Cymatodermata dendriticum	3	Rainy	*Coprinellus dessimentus*	38	Rainy
Daedaleopsis quercina	6	Rainy and dry	*Cyathus striatus*	9	Rainy
Daldinia concentrica	5	Rainy and dry	*Daldinia concentrica*	3	Rainy and dry
Fistulina hepatica	3	Rainy	*Fistulina hepatica*	2	Rainy
Ganoderma lingzhi	7	Rainy and dry	*Ganoderma applanatum*	1	Rainy and dry
Hexagonia tenuis	27	Rainy and dry	*Hexagonia tenuis*	19	Rainy and dry
Laetiporus sulphureus	1	Rainy	*Lentinus badius*	2	Rainy and dry
Lentinula edodes	1	Rainy	*Lenzites acuta*	2	Rainy and dry
Lentinus badius	3	Rainy and dry	*Marasmius sp.*	15	Rainy
Lentinus sajor caju	3	*Rainy*	*Microporus affinis*	6	Rainy and dry
Lenzites elegans	17	Rainy and dry	*Microporus xanthopus*	76	Rainy and dry
Marasmius sp.	1	Rainy	*Mycena sp.*	5	Rainy

Micromphale foetidum	8	Rainy	*Schizophyllum commune*	34	Rainy and dry
Microporus affinis	12	Rainy and dry	*Stereum hirsutum*	12	Rainy and dry
Microporus xanthopus	56	Rainy and dry	*Stereum rugosum*	12	Rainy and dry
Mycena sp.	8	Rainy	*Trametes hirsuta*	23	Rainy and dry
Pleurotus ostreatus	1	Rainy	*Trametes trogii*	17	Rainy and dry
Polyporus alveolaris	16	Rainy	*Tremella fuciformis*	4	Rainy
Polyporus arcularis	5	Rainy	*Tremella mesentrica*	3	Rainy
Polyporus badius	12	Rainy	*Xylaria hypoxylon*	17	Rainy and dry
Polyporus dictyopus	15	Rainy	*Xylaria longipes*	14	Rainy and dry
Polyporus tenuiculus	8	Rainy			
Pycnoporus sanguineus	5	Rainy and dry			
Schizophyllum commune	25	Rainy and dry			
Stereum hirsutum	17	Rainy and dry			
Stereum rugosum	2	Rainy and dry			
Tramates modesta	12	Rainy and dry			
Trametes hirsuta	21	Rainy and dry			
Trametes trogii	6	Rainy and dry			
Tremella fuciformis	3	Rainy			
Tremelles mesentrica	6	Rainy			
Trichaptum biforme	18	Rainy and dry			
Xylaria gramica	24	Rainy and dry			
Xylaria hypoxylon	18	Rainy and dry			
Xylaria longipes	18	Rainy and dry			

Appendix.II. Paper published in peered reviewed journal

1. Vabeikhokhei, J. Zohmangaiha, Zothanzama, J. and Lalrinawmi, H. (2019). Taxonomic study of the wood inhabiting fungi of Reiek reserved Forest, Mizoram,India. *Journal of Emerging Technologies and Innovative Research.* Volume 6, Issue 4, 698-702pp.
2. Vabeikhokhei, J. Zohmangaiha, Zothanzama, J. and Lalrinawmi, H. (2019). Diversity Study of Wood Rotting Fungi from Two different Forests in Mizoram, India. *Int.J.Curr.Microbiol.App.Sci*. 8(04): 2775-2785. doi: https://doi.org/10.20546/ijcmas.2019.804.323
3. Zothanzama, J, Vabeikhokhei, J., Robert, A.B., and Benjamin, W.H. (2017). Ganoderma mizoramense, *Persoonia* – Volume 38,pp 326-327.

Appendix III. List of paper published in conference/ symposium

1. "The Wood inhabiting Fungi of Mizoram." in the Regional Seminar on Climate Change: Impact, Adaptation & Respose in the Eastern Himalayas during 1st to 2nd November, 2018.

Appendix IV. Lists of presentation in conference/ symposium/ seminar

1. "*Taxonomic study of wood rotting fungi of Reiek Reserved Forest, Mizoram."* in the 12th Annual convention of Association of Biotechnology and Pharmacy(ABAP) & International Conference on Biodiversity, Environment and human Health: Innvations and Emerging Trends(BEHIET,2018) organized at the School of Life Sciences, Mizoram University, Aizawl, Mizoram during November 12 to 14, 2018.

2. *"Wood-Inhabiting wild edible Mushroom of Mizoram."* in the Mizoram Science Congress 2018, a National Conference, held at Pachhunga University College during 4th – 5th Oct. 2018.

3. "*The Wood inhabiting Fungi of Mizoram*." in the Regional Seminar on Climate Change: Impact, Adaptation & Respose in the Eastern Himalayas during 1st to 2nd November, 2018.

Appendix V. Lists of conference/ symposium/ seminar attended

1. Workshop on Northeast India Biodiversity Portal organized by Ashoka Trust for Research in Ecology and the Environment(ATREE) in collaboration with Mizo Academy of Science on May 7th 2016.

2. One day Workshop on EIA on 11th Nov. 2016, organized by State Environmental Impact Assessment authority and State Environmental Expert Appraisal Committee, Mizoram: Aizawl.

3. Science Communication Workshop (SciComm 101) held on 9th June at North-Eastern Hill University, Shillong, Meghalaya.

4. State Level Workshop & Round Table Discussion on "Combating Climate Change' held on 20th April 2018, organized by the Mizoram Sustainable Development Foundation (MSDF), under the aegis of the Integrated Mountain Initiative(IMI) and the National Mission on Himalayan Studies.

ABSTRACT

The present study entitled “Diversity of wood rotting fungi in protected forest areas of Mizoram” was carried out in selected protected forests of Mizoram. Mizoram is one of the seven sister states in North East India. It lies in the extreme eastern corner of the country and shares its borders with Assam, Manipur and Tripura and has very long international borders with Myanmar and Bangladesh. The state has a geographical area of 21,087 sq. km. and lies between 21˚56’ and 24˚35’ N and 92˚16’ and 93˚26’E. The Tropic of Cancer passes through the State at 23˚30’N latitude. For carrying out for the study, one National Park and three Wildlife Sanctuaries were selected namely Murlen National Park, Dampa Tiger Reserved Forest, Thorang Wildlife Sanctuary and Tokalo Wlidlife Sanctuary. For comparative study, a disturbed forest i.e. Tanhril forest and undisturbed forest i.e. Hmuifang reserved forest were selected.

The study was carried out with the aim to generate a baseline data on taxonomy and highlight the diversity and distribution framework of the wood rotting fungi present in Mizoram. The present study was carried out with the following objectives:

1. To study the taxon identity through macro and micro-morphological characteristics of the samples collected.
2. To study the diversity of wood rotting fungi within the study sites.
3. Comparative study of wood rotting fungi from Disturbed and Undisturbed forests.

Survey and collection of wood rotting fungi was carried out in the selected sites from May 2016 to April 2018. The study period was divided into two seasons i.e. wet and dry season. Wet season represents the best collecting period which was characterized by the soft and fleshy mushroom. Dry season was mainly characterised by corky and hard fungal specimens.

For taxonomical study, the fungal specimens were photographed in the natural habitats. The collected specimens were identified according to standard macroscopic and microscopic characteristics through consultation with appropriate literature (Gilbertson & Ryvarden, 1986; Núñez & Ryvarden, 2000; Wang and Zabel 1990; Huckfeldt and Schmidt 2006). The morphology or the macro-characteristics

i.e. the outward appearance (fruiting body) were studied carefully and compared or expressed through photographs and literatures from books and journals. For microscopic study, thin sections of dried specimens were taken with the help of a sharp razor blade and were mounted in 3% KOH solution and stained in 2% aqueous phloxine. Sections were mounted in Lactophenol or 60% lactic acid + cotton blue. Phloxine and Cotton blue stains were also be routinely used. Spore print of the collected specimenswere obtained by cutting off the cap and placing it in a piece of white paper/glass slides (Surcek, 1988; Barnett *et al,*. 1990; Ryvarden and Gilbertson 1993; Roy and De, 1996). Nomenclature, taxonomic position and author names follow the databases: Index Fungorum- IFS(http://www.indexfungorum.org), the International Plant Names Index- IPNI(http://www.ipni.org) and Mycobank (http://www.mycobank.com). The specimens are preserved by air drying and liquid preservation (Barnett *et al,*. 1990; Ryvarden and Gilbertson 1993; Meenakshisundaram and Bharathiraja, 2013). Voucher numbers were given to the specimens and stored in the Department of Environmental Science, Mizoram University.

During the study period, a total of 81 specimens were identified upto species level and 3 specimens upto genus. The family Polyporaceae represents the most abundant family with a species number of 33 followed by Auriculariaceae, Ganodermataceae, Marasmiaceae with 5 species each, and Fomitopsidaceae and Stereaceae (4 species), Pleurotaceae (3 species), Hymenochaetaceae, Mycenaceae, Tremellaceae (2 species), and Aporpiaceae, Cortinariaceae, Dacrymycetaceae, Fistulinaceae, Helotiaceae, Meruliaceae, Nidulariaceae, Phanerochaetaceae, Psathyrellaceae, Pyronemataceae, Sarcoscyphaceae, Schizophyllaceae with 1 species each. 22 edible species were also identified which are *Auricularia auricula-judae, A. cornea, A.delicata, A. mesenterica, A. polytricha, Fistulina hepatica, Lentinula edodes, L. lateritia, Pleurotus djamor, P. sajor-caju, P. ostreatus, Lentinus concavus, L. polychrous, L.roseus, L.sajor-caju, L.tigrinus, L. squarrulosus, L.strigosus, Schizophyllum commune, Tremella fuciformis* and *T. mesenterica.*

For diversity study, the sampling period were divided into two seasons (Wet season - April to September and Dry season - October to March). The fungal

specimens were collected randomly by laying out line transects of size 500 x 40 m three times in each study sites following the methods by (O'Dell *et al*., 2004; Labilles, *et al*., 2016) with modifications. Each fruiting body was taken as one sample. Each site was visited two times for each season. For diversity calculation, the unidentified fungal specimens were also taken into account.

The diversity indices were calculated using the standard protocol, Simpson's Index (Simpson 1949) and Shannon-Weiner's diversity index were used (Shannon, 1948). The Pielou's measure of species evenness was estimated (Pielou, 1966) and the species richness was measured using Margalef's richness index (Margalef, 1958). The percentage of species occurrence was also calculated following (Zothanzama, 2011a) with modifications.

Shannon's diversity Index (H_s)

The index assumes that individuals are randomly sampled from an infinitely large community (Shannon, 1948) and that all species are represented in the sample. The Shannon's Index is calculated from the equation-

$$H_s = -\sum p_i l_n p_i$$

Where p_i = the proportion of individuals found in the i^{th} species

Or $p_i = n_i/N$

Where n_i =the abundance of the individual in the i^{th} species.

N = the abundance of all the species.

Simpson's Index of Dominance (D_S)

Simpson (1949) gave the probability of any two individuals drawn at random from an infinitely large community belonging to the same species.

The form of the index appropriate for a finite community is represented by

$$D_s = \sum [\{ni\ (ni-1)\}/\{N(N-1)\}]$$

Where, n_i =No. of individuals of the i^{th} species

N= total no. of individual

As the Simpson's index values increases, diversity decreases. Simpson index is therefore usually expressed as "1- D" or "1/D".

Species Evenness:

The evenness of a community can be represented by Pielou's evenness index (Pielou, 1975)

J’ = H’/H’max

Where, H’ is the number derived from the Shannon diversity index and H’max is the maximum possible value of H’ (if every species was equally as likely) equal to:

$$H'_{\max} = -\sum_{i=1}^{S} \frac{1}{S} \ln \frac{1}{S} = \ln S.$$

Margalef’s Diversity Index

The Margalef’s diversity index (Margalef, 1958) expressed as ’d’ can be calculated in a spreadsheet by using the formula

d = (S – 1)/ ln N

Where S is the number of species, and N is the total number of individuals in the sample.

Percentage of Occurrence

The percentage of species occurrence was also calculated following (Zothazanma, 2011a) with modifications.

The percentage of occurrence (%) of each fungal species was calculated as follows:

$$(\%) = \frac{\text{No. of sites in which species is present}}{\text{Total No. of Sites}} \times 100$$

The highest value of Shannon’s Index was recorded in Dampa Tiger Reserve Forest i.e. 3.80 in wet season during the period of 2016-2017 and the lowest value was seen in Thorang Wildlife Sanctuary i.e. 2.05 in the dry season during the period of 2016-2017.

The overall highest value of Simpson’s Index was recorded in Dampa Tiger Reserve Forest i.e. 0.98 in wet season during the period of 2017-2018 and the lowest value was seen in Murlen National Park i.e. 0.73 in the dry season during the period of 2017-2018.

The overall highest value of Pielou’s Eveness index was recorded in Murlen National Park i.e. 0.93 during 2017-2018 in the wet season and the lowest value of 0.55 in Dampa Tiger Reserve Forest in the dry season during 2016-2017.

The highest value of Margalef’s Diversity Index of Species Richness (DMg) was seen in Dampa Tiger Reserve Forest during 2017 – 2018 in the wet season i.e.

13.35 and the lowest value of 5.32 in Tokalo Wildlife Sanctuary during 2017 – 2018 in the dry season.

The diversity indices shows higher values in the wet season of the year in all the the study sites. Most of the fleshy, jelly and gilled wood rotting fungi like *Bisporellus citrina, Coprinellus dessimentus, Cookeinia tricholoma, Favolaschia pustulosa, Fistulina hepatica, Lentinus edodes, Tremella fuciformis, T. mesenterica* etc. were recorded in the rainy seasons as this period is favourable for their production, since there was adequate amount moisture, favourable temperature, relative humidity. While the dry season collection was predominated by the polypores like *Daedalea quercina, Ganoderma sps, Microporus xanthopus, Trametes hirsutum, T. trogii, Xylobolus subpileatus* etc., which may be due to their tough texture and large sized fruiting bodies, and their unique adaptations of surviving for several periods.

In the comparative study of a disturbed and undisturbed forests i.e. Tanhril forest (Disturbed) and Hmuifang Reserve Forest (Undisturbed). 46 species were identified from both the study sites, 42 belonging to the phylum basidiomycota and 4 belong to the ascomycota all of them falling under 13 families and 26 genera. It was observed that a total of 21 species were common to both the forests wherein 19 species were found only found in Hmuifang forest and 6 species were present only in Tanhril forest. Polyporaceae is the dominant family and *Microporus xanthopus* represents the most abundant species in both the study sites with species number of 56 and 76 in Hmuifang and Tanhril forests respectively.

The diversity indices were found to be 3.31 and 2.99 for Shannon's index, 0.95 and 0.90 for Simpson's index at Hmuifang and Tanhril respectively. The species richness indices were 1.91 and 1.22 for Menhinick's index, 6.41 and 3.98 for Margalef's index at Hmuifang and Tanhril forest respectively. The Pielou's eveness index was 0.54 in Hmuifang and 0.51 in Tanhril forest respectively. Following reports of earlier workers it follows in general that fungal diversity are effected by plant-tree species diversity. In the present study, although the tree diversity of Tanhril Forest was higher as compared to Hmuifang Forest, however, the species diversity of wood rotting fungi was higher in Hmuifang forest as compared to Tanhril forest which may be due to higher altitude, low temperature, high relative

humidity, soil moisture content and experiences higher amount of rainfall annually which in turn have a great impact on the type of vegetation. Also, Hmuifang forest is a community reserved forest and is free from anthropogenic activities, whereas Tanhril forest experiences various kind of anthropogenic disturbances from the on-going development activities of Mizoram University Campus and collection of the dead wood and logs for fuel-wood by the nearby villagers. Moreover, forest thinning and clear cutting alter the fungal community and can reduce the production of sporocarps due to lack of substrate to grow on.

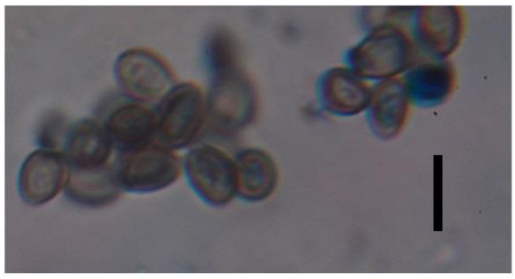
It may be concluded that there is abundant richness of the wood rotting fungi in Mizoram as evident from collection study from the selected sites. The present study presents a total of 81 species which may be fraction of the total species that is present through taxonomic identification. The comparative study of a disturbed and undisturbed forest also shows the difference in the diversity and richness.

The study highlighted the species description, composition and the diversity of the wood rotting fungi in the selected sites. The study also provides an important baseline data on the wood rotting fungi of the state as to their occurrence and diversity in the different sites and with the seasons which may be an important source for future references.

From the current findings it is observed that the diversity of the mushrooms is rich in the state which is evidently proved with an addition of a new species *Ganoderma mizoramense* into the fungal kingdom. The comparative study between disturbed and undisturbed forest on the diversity of the wood rotting fungi also gives evidence of the importance of conservation of forests and the effects of disturbances on the species richness in the selected forests.

It would be valuable to continue and maintain a long-term monitoring of these species to understand the nature of diversity and succession influenced by numerous environmental factors both biotic and abiotic, as well as the complex interactions among them.

B



C

Photo Plate: 1. *Amauroderma rude*
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

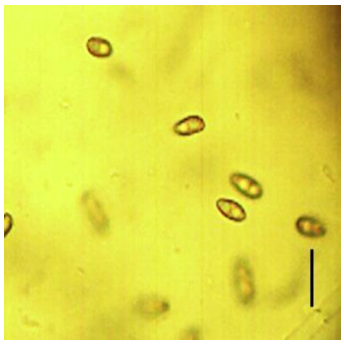
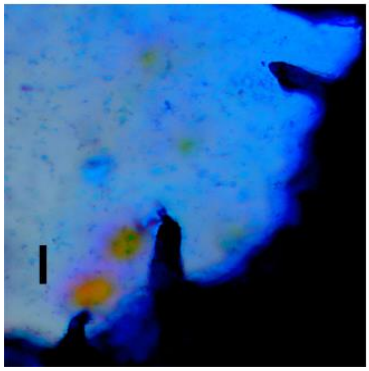


Photo Plate: 2. *Amauroderma rugosum*
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A

B



C

Photo Plate: 3. *Aporpium strigosum*
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

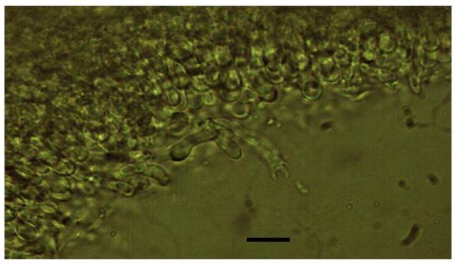
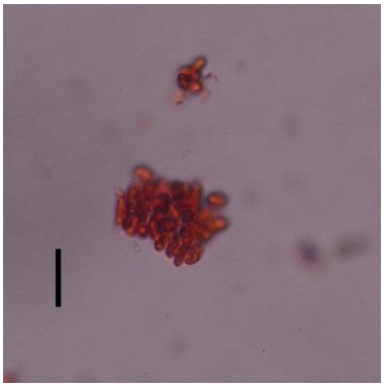


Photo Plate: 4. *Auricularia auricula-judae*
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm

A

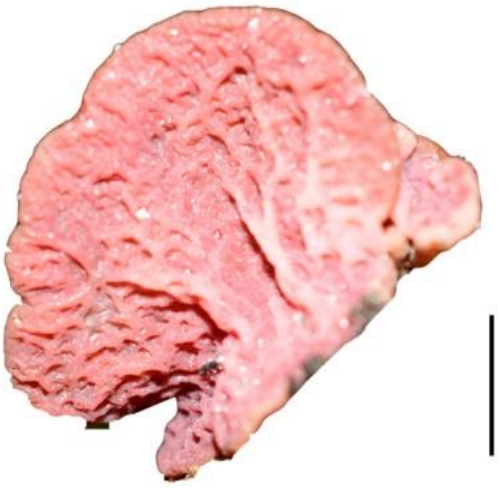
B



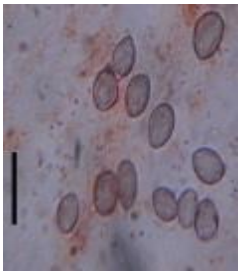
C

Photo Plate: 5. ***Auricularia cornea***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A



B



C

Photo Plate : 6. ***Auricularia delicate***

A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

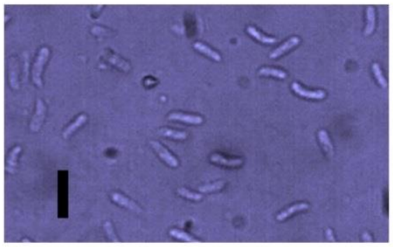


Photo Plate : 7. ***Auricularia mesenterica***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

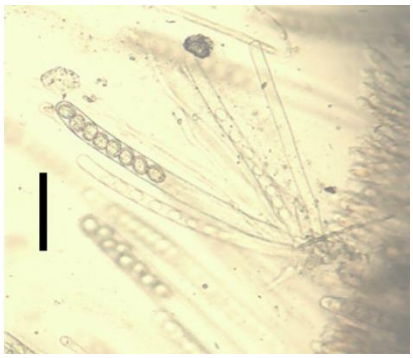
A

B

Photo Plate : 8. ***Auricularia polytricha***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm;

A

B

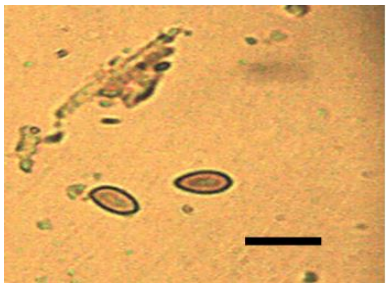


C

Photo Plate: 9*. Bisporella citrina*
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 20µm

A

B



C

Photo Plate: 10. ***Coprinellus disseminatus***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

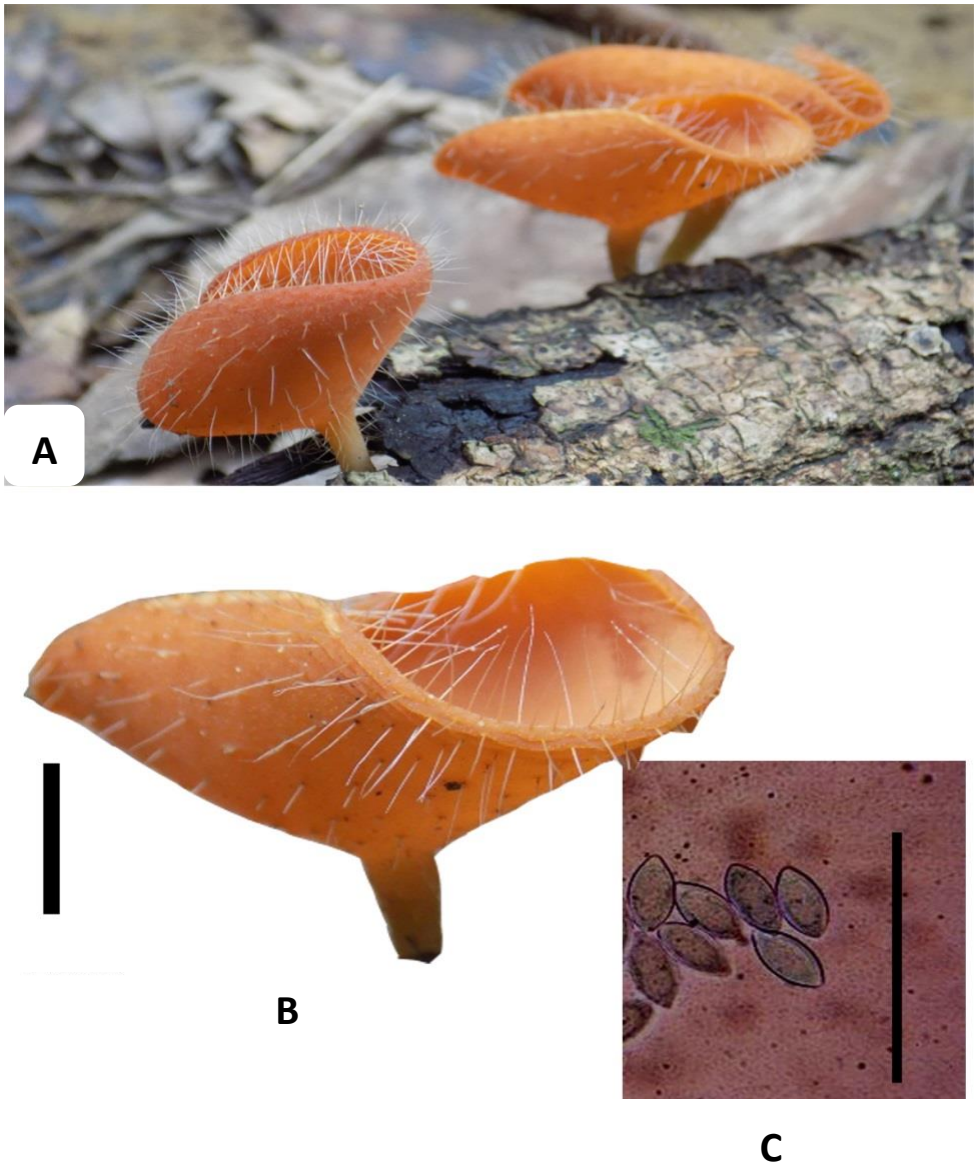


Photo Plate: 11. ***Cookeina tricholoma***

A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 20µm

A

B

C

Photo Plate: 12. ***Coriolopsis aspera***
A. Field Photo
B. Close-up Photo (Upper Surface)
C. Close-up Photo (Lower Surface)
Scale Bar: **B & C** = 2cm.

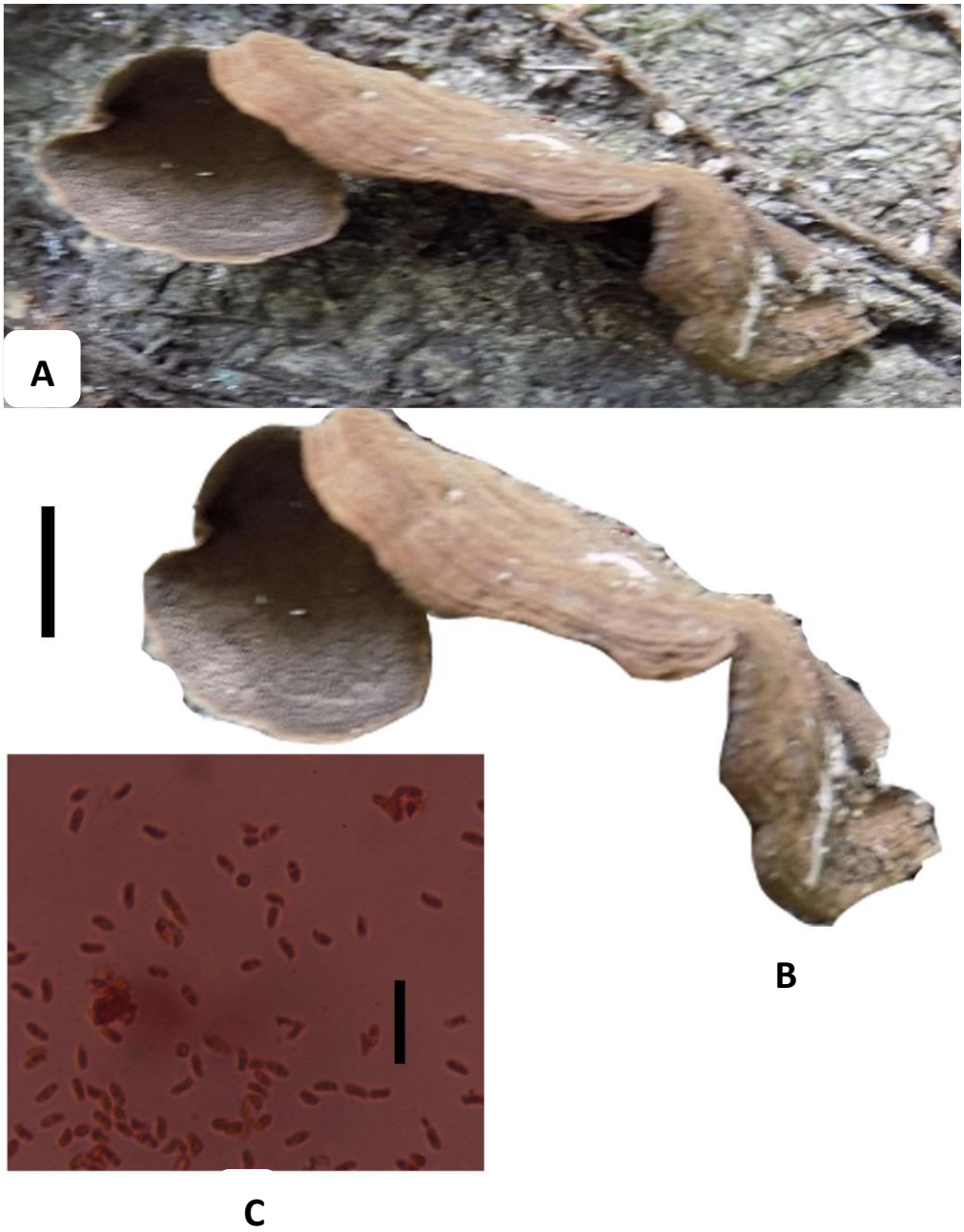
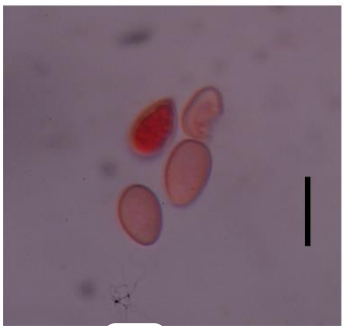


Photo Plate: 13. ***Cyclomyces tabacinus***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** =20µm

A

B



C

Photo Plate: 14. *Cyathus striatus*

A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 1cm; **C** = 10µm

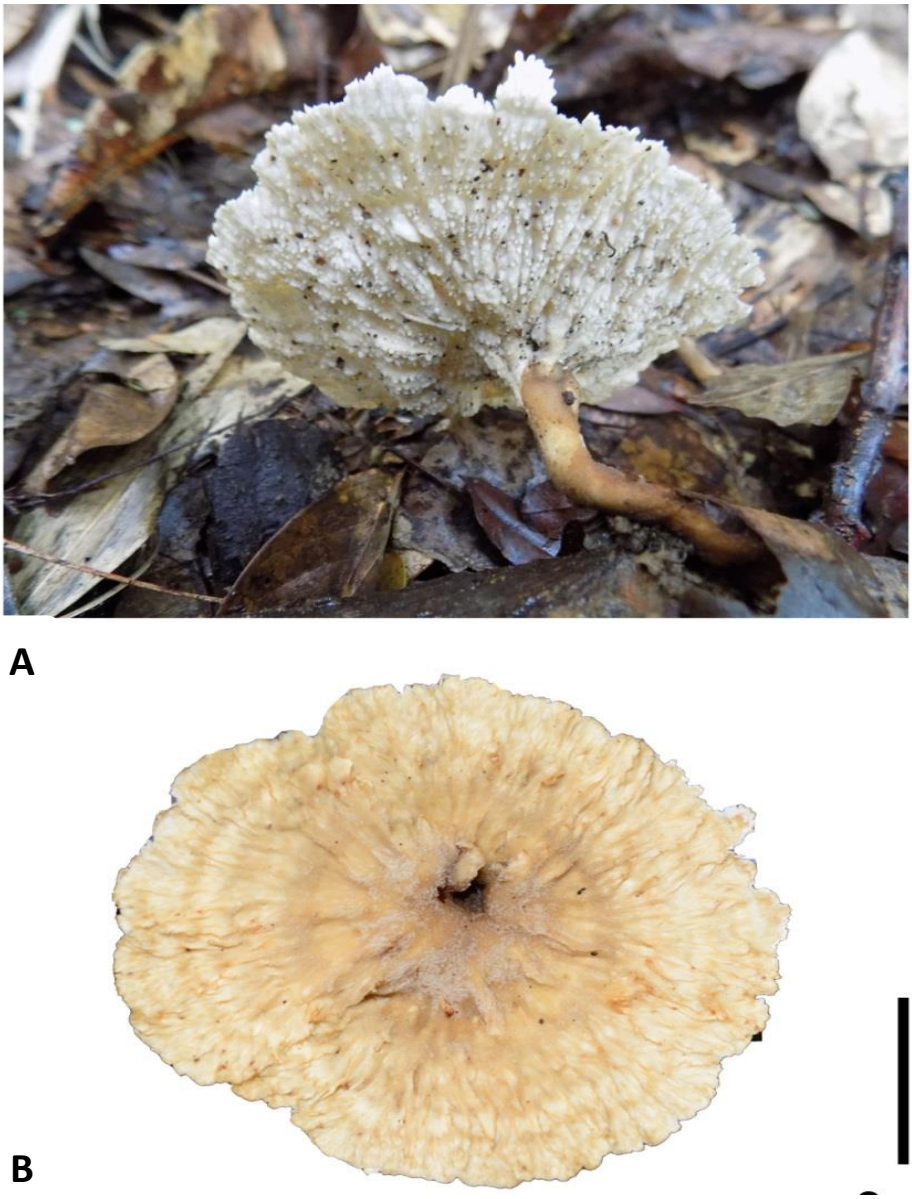


Photo Plate: 15. ***Cymatoderma dendriticum***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm

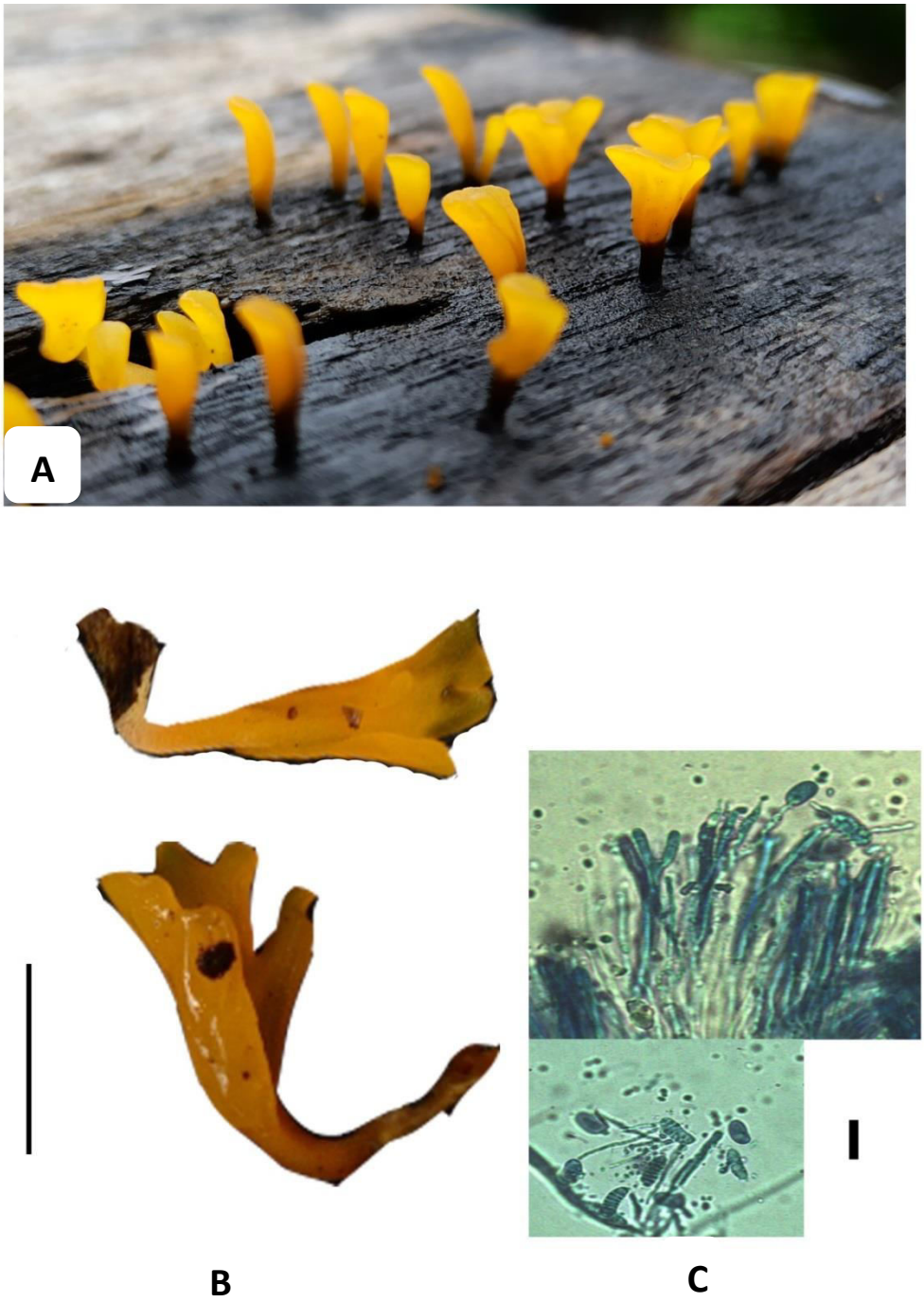
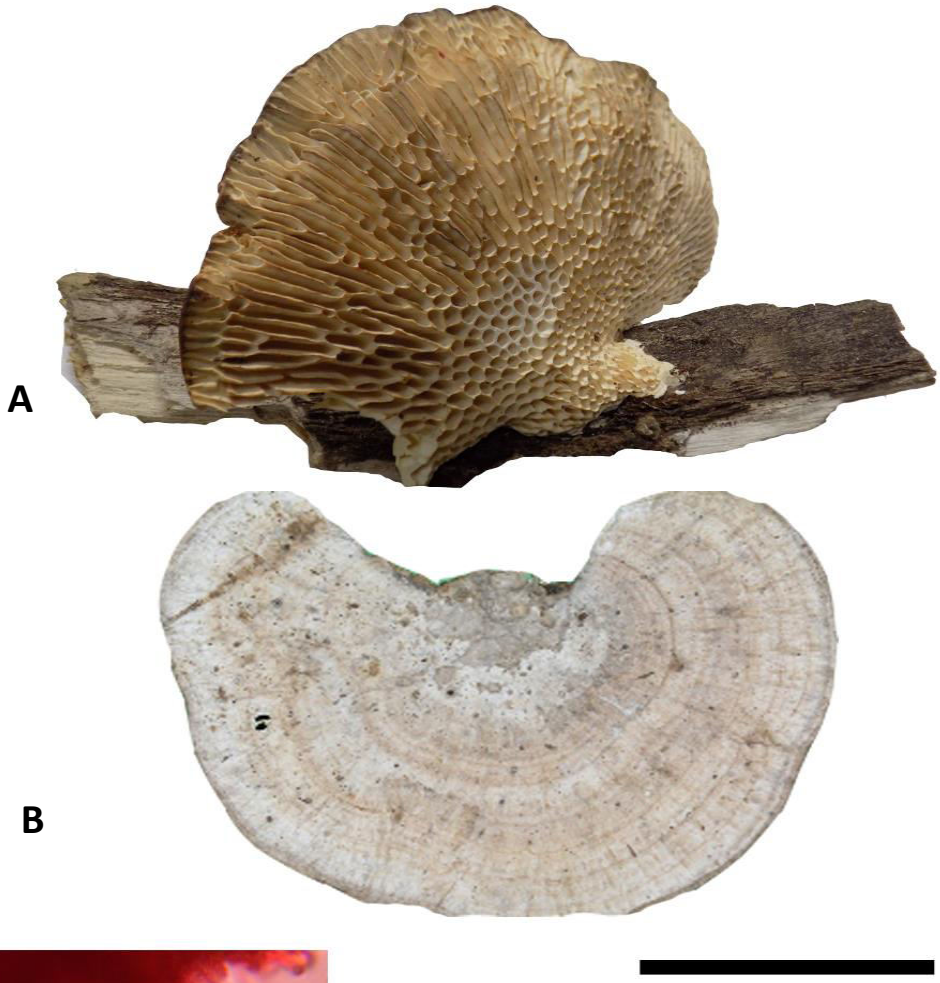


Photo Plate: 16. ***Dacryopinax spathularia***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm



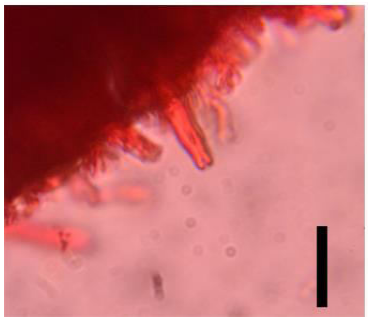


Photo Plate: 17. ***Daedalea circularis***
A. Field Photo
B. Close-up Photo
C. Microscopic (Basidium)
Scale Bar: **B** = 5cm; **C** = 10µm

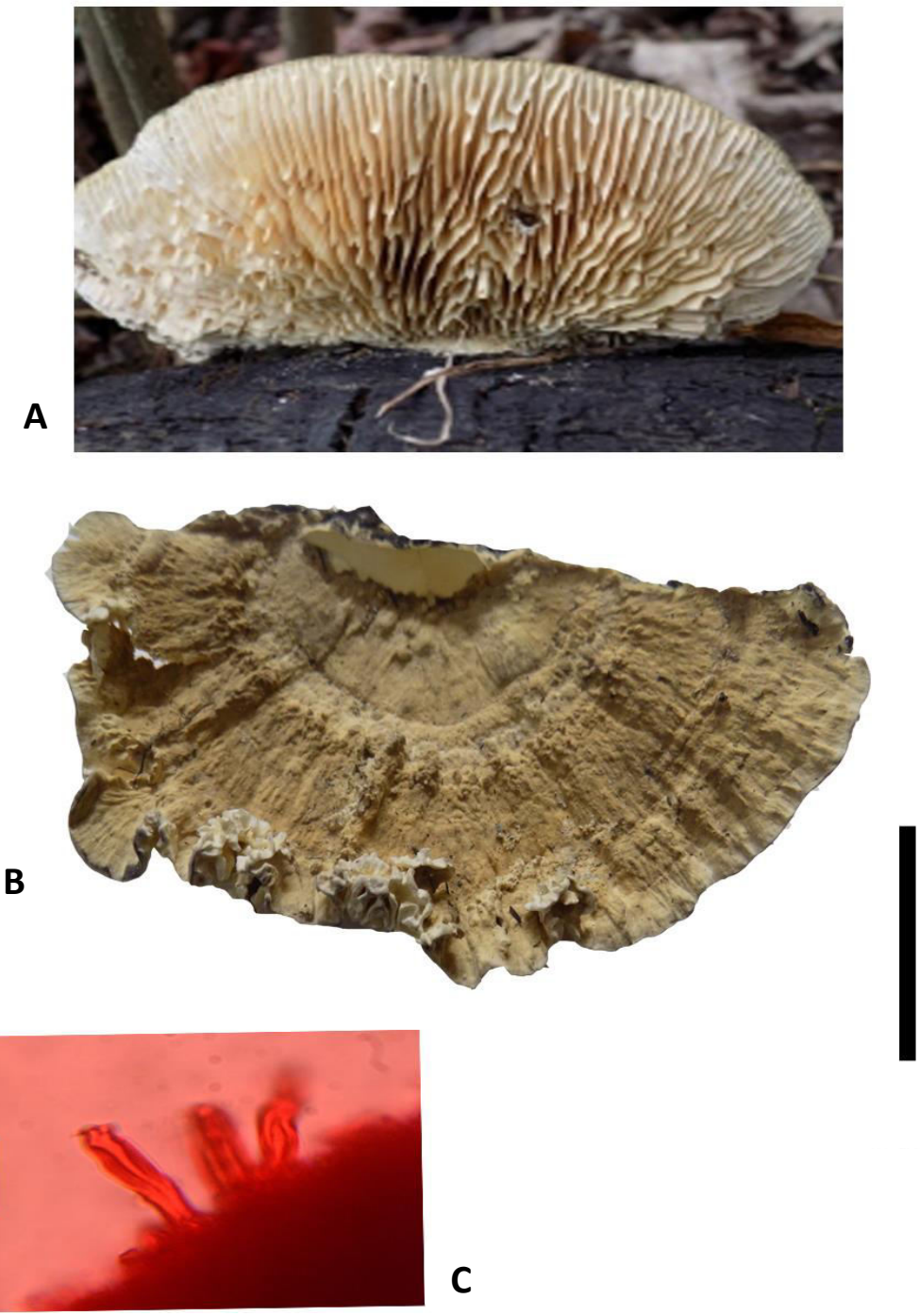


Photo Plate: 18. ***Daedalea confrogosa***
A. Field Photo
B. Close-up Photo
C. Microscopic (Basidium)
Scale Bar: **B** = 5cm; **C** = 10µm

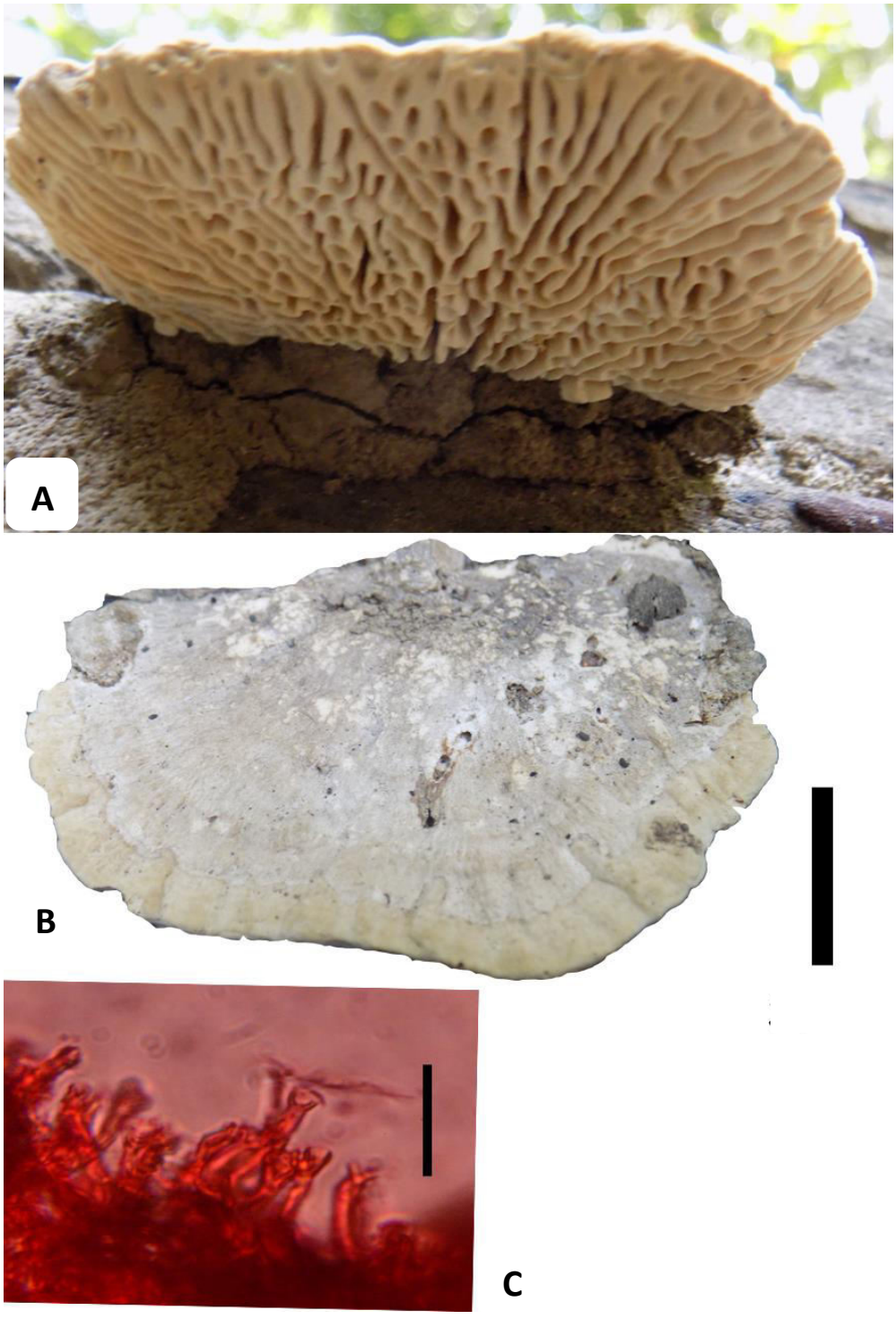


Photo Plate: 19. ***Daedalea quercina***
A. Field Photo
B. Close-up Photo
C. Microscopic (Basidium)
Scale Bar: **B** = 5cm; **C** = 20µm

A

B

C

Photo Plate: 20. ***Daldinia concentrica***
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 10µm

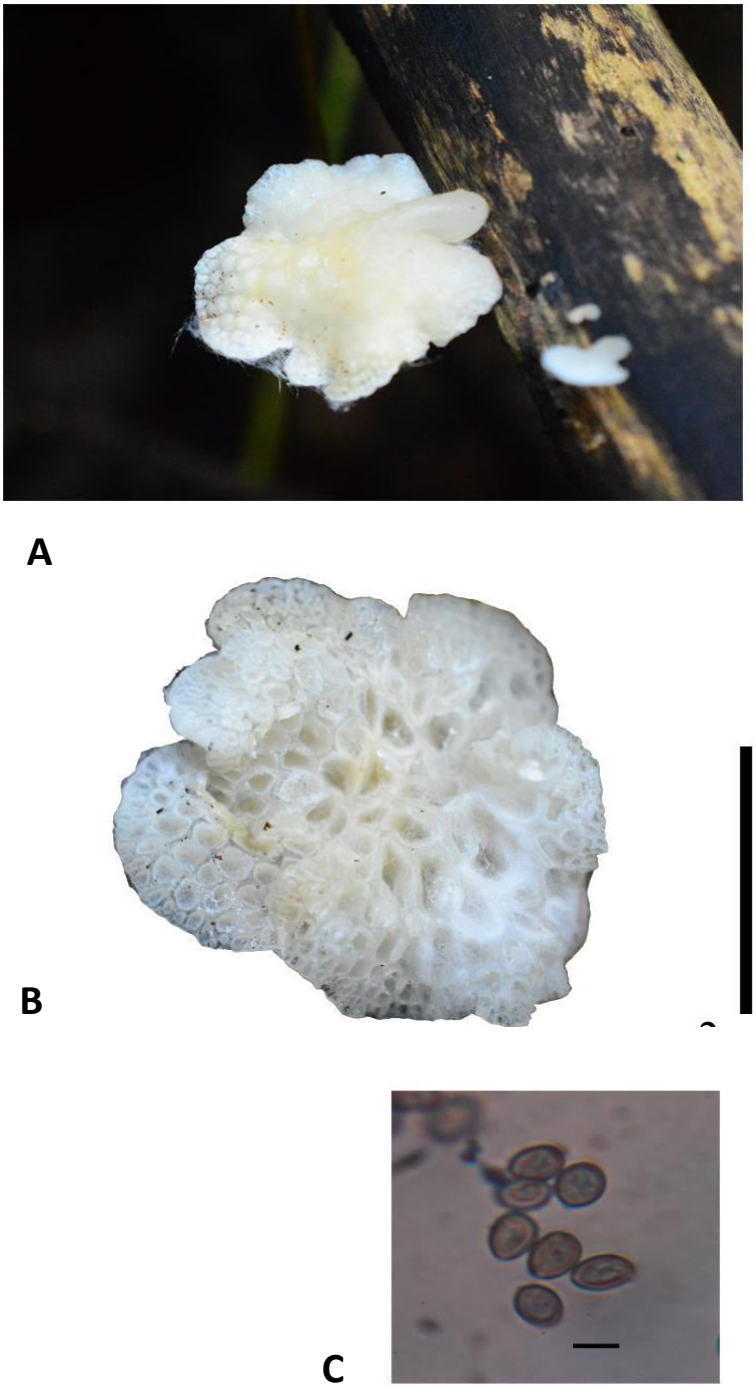
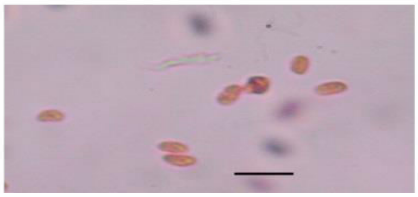


Photo Plate: 21. ***Favolaschia pustulosa***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm



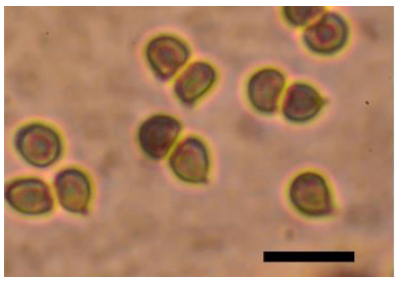
B

C

Photo Plate: 22. ***Filoboletus manipularis***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A

B



C

Photo Plate: 23. ***Fistulina hepatica***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

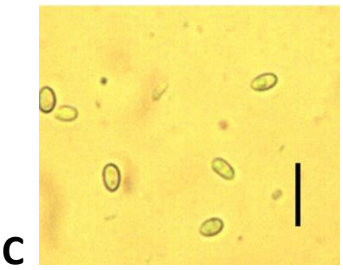
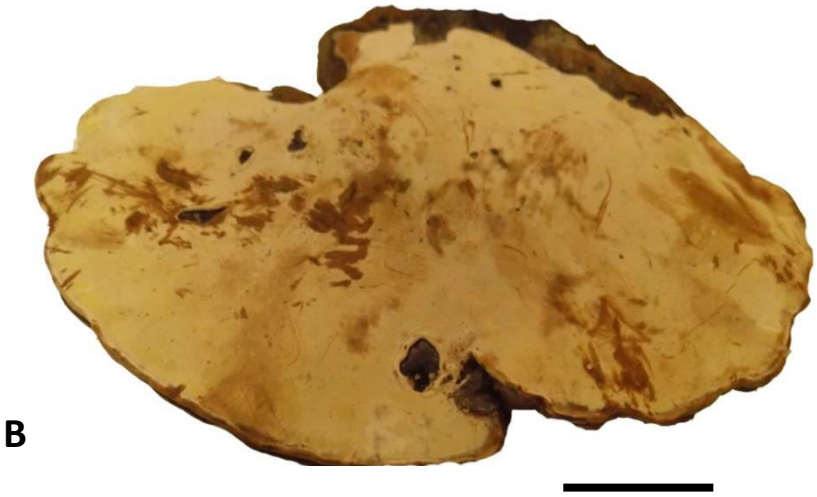


Photo Plate: 24. ***Fomitopsis dochmia***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm



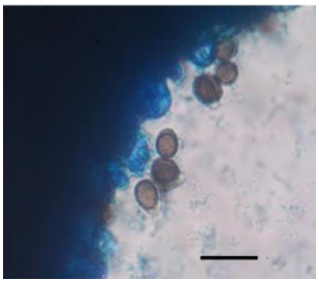


Photo Plate: 25. ***Ganoderma applanatum***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm

A

B

C

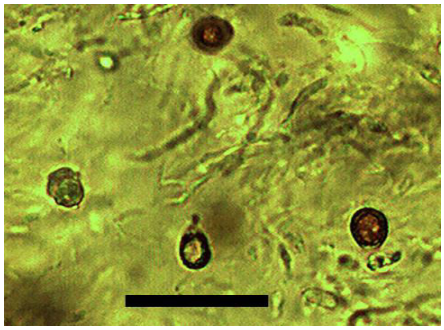
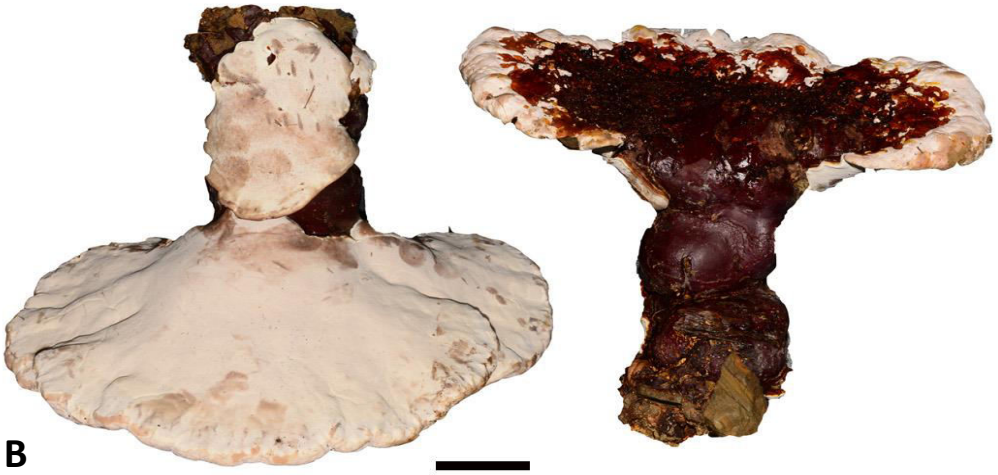


Photo Plate: 26. ***Ganoderma lucidum***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm

Photo Plate: 27. ***Ganoderma mastoporum***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm.



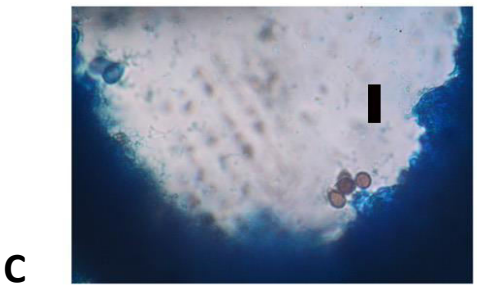


Photo Plate: 28. ***Ganoderma mizoramense***

A. Field Photo

B. Close-up Photo

C. Basidiospore

Scale Bar: **B** = 5cm; **C** = 10µm

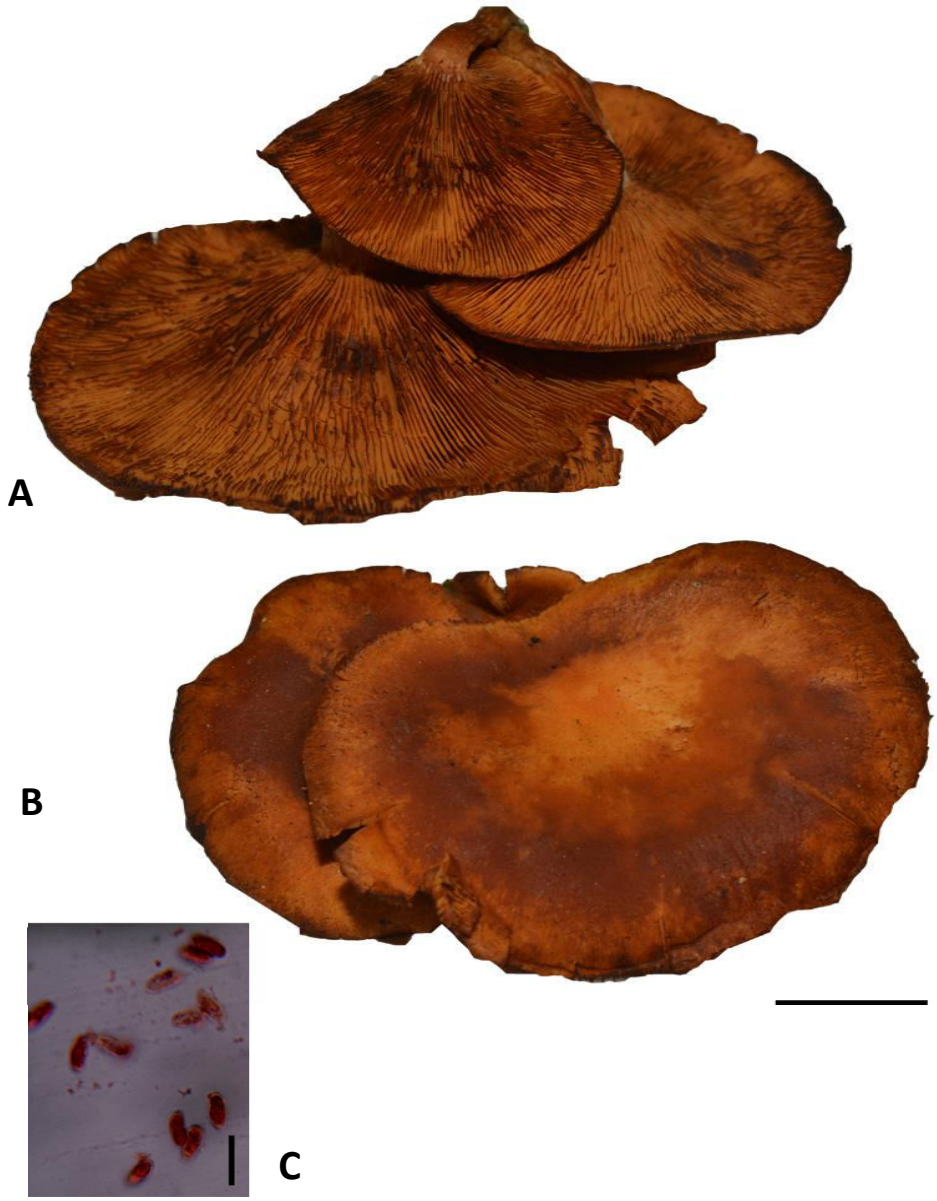
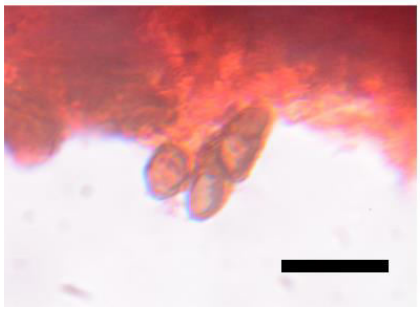


Photo Plate: 29. ***Gymnopilus spectabilis***
A. Close-up Photo (Lower Layer)
B. Close-up Photo (Upper Layer)
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A

B

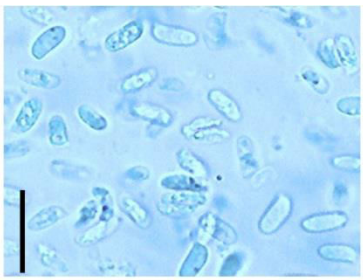


C

Photo Plate: 30. ***Hexagonia tenuis***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A

B

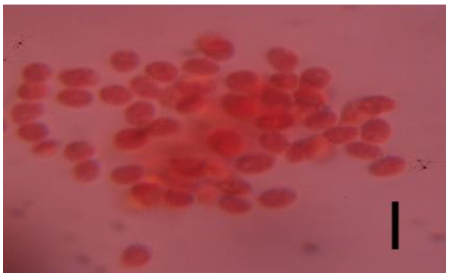


C

Photo Plate: 31. ***Hymenochaete villosa***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm

A

B

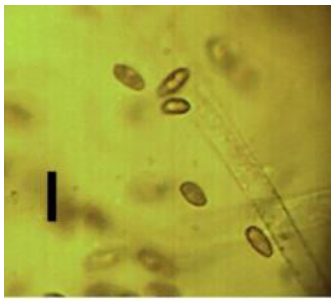


C

Photo Plate: 32. ***Laetiporus sulphurous***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 5cm; **C** = 10µm

A

B



C

Photo Plate: 33. ***Lentinula edodes***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

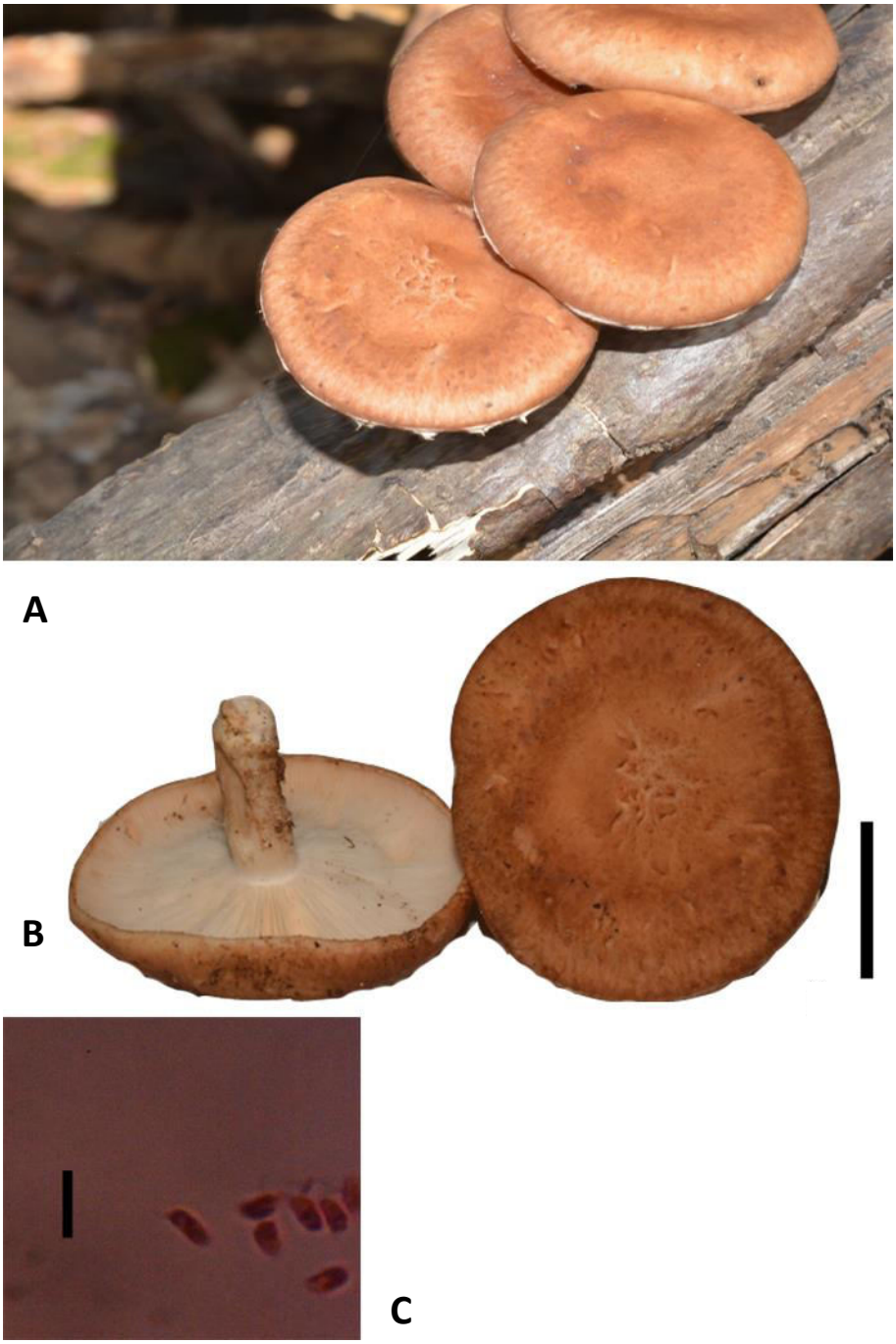
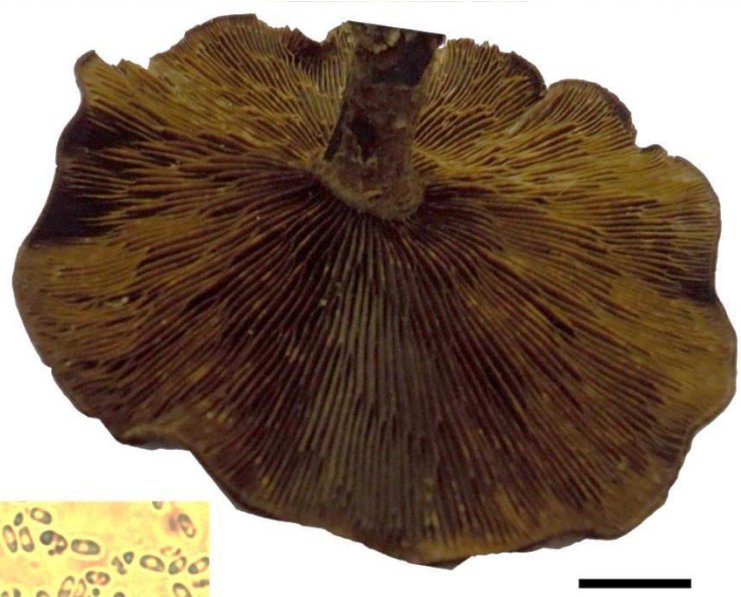
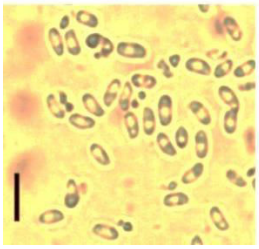


Photo Plate: 34. ***Lentinula lateritia***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A



B



C

Photo Plate: 35. ***Lentinus badius***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

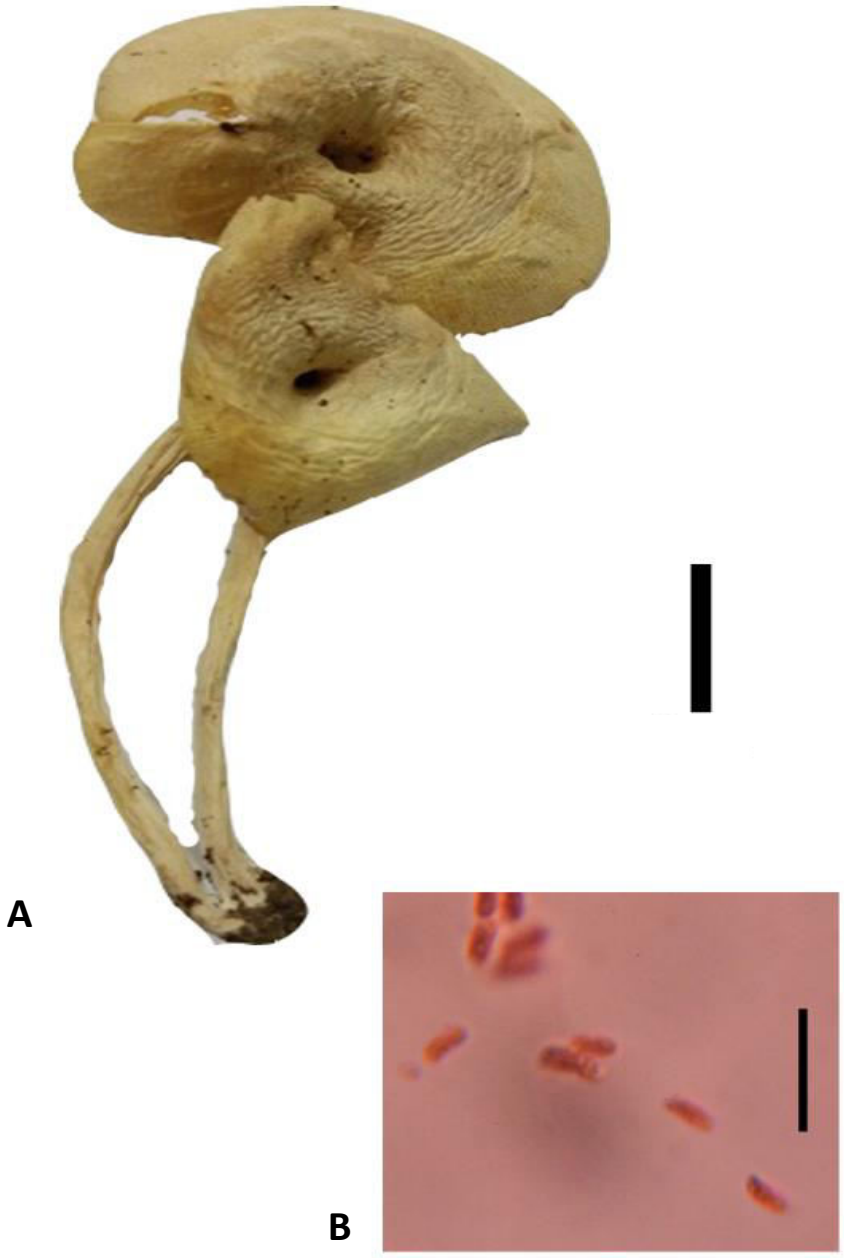


Photo Plate: 36. ***Lentinus concavus***
A. Close-up Photo
B. Basidiospore
Scale Bar: **A** = 2cm; **B** = 10µm

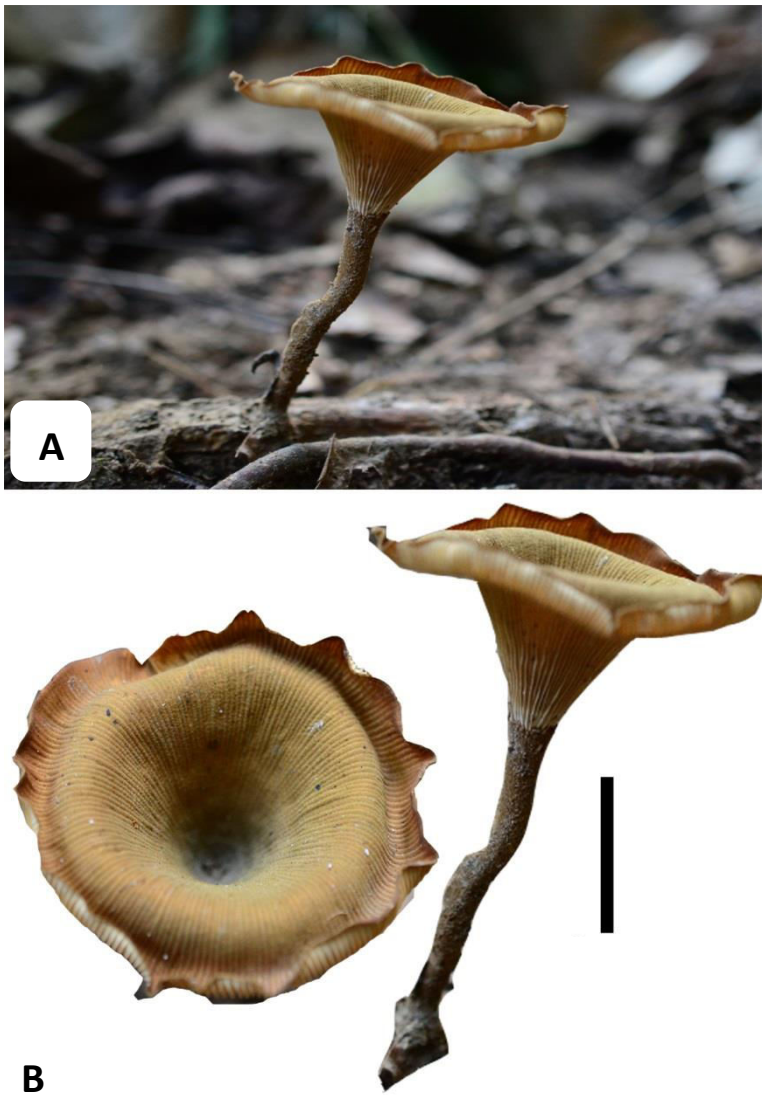


Photo Plate: 37. ***Lentinus crinitus***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm;

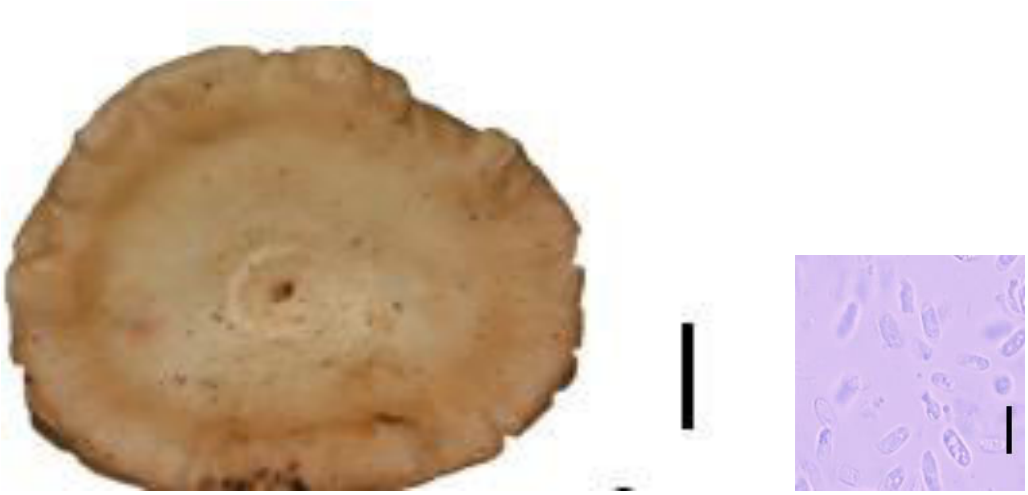
A

B

C

Photo Plate: 38. ***Lentinus polychrous***
A. Field Photo
B. Close-up Photo
C. Basidiospore
Scale Bar: **B** = 2cm; **C** = 10µm

A

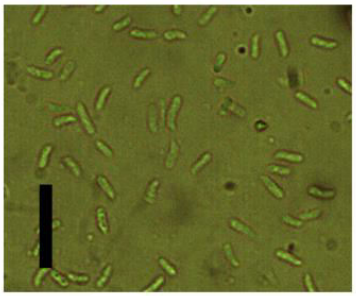


B C

Photo Plate: 39. ***Lentinus roseus***
A. Close-up Photo (Lower Layer)
B. Close-up Photo (Upper Layer)
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

A

B



C

Photo Plate: 40. ***Lentinus sajor-caju***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

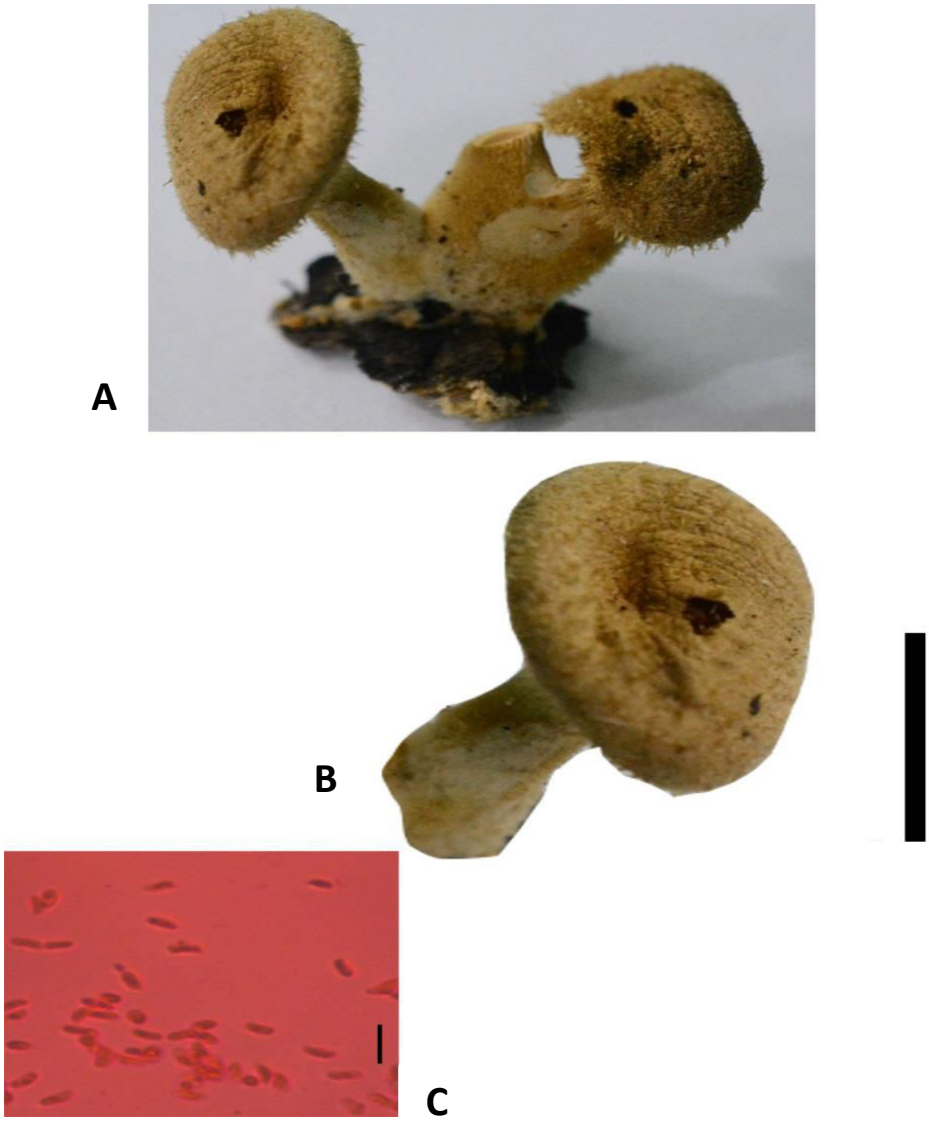


Photo Plate: 41. ***Lentinus strigosus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

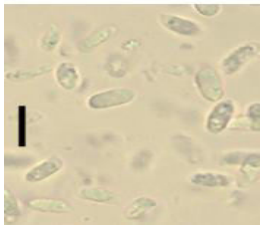


Photo Plate: 42. ***Lentinus squarrosulus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

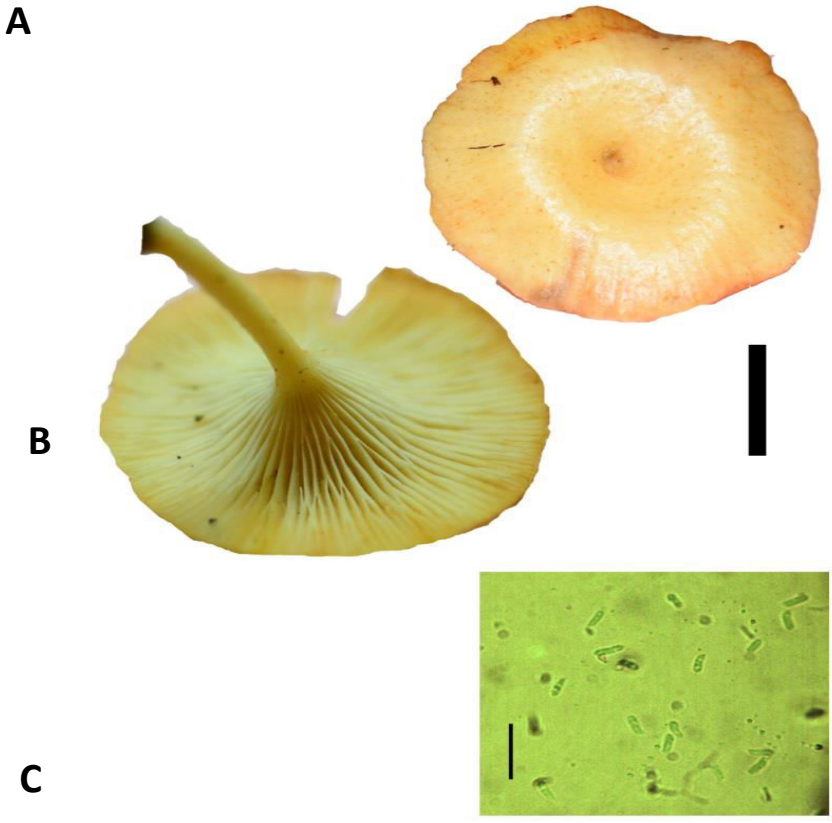


Photo Plate: 43. ***Lentinus tigrinus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

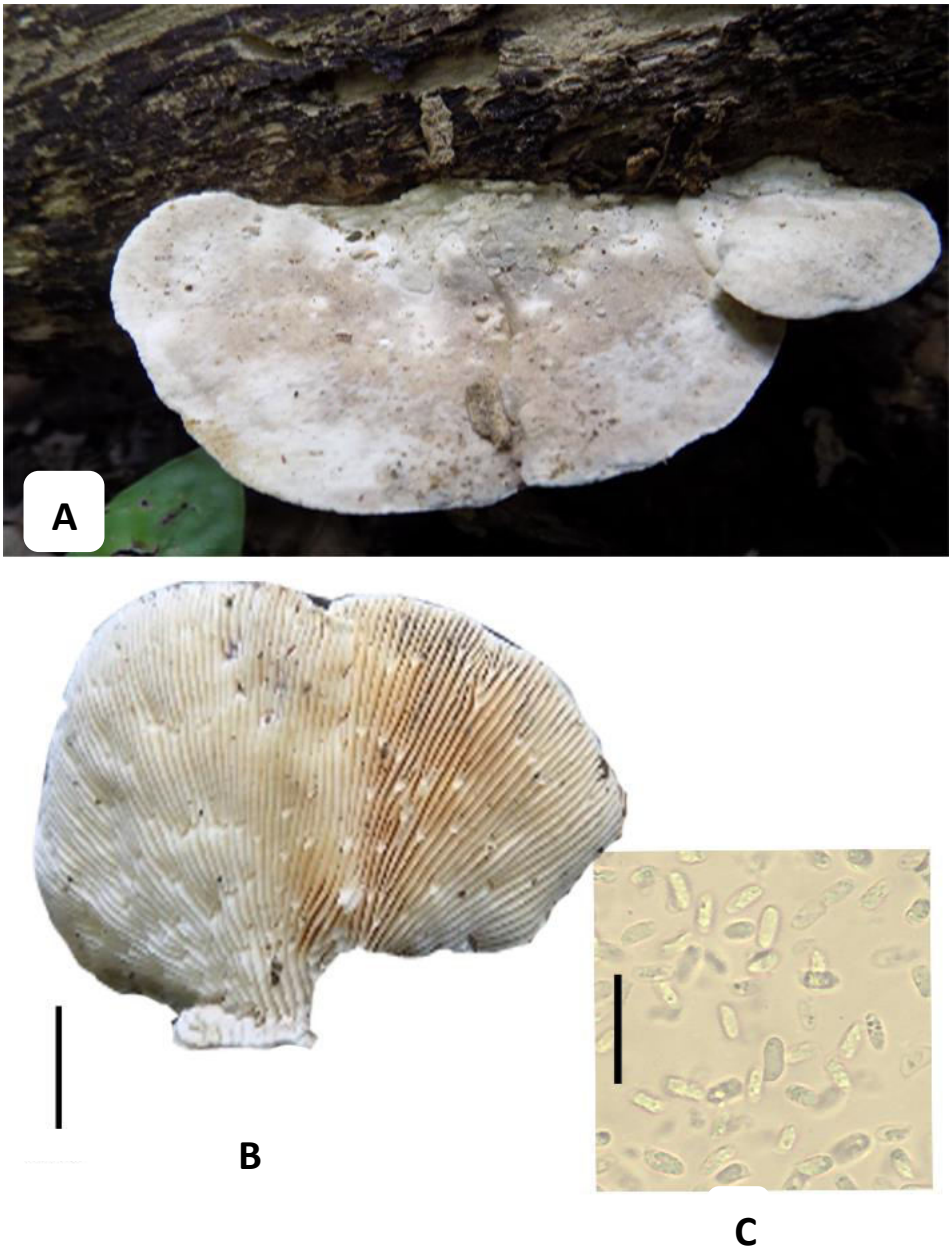


Photo Plate: 44. ***Lenzites acuta***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

A

B

Photo Plate: 45. ***Lenzites betulina***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm

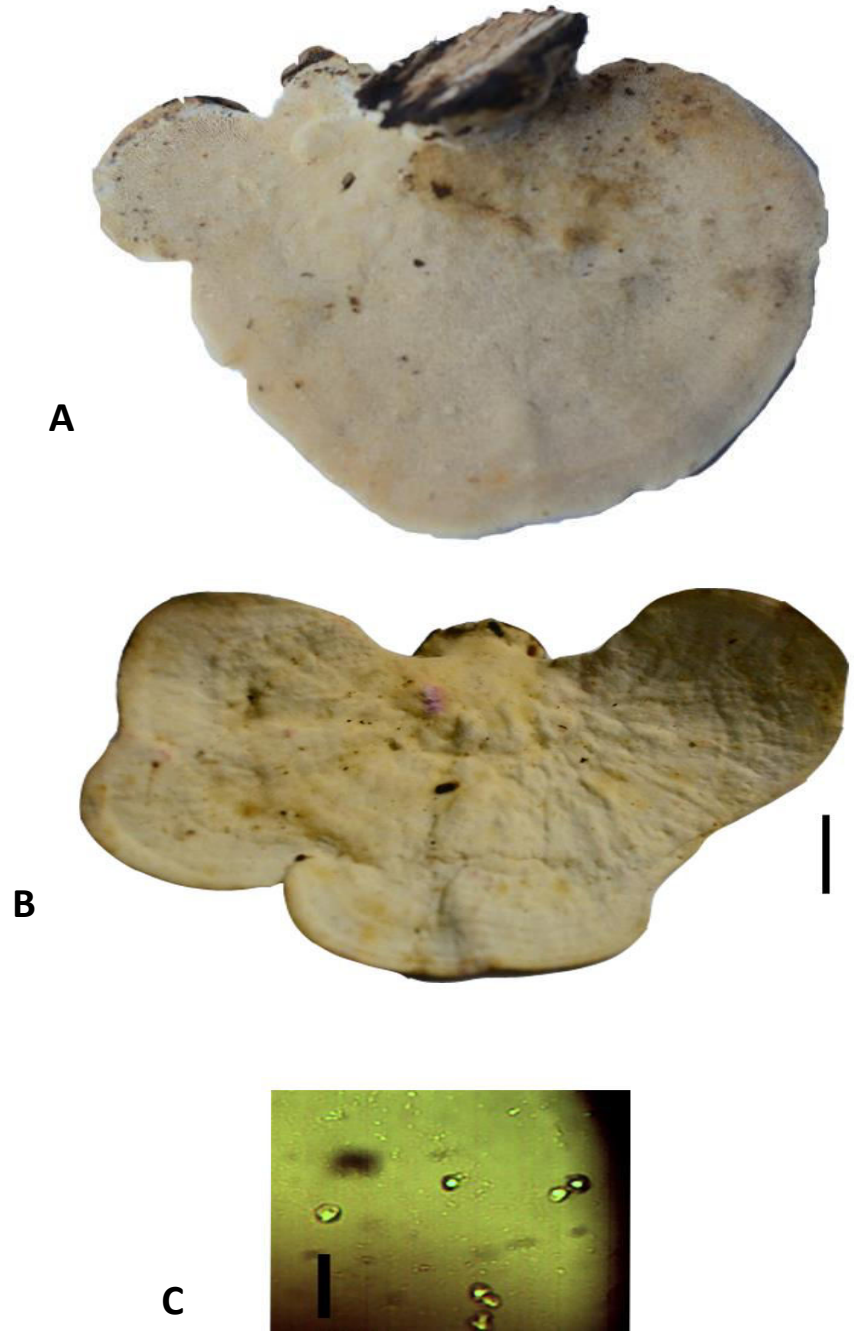
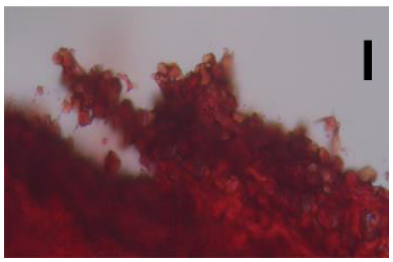


Photo Plate: 46. ***Lenzites elegans***
A. Close-up Photo (Lower Layer)
B. Close-up Photo (Upper Layer)
C. Basidiospores
Scale Bar: **B** = 5 cm; **C** = 10µm

A

B



C

Photo Plate: 47. ***Micromphale foetidum***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

A

B

Photo Plate: 48. ***Microporus affinis***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm

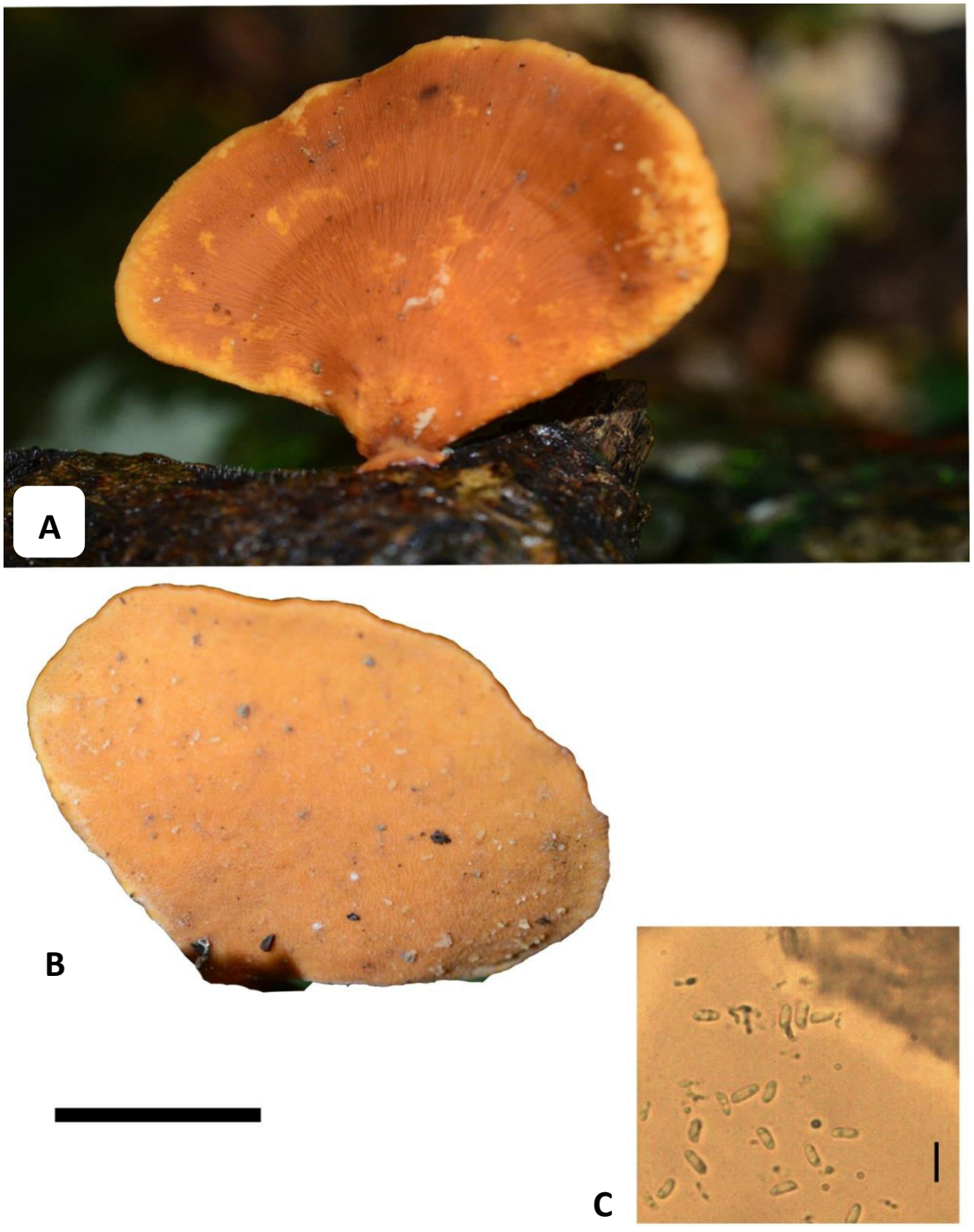


Photo Plate: 49. ***Microporus ochrotinctus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

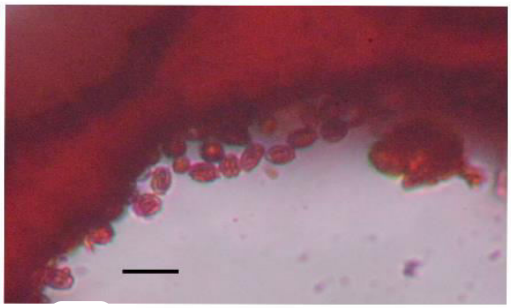


Photo Plate: 50. ***Microporus vernicipes***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

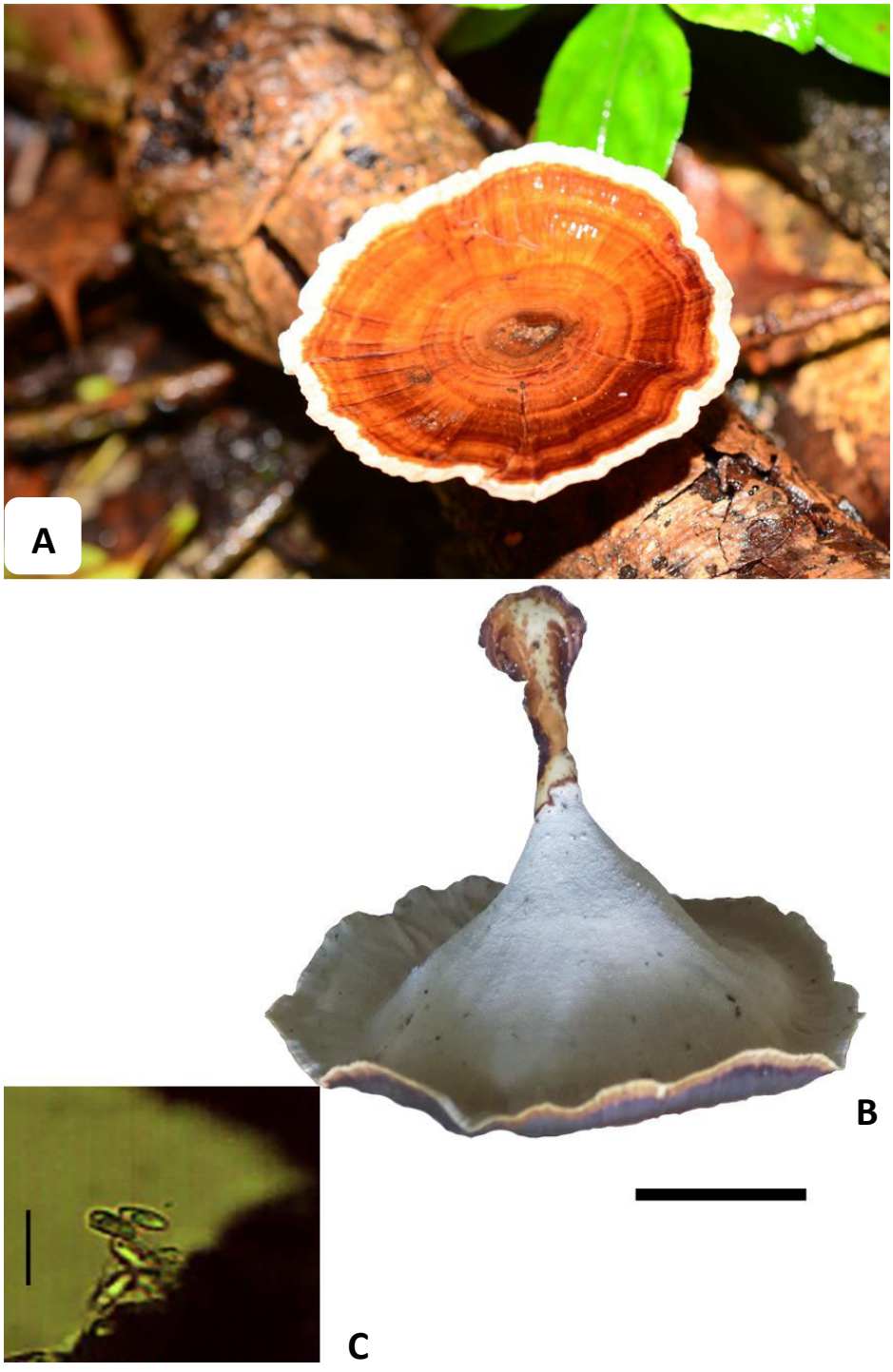


Photo Plate: 51. ***Microporus xanthopus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

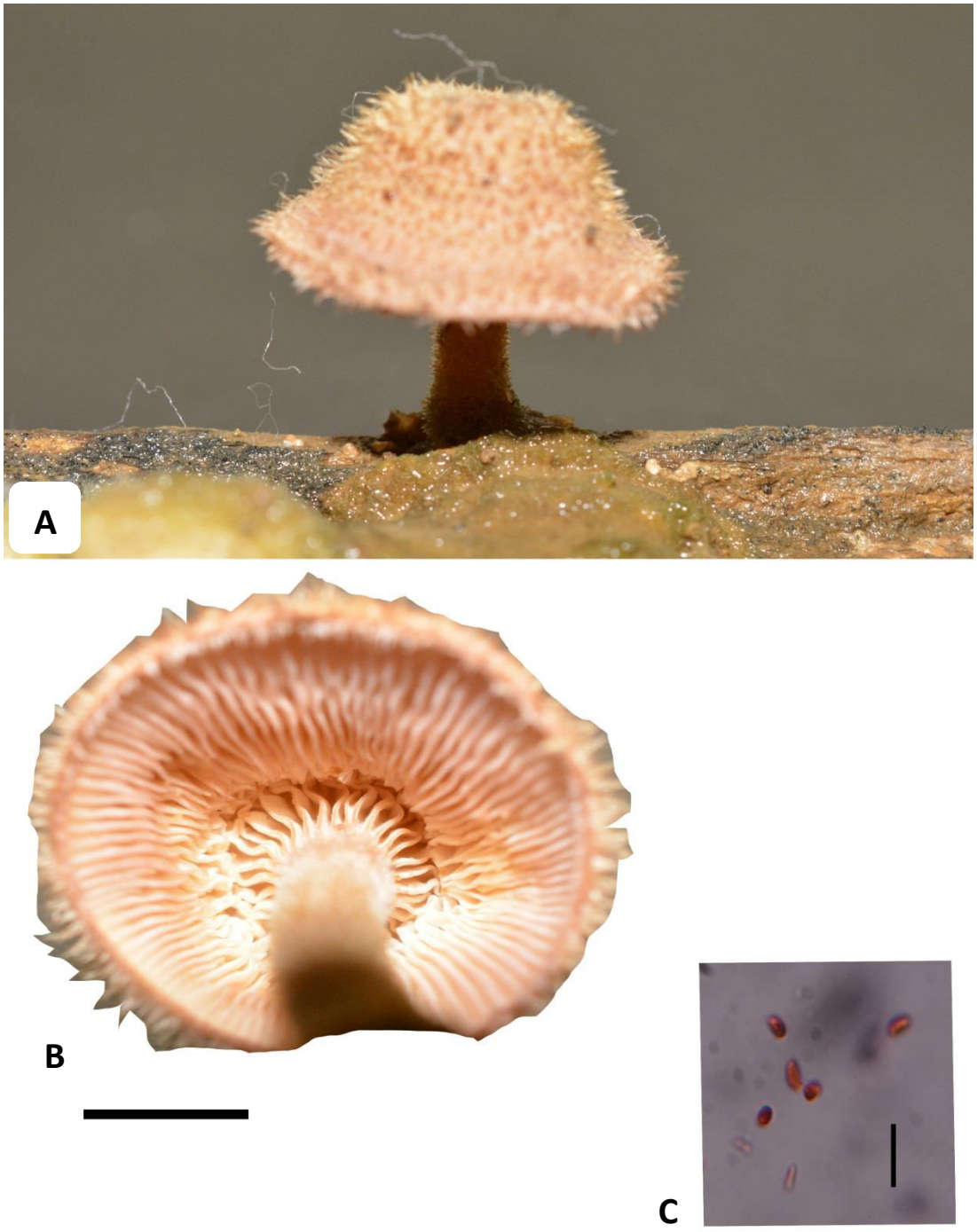


Photo Plate: 52. ***Panus fasciatus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

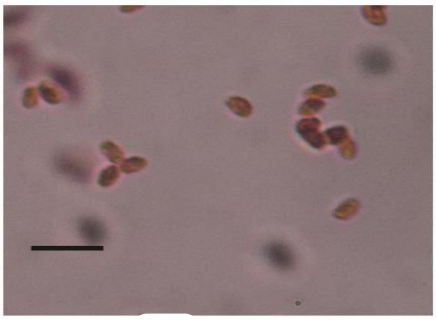


Photo Plate: 53. ***Pleurotus djamor***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

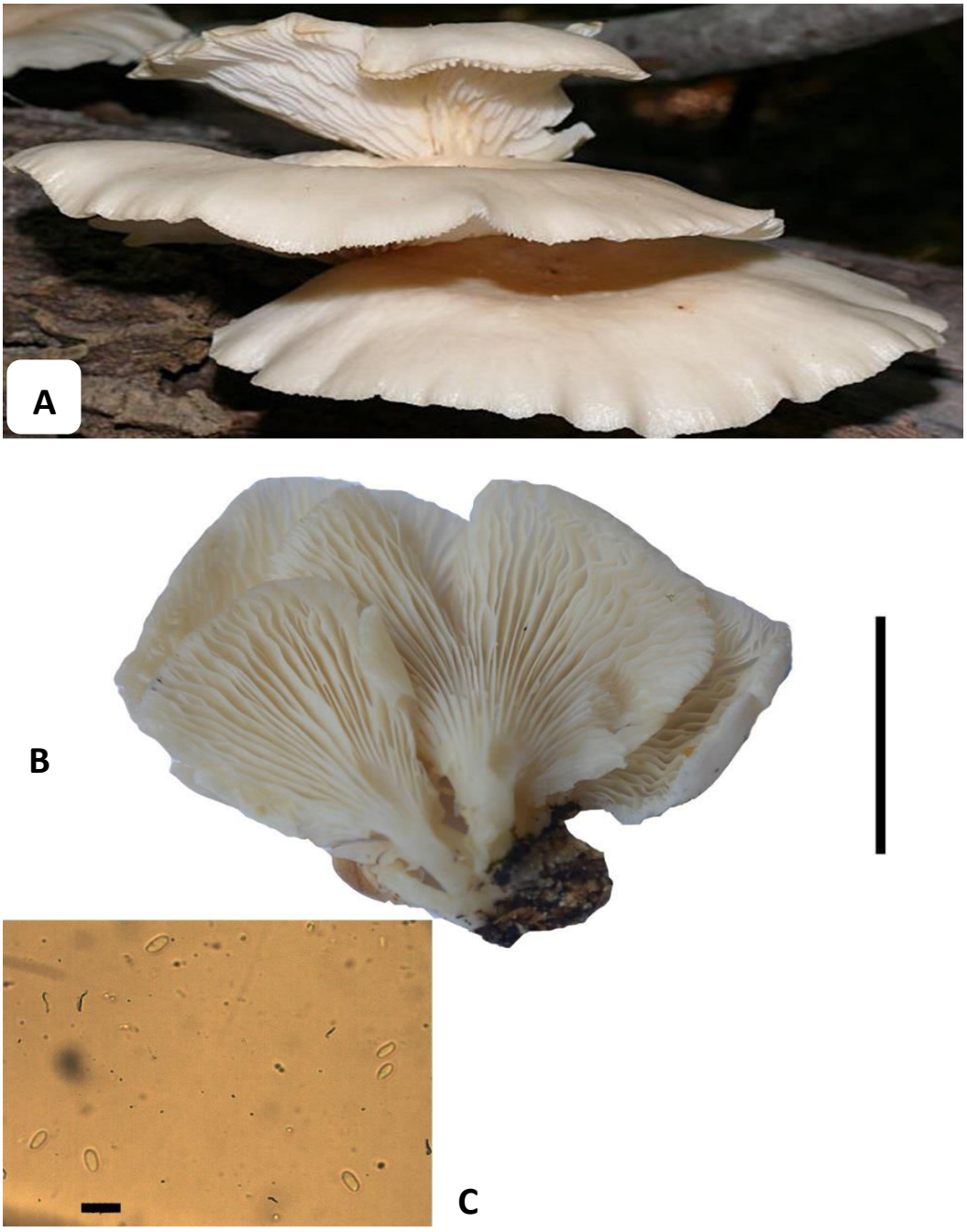


Photo Plate: 54. ***Pleurotus ostreatus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

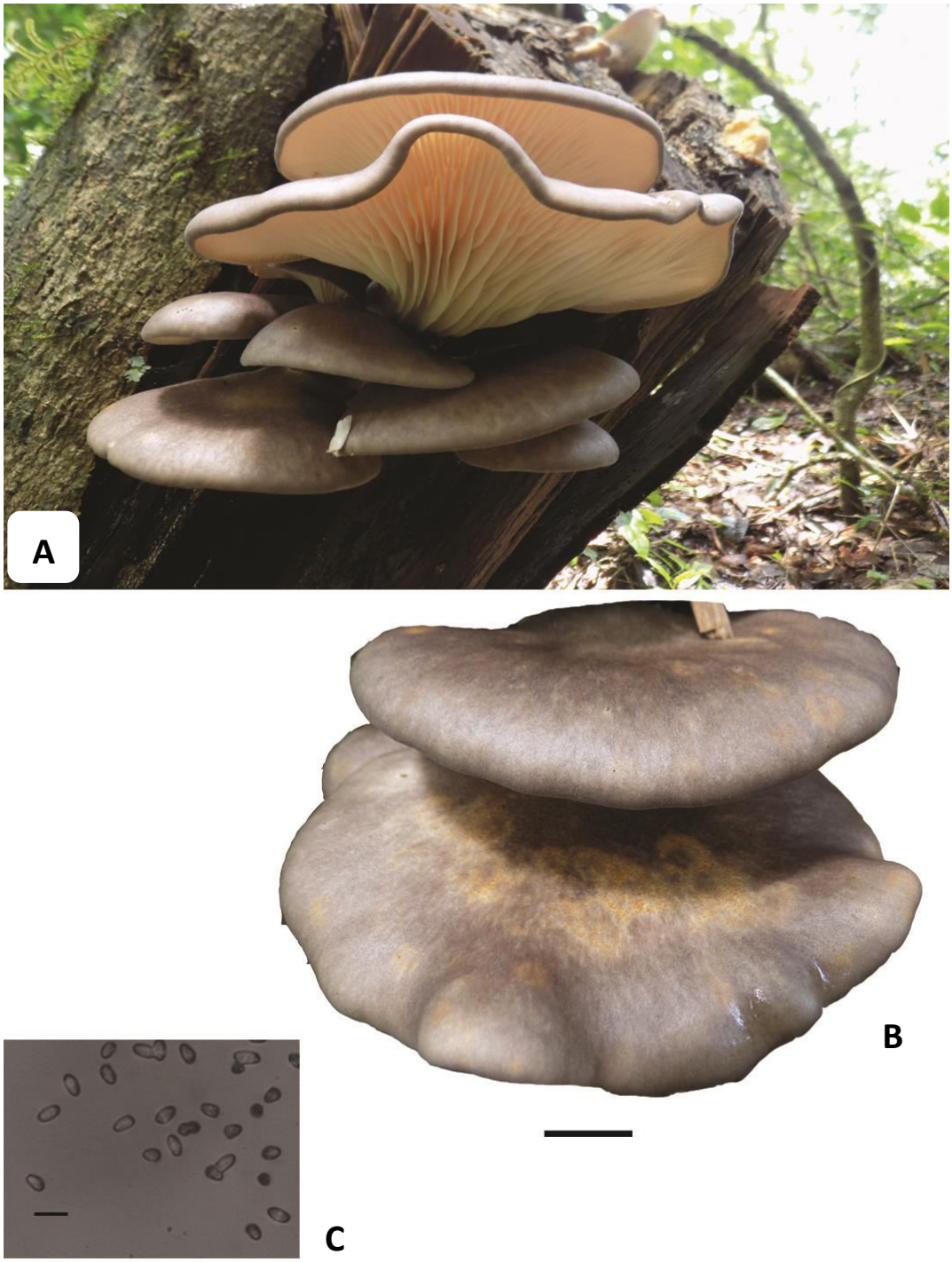
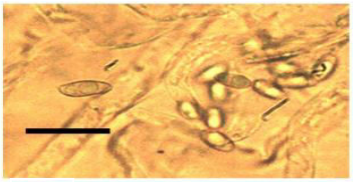


Photo Plate: 55. ***Pleurotus sajor-caju***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 5cm; **C** = 10µm

A



B

Photo Plate: 56. ***Polyporus alveolaris***
A. Close-up Photo
B. Basidiospores
Scale Bar: **A** = 2cm; B = 10µm

Photo Plate: 57. ***Polyporus arcularius***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 20µm

B

C

Photo Plate: 58. ***Polyporus badius***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

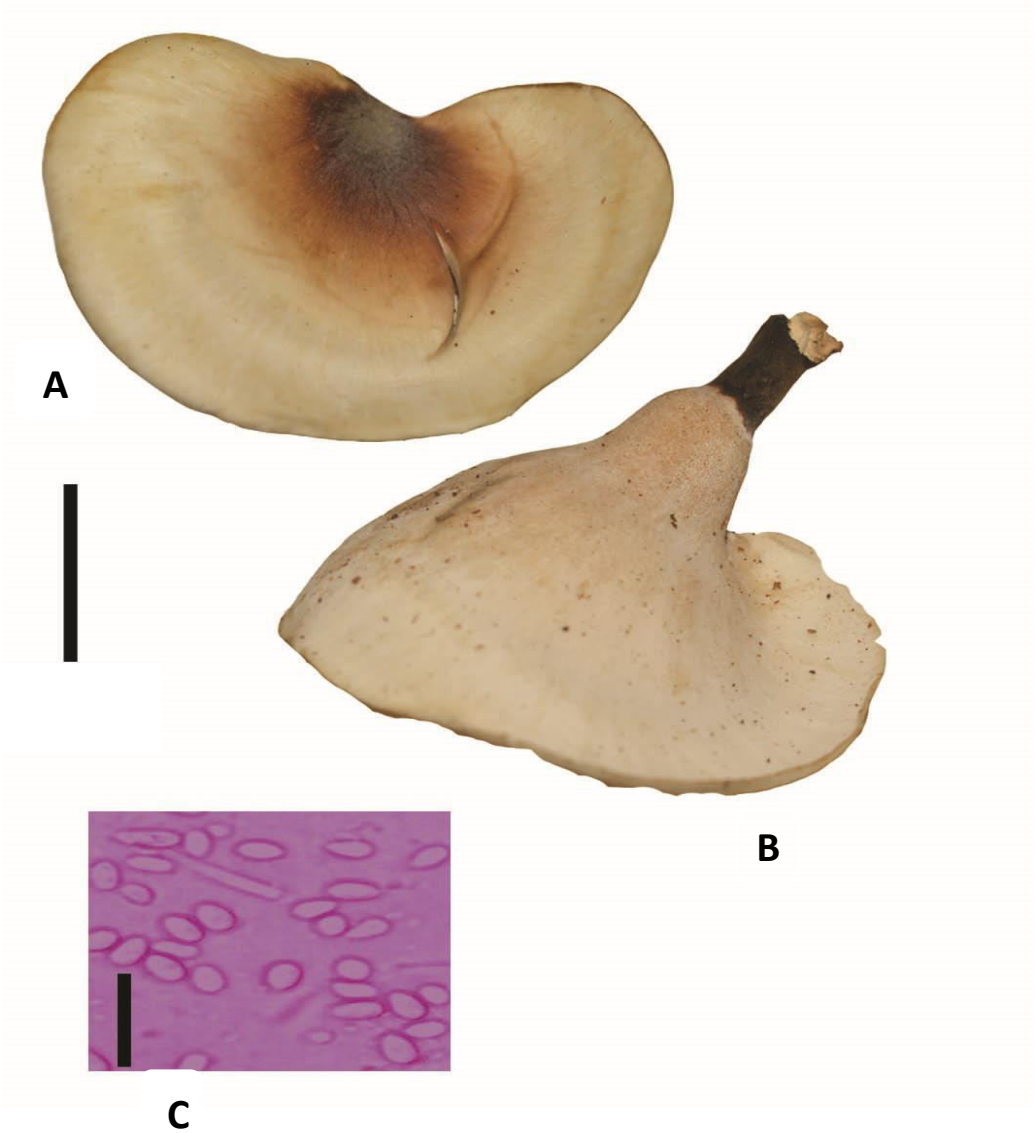


Photo Plate: 59. ***Polyporus dictyopus***
A. Close-up Photo (Upper Layer)
B. Close-up Photo (Lower Layer)
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

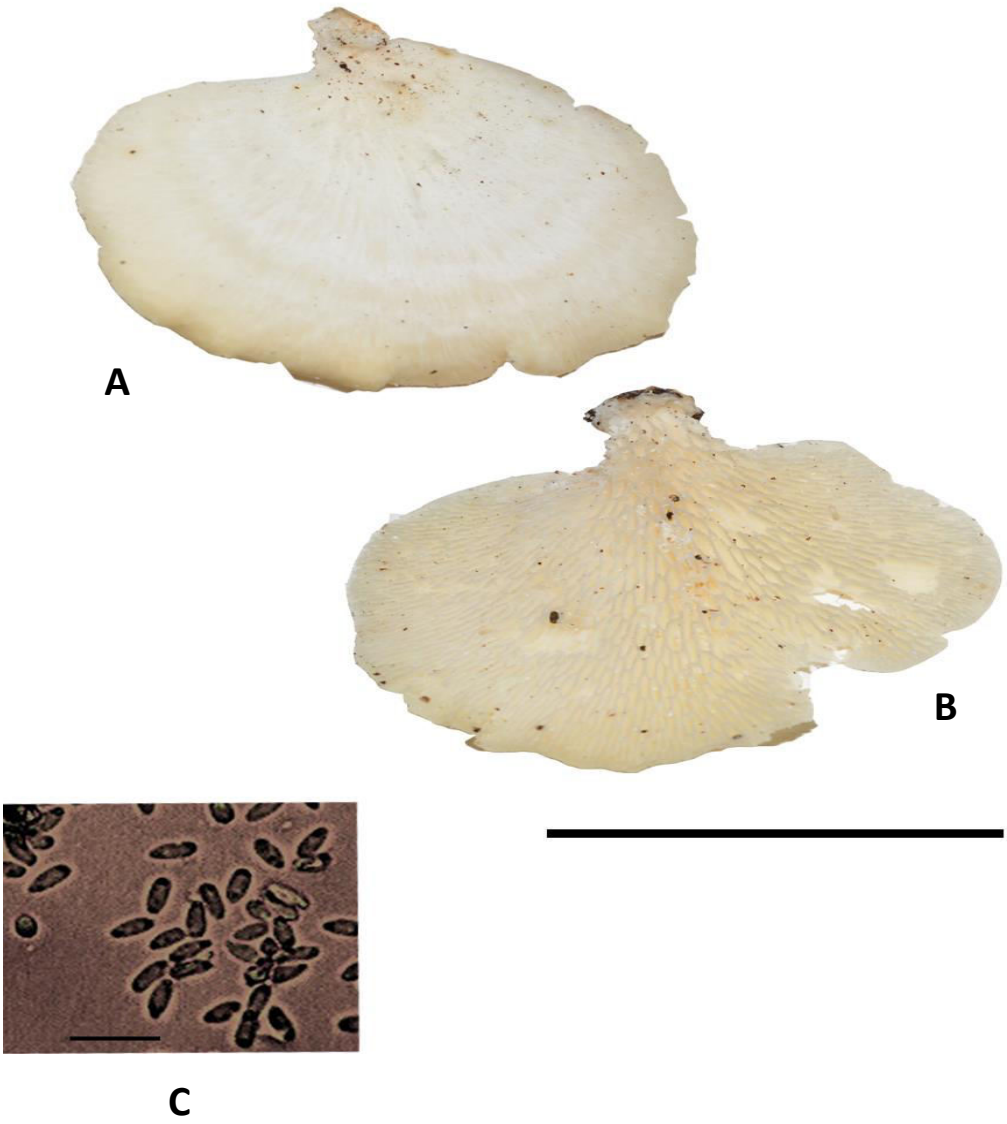


Photo Plate: 60. ***Polyporus tenuiculus***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

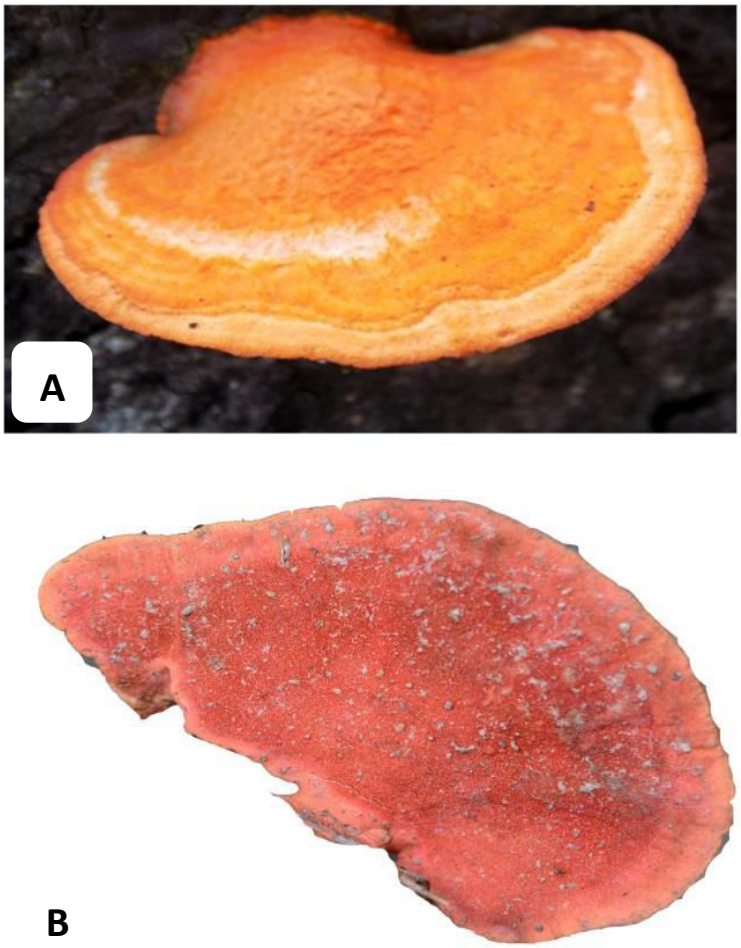
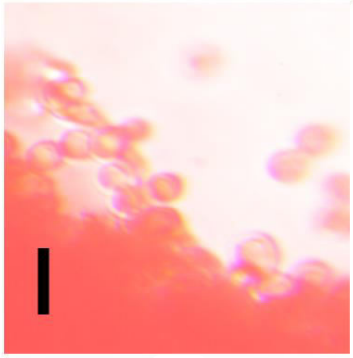


Photo Plate: 61. ***Pycnoporus cinnabarinus***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm

B

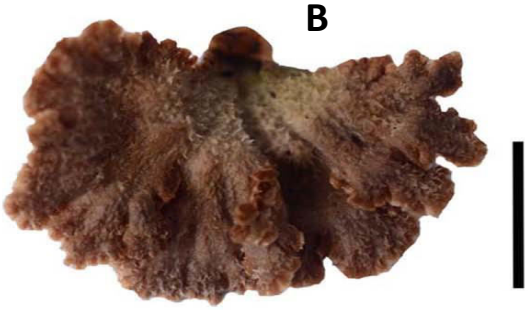


C

Photo Plate: 62. ***Pycnoporus sanguineus***
A. Close-up Photo (Upper Layer)
B. Close-up Photo (Lower Layer)
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

A

B

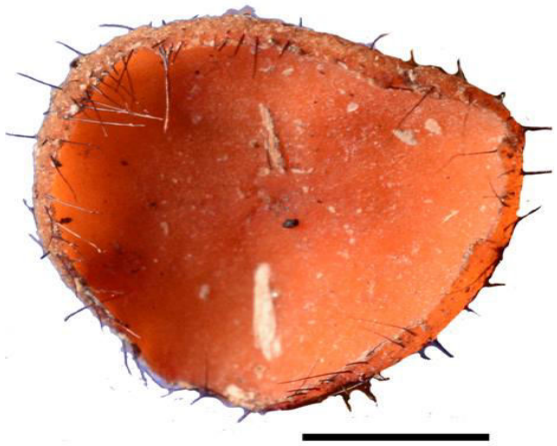


C

Photo Plate: 63. *Schizophylum commune*
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

A

B



C

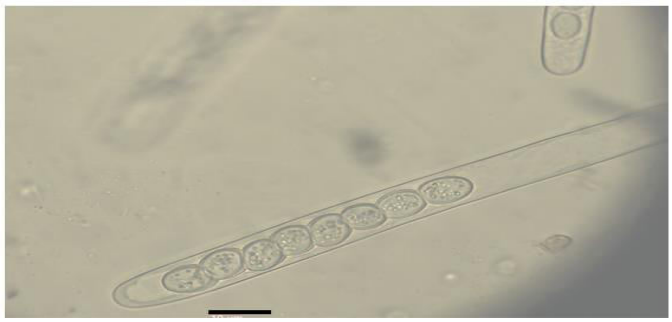


Photo Plate: 64. ***Scutellinia scutellata***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 1cm; **C** = 10µm

Photo Plate: 65. ***Stereum hirsutum***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

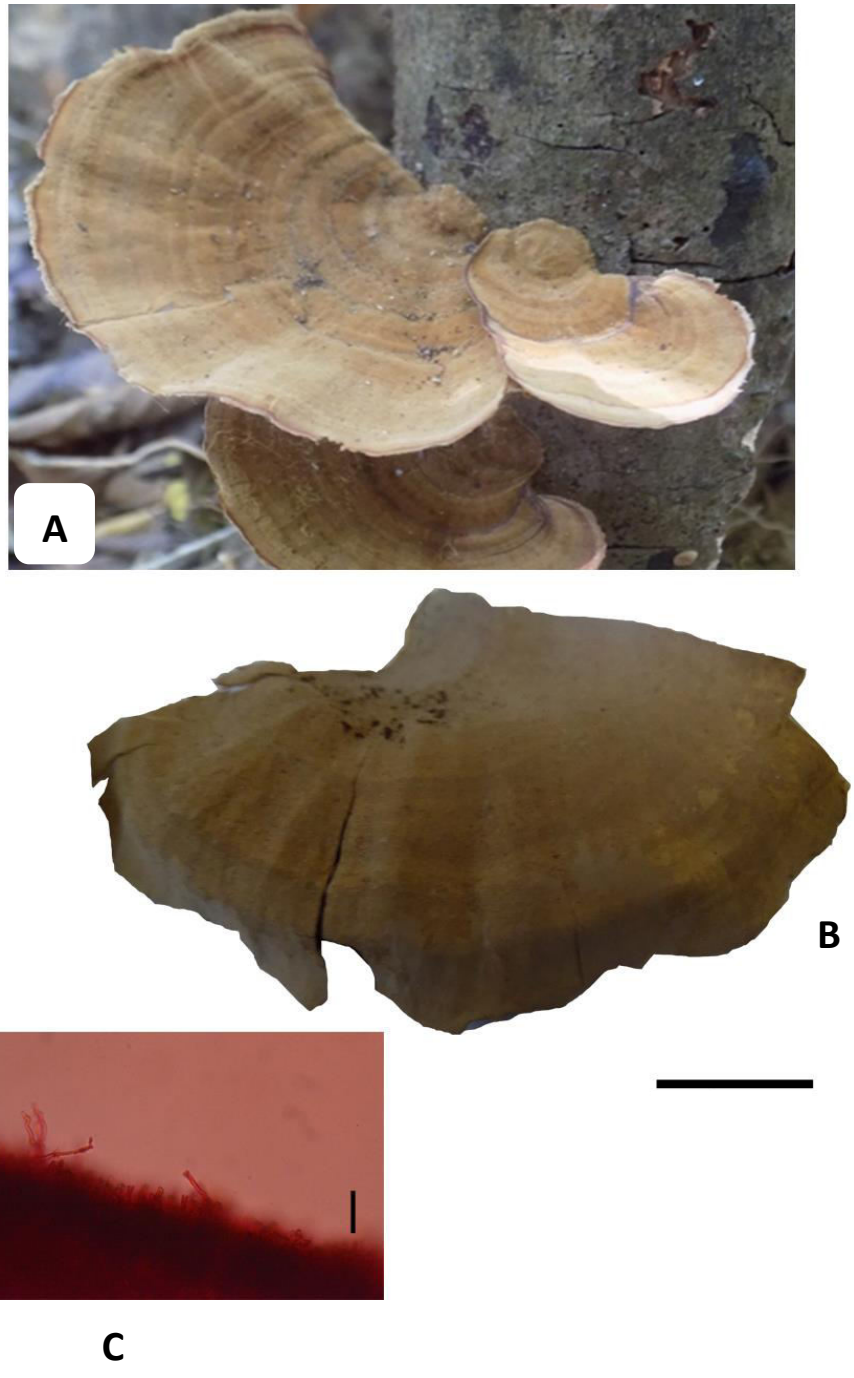


Photo Plate: 66. ***Stereum ostrea***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 20µm

Photo Plate: 67. ***Stereum rugosum***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 5cm

A

B

Photo Plate: 68. ***Terana caerulea***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 5 cm

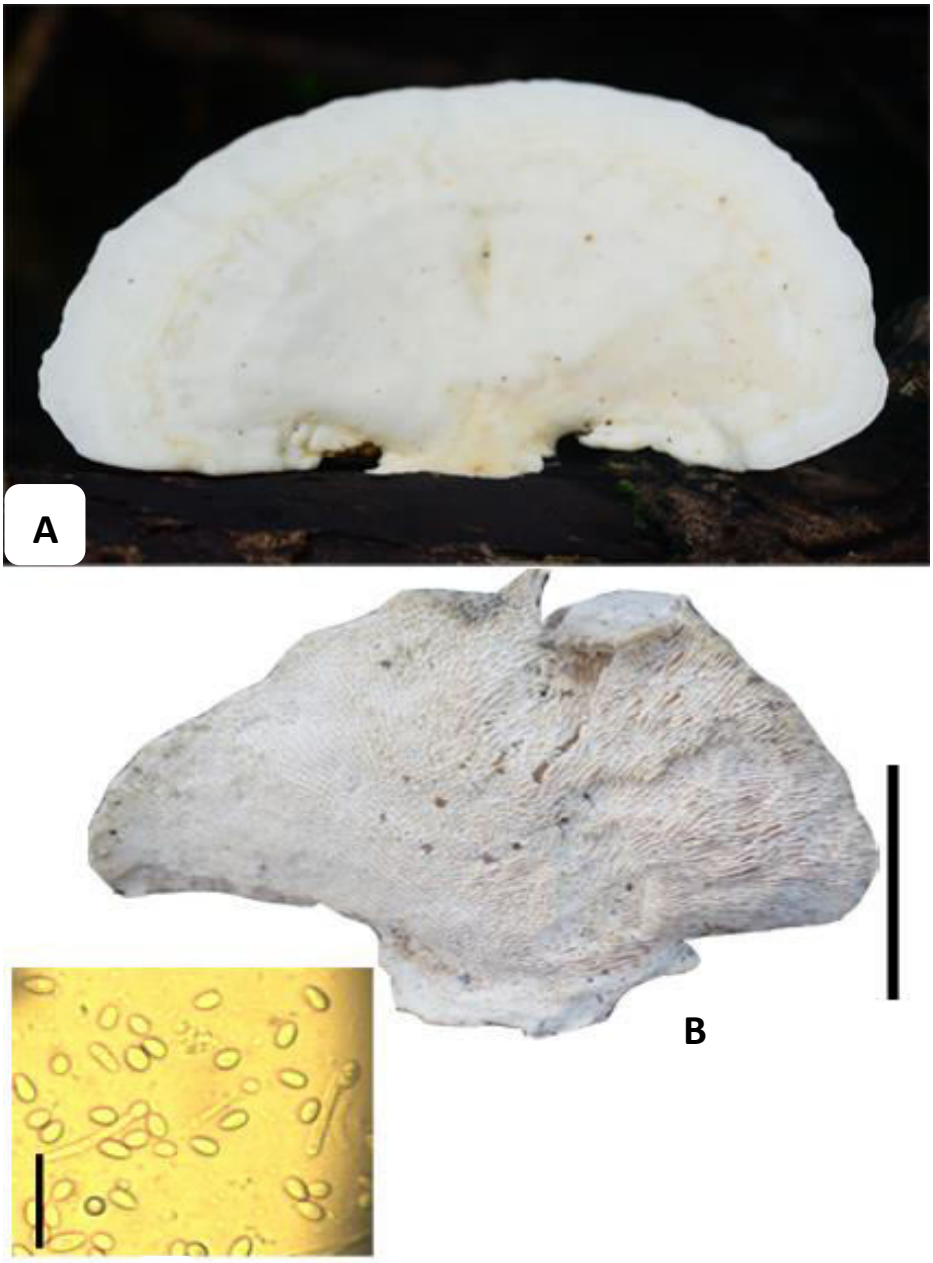


Photo Plate: 69. ***Trametes gibbosa***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 5cm; **C** = 10µm

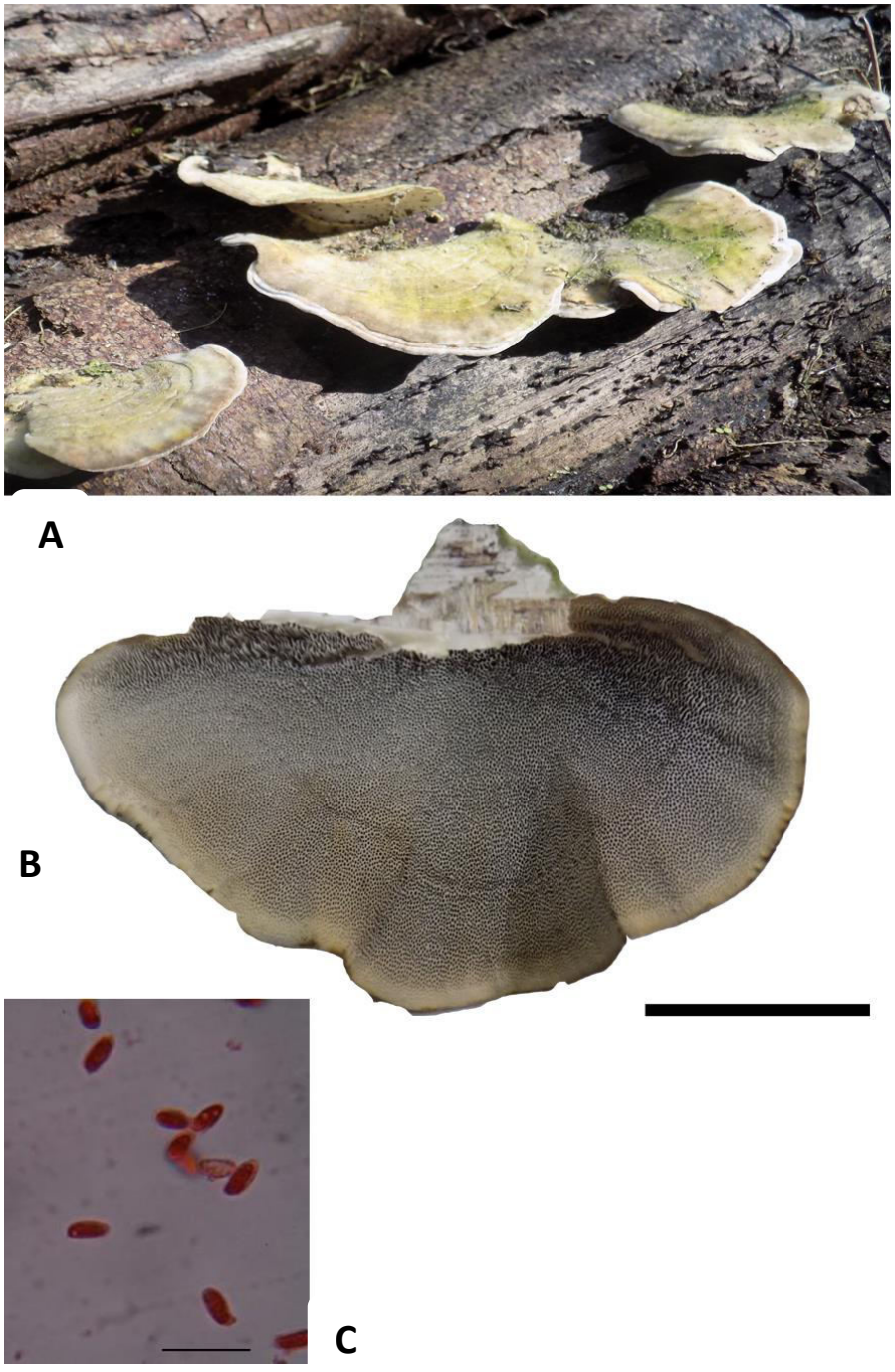


Photo Plate: 70. ***Trametes hirsuta***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 5cm; **C** = 10µm

Photo Plate: 71. ***Trametes modesta***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm;

A

B

Photo Plate: 72. ***Trametes trogii***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 2cm

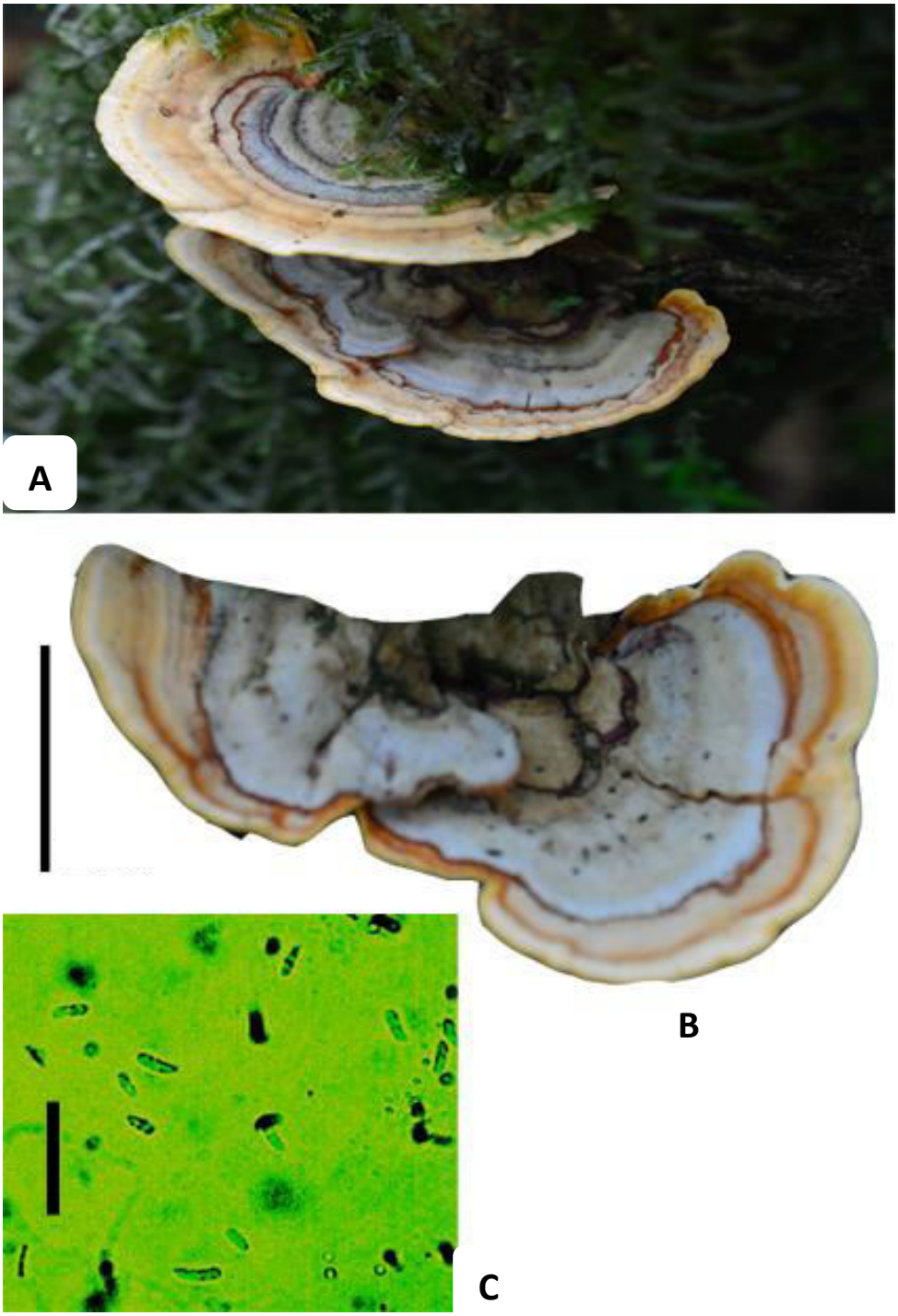


Photo Plate: 73. ***Trametes versicolor***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 10µm

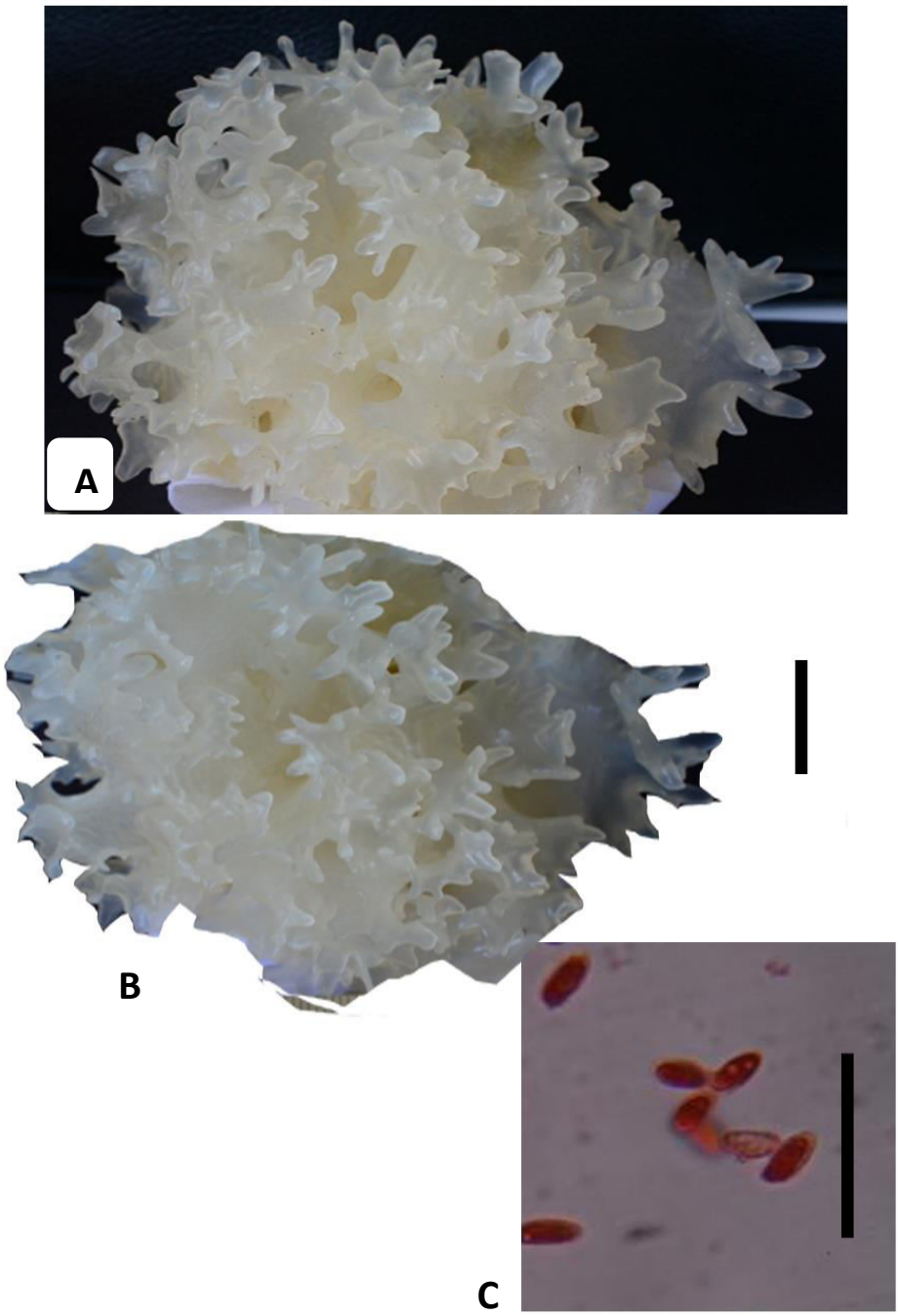


Photo Plate: 74. ***Tremella fuciformis***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 20µm

Photo Plate: 75. ***Tremella mesenterica***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 20µm

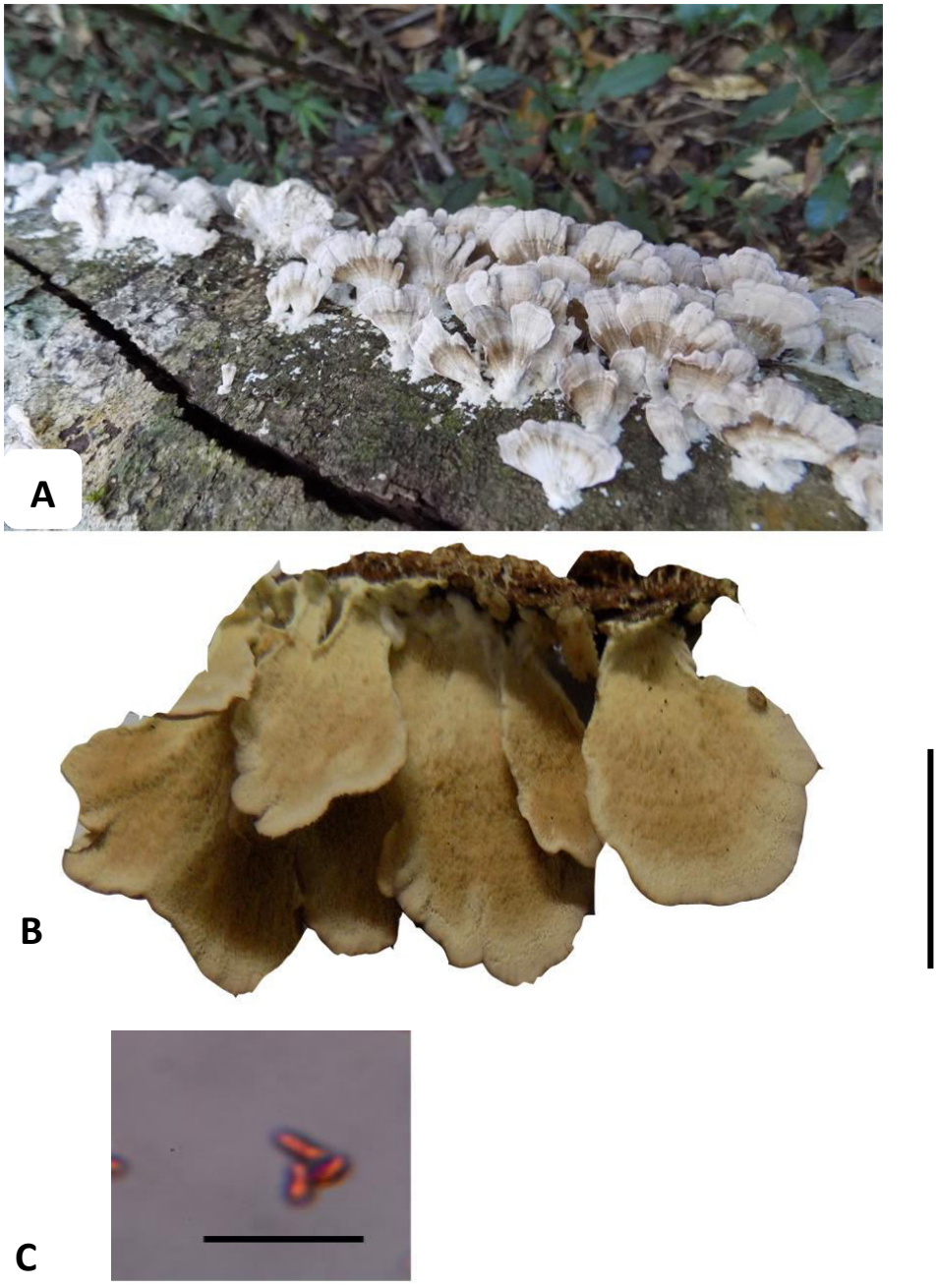


Photo Plate: 76. ***Trichaptum biforme***
A. Field Photo
B. Close-up Photo
C. Basidiospores
Scale Bar: **B** = 2cm; **C** = 20µm

B

C

Photo Plate: 77. ***Xylaria grammica***
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 10µm

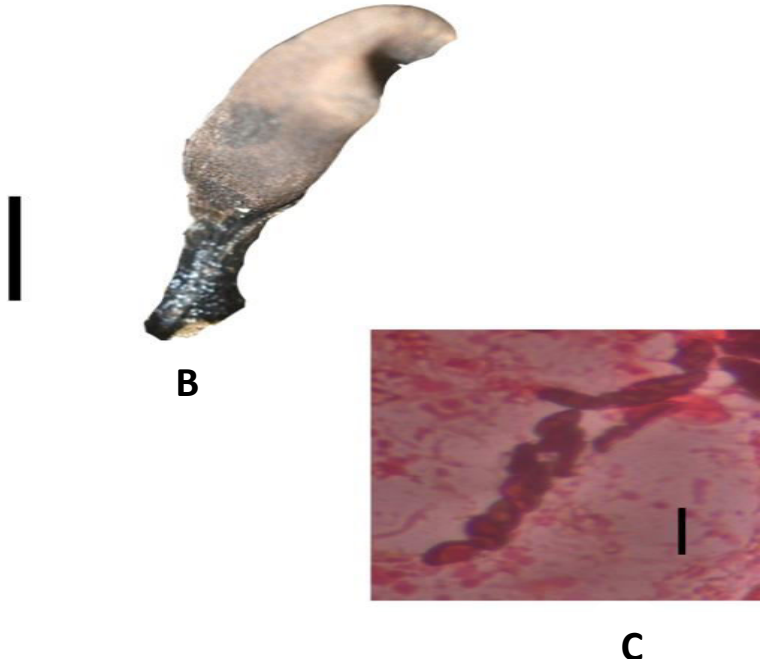
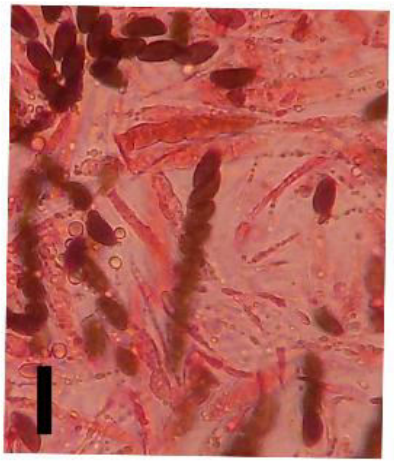


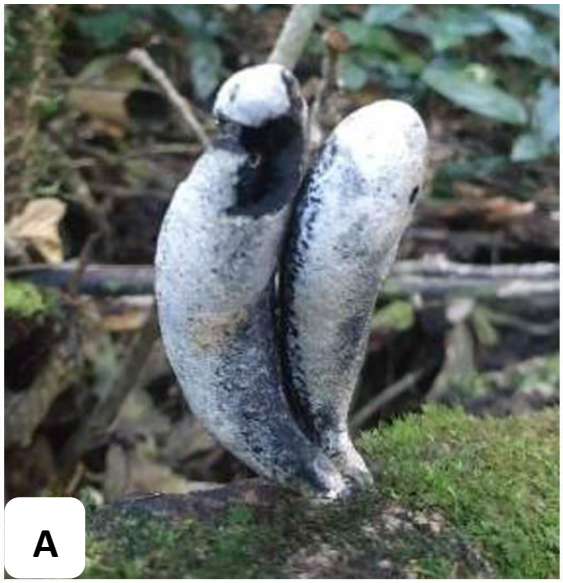
Photo Plate: 78. ***Xylaria polymorpha***
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 10µm

B



C

Photo Plate: 79. ***Xylaria hypoxylon***
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 10µm



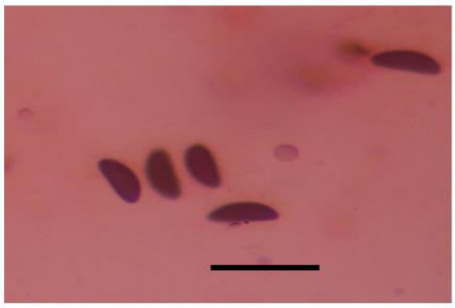


Photo Plate: 80. ***Xylaria longipes***
A. Field Photo
B. Close-up Photo
C. Ascospores
Scale Bar: **B** = 2cm; **C** = 20µm

B

Photo Plate: 81. ***Xylobolus subpileatus***
A. Field Photo
B. Close-up Photo
Scale Bar: **B** = 5cm

Photo Plate: 82. Field Work