5
Description of Macrofungi

5.1 Introduction
Fungi constitute the third important functional segment after flora and fauna as decomposers, symbionts and pathogens representing global diversity between 1.5 and 3 million species based on the reports on new species and fungus/plant ratios in tropics (Hawksworth, 2001, 2012). Macrofungi especially mushrooms represent up to 41,000 species, of which about 850 species are recorded from different parts of India especially in Himalayas and Western Ghats (Manoharachary et al., 2005). Like Himalayas, the Western Ghats of India is also one of the most valuable natural repositories of macro- and microfungi of the world. It runs up to 1,600 km (~160,000 km²) through the western part of Deccan Plateau in Gujarat, Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala States passing through complex riverine system encompassing a wide range of hills and mountains (up to 1,200 m asl).

Some studies are available on the macrofungi in different parts of the Western Ghats. Thomas et al. (2001) have reported 13 species belonging to Bolbitiaceae from Kerala. In 25 sacred groves, 23 coffee agroforests and 10 reserve forest sites in Karnataka, a total of 163 macrofungi were recovered and identified only up to genus level (Bhagwath et al., 2005; Brown et al., 2006). Nearly 195 species and 28 species of agarics have been reported from the Nilgiri Biosphere Reserve of Tamil Nadu and Kerala region (Natarajan et al., 2005a). Up to 25 species of ectomycorrhizal fungi in dipterocarp evergreen Kadamakkal Reserve Forest of Kodagu (Karnataka State) were documented by Natarajan et al. (2005b). Twenty five species of Hygrocybe were described from Kerala by Leclavathy et al. (2006). Riviere et al. (2007) compared the diversity of ectomycorrhizal fungi of the rain forests of Africa and
Western Ghats of India based on mitochondrial large subunit rRNA. Surveys in semi-evergreen and moist-deciduous forests of Karnataka yielded 778 species of macrofungi (Swapna et al., 2008). Twenty two species of *Lepiota*, nine species of *Leucoagaricus* and 15 species of *Leucocoprinus* were recorded from Kerala (Kumar and Manimohan, 2009a, 2009b). Mohanan (2011) documented 550 species (belonging to 51 families) from various parts of Kerala. Ranadive et al. (2011) gave a checklist of 256 species of Aphyllophorales from Maharashtra. A total of 68 species of mushrooms were recovered from Thiribhuvananmala et al. (2011) from Tamil Nadu and Kerala. Survey of Tamil Nadu and Karnataka yielded 56 species of woodrot fungi (Selvam et al., 2012). However, compared to the diversity of flora and fauna and varied ecological niches exists in the vast area of Western Ghats, knowledge on the macrofungal diversity, distribution and ecological functions is limited. In this report, occurrence, diversity and distribution of macrofungi from four protected biomes (two each of sacred groves and reserve forests) and two cultivated landscapes (coffee agroforests) of Kodagu region of the Western Ghats based on one-time survey are reported with a brief description of each species along with distribution in different parts of the Western Ghats.

5.2 Materials and methods

**Study area and sampling**

Kodagu District (formerly known as Coorg) in Karnataka State is situated between 11°56′–12°52′N, 75°22′–76°11′E (Pascal and Meher-Homji 1986). The mean temperature during the coldest months (December–January) in the study area selected ranges between 8°C and 20°C, approximate rainfall ranges from 200–500 cm/annum and dry season persists for about 3–4 months (February–May; 28–32°C). The landscape of Kodagu consists of a large number of sacred groves, reserve forests, tree-covered plantations and treeless cultivated lands (Bhagwath et al., 2005). For example, sacred groves (known as ‘Devarakadu’) are common in Kodagu region occupied about 2% of the landscape accounting one grove for every 300 ha, which vary in area from a fraction of hectare up to a few tens of hectares (Kushalappa and Bhagwat, 2001; Bhagwath et al., 2005; Brown et al., 2006). The reserve forests occupied up to 30% of the area, while the shade-grown plantations occupied about 60% (e.g. coffee) and the treeless cultivated lands occupied 8% (e.g. paddy).

Macrofungi were assessed in three biomes: i) Sacred groves (Maggula and Bettoli); ii) Reserve forests (Sampaje and Makutta); iii) Coffee agroforests (V’Badaga and B’Shettigeri)
Sacred groves studied have least human interference and encompass economically valuable plant species those were maintained traditionally by the local communities as a measure of biodiversity preservation and restoration: *Artocarpus hirsutus* (wild jack), *Canarium strictum* (Kappu Dhupa), *Caryota urens* (toddy palm), *Dysoxylum malabaricum* (white cedar), *Holigarna beddomei* (Kadu Geru), *H. nigra* (Kadu Geru), *Lagerstroemia microcarpa* (Nandi), *Mangifera indica* (kadu mavu), *Syzygium cumini* (Nerale), *Toona ciliata* (red cedar), and *Vateria indica* (Bili Dhupa). Usually edible mushrooms like *Lentinus* and *Pleurotus* are common in standing dead, woody litters and logs of *C. strictum, D. malabaricum, M. indica* and *V. indica*. The reserve forests studied are located in hilly zones with homogenous evergreen tree vegetation with high rainfall. The agroforests studied consists of shade-grown coffee plantations with common native (*Artocarpus hirsutus, Dalbergia latifolia, Syzygium cumini* and *Toona ciliata*) and exotic (*Acacia mangium, Acrocarpus fraxinifolius, Erythrina subumbrans* and *Grevelia robusta*) tree species.

Opportunistic mode of sampling was performed in three biomes during August (sacred groves), September (reserve forests) and October (agroforests) 2011. In each sampling, an area of 50 m² was intensely surveyed for the presence of fruit bodies of woodrots and mushrooms. Representative fruit bodies were sampled from different substrates like soil, leaf/bark/twig/woody litter, rotting logs/stubs, termite mounds and standing dead trees. The snaps of each mushroom was taken on the spot, fruit bodies were assessed for general features like type, colour, dimension, extent of fruit bodies (solitary or gregarious) and substrates. Part of fragile mushrooms possessing spores was fixed in lactophenol or aniline-blue-lactophenol in labeled vials. Sturdy fruit bodies of mushrooms were collected in labeled polythene bags and brought to the laboratory for further observations. Spores of each mushroom were evaluated based on the light microscopic observations. Each mushroom was fixed (formalin-ethanol-water) and deposited in the herbarium of the Department of Biosciences, Mangalore University(# MUBSNCKKRSMF-002-026) (Fig. 5.2–5). A brief morphological description of each fungus is given after confirming the identity based on the monographs (Kibby, 1979; Purkayastha and Chandra, 1985; Jordan, 1995; Mohanan, 2011) along with their substrates and distribution.

**Diversity and distribution**

One-time survey in sacred groves, reserve forests and agroforests in Kodagu region yielded 25 macrofungi (Table 5.1; Fig. 5.2–5). Agroforests consists of a maximum of 23
Fig. 5.1. Map of the study area and biomes studied in Kodagu District of Karnataka State of the Western Ghats (Sacred grove: 1. Maggula, 2. Bettoli; Forest reserve: 3. Sampaje, 4. Makutta; Agroforest: 5. V'Badaga, 6. B'Shettigeri).
Table 5.1. Distribution of macrofungi in three biomes of Kodagu region of the Western Ghats (−, not found; +, rare; ++, common; ++++, frequent).

<table>
<thead>
<tr>
<th>Macrofungi</th>
<th>Sacred-groves</th>
<th>Reserve forests</th>
<th>Agro-forests</th>
<th>Economic value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sacred-Reserve Agro- Economic value</strong></td>
<td>5.2a</td>
<td>5.2b &amp; c</td>
<td>5.2d &amp; e</td>
<td></td>
</tr>
<tr>
<td><em>Auricularia auricula-judae</em> (Bull.) Quél.</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>Edible and medicinal</td>
</tr>
<tr>
<td><em>A. mesenterica</em> (Dicks.) Pers.</td>
<td>−</td>
<td>−</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td><em>Clitocybe infundibuliformis</em> Quél.</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>Edible</td>
</tr>
<tr>
<td><em>Cookeina tricholoma</em> (Mont.) Kuntze</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td></td>
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<tr>
<td><em>Crepidotus variabilis</em> (Pers.) P. Kumm.</td>
<td>−</td>
<td>−</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td><em>Cygathus striatus</em> (Huds.) Willd.</td>
<td>+</td>
<td>−</td>
<td>+++</td>
<td></td>
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<tr>
<td><em>Dalcedinia concentrica</em> (Bolton) Ces. &amp; De Not.</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>Medicinal</td>
</tr>
<tr>
<td><em>Dictyophora cinabarina</em> W.S. Lee</td>
<td>−</td>
<td>+</td>
<td>+</td>
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<tr>
<td><em>Exidia glandulosa</em> (Bull.) Fr.</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td></td>
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<tr>
<td><em>Ganoderma applanatum</em> (Pers.) Pat.</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>Medicinal</td>
</tr>
<tr>
<td><em>Geastrum schweinitzii</em> (5.3g)</td>
<td>+</td>
<td>−</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td><em>Gymnopilus junonius</em> (Fr.) P.D. Orton (5.3e &amp; f)</td>
<td>−</td>
<td>−</td>
<td>+++</td>
<td>Edible</td>
</tr>
<tr>
<td><em>Ileodictyon gracile</em> Berk. (5.3h)</td>
<td>−</td>
<td>++</td>
<td>++</td>
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<tr>
<td><em>Lentinus dicholamellatus</em> Manim.</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>Edible</td>
</tr>
<tr>
<td><em>L. palusus</em> Lév. (5.4e)</td>
<td>−</td>
<td>−</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td><em>Lenzites vescapitala</em> (Pers.) Pat.</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td><em>Panus conchatus</em> (Bull.) Fr. (5.4g &amp; h)</td>
<td>−</td>
<td>++</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><em>Pleurotus pulmonarius</em> (Fr.) Quél. (5.4a &amp; b)</td>
<td>−</td>
<td>−</td>
<td>++</td>
<td>Edible</td>
</tr>
<tr>
<td><em>Polyporus sp.</em> (5.4c &amp; d)</td>
<td>+</td>
<td>−</td>
<td>−</td>
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<tr>
<td><em>Ramaria sp.</em> (5.4f)</td>
<td>−</td>
<td>−</td>
<td>++</td>
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<tr>
<td><em>Scleroderma verrucosum</em> (Bull.) Pers. (5.5e)</td>
<td>++</td>
<td>−</td>
<td>++</td>
<td>Edible and Ectomycorrhizal</td>
</tr>
<tr>
<td><em>Termitomyces tylerianus</em> Otieno (5.5f &amp; g)</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>Edible and medicinal</td>
</tr>
<tr>
<td><em>Tricholoma sp.</em> (5.5i &amp; j)</td>
<td>−</td>
<td>++</td>
<td>−</td>
<td>Edible</td>
</tr>
<tr>
<td><em>Trogia infundibuliformis</em> Berk. &amp; Broome (5.5h)</td>
<td>−</td>
<td>−</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td><em>Xylaria longipes</em> Nitschke (5.5k)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>Medicinal</td>
</tr>
</tbody>
</table>

Total species 12 12 23
Fig. 5.2. Photographs of macrofungi of Kadagu region: a, *Auricularia auricula-judae* on wood; b & c, *A. mescenterica* on wood; d & e, *Clitocybe infundibuliformis* on coconut surface (cor); f & g, *Crepidotus variabilis* on wood; h, *Cookeina tricholoma* on bark and wood; i, *Cyathus striatus* on twigs and embedded in soil; j, *Dictyophora cinnabarina* on soil.
Fig. 5.3. Photographs of macrofungi of Kadagu region: a. *Daldinia concentrica* on wood; b. *Exidia glandulosa* on wood; c & d. *Ganoderma applanatum* on wood; e & f. *Gymnopilus junonius* on burnt soil; g. *Geastrum* sp. on leaves, twigs and soil; h. *Ileodictyon gracile* on twigs.
Fig. 5.4. Photographs of macrofungi of Kadagu region: a & b, *Lentinus dicholamellatus* on wood; c & d, *Lenzites vespacea* on stub; e, *Lentinus patulus* on stub; f, *Ramaria* sp. on soil; g & h, *Panus conchatus* on twig.
Fig. 5.5. Photographs of macrofungi of Kadagu region: a & b. Pleurotus pulmonarius on wood; c & d. Polyporus sp. on twig; e. Scleroderma verrucosum on soil; f & g. Termitomyces tylerianus on termite soil; h. Trogia infundibuliformis on twig; i & j. Tricholoma sp. on soil with woody debris; k. Xylaria longipes on wood embedded in soil.
species and the rest (sacred groves and reserve forests) possess 12 species each. Eight species were seen in all biomes (*Auricularia auricula-judae*, * Cookeina tricholoma*, *Daldinia concentrica*, *Ganoderma applanatum*, * Lentinus dicholamellatus*, *Lenzites vespacea*, *Termitomyces tylarianus* and *Xylaria longipes*), nine species were restricted to agroforests (*Auricularia mescenterica*, *Clitocybe infundibuliformis*, *Crepidotus variabilis*, *Exidia glandulosa*, *Gymnopilus junonius*, * Lentinus patulus*, *Pleurotus pulmonarius*, *Ramaria* sp. and *Trogia infundibuliformis*) and one species each confined to the sacred groves (*Ployporus* sp.) and reserve forests (*Tricholoma* sp.). None of the macrofungi was frequent in all biomes. Only * Cookeina tricholoma* was frequent in sacred groves as well as reserve forests, while *A. auricula-judae*, *C. variabilis*, *C. striatus*, *L. patulus* and *T. tylarianus* were frequent in agroforests. Based on published records, a maximum of 17 species are known from the Western Ghats of Kerala followed by four species in Karnataka and one species in Tamil Nadu. One species each of *Ployporus*, *Ramaria* and *Tricholoma* was not identifiable up to species level and seem to be new species to the Western Ghats needs further enquiry. Among the macrofungi recorded, eight species were edible, five species were medicinal and one species was ectomycorrhizal based on literature and traditional knowledge (Purkayastha and Chandra, 1985; Jordan, 1995; Puttaraju et al, 2006; Das, 2010; Jha et al., 2011; Mohanan, 2011). All of them (except for *Tricholoma* sp.) were recovered from the agroforests shows the potential of this biome in Kodagu region for cultivation and harnessing economically important macrofungi.

### 5.3 Description

**Auricularia auricula-judae** (Bull.) Quel. (Fig. 5.2a) (Auriculariaceae – Basidiomycotina) (# MUBSNCKKRSMF-002)

Non-gilled, small to medium, fleshy, neither encrusting nor bracket-like, purple brown to grey brown, fruit bodies sessile, ear-like, grow in clusters, annual, lignicolous, odour and taste not distinctive, edible and medicinal.

*Fruitbody.* Upper surface purple brown with grey tinge when damp, shiny, lower surface grey brown, shiny, smooth becoming wrinkled, inverted cup-irregular bracket (flabelliform)/fan-shaped, often fused with adjacent fruit bodies and narrowly attached: 4.4 (2.1–6.2) cm diam. (n=10). Flesh purple brown, gelatinous, tough and rubbery when damp, and hard and brittle on drying.

*Spores.* Hyaline, allantoid or cylindrical and smooth: 12.9 (11.1–13.9) × 5.2 (4.7–5.5) μm (n=10).
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Substrate. Rotting logs and bark of *Acacia mangium*, *Acrocarpus fraxinifolius*, *Artocarpus hirsutus*, *Careya arborea*, *Olea dioica* and *Toona ciliata*.

Occurrence. Found in all the locations of sacred groves, reserve forests and agroforests.

Distribution. Karnataka (Swapna et al., 2008), Tamil Nadu (Johnsy et al., 2011; Sargunum et al., 2012) and Kerala (Mohanan, 2011).

*Auricularia mesentrica* (Bull.) Quél. (Fig. 5.2a) (Auriculariaceae – Basidiomycotina) (# MUBSNCKKRSMF-003)

Non-gilled, small to medium, fleshy, neither encrusting nor bracket-like, purple brown to grey brown, fruit bodies sessile, ear-like, grow in tires, annual, lignicolous, infrequent, odour and taste are not distinctive and inedible.

Fruit body. Upper surface brownish-grey, zoned, more pallid at margin, hairy, lobed margin, initially disc-shaped and becoming expanded into densely tiered brackets. Under surface reddish purple, wrinkled, white and pruinose: 3.5 (1.1–4.8) cm diam. (n=14). Flesh brown, gelatinous, elastic when damp, hard and brittle when dry.

Spores. Hyaline, smooth and ellipsoidal: 8.5 (6.6–9.7) × 5.4 (4.6–5.9) μm (n=10).

Substrate. Rotting logs and bark of *Memecylon umbellatum* and *Syzygium cumini*.


*Clitocybe infundibuliformis* Quél. (Fig. 5.2d & e) (Tricholomataceae – Basidiomycotina) (# MUBSNCKKRSMF-004)

Gilled, medium-size agaric, fleshy, stipe central, foamy white, solitary or in small troops, annual, rare, humicolous/lignicolous, odour of almonds, taste not distinctive and edible.

Cap. Whitish to cream, smooth and silky, infundibuliform with typical wavy margin: 1.8–6.6 cm diam. (n=5). Flesh whitish, thick and soft.

Gills. Creamish, deeply decurrent, narrow and crowded.

Spore. Hyaline, smooth and ellipsoidal: 5.9 (4–7.9) × 3.2 (2.6–4) μm (n=14).

Stipes. Concolorous with cap, smooth, equal and slightly swollen at base: 0.7–1.8 cm tall × 0.2–0.4 cm thick (n=5). Flesh creamish, tougher than in cap and partly stuffed or hollow.

Substrate. On the decomposing coir of *Cocos nucifera*. 


Distribution. Not known.

*Cookeina tricholoma* (Mont.) Kuntze (Fig. 5.2h) (Sarcocystaceae – Ascomycotina) (# MUBSNCKKRSMF-005)

Small to medium, top shaped, fleshy, orange, spiny, in trooping groups/clusters, frequent, annual, lignicolous, odour and taste not distinctive and inedible.

**Fruit body.** Orange coloured, fading to pinkish-orange with age, deeply cup- to funnel-shaped: 2.1 (1.3–2.4) × 2.8 (2.2–3.6) cm (n=10), sparse long whitish hairs throughout, more hairs towards margin, without hairs on stipe, inner hymenial surface orange coloured, smooth and bears sporangium.

Asci. Cylindrical and equal: 320.9 (289.3–341.9) × 19.9 (18.4–21) μm.


Stipe. Smooth, equal and hallow: 1.5 (0.4–2.8) × 0.4 (0.3–0.5) cm (n=10).

Substrate. On rotting twigs of *Canarium strictum*, *Dysoxylum malabaricum*, *Euodia lunu-ankenda*, *Toona ciliata* and *Vateria indica*.

Occurrence. Found in all the locations of sacred groves, reserve forests and agroforests.


*Crepidotus variabilis* (Pers.) P. Kumm. (Fig. 5.2f & g) (Crepidotaceae – Basidiomycotina) (# MUBSNCKKRSMF-006)

Gilled, small, fleshy, sessile, whitish to creamish, irregular, in trooping groups/clusters, annual, rare, lignicolous, odour and taste not distinctive and inedible.

**Fruit body.** Upper surface whitish become creamish with age, kidney or reniform or irregularly fan-shaped or lobed and faintly striate towards the margin: 1.7 (0.7–2) cm diam. (n=9). Flesh white, thin, soft and brittle.

Gills. Whitish becoming pink-violet, decurrent and fairly crowded.

Spores. Pinkish-brown, minutely warty and elongated to ellipsoidal: 7.5 (5.3–7.9) × 4.7 (3.3–5.3) μm (n=10).

Stipe. Lateral, rudimentary or absent.

Substrate. On the rotting burnt *Bambusa* sp. and rotting twigs of *Jatropha curcas*.

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Cyathus striatus (Huds.)Willd. (Fig. 5.2i) (Nidulariaceae – Basidiomycotina) (# MUBSNCKKKRSMF-007)

Non-gilled, small, cone-/trumpet-shaped, leathery, blackish-greyish brown, hairy, in small clusters, rare, annual, lignonicolous, odour and taste not distinctive and inedible.

**Fruit body.** Cone- or trumpet-shaped peridium: 0.9 (0.8-0.9) x 0.8 (0.7-0.9) cm (n=10). Outer surface brownish, shaggy and covered in fine felty hairs. Inner surface greyish-brown to greyish-silver, vertically striated and covered by operculum (whitish membrane), which ruptures at maturity to expose several (20-30) greyish-white lens shaped ‘eggs’ (peridioles) (2mm diam.), immersed in mucilage at the base and attached by fine mycelial strands. Flesh soft, paper-thin and resistant.

**Spores.** Hyaline, smooth and ellipsoidal: 6.8 (5.3-7.9) x 3.7 (2.9-4) μm (n=10).

**Substrate.** On rotting twigs of Aporusa lindleyana, Euodia lunu-ankenda, Erythrina subumbrans and on soil rich with woody debris.

**Occurrence.** Sacred grove in Bettoli and coffee agroforest in B'Shettigeri.

**Distribution.** Karnataka (Swapna et al., 2008) and Kerala (Mohanan, 2011).

Daldinia concentrica (Bolton) Ces. & De Not. (Fig. 5.3a) (Xylariaceae – Ascomycotina) (# MUBSNCKKKRSMF-008)

Small to medium, irregularly sub-spherical, tough and woody, reddish-brown to purple brown, sessile, annual, frequent, lignonicolous, solitary to gregarious, odour and taste not distinctive, inedible and medicinal.

**Fruit body.** Stroma reddish-purple brown, becoming black with age by shedding black spores, sub-spherical, sometimes shiny, ostiolate: 5.1 (1.8-7.8) cm diam. (n=12). Perithecia black, sub-spherical, embedded in stromatal tissue in single layer below the surface. Flesh blackish-grey with zebra-banded silver sheen on cut surface, hard, brittle and fibrous.

**Asci.** Baseball bat-shaped, long and 8-spored: 141.5 (113.1-173.6) x 9.2 (6.8-10.5) μm (n=10).

**Spores.** Black, smooth and ellipsoidal with longitudinal slit 12.5 (11.6-15.1) x 5.6 (5.3–6.1) μm (n=10).

**Substrate.** Rotting logs and bark of Acacia mangium, Acrocarpus fraxinifolius, Artocarpus hirsutus, Careya arborea and Toona ciliata.
Occurrence. Found in all the locations of sacred groves, reserve forests and agroforests.

Distribution. Karnataka (Swapna et al., 2008) and Kerala (Mohanan, 2011).

**Dictyophora cinnabarina** W.S. Lee (Fig. 5.2j) (Phallaceae – Basidiomycotina) (# MUBSNCKKRSMF-009)

Non-gilled, medium, fleshy, phallic, white stipe with brownish head and orange net, solitary, annual, rare, silvicolous, odour foetid/stringent, taste not distinctive and inedible.

Fruit body. White egg, sub-spherical, resistant to rubbery outer membrane with gelatinous matrix separated from the embryonic spore mass and stipe by an inner membrane. Attached to soil by a rhizomorphs (3–4) and on maturity the egg ruptures and the spore mass are carried rapidly upward on the receptacle in tip of stipe. Stipe whitish, honey-combed, cylindrical, spongy, hollow: 13.1 (12.9–13.3) × 1.7 (1.6–1.7) cm (n=3) and leaving membranous volva around the base of stipe. Volva white to creamish or yellowish brown, thickly gelatinous, soft: 3.6(3.5–3.8) cm diam. (n=3), surmounted by a greyish yellow to brownish yellow conical head carrying the spore mass and orange indusium hanging out from under the lower margin. The head is strongly chambered, bears a reticulate mesh of raised ribs with apical disc perforated in centre and surrounded throughout with dark olive-green to metallic green mucilaginous gleba (spore mass): 2.2(2.1–2.3) × 2.2 (2–2.3) cm (n=3). Indusium orange to yellowish orange, netted, partly elastic and flaring at bottom: 6.9 (6.7–7.1) cm height (n=3).

Spores. Smooth, ellipsoidal and hyaline. 3.3 (2.6–3.9) × 1.3 (1.1–1.6) μm (n=10).

Substrate. Soil below the trees of *Lagerstroemia microcarpa*.


Distribution. Karnataka (Abrar et al., 2007; Swapna et al., 2008) and Kerala (Mohanan, 2011).

**Exidia glandulosa** (Bull.) Fr. (Fig. 5.3b) (Tremellaceae – Basidiomycotina) (# MUBSNCKKRSMF-010)

Non-gilled, small to medium, gelatinous, blackish brown to blackish ash, sessile, contorted disc-shaped, grow in groups, annual, lignicolous, rare, odour and taste not distinctive and inedible.

Fruit body. Brownish when damp, ash black when dry, expanses of tissues appear like brain folding and fused with adjacent sporophores, smooth, shiny with glandular warts and
Ganoderma applanatum (Pers.) Pat. (Fig. 5.3c & d) (Ganodermataceae – Basidiomycotina) (# MUBSNCKKRSMF-011)

Non-gilled, large to very large, woody bracket, sessile, grey-brown, grow in limited overlapping tiers, perennial, lignicolous, common on wood, odour fungoid, taste bitter, inedible and medicinal.

**Fruit body.** Greyish-brown, often discoloured into reddish brown or cocoa brown from deposited spores, generally flattened, radially wavy or wrinkled, concentrically grooved and zoned, broadly attached, sessile: 18.8 (12.6–24.9) cm diam. (n=5). Flesh dark brick, thicker than the tube region, very tough and fibrous.

**Pores.** White, bruising brown and circular in annual layers.

**Spores.** Brown, smooth, ovoid to broadly ellipsoidal and flattened at one end with hyaline germ pore: 7.8 (7.7–7.9) x 5.4 (5.3–5.9) μm (n=14).

**Substrate.** Rotting trunks of *Artocarpus heterophyllus* and *A. hirsutus*.

**Occurrence.** Found in all the locations of sacred groves, reserve forests and agroforests.

**Distribution.** Maharashtra (Ranadive et al., 2011) and Kerala (Mohanan, 2011).

Geastrum schweinitzii (Fig. 5.3g) (Geastraceae – Basidiomycotina) (# MUBSNCKKRSMF-012)

Non-gilled, small, sessile, creamish-white, rounded/bulb on a star shaped outer wall, grow in trooping groups, annual, humicolous, infrequent, odour and taste not distinctive and inedible.

**Fruit body.** At first brownish, coarsely scaly, bulb shaped, 0.6(0.4–0.7) cm diam. (n=5), sessile, thick and brittle. Outer peridium splitting at maturity into 5 pointed starfish-like rays which reflex back to reveal the creamy-white inner fleshy layer. Inner peridium (sporesac, gleba and spore mass) creamish-white, sub-spherical, thin, papery, sessile and
opening by a fringed apical pore: 1.4 (1.1–1.8) cm diam. (n=7). Gleba (spore mass) at first pallid, firm and becoming brown with powdery deposits.

*Spores.* Spherical, warty and brown, 4–5 μm diam. (n=10).

*Substrate.* On decomposing leaf litter and twigs of *Acacia mangium* and *Sapium insigne*.

*Occurrence.* Sacred grove in Maggula and coffee agroforest in V’Badaga.

*Distribution.* Not known.

**Gymnopilus junonius** (Fr.) P.D. Orton (Fig. 5.3e & f) (Strophariaceae – Basidiomycotina) (# MUBSNCKKRSMF-013)

Gilled, medium to large agaric, orange to yellow, in dense caespitose clusters, annual, carbonicolous, rare, odour acidic or bamboo shoot, taste not distinctive and edible.

*Cap.* Initially dark orange fades to yellow with age, appressed fibrillose-squamulose, convex, becoming expanded, plane and wavy and depression often deepens to the stipe. Flesh concolorous, firm and medium: 5.2 (2.8–8.2) cm diam. (n=10).

*Gills.* Orange brown to creamish yellow, adnate, broad and crowded.

*Spores.* Brownish orange, finely warty and ellipsoid: 8 (7.9–8.3) × 5.4 (5.3–5.9) μm(n=14).

*Stipe.* Ring absent, pallid ochraceous-brown, more or less equal or slightly bulged towards the base and fibrillose-striate with scattered squamules: 4.9 (2.4–8.4) × 0.9 (0.35–1.6) cm (n=10). Flesh yellowish, firm, stuffed and full.

*Substrate.* On soil, roots and stumps of burnt decaying *Bambusa* sp.

*Occurrence.* Coffee agroforestry in B’Shettigeri.

*Distribution.* Kerala (Mohanan, 2011).

**Ileodictyon gracile** Berk. (Fig. 5.3h) (Phallaceae – Basidiomycotina) (# MUBSNCKKRSMF-014)

Non-gilled, small, sessile, white, lattice-like sphere extruding from a partially submerged egg, grow in troops or solitary, annual, humicolous, infrequent, odour foul/foetid, taste not distinctive and inedible.

*Fruit body.* Initially bone-white, egg-shaped/sub-spherical: 0.7 (0.6–0.8) × 0.5 (0.4–0.6) cm (n=6), attached to the substrate by a mycelial cord, outer membrane delicate, finely elastic, and closing the compressed lattice surrounded the white gleba (spore mass). At
maturity the egg ruptures and the spore mass carried upwards on the inside surface of the bright white lattice: 2.7 cm (1.5–3.3) × 1.3 cm (1.0–1.6) diam. (n=6).

**Spores.** Hyaline, smooth and ellipsoidal: 4.4 (3.3–4.6) × 1.6 (1.3–1.8) µm (n=10).

**Substrate.** Rotting sheath of inflorescence of *Cocos nucifera* and rotting twigs and leaf litter of *Eupatorium odoratum* and *Pongamia pinnata*.

**Occurrence.** Reserve forest of Makutta and coffee agroforest of V’Badaga.

**Distribution.** Kerala (Mohanan, 2011).

*Lentinus dicholamellatus* Manim.(Fig. 5.4a & b) (Polyporaceae – Basidiomycotina) (# MUBSNCKKRSMF-015)

Gilled, large, irregular infundibuliform bracket with lateral stipe, creamish with brownish squamules/tinge, solitary or in groups, annual, lignicolous, frequent, odour mealy, taste not distinctive and edible with second preference.

**Cap.** Upper surface at first pale yellow changing to brownish orange and densely dotted with very fine appressed or erect squamules. Initially convex with a depressed centre, becoming deeply infundibuliform, finely striate, radially fibrillose, margin incurved/inrolled and lobate: 19.3 (25.6–14.2) cm diam. (n=3). Flesh creamish, thin, elastic and leathery.

**Gills.** Yellowish-white, deeply decurrent and crowded.

**Spores.** Hyaline, smooth and ellipsoidal: 7.7 (7.2–7.9) × 3.8 (3.4–3.9) µm (n=10).

**Stipe.** Concolorous with cap, often dotted with erect pointed squamules, central/centric/lateral, almost equal and solid: 4.1 (3.1–4.7) × 1.3 (1.2–1.3) cm (n=3).

**Substrate.** Rotting logs of *Canarium strictum*, *Mangifera indica* and *Vateria indica*.

**Occurrence.** In Bettoli sacred grove, reserve forest in Makkuta and coffee agroforest in V’Badaga.

**Distribution.** Kerala (Mohanan, 2011).

*Lentinus patulus* Lév. (Fig. 5.4e) (Polyporaceae – Basidiomycotina) (# MUBSNCKKRSMF-016)

Gilled, small to medium, infundibuliform with central stipe, creamish-white with brownish squamules, in small clusters, annual, lignicolous, infrequent, odour mealy, taste not distinctive and inedible.

**Cap.** White to cream, with fine brown to blackish squamules more towards the centre, at first convex with depressed centre, finally attain infundibuliform, finely sulcate, striate
towards margin, margin regular and thin: 3.8 (2.7–4.9) cm (n=10). Flesh white, thin and at first weakly elastic becoming more leathery on drying.

_Gills._ White becoming creamish buff, decurrent, narrow and moderately crowded.

_Spores._ Hyaline, smooth and ellipsoidal: 8 (6.6–9.2) × 4.6 (4–5.3) μm (n=14).

_Stipe._ Ring absent, concolorous with cap, possess fine blackish fibrillose squamules, typically central to eccentric, short, more or less equal, arising from rhizomorph: 1.7 (0.9–3.8) × 0.3 (0.2–0.6) cm (n=10). Flesh white, firm, tough and thin.

_Substrate._ On dead stub of _Mangifera indica._

_Occurrence._ Coffee agroforest in B’Shettigeri.

_Distribution._ Kerala (Mohanan, 2011).

**Lenzites vespacea** (Pers.) Pat. (Fig. 5.4c & d) (Polyporaceae – Basidiomycotina) (# MUBSNCKKRSMF-017)

Non-gilled, Large, semi-circular or fan-shaped bracket, creamish-white to brownish-orange, solitary or in limited tires, perennial, lignicolous, common, odour and taste not distinctive and inedible.

_Fruit body._ Upper surface creamish brown with concentric zones (brown, tan and grey), downy or finely hairy, concentrically grooved and radially wrinkled, sometimes surface shows algal growth, narrowly attached and sessile: 15 (10.4–23.4) cm diam. × 1–1.2 cm thick (n=3). Flesh creamish, leathery and tough.

_Pores._ Whitish-buff and straw/gill/maize-like in a radial arrangement with branching.

_Spores._ Hyaline, broadly ellipsoidal and smooth: 7.8 (5.3–9.2) × 5.7 (5.3–6.6) μm (n=11).

_Substrate._ Rotting logs of _Acacia mangium, Acrocarpus fraxinifolius, Artocarpus heterophyllus, A. hirsutus, Lagerstroemia microcarpa, Syzygium cumini, Tectona grandis_ and _Toona ciliata._

_Occurrence._ Found in all the locations of sacred groves, reserve forests and agroforests.

_Distribution._ Maharashtra (Ranadive et al., 2011) and Kerala (Mohanan, 2011).

**Panus conchatus** (Bull.) Fr. (Fig. 5.4g & h) (Polyporaceae – Basidiomycotina) (# MUBSNCKKRSMF-018)
Gilled, medium, trumpet-shaped agaric, infundibuliform with central stipe, brownish-orange, velvety, solitary or in small clusters, annual, lignicolous, infrequent, odour and taste not distinctive and inedible.

**Cap.** Upper surface at first purple red, fading to brownish-orange with age, planate to depressed, surface striate, velvety, smooth, thin, leathery, appressed squamules at centre, margin invaginated, lobed and hairy throughout: 8.8 (6.5–10.2) cm diam. (n=5). Lower hymenial surface at first violet or purple fading to creamish, possess a series of irregular, blunt gill-like wrinkles and folds and decurrent.

**Stipe.** Purple-brown, thickly velvety/pubescent throughout, fading with age, tough, long, solid and more or less equal: 4.6 (3.4–5.8) × 0.9 (0.6–1.1) (n=5). Flesh creamish-brown, tough, leathery and thin.

**Spores.** Hyaline, smooth and ellipsoidal: 5.3 (4.6–5.9) × 2.8 (2.6–3.2) μm (n=12).

**Substrate.** Rotting logs of Delonix regia, Mangifera indica and Memecylon umbellatum.

**Occurrence.** Reserve forest in Sampaje and coffee agroforestry in B’Shettigeri.

**Distribution.** Kerala (Mohanan, 2011).

*Pleurotus pulmonarius* (Fr.) Quél. (Fig. 5.4a & b) (Pleurotaceae – Basidiomycotina) (# MUBSNCKKRSMF-019)

Gilled, small to medium, fleshy, stipe lateral or absent, whitish becoming creamish, irregular, fan- or bracket-shaped, in caespitose tufts or groups, annual, infrequent, lignicolous, mealy odour and taste, and edible.

**Cap.** Whitish becoming creamish-yellow with age, at first shallowly convex then flattened, reniform to irregularly flabelliform, undulating and wavy, lobed as well as split margin, narrowing at point of attachment, fleshy and smooth: 2.1 (0.8–3.8) cm diam. (n=6). Flesh white, slightly fibrous and moderate.

**Gills.** White, becoming creamish, decurrent, narrow and close.

**Spores.** Hyaline, smooth and elliptoidal or cylindrical: 8.1 (7.9–8.6) × 4.9 (4–5.3) μm (n=12).

**Stipe.** White, lateral or eccentric, very short, slightly woolly, stout and hard: 0.5 (0.3–0.7) × 0.4 (0.3–0.5) cm (n=6). Flesh white, firm and full.

**Substrate.** Rotting twigs of Erythrina subumbrans and Jatropha curcas.

**Occurrence.** Coffee agroforestry in B’Shettigeri.

**Distribution.** Not known.
**Polyporus sp.** (Fig. 5.4c & d) (Polyporaceae – Basidiomycotina) (# MUBSNCKKRSMF-020)

Porous, small, fan- or kidney-shaped, creamy-brown, solitary, annual, lignicolous, rare, odour and taste not distinctive and inedible.

*Cap.* Camouflaged, upper surface creamy with coffee-brown concentric bands, kidney- or fan shaped, fleshy, shiny, smooth and with regular margin: 2.6–2.8 cm diam. (n=2). Flesh white, thick and fleshy.

*Stipe.* Lateral, short, ivory-colour and tough.

*Pores.* Whitish, irregularly angular, decurrent and 3.5–4 mm deep.

*Spores.* White, fusiform and smooth: 10.7 (9.2–13.2) × 5.4 (5.3–5.9) μm (n=6).

*Substrate.* Rotting twigs of *Ficus religiosa*.

*Occurrence.* Sacred grove in Maggula.

*Distribution.* Not known.

**Ramaria sp.** (Fig. 5.4f) (Gomphaceae – Basidiomycotina) (# MUBSNCKKRSMF-021)

Non-gilled, small to medium, coral-like and antler-tip-like, lilac to creamish, solitary, or in small groups, annual, carbonicolous, rare, odour and taste not distinctive and inedible.

*Fruit body.* Lilaceous to creamish, fragile with loose limited branching and coral-like with pointed forked tips (antler-like). Branches filiform arising from long slender stipe and dusted with smokes of grey spores and minutely downy at the base: 5.4 (2.5–9.6) × 1.8 (1.1–2.5) cm diam. (n=10). Flesh creamish and elastic.

*Spores.* Fusiform, hyaline and smooth: 10.3 (7.9–13.2) × 5.6 (5.3–7.9) μm (n=10)

*Stipe.* Long, slender, fibrous, tough, smooth and equal: 4.6 (2.2–8.3) × 0.2 (0.2–0.3) cm (n=10).

*Substrate.* On laterite soil and clay roof tiles.

*Occurrence.* Clay tailed roofs of coffee agroforest in B’Shettigeri.

*Distribution.* Not known.

**Scleroderma verrucosum** (Bull.) Pers. (Fig. 5.5e) (Sclerodermataceae – Basidiomycotina) (# MUBSNCKKRSMF-022)

Non-gilled, medium, knobbly, yellowish-brown, solitary or in small groups, annual, silvicolous, rare, odour and taste not distinctive, edible and ectomycorrhizal.
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Fruit body. Yellowish-brown, knobbly (round headed hammer-like) and tapered below into a thick grooved hard long stipe-like base: 5.7 (3.8–7.9) × 2.4 (1.8–3.3) cm (n=10). Attached to the soil by a dense mass of mycelial cord, wall of head/hymenial portion thin, smooth, brittle and sparsely scaly throughout: 4.3 (3.2–6.6) cm diam. (n=10). On cracking opens at apex to form an irregular slit for the release/dispersal of spores.

Spores. Spherical, dark brown and spiny: 11.1 (9.2–13.2) × 10.8 (9.2–13.2) μm (n=10).

Substrate. On soil below the trees of Canarium strictum, Holigarna nigra and Vateria indica.

Occurrence. Sacred grove in Bettoli and coffee agroforest of V’Badaga.


Termiomyces tylerianus Otieno (Fig. 5.5f & g) (Lyophyllaceae – Basidiomycotina) (# MUBSNCKKRSMF-023)

Gilled, medium to large agaric, grayish-white, solitary or occasionally in small groups (3-5), annual, particolous, common, odour and taste mealy, edible and medicinal.

Cap. Upper surface grayish-white to slightly grayish-yellow, convex to plane, with a prominent umbo/perforatorium and pointed to broadly conical (sharply to bluntly umbonate): 9.5 (4.9–14.4) cm diam. (n=10). Margin straight, smooth, entire and splitting with age. Flesh white to creamish, thick, smooth and fleshy.

Gills. White, free, crowded and regular.

Spores. Hyaline, smooth and broadly ellipsoidal: 7.2 (5.9–9.2) × 3.8 (3.3–4.7) μm (n=10).

Stipe. White, long, fibrillosce, cylindrical with a swollen base and tapering downwards to a long firm pseudorrhiza: 14.6 (10.2–17.6) × 2.3 (1.2–4.5) cm (n=10).

Substrate. Termite mounds and soils of grasslands, path of paddy fields, playgrounds, sacred groves, forests and coffee plantations.

Occurrence. Found in all the locations of sacred groves, reserve forests and agroforests.


Tricholoma sp. (Fig. 5.5i & j) (Tricholomataceae – Basidiomycotina) (# MUBSNCKKRSMF-024)
Gilled, medium to large agaric, creamish-brown to potato-brown, caespitose clusters, annual, silvicolous and lignicolous, rare, odour and taste mealy and edible.

*Cap.* Greyish-brown with deposition of fine powder paling almost wholly after rain to potato/sapota-brown. Initially hemispherical, becoming campanulate, margin inrolled, smooth and dry: 3.9 (5.5–2.8) cm diam. (n=10). Flesh white and medium.

*Gills.* Initially whitish becoming slightly creamish, emarginate and distant.

*Spores.* Hyaline, smooth and oval-ellipsoidal: 6.9 (5.3–7.9) × 4.4 (4–5.3) μm (n=12).

*Stipe.* Long: 9.2 (7.2–11.3) cm tall (n=10), pallid, decorated with whitish-brown speckled fibrils below ring-zone, bulbous at base: 2.02 (1–2.7) cm diam. (n=10), tapering towards apex: 1.3 (0.7–1.9) cm diam. (n=10) and ring absent. Flesh white, becoming yellowish with age and stuffed.

*Substrate.* On soil rich with debris of *Caryota urens*.

*Occurrence.* In reserve forest in Sampaje.

*Distribution.* Not known.

*Trogia infundibuliformis* Berk. & Broome (Fig. 5.5h) (Marasmiaceae – Basidiomycotina) (# MUBSNCKKRSMF-025)

Vein-like ridges, small, funnel-shaped, brownish to orange, solitary or in small groups, annual, lignicolous, infrequent, odour fungoid, taste not distinctive and inedible.

*Cap.* Brown to orange, fading with age, deeply infundibuliform, fleshy, thin, smooth, shiny, surface deeply sulcate and margin wavy and irregular: 2.6 (1.4–3.3) cm diam. (n=6). Gills absent, lower hymenial surface orange, possess vein-like ridges and decurrent.

*Stipe.* Brownish fading with age, smooth, hollow and more or less equal but slightly bulged at the base or point of attachment to wood: 2.2 (1.5–2.6) × 0.3 (0.2–0.4) cm (n=6). Flesh brownish orange, tough and thin.

*Spores.* Hyaline, smooth and ellipsoidal: 7.8 (7.2–8.5) × 4.1 (3.3–4.6) μm (n=10).

*Substrate.* On decaying twigs of *Coffea robusta*.

*Occurrence.* Sacred grove in Maggula and coffee agroforestry in V’Badaga.

*Distribution.* Kerala (Kumar and Manimohan, 2009c; Mohanan, 2011).

*Xylarialongipes* Nitschke (Fig. 5.5k) (Xylariaceae – Ascomycotina) (# MUBSNCKKRSMF-026)
Club-shaped mature fruit body, develops on wood, project above ground, usually gregarious, common, possess stipe, tough or woody, annual, odour and taste not distinctive, and medicinal.

Fruit body. Upper stromatal surface black, warty, often somewhat bent over and narrowing slightly into a brownish-black sterile. Stipe cylindrical or baseball bat-shaped or clavate and smooth or slightly downy. Perithecia black, sub-spherical, fully embedded in stromatal tissue and arranged in a single dense layer just below the surface towards the apex: 4.8 (2.8–6.1) × 0.7 (0.4–0.8) cm (n=10). Flesh white and hard.

Asci. Cylindrical: 155.6 (147.3–163.1) × 7.5 (5.5–9) μm. Spores dark brown, smooth, ellipsoid to reniform, flattened on one side with distinct cleft, non-septate and uniseriate: 13.3 (12.5–14.5) × 5.9 (5.5–6) μm (n=10).

Substrate. Rotting logs and stumps of Acrocarpus fraxinifolius, Artocarpus hirsutus, Erythrina subumbrans, Memecylon umbellatum and Syzygium cumini.

Occurrence. Found in all the locations of sacred groves, reserve forests and agroforests.


5.4 Discussion

Two megadiversity hotspots in India, the Western Ghats and Himalayas are the treasures of a variety of life forms and always fascinating for exploration. Mushrooms especially edible forms are of immense economic value as alternative food source against plant and animal food sources. They are versatile as source of adequate protein, fibre and a variety of bioactive compounds and possess the capacity to decrease cholesterol level in blood. Besides food source, several macrofungi serve as medicinal and some are of agricultural importance as ectomycorrhizal fungi. Interestingly, a wide range of agarics has been reported from the Nilgiri Biosphere Reserve (Natarajan et al., 2005a) and ectomycorrhizal fungi from dipterocarp forest stands of Kodagu region (Natarajan et al., 2005b).

The current study projected several edible, medicinal and one ectomycorrhizal fungi in one-time survey. Sacred groves and reserve forests provide fairly undisturbed natural habitats for a variety of macrofungi. These biomes are the ideal sites for successful conservation of macrofungi as natural repositories (Brown et al., 2006). Domestication of desired macrofungi can be achieved in agroforest consisting of shade-grown commercial
plantations (e.g. coffee, cardamom, cocoa and areca), monocrops (e.g. rubber) and tree-less field crops (e.g. paddy, sugarcane and banana). Brown et al. (2006) studied the impact of fragmentation and disturbance on the diversity and distribution of macrofungi in tropical rain forests of Kodagu region. They recorded macrofungi during three wet seasons in 25 sacred groves, 10 reserve forests and 23 coffee plantations. Based on this long-term study, they concluded that habitat degradation is an important threat to macrofungal diversity than fragmentation. Although sacred groves occupied less area, they are valuable in macrofungal conservation due to unique habitat with higher abundance of sporocarp as well as morphospecies compared to reserve forests and coffee-agroforests. On the contrary, this one-time study revealed the highest species richness in coffee-agroforests than sacred groves and reserve forests. However, there may be some difference regarding the abundance of sporocarps of macrofungi in these habitats and long-term studies may reveal more improved perception. In shade-grown coffee-agroforests, in addition to native trees, several exotic tree species are common (e.g. Acacia mangium, Acrocarpus fraxinifolius, Artocarpus hirsutus, Dalbergia latifolia, Grevelia robusta, Syzygium cumini and Toona ciliata). Besides, small treespecies are also common (e.g. Erythrina subumbrans and Glyricidia sepium). It is likely, regular pruning of such shade trees as litter source for coffee plantation and misting during dry seasons might be responsible for occurrence of macrofungi throughout the year. As human disturbances have been restricted in sacred groves and reserve forests, agroforests constitute ideal habitats to domesticate edible, medicinal and ectomycorrhizal fungi for economic growth. Similar to flora and fauna, macrofungi also constitute another important link in forest ecosystems as detritus decomposers. But, knowledge on the diversity, distribution of macrofungi and impact of forest degradation/fragmentation on macrofungi is insufficient. Rehabilitation of many forest communities needs considerable time especially macrofungi prefers old-growth forests than the new forests for their perpetuation (Norden and Appelqvist, 2001). For instance, distinct succession pattern of ectomycorrhizal fungi was seen in old (11–17 years) and young (3–7 years) dipterocarp forests in Kodagu region (Natarajan et al., 2005b). Besides plant detritus and pure forest stands (e.g. dipterocarp and bamboo groves), there are several ecological niches deserve meticulous attention to explore macrofungi in the Western Ghats: coprophilous fungi on the dung of wild animals (e.g. Amanita, Entoloma and Xylaria), medicinally valuable entomopathogens (e.g. Cordyceps and Ophiocordyceps) and termite mounds for edible mushrooms (e.g. Termitomyces).

Each geographical location has specific characteristic features and yield of optimum number of macrofungi depends on the time and frequency of field survey (Halme and
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Kotiaho, 2012). For each biome in a location, it is necessary to earmark substrate, time and frequency of sampling for maximum recovery of macrofungi. In addition, phase-wise long-term studies on macrofungi are warranted for a comprehensive and total understanding of the diversity in different parts of the Western Ghats to improve our knowledge on the species richness, functional diversity, conservation strategies and economic benefits. Traditional experience of local people and tribes should not be ignored to fill the knowledge gaps on the value of macrofungi.

5.5 References


