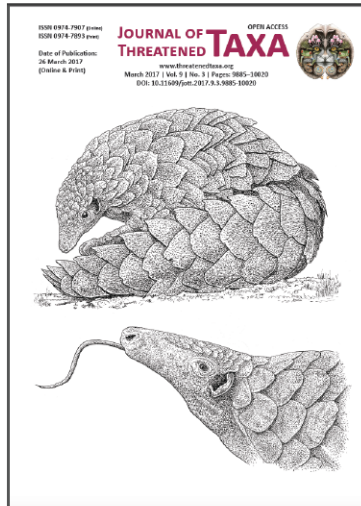


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Journal of Threatened Taxa

Building evidence for conservation globally

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

SHORT COMMUNICATION

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26 March 2017 | Vol. 9 | No. 3 | Pp. 9962–9970
10.11609/jott.2747.9.3.9962-9970



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MACROFUNGI IN TWO BOTANICAL GARDENS IN SOUTHWESTERN INDIA

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ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

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Abstract: This study reports 11 species of macrofungi in the botanical garden and arboretum of Mangalore University. Frequent species include *Clathrus delicatus*, *Entoloma serrulatum* and *Tetrapyrgos nigripes* in the botanical garden, and *Collybia aurea* and *T. nigripes* in the arboretum. Five species are edible (*Collybia aurea*, *Lepista* sp., *Russula adusta*, *R. atropurpurea* and *Termitomyces microcarpus*), one is medicinal (*T. microcarpus*) and two are ectomycorrhizal (*Russula adusta* and *R. atropurpurea*) with critically endangered endemic tree species *Vateria indica* (Dipterocarpaceae). Some macrofungi grow on bark, woody litter and leaf litter, while others were found on typical lateritic soils with organic matter. *Termitomyces microcarpus* was common in the faecal pellets of termites in the botanical garden. Brief descriptions of species based on field and laboratory observations, along with their substrates and distribution, are given.

Keywords: Arboretum, ectomycorrhizae, edibility, laterite soil, macrofungi, mushrooms.

The Western Ghats are known for heritage value with vast landscapes and forests endowed with native and indigenous plants. These forests are especially rich in flowering trees, with 1,720 recorded species (in 54 genera) of which 8% (135 species) are endemic (Nair & Daniel 1986; Nayar 1996; Shetty & Kaveriappa 2001a). Endemics in the Western Ghats have also been recognized among woody plants, palms and gymnosperms (Ahmedullah & Nayar 1986; Renuka 1992;

Shetty & Kaveriappa 2001b). Several endemic species were cultivated during 1992-1994 with the support of the MacArthur Foundation, Chicago in the arboretum and botanical garden of Mangalore University Campus. Eighty-two endemic plant species have been introduced and maintained (57 tree species, two bamboo species and 23 species of shrubs) in these gardens along with native flora. These gardens are now over 20 years old and have become excellent platforms for ecosystem and forestry-related studies. Recently, macrofungi have been reported from the arboretum those are not usually found in the coastal region (Karun & Sridhar 2014). Nearly 850 species of macrofungi have been reported from the Himalaya and Western Ghats of India (Manoharachary et al. 2006). An illustrated monograph by Mohanan (2011) documented up to 550 species in 166 genera and 51 families from Kerala State. The aim of this current study was to document interesting macrofungi in these botanical gardens, and provide a brief description of each species along with information regarding distribution and economic value.

MATERIALS AND METHODS

Surveys were carried out periodically (June-October

DOI: <http://doi.org/10.11609/jott.2747.9.3.9962-9970>

Editor: R.K. Verma, Tropical Forest Research Institute, Jabalpur, India.

Date of publication: 26 March 2017 (online & print)

Manuscript details: Ms # 2747 | Received 30 May 2016 | Final received 24 February 2017 | Finally accepted 02 March 2017

Citation: Pavithra, M., K.R. Sridhar & A.A. Greeshma (2017). Macrofungi in two botanical gardens in southwestern India. *Journal of Threatened Taxa* 9(3): 9962–9970; <http://doi.org/10.11609/jott.2747.9.3.9962-9970>

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Funding: The University Grants Commission, New Delhi, India.

Competing interests: The authors declare no competing interests.

Acknowledgements: Authors are grateful to Mangalore University for permission to carry out this study in the Department of Biosciences. KRS acknowledges the University Grants Commission, New Delhi, India for the award of UGC-BSR Faculty Fellowship. GAA acknowledges the award of INSPIRE Fellowship, Department of Science and Technology, New Delhi, Government of India. We thank Karun N. Chinnappa, Sudeep D. Ghate (Department of Biosciences) and K. Keshavachandra (Department of Applied Botany), Mangalore University for helpful suggestions.



2014) in the botanical garden and arboretum situated on the lateritic terrain of Mangalore University Campus (Dakshina Kannada District, Karnataka) (12°49'N & 74°55'E). Identification of macrofungi was based on macro- and micro-morphological features using identification keys (Sathe & Daniel 1980; Sathe & Deshpande 1980; Jordan 2004; Phillips 2006; Mohanan 2011). Specimens were preserved in the herbarium of the Department of Biosciences (MUBSPMKRSMF: BG1-BG9; MUBSPMKRSMF: AB1-AB2).

RESULTS

Among the 11 macrofungi documented in this survey, *Clathrus delicatus*, *Entoloma serrulatum* and *Tetrapyrgos nigripes* in botanical garden and *Collybia aurea* and *T. nigripes* in arboretum were frequent, while *Russula adusta*, *R. atropurpurea* and *Termitomyces microcarpus* were common (Table 1). *Tetrapyrgos nigripes* was common to botanical garden as well as arboretum. Edible species include *Collybia aurea*, *Lepista* sp., *Russula adusta*, *R. atropurpurea* and *Termitomyces microcarpus*. Among them, *Russula* spp. were also ectomycorrhizal with critically endangered tree species *Vateria indica* belongs to Dipterocarpaceae. Some of the macrofungi grew on bark, woody litter and leaf litter, while others preferred typical lateritic soils with organic matter. *T. microcarpus* was common on the faecal pellets of termites in botanical garden. Brief description of each species based on field and laboratory observations along with their substrates and distribution in the Western Ghats have been given.

DESCRIPTION

***Clathrus delicatus* Berk. & Broome**

(Phallaceae: Basidiomycotina) (Image 1A–D) (# MUBSPMKRSMF-BG1)

Fruit body small to medium size, soft, smooth, creamish-white, initially spherical 0.2–0.5 cm (n=14) (Image 1A), opens into delicate net/mesh, on maturity 1.7 (1.8–2.0) 2.2 × 1.0 (1.1–1.3) 1.4 cm (n=6), shuttle cock-shaped, creamish-white without cap and gills and with small stipe having thick rhizomorphs (Image 1B–D). Lignicolous, gregarious, annual and edibility not known. Stipe 0.6 (0.8–1.0) 1.2 × 0.4 (0.6–0.85) 0.9 cm (n=6), white, central, cylindrical, partially stuffed with thick rhizomorphs at base (Image 1C, D). Spores 3.0 (3.4–3.95) 4.0 × 1.25 (1.55–1.75) 2.2 μm (n=20); hyaline, ellipsoidal, smooth and thin walled.

Fresh weight: Mature fruit body 0.07–0.1 g (n=6), immature fruit body 0.05–0.09 g (n=10). Substrate: Dead woody debris (fine, medium and coarse) and also grows on the bark of *Calycopteris floribunda* Lam., having thick creamy white rhizomorphs on substrate (Image 1A).

Occurrence and distribution: Botanical garden and non-fired scrub jungle, Konaje, Mangalore, Karnataka (present study); Muthodi forest range in the Bhadra Wildlife Sanctuary in Karnataka (Swapna et al. 2010) and Porvorim in Goa (Kamath 2014).

***Collybia aurea* (Beeli) Pegler**

(Tricholomataceae: Basidiomycotina) (Image 1E–H) (# MUBSPMKRSMF-AB1)

Fruit body small to medium size, fleshy agaric, creamish-white cap, white gills, stipe brownish devoid of pseudorhiza. Lignicolous, gregarious, annual and edible.

Table 1. Macrofungi recorded in botanical gardens of the west coast of India

Taxon	Substrate	Economic value
<i>Clathrus delicatus</i> Berk. & Broome (Image 1A–D)***	Woody debris and bark (<i>Calycopteris floribunda</i>)	-
<i>Collybia aurea</i> (Beeli) Pegler (Image 1E–H)***	Decaying wood and twigs interspersed with leaf litter.	Edible
<i>Entoloma serrulatum</i> (Fr.) Hesler (Image 2A–D) ***	Soil with pebbles and leaf litter	-
<i>Lepiota echinella</i> Quéél. & G.E. Bernard (Image 2E–G)*	Soil with leaf litter	-
<i>Lepista</i> sp. (Image 3A–D)*	Soil with pebbles and leaf litter	Edible
<i>Leucoagaricus rubrotinctus</i> (Peck) Singer (Image 3E–G)*	Laterite soil rich in pebbles	-
<i>Lycoperdon lividum</i> Pers. (Image 3H)*	Soil with leaf litter	-
<i>Russula adusta</i> (Pers.) Fr. (Image 4A–C)**	Black soil interspersed with leaf litter and pebbles; Roots (<i>Vateria indica</i>)	Edible and ectomycorrhizal with <i>Vateria indica</i>
<i>Russula atropurpurea</i> (Krombh.) Britzelm. (Image 4D–G)**	Black soil with pebbles and leaf litter; Roots (<i>Vateria indica</i>)	Edible and ectomycorrhizal with <i>Vateria indica</i>
<i>Termitomyces microcarpus</i> (Berk. & Broome) R. Heim (Image 4H–J)**	Faecal pellets of termites	Edible and used to treat gonorrhoea
<i>Tetrapyrgos nigripes</i> (Fr.) E. Horak (Image 4K–M)***	Decaying twigs and leaf midrib/veins	-

*** - Frequent; ** - Common; * - Rare



Image 1. White to egg-white immature and mature fruit bodies of *Clathrus delicatus* developed on woody debris (A–D); mature fruit bodies of *Collybia aurea* grown on decaying wood, twigs and leaf litter with creamish-white pileus, brown-white woolly stipe (E–G) and creamish gills (H) (Scale = 1cm). © M. Pavithra

Pileus 3 (3.2–3.6) 3.8 cm (n=28); bright white at centre, creamish-white towards periphery, smooth, papery on maturity, at first convex becoming flat on maturity with small central depression and incurved margin (Image 1E,F). Gills creamish-white, adnexed, narrow and less crowded (Image 1H). Stipe 7.3 (7.5–8) 8.2 × 0.1 (0.15–0.2) 0.25 cm (n=25), brown with white woolly, central, cylindrical, smooth, partially stuffed, tapering towards apex, without annulus and pseudorhiza (Image 1F,G). Spores 3.0 (3.8–5.26) 6.0 × 2.0 (2.63–3.9) 4.0 μm (n=15), hyaline, broadly ellipsoidal, smooth and thin-walled.

Fresh weight: Mature fruit body 0.3–0.7 g (n=28). Substrate: Decaying wood and twigs interspersed with leaf litter, commonly found in humid environment and shaded region.

Occurrence and distribution: Arboretum, Konaje, Mangalore, Karnataka (present study); Kochupilakkode Swamp and Arippa in Kerala (Mohan 2011).

***Entoloma serrulatum* (Fr.) Hesler**

(Entolomataceae: Basidiomycotina) (Image 2A–D) (# MUBSPMKRSMF-BG2)

Fruit body small to medium size; cap creamish-/bluish-purple, gills creamish-pink, stipe bluish-grey without pseudorhiza; solitary or scattered in small groups, annual, inedible. Pileus 1.5 (2.2–3.6) 4.4 cm (n=20), at first dark bluish-purple at centre and creamish towards periphery becoming brown on maturity, silky, convex becoming centrally depressed on maturity with incurved margin (Image 2A–C). Gills creamish-pink with bluish margin, adnate, narrow and moderately crowded (Image 2D). Stipe 1.8 (3.3–4.5) 4.7 × 0.2 (0.25–0.55) 0.65 cm (n=20), bluish-grey, base creamish-white, central, cylindrical, smooth, silky, delicate, hollow, slightly tapering towards apex, devoid of annulus and pseudorhiza (Image 2A, B). Spores 6.5 (7.8–9.8) 10.5 × 6.0 (6.5–7.8) 8.0 μm (n=12), hyaline, angular with ornamentation and double-layered.



Image 2. Mature fruit bodies of *Entoloma serrulatum* grown on lateritic pebble rich soil with leaf litter showing bluish-grey stipe (A, B), bluish-purple pileus (C) and creamish-pink gills (D); mature fruit bodies of *Lepiota echinella* with orange-brown stipe (F), pileus dark-brown centre with creamish boarder (E, F) and creamish-yellow gills (G) (Scale = 1cm). © M. Pavithra

Fresh weight: mature fruit body 0.19–2.5 g (n=20). Substrate: Grows on soil interspersed with leaf litter and pebbles.

Occurrence and distribution: Arboretum and Botanical garden, Konaje, Mangalore, Karnataka (present study); Chethalayam, Kuppadi, Malappuram and Wayanad in Kerala (Mohanam 2011; Farook et al. 2013).

***Lepiota echinella* Quél. & G.E. Bernard**

(Agaricaceae: Basidiomycotina) (Image 2E–G) (# MUBSPMKRSMF-BG3)

Fruit body small to medium size, fleshy agaric, cap creamish-brown, gills creamish-yellow, stipe orange-brown without pseudorhiza; solitary, annual and poisonous (Phillips 2006). Pileus 1.4 (1.5–1.9) 2.0 cm (n=8), dark brownish-black at centre, cream with brown hairy towards periphery, rough surface, at first convex becoming flat on maturity with shield-shaped umbo and uplifted margin (Image 2E,F). Gills creamish-yellow, free, narrow and crowded (Image 2G). Stipe 2.8 (3.0–

3.5) 3.6 × 0.1 (0.15–0.2) 0.25 cm (n=8), orange-brown with cream scaly structure, central, cylindrical, smooth, stuffed, slightly tapering towards apex with annulus, devoid of pseudorhiza; presence of white cottony rhizomorphs at the base (Image 2F). Spores 7.89 (8.5–9.8) 10.5 × 2.63 (3.28–3.9) 5.26 μm (n=10), hyaline, naviculate, thin walled and single layered.

Fresh weight: Mature fruit body 0.5-0.8 g (n=8). Substrate: Moist soil interspersed with thick bed of leaf litter.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study).

***Lepista* sp.**

(Tricholomataceae: Basidiomycotina) (Image 3A–D) (# MUBSPMKRSMF-BG4)

Fruit body medium to large, fleshy agaric, purplish-brown cap, lavender gills, stipe ash-purple devoid of pseudorhiza; solitary, annual and edible with pleasant flavour. Pileus 5.0 (6.4–10.0) 10.15 cm (n=6), brownish-purple at centre and light towards periphery, smooth,



Image 3. Mature fruit bodies of *Lepista* sp. grown on pebble rich lateritic soil with leaf litter showing greyish-purple stipe (A, B), purplish-brown pileus (A, C) and lavender gills (D); mature fruit bodies of *Leucoagaricus rubrotinctus* grown on pebble rich lateritic soil with leaf litter showing creamish-brown stipe (E), creamish-orange pileus (F) and creamish gills (G); dried mature fruit bodies of *Lycoperdon lividum* grown on soil with leaf litter showing ash-brown puffball with pseudorhiza (H) (Scale = 1cm). © M. Pavithra

shiny when wet, at first convex becoming flat on maturity with slight central depression and partially uplifted margin (Image 3A–C). Gills lavender, adnate, broad, papery and crowded (Image 3D). Stipe 3.0 (5.25–6.0) 7.0 × 0.9 (1.0–1.2) 1.5 cm (n=6), greyish-purple, central, cylindrical, solid, thick and equal, smooth and stuffed, without annulus and pseudorhiza (Image 3B). Spores 5.26 (5.9–7.8) 8.5 × 3.2 (3.9–5.2) 5.9 μm (n=12), hyaline, ellipsoid, smooth and thin-walled.

Fresh weight: Mature fruit body 18–45 g (n=6). Substrate: Common on lateritic soil rich with pebbles and also grows on moist soil interspersed with large

amount of leaf litter.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); Chandhakkunnu, Iringole Kavuu, Kuthiran, Muthanga, Nilambur, Peechi, Perumbavoor and Wayanad in Kerala (Mohanan 2011).

***Leucoagaricus rubrotinctus* (Peck) Singer**

(Agaricaceae: Basidiomycotina) (Image 3E–G) (# MUBSPMKRSMF-BG5)

Fruit body medium size, fleshy agaric, creamish-orange cap, creamish gills and creamish-brown stipe

devoid of pseudorhiza; solitary, annual and inedible. Pileus 3.0 (3.2–3.7) 5.0 cm (n=6), dark brownish-orange centre, creamish toward periphery with light-orange scales/fibres, rough, slimy when wet, flat with small central depression and slightly uplifted margin (Image 3F). Gills creamish, free, broad and less crowded (Image 3G). Stipe 4.0 (4.2–4.9) 5.0 × 0.25 (0.3–0.4) 0.45 cm (n=6), creamish towards apex and creamish with brown tinge towards base, central, cylindrical, smooth and stuffed, tapering towards apex with annulus, without pseudorhiza (Image 3E). Spores 5.26 (5.9–6.8) 9.2 × 2.63 (3.28–4.47) 5.26 μm (n=15), hyaline, ellipsoidal, smooth and thick-walled.

Fresh weight: Mature fruit body 3–4.5 g (n=6). Substrate: Laterite soil rich with pebbles and interspersed with less amount of leaf litter.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); Idukki, Karulai, Kollam, Kozhikode, Kuthiran, Malappuram, Muthanga, Nilambur, Peechi, Thrissur and Wayanad in Kerala (Mohanan 2011; Farook et al. 2013).

***Lycoperdon lividum* Pers.**

(Lycoperdaceae - Basidiomycotina) (Image 3H) (# MUBSPMKRSMF-BG6)

Fruit body medium, puffball, smooth, ash-brown, seen in small groups, annual and edibility not known. Mature puffball 2 (2.15–2.7) 4 × 1 (1.4–2.5) 3 cm (n=6), papery when dry, pear-shaped with small central spine, consists of pseudorhiza (Image 3H). Spores 2.63 (3.28–3.9) 4.6 μm (n=15), light-brown, spherical and finely warty.

Fresh weight: Mature fruit body 0.09–0.15 g (n=6). Substrate: Dry soil interspersed with leaf litter.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); Mannavan Shola and Munnar in Kerala (Mohanan 2011).

***Russula adusta* (Pers.) Fr.**

(Russulaceae: Basidiomycotina) (Image 4A–C) (# MUBSPMKRSMF-BG7)

Fruit body medium to large size, fleshy agaric, greyish-white cap, creamish gills, stipe greyish-cream without pseudorhiza; solitary or scattered or in small troops, annual and edible with mild/poor taste (Joshi & Joshi 2008). Pileus 4 (4.5–8.6) 9 cm (n=12), at first creamish-white turns to greyish-white becoming ash-brown on maturity finally into black, surface smooth on drying, at first flat becoming centrally depressed (infundibuliform/funnel-shaped) uplifted on maturity with irregularly lobed margin (Image 4A,B). Gills at first

cream turns to ash-brown on maturity finally into black, decurrent, broad and crowded (Image 4C). Stipe 3 (3.2–5.5) 5.8 × 1 (1.3–1.9) 2 cm (n=12), at first creamish, turns to ash-brown on maturity and finally to black, central, cylindrical, thick, smooth, stuffed, tapering towards base without annulus and pseudorhiza (Image 4A). Spores 7 (7.8–8.5) 9.8 × 5 (5.3–5.9) 6.5 μm (n=20), brown, broadly ovoid with thick outer layer looks like presence of spines/warts, but without spines/warts.

Fresh weight: Mature fruit body 9.0–35 g (n=12). Substrate: Moist black soil interspersed with leaf litter and pebbles, also having ectomycorrhizal association with *Vateria indica* (Dipterocarpaceae).

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); Chandhakkunnu, Malappuram, Nilambur and Thiruvananthapuram, Kerala (Farook et al. 2013; Mohanan 2011, 2014).

***Russula atropurpurea* (Krombh.) Britzelm.**

(Russulaceae - Basidiomycotina) (Image 4D–G) (# MUBSPMKRSMF-BG8)

Fruit body small to medium size, fleshy agaric, bright red cap, creamish-yellow gills, creamy white stipe without pseudorhiza; solitary, annual, inedible (Pala et al. 2012) and edible only after cooking (Jordan 2004). Pileus 3 (3.6–6.15) 6.5 cm (n=6), bright red, smooth, slimy, shiny when wet and at first flat becoming centrally depressed on maturity with uplifted margin (Image 4D, F). Gills at first cream becoming creamish-yellow on maturity, decurrent, broad and moderately crowded (Image 4G). Stipe 4 (4.2–5.3) 5.5 × 0.55 (0.6–0.85) 0.9 cm (n=6), creamish-white with pink tinge, central, cylindrical, thick, smooth, hollow, equal without annulus and pseudorhiza (Image 4D, E). Spores 6 (6.5–7.3) 8 × 5 (5.3–5.9) 6 μm (n=15), hyaline, ovoid with ornamentation and single-layered.

Fresh weight: Mature fruit body 7.0–14.5 g (n=6). Substrate: Moist soil interspersed with leaf litter and pebbles and also having ectomycorrhizal association with *Vateria indica*.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); Chandhakkunnu, Malappuram and Nilambur in Kerala (Farook et al. 2013; Mohanan 2011, 2014).

***Termitomyces microcarpus* (Berk. & Broome) R. Heim**

(Lyophyllaceae - Basidiomycotina) (Image 4H–J) (# MUBSPMKRSMF-BG9)

Fruit body small to medium size, fleshy agaric, creamish-brown cap, creamish gills and stipe;



Image 4. Mature fruit bodies of *Russula adusta* ectomycorrhizal in *Vateria indica* showing creamish stipe (A), greyish-white pileus (B) and creamish gills (C); mature fruit bodies of *Russula atropurpurea* ectomycorrhizal in *V. indica* showing creamish-white stipe (D, E), bright red pileus (D-F) and creamish-yellow gills (G); mature fruit bodies of *Termitomyces microcarpus* grown on faecal pellets of termites showing creamish stipe (H), creamish-brown silky pileus (I) and creamish gills (J); mature fruit bodies of *Tetrapyrgos nigripes* grown on leaf and woody litter (K, L) showing white to black stipe (K), pileus with greyish-black centre with greyish periphery (L) and white to pinkish gills (M) (Scale = 1cm). © M. Pavithra

gregarious, annual, edible with excellent taste and used to treat gonorrhoea (Oyetayo 2011). Pileus 1.6 (1.8–3) 3.1 cm (n=25), creamish-brown, smooth, silky, shiny on wet, at first companulate becoming expanded/broad convex on maturity with shield-shaped umbo (bluntly-umbonate) and irregularly lobed margins (lobes, 4–6) (Image 4H,I). Gills at first cream turns into light-brown on maturity, free to adnexed, narrow and less crowded (Image 4J). Stipe 4.5 (4.8–8.9) 9.2 × 0.1 (0.15–0.25) 0.3 cm (n=25), creamish, central, cylindrical, thin, smooth, silky, hollow and tapering towards the base, devoid of annulus, possess short pseudorhiza (Image 4H). Spores 5.26 (6.5–7.2) 7.8 × 3.28 (3.9–5.26) 6.5 μm (n=30), hyaline with grey outline, ovoid to broadly ellipsoid, thin

walled and single-layered.

Fresh weight: Mature fruit body 0.5–1.2 g (n=25). Substrate: Faecal pellets of termites.

Occurrence and distribution: Botanical garden, Konaje, Mangalore, Karnataka (present study); B'Shettigeri, Madikeri and Virajpet in Kodagu District of Karnataka (Karun & Sridhar 2013); Pune in Maharashtra (Patil et al. 1979). Chandhakkunnu, Ernakulam, Idukki, Kollam, Kuthiran, Malappuram, Nilambur, Peechi, Peechi-Vazhani Wildlife Sanctuary, Potta, Thiruvananthapuram, Thrissur, Wadakkancherry and Wayanad in Kerala (Florence & Yesodharan 2000; Mohanan 2011; Farook et al. 2013); Kanyakumari in Tamil Nadu (Davidson et al. 2012).

***Tetrapyrgos nigripes* (Fr.) E. Horak**

(Marasmiaceae - Basidiomycotina) (Image 4K–M) (# MUBSPMKRSMF-AB2)

Fruit body small, delicate agaric, whitish-grey cap, white gills, black stipe without pseudorhiza; seen in small troops, annual and inedible. Pileus 0.35 (0.6–1.3) 1.5 cm (n=20), dark greyish-black centre, white with grey tinge towards periphery, smooth, silky, shiny when wet, wrinkled when dry, at first convex becoming flat on maturity with incurved margin (Image 4L). Gills white, adnate, narrow and less-crowded (Image 4M). Stipe 1.4 (1.6–1.75) 2.1 × 0.05 (0.1–0.15) 0.2 cm (n=20), at first white becoming black with white powdery hairs on maturity, central, cylindrical, smooth powdery, stuffed, tapering towards base without annulus and pseudorhiza (Image 4K). Spores 7.8 (8.5–9.2) 9.8 × 6.5 (7.2–7.89) 8.54 μm (n=15), hyaline, tetrahedral/star-shaped with four arms (short, 3; long, 1), smooth and thin-walled.

Fresh weight: Mature fruit body 0.02–0.1g (n=15). Substrate: Grows on decaying leaf midrib and veins and also on small twigs.

Occurrence and distribution: Arboretum, Botanical garden, scrub jungle and fire affected scrub jungle, Konaje, Mangalore, Karnataka (present study); Peechi and Thrissur in Kerala (Mohanani 2011; Farook et al. 2013).

DISCUSSION

The present study revealed several edible and ectomycorrhizal macrofungi from the lateritic regions of the southwestern coast of India complementing many studies carried out in the Western Ghats, west coast, and lateritic plateau of eastern India (e.g., Purkayastha & Chandra 1985; Natarajan et al. 2005; Farook et al. 2013; Pradhan et al. 2010, 2013a,b; Manna & Roy 2014; Senthilarasu 2014; Greeshma et al. 2015; Karun & Sridhar 2016). A wide range of edible macrofungi has been reported from the eastern lateritic regions of India, and they constitute a major livelihood for the ethnic groups especially during wet season. Similarly, Purkayastha & Chandra (1985) recognized up to 50 edible mushrooms from the Western Ghats of India. Recently, 17 macrofungi have been reported as edible in the coastal region of southwestern India (Karun & Sridhar 2014). Traditional knowledge revealed that a few macrofungi will be consumed by the local people in the coastal region (e.g., *Amanita* sp., *Astraeus hygrometricus*, *Termitomyces microcarpus* and *T. umkowaan*) (Karun & Sridhar 2013, 2014; Ghate et al. 2014; Greeshma et al. 2015). *Astraeus hygrometricus* is common in the lateritic zones of the foothill of the

Western Ghats and west coast regions (Greeshma et al. 2015; Pavithra et al. 2016). Pyasi et al. (2011) have also recorded this fungus from Sal forest of Jharsaguda, Odisha. Traditional knowledge of the local people on the edibility of wild mushrooms assumes utmost importance in nutrition of rural inhabitants.

Natarajan et al. (2005) have reported up to 25 species of ectomycorrhizal fungi in dipterocarp stands in evergreen Kadamakkal reserve forest of the Western Ghats. They recorded a distinct pattern of succession of ectomycorrhizal fungi in young (3–7 years) and old (11–17 years) dipterocarp stands. Up to about 50% of the macrofungi in dipterocarp stands belongs to Russulaceae. Verma (2014) has recorded 18 species of *Russula* from the central India and some of them are ectomycorrhizal. Recently, up to 25 species of macrofungi were identified as ectomycorrhizal in the west coast region, but none were belongs to the genera *Russula* (Karun & Sridhar 2014). This may be due to lack of suitable host tree species in the area of survey, or many ectomycorrhizal fungi may prefer old growth forests. This warrants cultivation of native and endemic tree species to reap maximum benefits from the ectomycorrhizal fungi. Native as well as endemic tree species need special attention to follow their association with ectomycorrhizal fungi in view of developing silviculture for rehabilitation of the west coast region.

Other ecosystems of great interest to explore macrofungi in the west coast of India includes: sacred groves, mangroves, sand dunes, freshwater marshes, saltwater marshes, plantations, paddy fields and scrub jungles. Scrub jungles in high elevation are succumb for occasional fire during dry season (February–May). Surprisingly a variety of macrofungi crop up immediately on the onset of rainy season in fire impacted areas of scrub jungles needs more exploration on the impact of fire (Greeshma et al. 2015). Understanding the traditional knowledge and educating local dwellers on the multiple values of macrofungi (edible, ectomycorrhizal and medicinal) would be highly beneficial to support conservation measures of coastal ecosystems.

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ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

March 2017 | Vol. 9 | No. 3 | Pages: 9885–10020

Date of Publication: 26 March 2017 (Online & Print)

DOI: 10.11609/jott.2017.9.3.9885-10020

www.threatenedtaxa.org

Articles

An updated report on the distribution and conservation status of the endangered Cat's Head Rockrose *Helianthemum caput-felis* (Magnoliopsida: Violales: Cistaceae) in Algeria
-- Jonás C. Agulló, Ana Juan, Manuel B. Crespo, María Ángele Alonso & Alejandro Terrones, Pp. 9885–9891

A comparative study of the diet of the Indian Eagle Owl *Bubo bengalensis* (Franklin, 1831) from two distinct habitats in the Tamil Nadu - Puducherry area, southern India
-- M. Eric Ramanujam & Tushita Singh, Pp. 9892–9902

Review

Status, distribution and threats of kraits (Squamata: Elapidae: *Bungarus*) in Bangladesh
-- M.F. Ahsan & M.M. Rahman, Pp. 9903–9910

Communications

Ecology of marine macro algal flora of Visakhapatnam coastal areas, Bay of Bengal, India
-- I. Vishnupriya Sowjanya & P.S. Raja Sekhar, Pp. 9911–9919

Distribution pattern, population estimation and threats to the Indian Pangolin *Manis crassicaudata* (Mammalia: Pholidota: Manidae) in and around Pir Lasura National Park, Azad Jammu & Kashmir, Pakistan
-- Faraz Akrim, Tariq Mahmood, Riaz Hussain, Siddiqa Qasim & Imad-ul-din Zangi, Pp. 9920–9927

Impact of vehicular traffic on vertebrate fauna in Horton plains and Yala national parks of Sri Lanka: some implications for conservation and management
-- Suranjan Karunaratna, Sudheera Ranwala, Thilina Surasinghe & Majintha Madawala, Pp. 9928–9939

Forest ghost moth fauna of northeastern India (Lepidoptera: Hepialidae: *Endoclita*, *Palpifer*, and *Hepialiscus*)
-- John R. Grehan & Vijay Anand Ismavel, Pp. 9940–9955

First record of tapeworm *Moniezia* (Cestoda: Anoplocephalidae) infections in Leopards: Coprological survey of gastrointestinal parasites of wild and captive cats in Sri Lanka
-- Vishvapali Kobbekaduwa, Caroline Fillieux, Ashan Thudugala, R.P.V. Jayantha Rajapakse & Rupika S. Rajakaruna, Pp. 9956–9961

Short Communications

Macrofungi in two botanical gardens in southwestern India
-- Mundamoole Pavithra, Kandikere R. Sridhar & Ammatanda A. Greeshma, Pp. 9962–9970

A report on some butterflies (Lepidoptera) from Ladakh in Jammu & Kashmir and Lahaul in Himachal Pradesh, India
-- Sanjay Sondhi, Balakrishnan Valappil, Yash Sondhi & Anchal Sondhi, Pp. 9971–9987

Status, abundance and habitat preference of butterflies (Insecta: Lepidoptera) in Chittagong University Campus, Chittagong, Bangladesh

-- Ibrahim Khalil Al Haidar, M. Mizanur Rahman, M. Farid Ahsan & M. Ariful Islam, Pp. 9988–10003

A preliminary report on the impact of road kills on the herpetofauna species in Nilgiris, Tamil Nadu, India
-- P. Santhoshkumar, P. Kannan, A. Veeramani, A. Samson, S. Karthick & J. Leonaprinicy, Pp. 10004–10010

Notes

Lifecycle and fecula measurements of *Cheritra freja* (Lepidoptera: Lycaenidae), as relevant to the different larval stages
-- Tharaka Sudesh Priyadarshana & Ishara Harshajith Wijewardhane, Pp. 10011–10013

New distribution record of Nagarjunasagar Racer *Platyceps bholanathi* (Reptilia: Squamata: Colubridae) in Sigur, Nilgiris landscape, India
-- Arockianathan Samson, Palanisamy Santhoshkumar, Balasundaram Ramakrishnan, Sivaraj Karthick & Chandrashekaruni Gnaneswar, Pp. 10014–10017

A first report of the presence of the Indian Wild Pig *Sus scrofa cristatus* from Kajinag Range, Kashmir, India
-- Riyaz Ahmad, Intesar Suhail & Yash Veer Bhatnagar, Pp. 10018–10020