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continued on the back inside cover

Cover: A Southern Rockhopper Penguin *Eudyptes chrysocome* stands on Tussock Grass on Westpoint Island. Painted in poster colors, this artwork is a reproduction of a photograph by Phillip Colla. Thanks to the photographer for the original image. © Pooja Patil.

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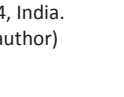

ARTICLE

Additions to the Agaricales of Kolhapur District, Maharashtra, India

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Abstract: This paper is a part of the series dealing with taxonomy of members of Agaricales from Kolhapur District. In the present investigation 10 species belonging to order Agaricales—*Agrocybe pediades*, *Amanita manicata*, *Bolbitius coprophilus*, *Entoloma serrulatum*, *E. theekshnagandhum*, *Hymenopellis radicata*, *Macrocybe gigantea*, *Schizophyllum commune*, *Termitomyces heimii*, *T. microcarpus*—have been elaborated, of which *A. manicata*, *B. coprophilus, E. serrulatum*, *E. theekshnagandhum*, *M. gigantea* have been reported for the first time from Maharashtra State.

Keywords: Basidiomycota, edible mushrooms, fungal diversity, fungal ecology, macrofungi, new records, taxonomy, Western Ghats, wild mushroom.

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Author contributions: ARP—served as the principal investigator of the study and contributed significantly to the writing and formatting of the manuscript. SIB—was responsible for the collection, identification, and description of the mushroom species, and also assisted in the writing and formatting of the manuscript.

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INTRODUCTION

Agaricales Underw. is the largest order in Agaricomycetes comprise of total eight suborders, 46 families, 482 genera, and more than 40,000 species. Previously, based on the phylogenetic studies Agaricales was divided into seven suborders, viz., *Agaricineae* Aime et al., *Pluteineae* Aime et al., *Tricholomatineae* Aime et al., *Marasmiineae* Aime et al., *Schizophyllineae* Aime et al., *Pleurotineae* Aime et al., and *Hygrophorineae* Aime et al. with one more addition of suborder *Clavariineae* Olariaga by Olariaga et al. in 2020 (Wang et al. 2023). Most species in the Agaricales form mushrooms with gilled hymenophore, pileus, and stipe which play various roles as decomposers, symbionts, and pathogens, helping to maintain the ecosystem. Most species belonging to this order consumed as foods and rich in nutrient supplements and medicines. Taxonomy of the order Agaricales has much debate on identifying species. Traditionally species belonging to the order identified based on their macroscopic and microscopic characteristics, however sometimes these characteristics are often not sufficient to identify Agaricales specimens to the species level. Nowadays, DNA sequence–based classification and identification are now being widely used to overcome the limitations of morphology-based identification (Yoo et al. 2022). Indian Agaricales were first reviewed by Sathe & Rahalkar (1978) and Manjula (1983) who provided a very exhaustive list of agaricoid and boletoid fungi from India and Nepal (Gogoi & Parkash 2015).

Maharashtra is the third largest state of India next to Rajasthan and Madhya Pradesh covering an area of 307,713 km^2. The state lies at 18.96^0 N, 72.82^0 E and altitude ranges 0–1,800 m. The state has ample forest area which occupies approximately one fifth of the state confined to the Western Ghats and eastern Vidarbha region with an annual rain fall of about 4,000 mm in the western region of Western Ghats and about 700–1,250 mm in Vidarbha region (Senthilarasu 2014).

Mycologists paid little attention to the diversity of mushrooms found in Maharashtra. The diversity of mushrooms from Maharashtra was mainly contributed by Blatter (1911), Parandekar (1964), Trivedi (1972), Sathe & Rahalkar (1975, 1976), Narendra & Rao (1976), Thite et al. (1976), Chavan & Barge (1977), Patil & Thite (1977, 1978), Sathe & Sasangan (1977, 1978), Patil (1978), Patil et al. (1979), Sathe & Kulkarni (1979), Sathe & Deshpande (1979, 1980a,b, 1982), Manjula (1983), Bhide et al. (1987), Kulkarni (1990, 1992), Hedawoo & Mohite (2008), Hedawoo (2010), and Senthilarasu (2014).

A detailed checklist of gilled mushrooms from Maharashtra was provided by Senthilarasu (2014), in which 178 species in 68 genera belonging to 23 families and five orders, viz., Agaricales, Boletales, Cantharellales, Polyporales, and Russulales have been reported. Most of the species diversity was published between 1901 and 1992. Since then, there was no report on the taxonomy and diversity of gilled fungi occurring in Maharashtra (Senthilarasu 2014). Borkar et al. (2015) studied Mushroom diversity of Konkan region of Maharashtra and described 21 species belonging to the order Agaricales. Patil & Bornak (2022, 2023) studied diversity of Agaricales from Kolhapur District, Maharashtra and listed 14 species of which one species is new to India and three species are new to Maharashtra State. This paper is the continuation of Agaricales diversity from Kolhapur District.

MATERIAL AND METHODS

Study area

Kolhapur lies in the south-west between 15.716–17.166^0 N and 73.666–74.700^0 E. As a part of Western Ghats, Kolhapur district has ample biodiversity having tropical climate with high rainfall and warm summers. The monsoon rains are due to winds from the southwest as well as north-east with the maximum rainfall of (6,000 mm) in the west to minimum (600 mm) in the east. The district is rich in vegetation cover. The total forest cover in the district is 1,672 km^2, out of which 563 km^2 is reserve forest and 417 km^2 is protected forest. Total forest area is about 22% of the total geographic area of the district. There are three main types of forests: a) subtropical evergreen, b) moist deciduous and semievergreen, and c) dry deciduous forest (Patil & Bornak 2023).

Collection and identification

Frequent trips were made to various localities of Kolhapur district between 2020 and 2023. All the species were collected during the monsoon season. Healthy specimens at different stages of development were collected. Field photographs were taken with the help of Xiaomi Redmi Note 5 Pro and OnePlus 9RT mobile camera to note colour, size, shape, and habitat whereas, odour and other ecological characters were noted down in the field notebook. Microscopic observations of fresh fruiting bodies were done using 1.5% Phloxine B stain and Lawrence and Mayo N-300M research microscope. Dry and wet (70% ethanol) preservation techniques

have been used for collected specimens.

RESULTS

Agrocybe pediades
(Image 1a–h)

(Pers.: Fr.) Fayod in *Ann. Sci. Nat. Bot. Ser*. 79: 359, 1889.

Fruiting body small to medium; **Pileus** up to 1–3 cm in diam., convex, ex-umbonate; surface pale brownish to yellowish-brown, moist, smooth, hygrophanous; margin regular, not splitting at maturity, non-striate; flesh thin, 0.2 cm thick, pale; taste and odour mild. **Lamellae** broadly adnate to sub-decurrent, ventricose, sub-distant to distant, moderately broad, pale brown. **Spore print** dark brown. **Stipe** 3–6 × 0.3 cm, central, cylindrical, slightly bulbous at base, solid, pale brown to brown, with granular texture, shiny. **Basidiospores** 10.2–14.5 × 6.6–9.2 µm, ellipsoidal, with a truncate germ pore, thick–walled, smooth; **Basidia** 22–26.8 × 7.8–10.2 µm, clavate, 4-spored, hyaline, lamella edge sterile. **Cheilocystidia** 16.8–33.5 × 6.6–9 µm, polymorphic, cylindrical, lageniform, thin–walled, hyaline, some with granular apices. **Pleurocystidia** absent. Clamp connections present throughout.

Collections examined

India, Maharashtra, Kolhapur, Bhudargad, Bhendvade, Gadhinglaj–Gargoti Road, (16.309^0 N, 74.181^0 E), on soil mixed in rice husk, gregarious, in cluster, 14.vi.2020, Bornak, S.I. & Patil, A.R. (Y20V1C3); Gaganbawda, Kolhapur–Gaganbawda Road, (16°33'26"N-73°51'11"E), on littered soil, gregarious, 26.vi.2020, Bornak, S.I. (Y20C4V4); Karvir, Rajaram College Campus, (16.686^0 N, 74.256^0 E), on humid soil, in cluster, 12.vii.2020, Bornak, S.I. (Y20V10C3); Karvir, Rajarshi Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur campus (16.687^0 N, 74.261^0 E), on soil, in pair, 07.vii.2022, Bornak, S.I, (Y22V3C9); Karvir, Rajaram College Campus, (16.687^0 N, 74.257^0 E), on soil, under *Gliricidia sepium* tree, in a cluster, 09.vii.2023. Bornak, S.I. (Y23V1C5).

Remarks

Agrocybe pediades, an edible mushroom recognized by its name 'Common field cap', is growing gregariously in grassy fields, on lawns, and pasture lands. *A. pediades* is recognized by the smooth pileus surface, which is brownish-yellow with some reddish shades, appendiculate pileal margin and powdery squamulose stipe with scattered remnants of evanescent annulus (Kaur et al. 2014). It is common and distributed worldwide and seems to be a problematic species. Many authors designate several species to *A. pediades* based on morphological characters such as pileus colour, viscidity, amount of veil, shape of pileus, spore size, although morphological studies have demonstrated most species to be synonymous or varieties within *A. pediades* (Niveiro et al. 2020). *A. pediades* is highly prized due to its edibility. The known Indian distribution of this species is Kerala, some parts of northern India and Punjab (Kaur et al. 2014). From Maharashtra this species has been reported from Pune (Senthilarasu 2014).

***Amanita manicata* (Berk. & Broome) Pegler**
(Image 2a–h)

Kew Bull., Addit. Ser. 12: 216 (1986).

Pileus 6–10 cm, fleshy, initially hemispherical, then convex to completely flat, whitish to creamy white, wrapped in a general grainy-greasy veil, the ochraceous orange colour that covers it entirely when young, but subsequently thins out in patches, leaving the underlying parts uncovered and clear. Margin smooth, not striated, strongly appended by triangular flap like remnants of the partial veil, then completely naked at maturity. **Lamellae** adnate to adnexed, low and only slightly ventricose, crowded, white to whitish pink, up to 10 mm broad with short lamellulae. **Stipe** 7–16 × 0.8–1.6 cm, cylindrical, solid, typically sinuous in the median part with rounded base, sub–clavate. Smooth above the ring, below entirely covered by ochre-orange coloured, large, fibrillose-hairy scales. Stipe is concolourous with the pileus surface. Flesh white, 1 cm thick, with strong unpleasant odour. **Basidiospores** 5.6–8.0 × 5.0–7.8 µm, globose to sub-globose, few broadly ellipsoidal, amyloid, smooth. **Basidia** 40–56 × 9–11 µm, tetrasporic cylindrical-clavate. **Cheilocystidia** and **pleurocystidia** absent.

Collection examined

India, Maharashtra, Kolhapur, Rajarshi Chhatrapati Shahu Maharaj College of Agriculture (16.684^0 N, 74.261^0 E), on ground, alone, scattered, 07.vii.2022, Bornak, S.I. (Y22V4C1)

Remarks

A. manicata can be easily recognized by its yellowish-brown to pale tawny brown pileus covering with floccoso-verrucose to felty squamules; margin appendiculates with large floccose fragments which hang down up to 2 cm; the cylindrical stipe covering with tawny brown floccoso-squamose which becomes more intense and

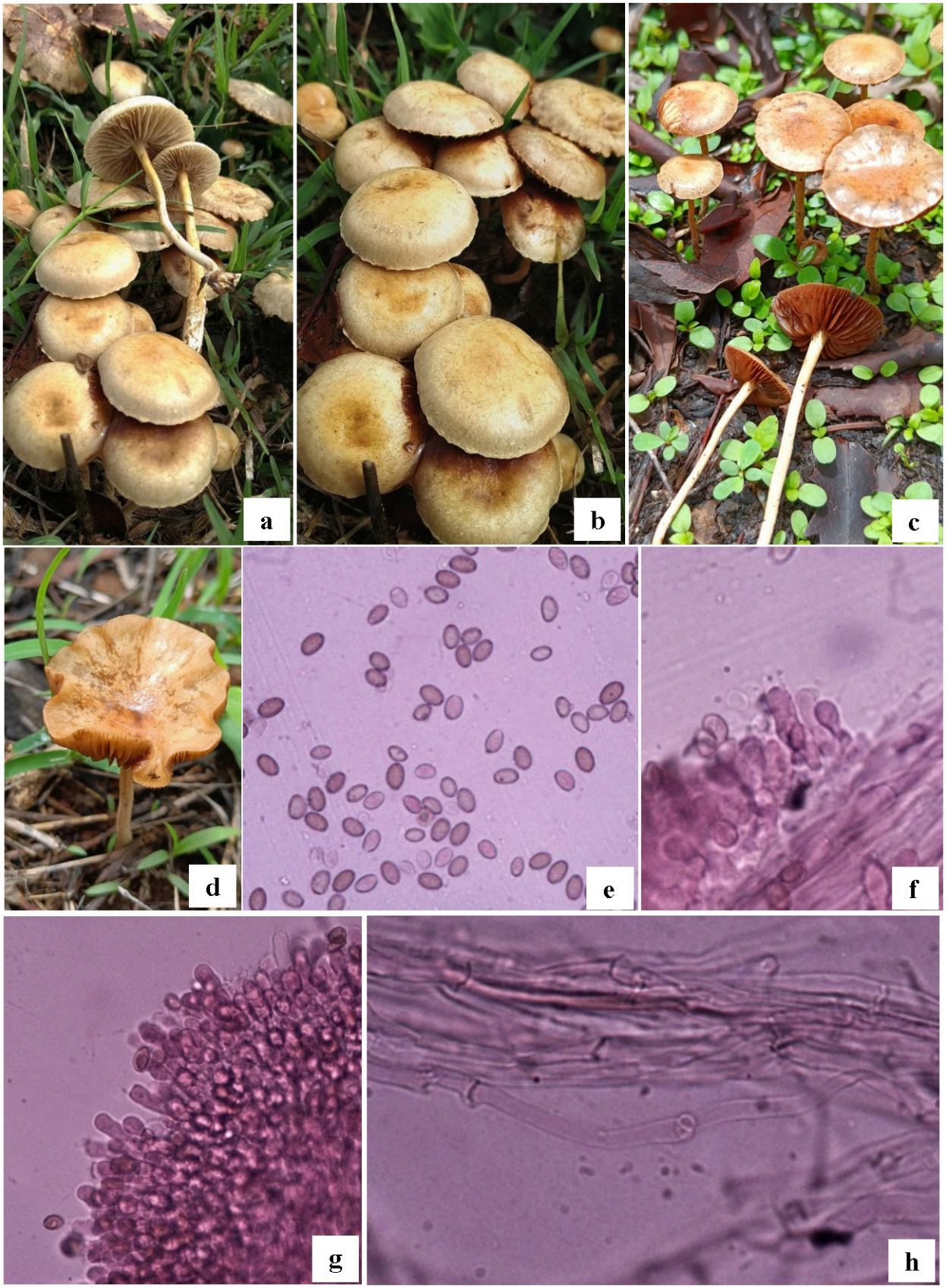

Image 1. *Agrocybe pediades* (Pers.: Fr.) Fayod.: a–d—Basidiomes in their natural habitat | e—Basidiospores 40x | f–g—Basidia with basidioles 40x | h—Pileipellis hyphae with clamp connections 40x. © Sushant Ishwar Bornak.

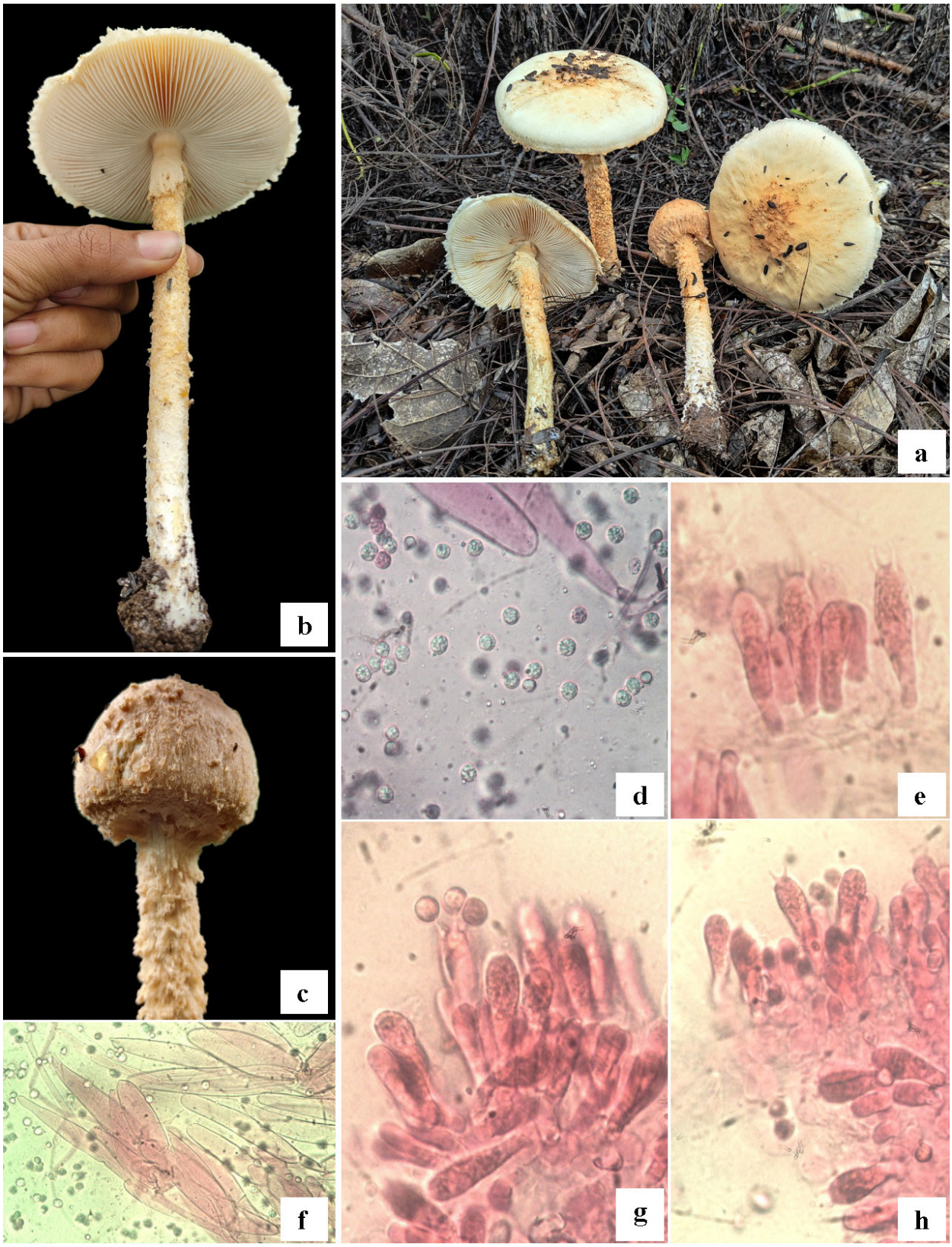

Image 2. *Amanita manicata* (Berk. & Broome) Pegler: a–c—Basidiomes in their natural habitat | d—Basidiospores 40x | e—Basidia 40x | f—Pileipellis 40x | g–h—Basidia with basidioles 40x. © Sushant Ishwar Bornak.

thicker as upwards; the cream to whitish or pinkish tint lamellae; the subglobose and amyloid basidiospores (Liu et al. 2022) This species has been described from Karnataka, India (Kantharaja & Krishnappa 2022). This is the first report from Maharashtra State.

***Bolbitius coprophilus* (Peck) Hongo**
(Image 3a–i)

Mem. Fac. Lib. Arts Educ., Shiga University, Nat. Sci. 9: 82, 1959.

Fruiting body small to medium, 3–20 cm in height. **Pileus** 2.5–6 cm in diam., campanulate when young, conical at maturity, becoming applanate; umbonate, umbo broad, reddish-brown to pale brown to brown; slightly pinkish when young, surface viscid, smooth, fragile, margin irregular, pellucid, striate, splitting at maturity; flesh thin; **Lamellae** free, unequal, crowded, narrow to moderately broad, white to pale yellow when young, grayish-brown to brown at maturity, fragile; gill edges curled with age. **Stipe** central, 3–18 × 0.4–0.6 cm broad, tubular, with slightly swollen base, hollow, surface pale yellow, unchanging, with pinkish excludes on surface when mature, pruinose–fibrillose, delicate, shiny, silky. **Basidiospores** 10.5–16 × 8–10 mm, ellipsoidal to ovate, truncated by a broad germ pore, thick-walled, smooth, yellowish-brown. **Basidia** 18–30 × 9.5–14.8 mm, clavate to cylindrico-clavate, thin walled, 2–4 spored; **Lamella edges** sterile. **Cheilocystidia** 25–35.5 × 7.6–18.5 mm, cylindrical, clavate-vesiculose, thin-walled, hyaline. **Pleurocystidia** not observed. **Pileipellis** hymeniform, 18–45 × 8–12 mm, inflated, clavate, thin walled, hyaline; clamp connections absent.

Collection examined

India, Maharashtra, Kolhapur, Karvir, Parite, Kolhapur–Radhanagari road (16.542^0 N, 74.115^0 E), on rice husk, alone, solitary, scattered, 16.vii.2023, Bornak, S.I. (Y23V6C3).

Remarks

B. coprophilus is characterized by a broad pileus which is pale with a distinct pinkish tinge and a pileal shape that varies from convex or campanulate when young and flat at maturity; the gills are free and non-deliquescent and the basidiospores are ellipsoid to ovoid. This species prefers to grow on organic substrates that are rich in nutrients, such as dung or compost (Usman et al. 2022). *B. coprophilus* was originally described from North America by Hongo in 1959. After that several investigations were made from various regions of the world viz. dung heaps in New York; wheat fields in England; horse and deer dung mixed with straw in Denmark, Italy; scattered on cow dung, compost, and rice straw in Singapore; compost and wheat straw in Argentina, Europe, and Poland; horse dung in France and Austria; straw, dung, and compost in Russia (Usman et al. 2022). *B. coprophilus* has been previously reported from India on elephant dung in Kerala (Thomas et al. 2001; Manimohan et al. 2007) and from Punjab by Amandeep et al. (2013). There is no report of this species from Maharashtra state. Thus, this is a first report from Maharashtra State.

***Entoloma serrulatum* (Fr.) Hesler**
(Image 4a–e)

Beih. Nova Hedwigia 21: 140 (1967).

Fruit body small to medium; **Pileus** 0.8–5 cm, dark bluish-purple, velvety when young becoming greyish-blue on maturity, silky, convex, centrally depressed when mature with incurved margin. **Lamellae** creamish-pink to pale blue, adnate, narrow and moderately crowded. **Stipe** 1.5–4.5 × 0.2–0.5 cm, bluish-grey, base cream, central, cylindrical, smooth, hollow. **Basidiospores** 7–11 × 5.8–7.5 µm, hyaline, angular, pentagonal. **Basidia** 26–34 × 9–11 µm, clavate, 4- spored. **Cheilocystidia** 35–60 × 8–11.5 µm; cylindric with clavate to subclavate apices. Lamellar edge sterile. **Clamp connections** absent.

Collections examined

India, Maharashtra, Kolhapur, Panhala, Pombare (16°43’05”N-73°54’09”E), on soil, under the trunk of *Acacia mearnsii* De Wild. tree, solitary or in pair, 16.vii.2020, Bornak, S.I. (Y20V15C4); Panhala, Padsali (16.589^0 N, 73.867^0 E), amongst decaying leaf litter, solitary, scattered, 24.vi.2021, Bornak, S.I. & Patil, Y.S. (Y21V3C4).

Remarks

Entoloma serrulatum can be recognized by the dark blue cap, squamous pileal surface in the center and bluish lamellae with a dark margin. Microscopically basidiospores measure 9–13 × 6–9 µm and the pileal surface is composed of a cutis with pileocystidis forming a transition between cutis and trichoderm, sometimes almost hymeniform. *E. serrulatum* has a wide geographic distribution, occurring in Europe, South America, North America, Asia, and Brazil (Karstedt 2010).

This species has been previously reported from Kerala (Farook et al. 2013) and southwestern India (Pavithra et al. 2016). Jagadish et al. (2019) showed that the species *E. serrulatum* along with 20 other species have ectomycorrhizal assemblage in the vicinity

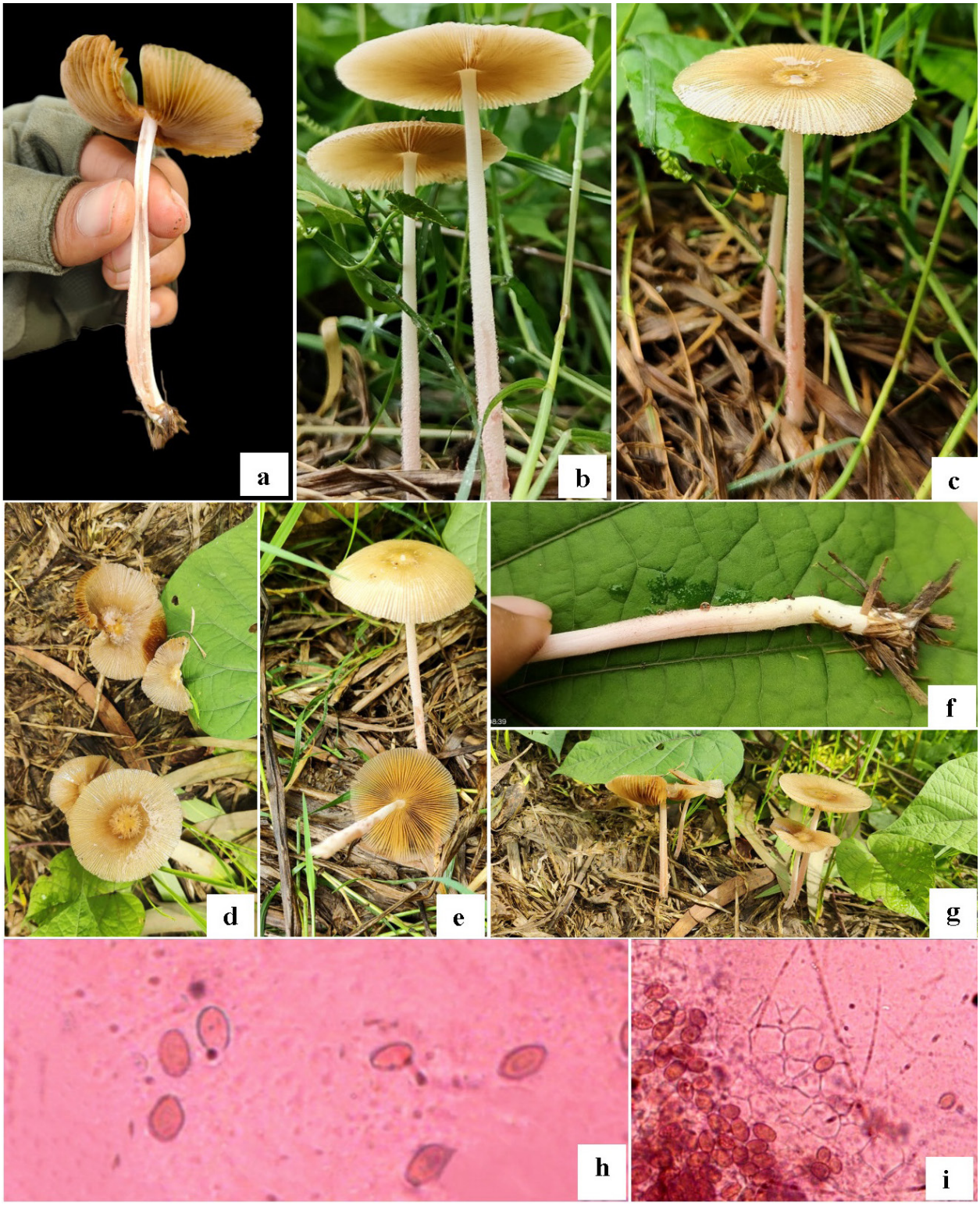

Image 3. *Bolbitius coprophilus* (Peck) Hongo.: a–g—Basidiomes in their natural habitat | h—Basidiospores 40x | i—Pileipellis 40x. © Sushant Ishwar Bornak.

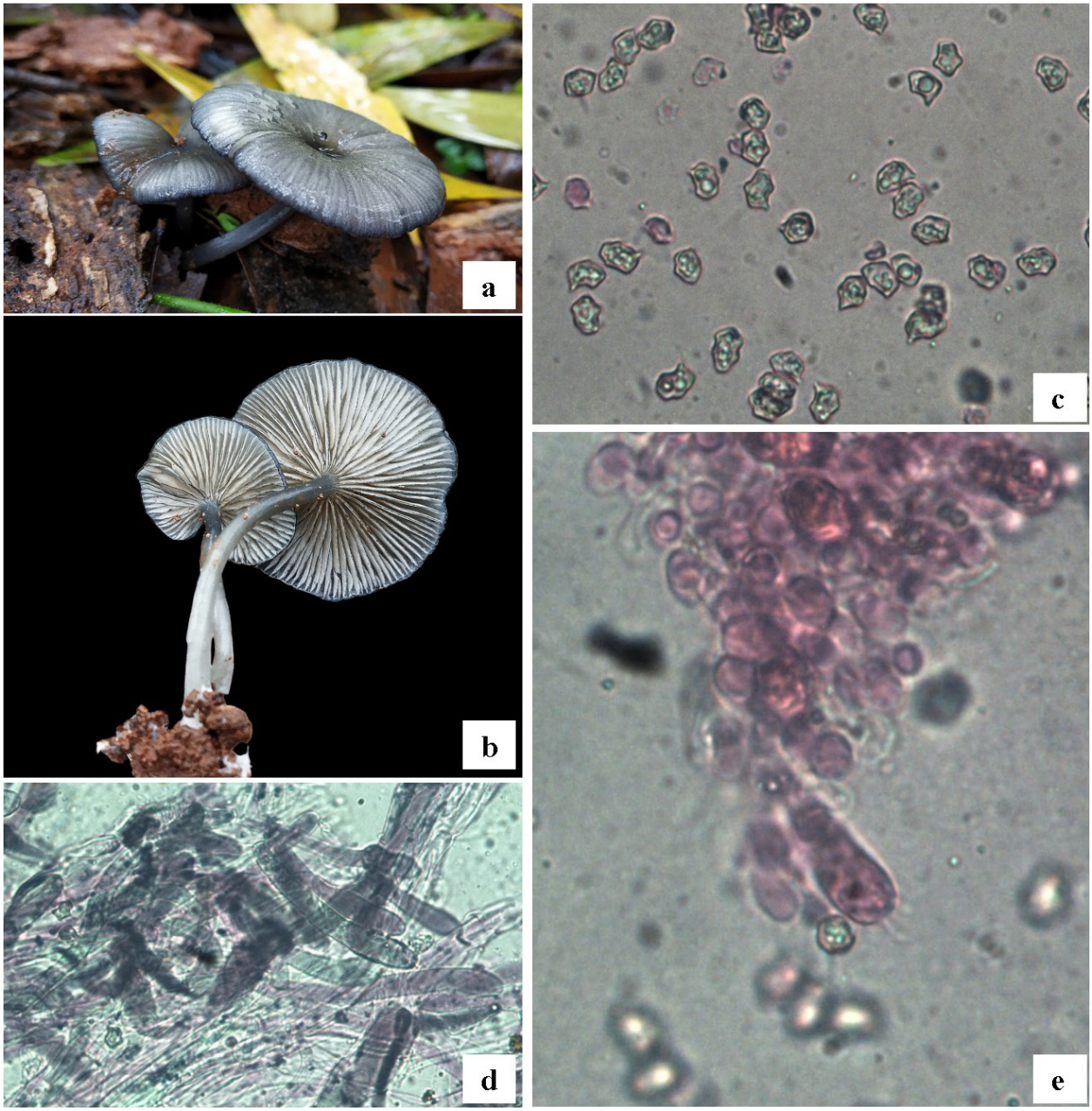

Image 4. ***Entoloma serrulatum*** **(Fr.) Hesler: a–b—Basidiomes in their natural habitat | c—Basidiospores 40x | d—Pileipellis 40x | e—Basidia with basidioles 40x. © Sushant Ishwar Bornak.**

of *Anacardium occidentale* from the Arabian Sea coast near Mangalore City, Karnataka State. This species is the first record from Maharashtra State.

Entoloma theekshnagandhum **Manim., A.V. Joseph & Leelav.**
(Image 5a–h)

Mycol. Res. 99(9): 1088 (1995).

Fruiting body small to medium. **Pileus** 2–4 cm in diameter, convex, centrally depressed cap; surface white to yellowish white, pale greenish-white when young, glabrous, smooth, pellucid–striate; margin regular. **Lamellae** adnate to sub-decurrent, white to yellowish-white, with lamellulae. **Stipe** 3–7 × 0.2–0.5 cm; central or slightly eccentric, cylindric, sometimes compressed, hollow; yellowish-white, pruinose at apex, glabrous towards base. **Odour** very strong, unpleasant; taste unpleasant. **Basidiospores** 7–9 × 6.8–8.2 µm, quadrate or pentagonal. **Basidia** 23–39 × 8–13 µm, clavate with four sterigmata. Lamella edge sterile. **Cheilocystidia**

18–65 × 6.5–22 µm, copious, lageniform, clavate to obclavate, cylindrical, hyaline. **Pleurocystidia** not observed. **Caulocystidia** 32–70 × 10–18 µm, similar to cheilocystidia. Spore print pale pink to orange white.

Collections examined

India, Maharashtra, Kolhapur, Panhala, Pombare (16.689^0 N, 73.906^0 E), on soil, solitary, scattered, 16.vii.2020, Bornak, S.I. (Y20V15C3); Shahuwadi, Nandari (16.098^0 N, 73.835^0 E), on soil, single, 05.viii.2021, Bornak, S.I. & Patil, Y.S. (Y21V7C6).

Remarks

This species was first described by Manimohan and Leelavathy (1988) as *Alboleptonia graveolens*. Later, the name was changed to *Entoloma theekshnagandhum* (Manimohan et al. 1995). The species can be easily recognized by its robust, whitish, omphalinoid basidiomes; the strong, unpleasant odour, quadrate spores, versiform cheilocystidia and the darkening nature of the basidiomes upon drying, development of a yellow colour when the fresh basidiomes are bruised (Manimohan et al. 1995). The species has been reported from several places of Kerala (Manimohan & Leelavathy 1988; Manimohan et al. 1995), Karnataka (Karun & Sridhar 2016) and Hollongapar Gibbon Wildlife Sanctuary, Assam (Gogoi & Parkash 2015). Diversity of genus *Entoloma* is not well studied in Maharashtra state. So far only *E. brassicolens, E. byssisedum, E. ochrospora, E. strictius*, *E. roseoflavum* have been reported from Maharashtra State (Senthilarasu 2014; Borkar et al. 2015). *E. theekshnagandhum* is the first report from Maharashtra State.

***Hymenopellis radicata* (Relhan) R.H.Petersen**
(Image 6 a–j)

Petersen & Hughes, *Nova Hedwigia*, Beih. 137: 202 (2010).

Fruiting body medium**; Pileus** 2.5–9cm, initially convex, then flattened-convex to flat, with wide low and obtuse umbo; margin thin, regular, acute, smooth, a little wavy; smooth cuticle when young, sooner or later radially wrinkled, glabrous, opaque with dry weather, viscous when humid; pale brown, hazel, ochraceus, whitish at times, darker at the centre; **Lamellae** of spaced gills, adnate or rounded, ventricose, wide, interspersed with numerous lamellulae of various length; the colour is white, the thread is entire and just stains brown when ripe; **Stipe** 5–16(20) × 0.5–1.5 cm, slender, long, cylindrical, with the enlarged base continuing in the soil under in the form of long root, rigid, fibrous, tough, full, at times twisted; surface finely floccose, longitudinally fibrillar, white at the apex, darkens gradually towards the base, where it has a colouration more or less similar to that of the cap; **Basidiospores** 15–18 × 8–10 µm; widely ellipsoidal, elongated–ovoid, smooth, guttulous; **Basidia** 45–55 × 10–15 µm; cylindrical, clavate, tetrasporic, with clamp connections; **Cheilocystidia** 12–35 µm; clavate, ventricose, smooth; **Pleurocystidia** 22–35 µm; widely clavate, widely rounded, truncated at the apex; **Annulus** absent. **Spore print** white.

Collections examined

India, Maharashtra, Kolhapur, Bhudargad, Bediv (16.211^0 N, 74.163^0 E), on ground, alone, solitary, 14.vi.2020, Bornak S.I. (Y20V2C12); Shahuwadi, Ambeshwar Devrai, (16.974^0 N, 74.801^0 E), on soil, alone, solitary, 19.vi.2020, Bornak S.I. (Y20V4C26); Kalammawadi Road, Radhanagari, (16.404^{0}N, 74.018^{0}E), on soil, single, 16.vii.2023, Bornak, S.I. (Y23V4C4).

Remarks

The type species of *Hymenopellis* is *H. radicata* described in 1786 under the name *Agaricus radicatus. H. radicata* is an edible species and can be cultivated commercially which *contains bioactive compound lectin which is antifungal, mucidin which is antioxidative, anti-inflammatory and shows lung-protective effects and some polysaccharides which are antifungal in nature* (Niego et al. 2021). The species is cosmopolitan. In *Maharashtra this species has been reported from Karnala, Thungareshwar, Lonavala, and Bhimashankar.*

***Macrocybe gigantea* (Massee) Pegler & Lodgel.**
(Image 7a–g)

Mycologia, 1998

Pileus 8–35 cm across, convex to flat, white, grayish-white, cream white, paler towards margin, glabrous and silky smooth, margin entire and incurved, expands when mature, often cracking. **Lamellae** notched, crowded, pale white to straw yellow, many tiers of lamellulae. **Stipe** 10–40 × 4–6 cm, central, solid, concolorous with pileus, fibrillose. **Basidiospores** 4.8–6.6 × 3.2–4.2 µm, ovate to ellipsoidal, hyaline, thin walled, smooth. **Basidia** 23–26.5 × 5.8–8.8 µm, four spored, clavate to sub-cylindrical, hyaline, oil droplets prominent, basal clamp connections present. **Cystidia** absent. **Lamellar** edges fertile. **Hymenophoral** trama regular, made up of thin-walled parallel hyphae. Pileipellis a cutis of narrow hyphae 4–8 µm in diameter, hyaline in 5% KOH, **clamp connections** present. Spore print white. **Odour** and taste

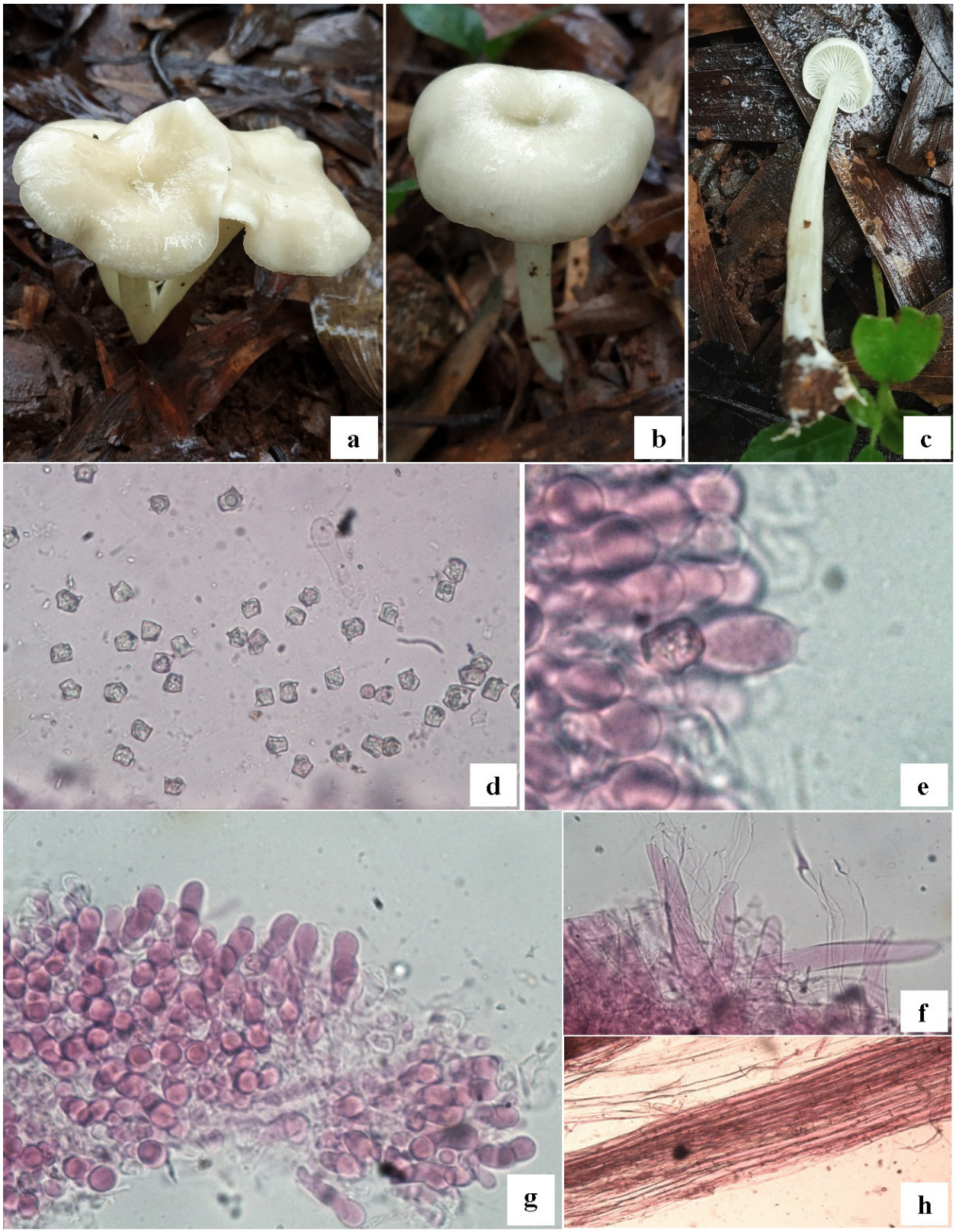

Image 5. *Entoloma theekshnagandhum* Manim., A.V.Joseph & Leelav.: a–c—Basidiomes in their natural habitat | d—Basidiospores 40x | e—Basidia 40x | f—Pileipellis 40x | g—Basidioles 40x | h—Stiptipellis 40x. © Sushant Ishwar Bornak.

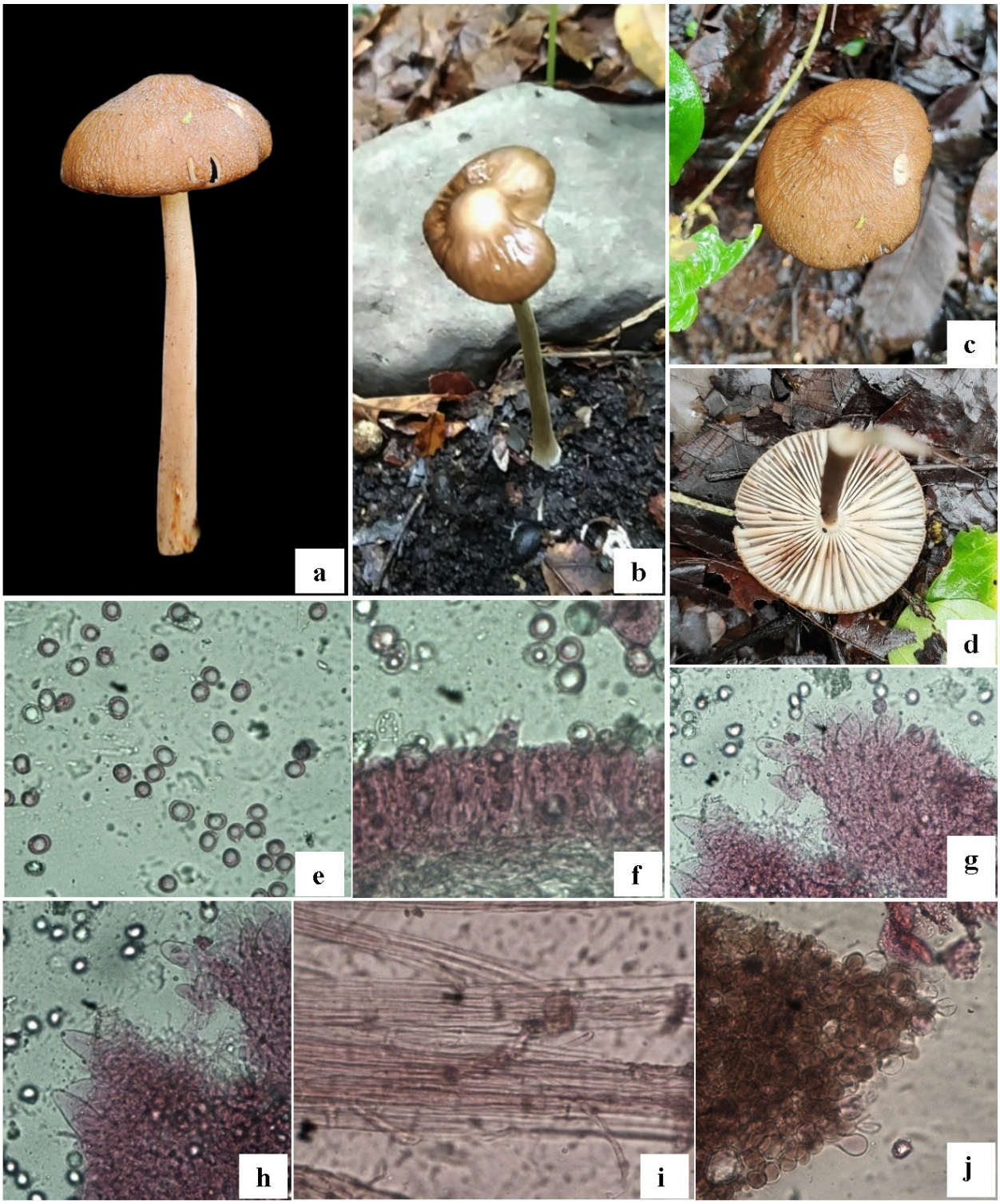

Image 6. *Hymenopellis radicata* (Relhan) R.H.Petersen: a–d—Basidiomes in their natural habitat | e—Basidiospores 40x | f—Basidia with basidioles 40x | g–h—Cheilocyctidia 40x | i—Stipetipellis 40x | j—Pileipellis 40x. © Sushant Ishwar Bornak.

not recorded.

Collections examined

India, Maharashtra, Kolhapur, Karvir, Samrat Nagar, (16.680^0 N – 74.243^0 E) on soil, in cluster, gregarious, 22.vi.2020, Bornak, S.I. & Patil, Y.S. (Y20V3C1); Shivaji University Campus (16.677^0 N, 74.254^0 E), on soil, solitary or scattered, 19.vii.2022, Bornak, S.I. & Patil, Y.S.

(Y22V6C1).

Remarks

Macrocybe gigantea was previously known as *Tricholoma giganteum* reported for the first time from West Bengal, India (Pegler et al. 1998). This species belongs to the family Tricholomataceae. *Macrocybe* species are characterized by white, cream to greyish, or ochraceous, and convex, umbonate to depressed pileus. The genus *Macrocybe* has been considered as *Tricholoma*. Later, it was segregated from *Tricholoma* and ranked as a genus using distinct morphological and molecular characteristics (Razaq et al. 2016). *Macrocybe* species are widely distributed in tropical regions from various parts of the world (Pegler et al.1998). The genus shows similar characters with *Calocybe*, both having conspicuous large basidiomata. However, *Macrocybe* species differs from *Calocybe* in lacking siderophilous granulation in the basidia and molecular characteristics. *M. gigantea* is an edible species with many varieties recognized and is cultivated in the wild tropical and subtropical regions of the world. It has a sweet taste and is rich in nutritive components such as proteins, polysaccharides, fat, amino acids, and many mineral elements (Galappaththi et al. 2022). Due to these nutritional and therapeutic attributes, it could be advantageous to grow this fungus at industrial scale for maximum benefits. *M. gigantea* can meet the demand of food for growing population due to both nutritional and therapeutic peculiarities. However, in wild form, there is a chance of radioactive contamination, which can be overcome by the cultivation under controlled conditions. (Ghafoor et al. 2022). *M. gigantea* is distributed only in the Asian countries such as China, India, Nepal, and Pakistan and there is no other report of this species from the western Hemisphere. (Razaq et al. 2016). In India, this species has been previously reported from Kerala, Karnataka, and West Bengal. This is the first report from Maharashtra State.

***Schizophyllum commune* Fr.**
(Image 8a–i)

Observ. mycol. (Havniae) **1**: 103 (1815).

Fruiting body small. **Pileus** 1–4.5 cm diam., thin, fan–shaped, shell like, in group or sessile or rudimentary stem, soft when fresh, leathery when dry; margin involute, lobed, wavy; whitish-grayish with hairy or velvety surface, greyish-brown towards the margin. **Lamellae** decurrent, unequal, narrow, split along the edge, distant, whitish to cream then pale grey–brown. **Stipe** rudimentary or absent, lateral. Flesh very tough, thin, pinkish. **Basidiospores** 4.3–6.2 × 1.8–2.2 µm, smooth, hyaline, subcylindrical. **Basidia** 16–22 × 3.8–6.2 µm, tightly clavate, 4-spored.

Collections examined

India, Maharashtra, Kolhapur, Bhudargad, Bhendvade, Gadhinglaj–Gargoti Road, (16°24'13"N-74°22'11"E), on dead wood, in cluster, 14.vi.2020., Bornak, S.I. & Patil, A.R. (Y20V1C7); Shahuwadi, Amba, Ambeshwar Devrai, (16.341^0 N, 73.845^0 E), on dead wood, in group, 19.vi.2020, Bornak, S.I. (Y20V6C6); Panhala, Pombare (16.721^0 N, 73.889^0 E), on unknown living tree trunk, gregarious, scattered, 20.vi.2021, Bornak, S.I., Biranje, S.S. & Patil, Y.S. (Y21V4C9); Panhala, Padasali (16.703^0 N, 73.672^0 E), on dead wood, in cluster, 24.vi.2021, Bornak, S.I. (Y21V3C8); Bhudargad, Pal, Pal Devrai (16.371^0 N, 74.190^0 E), on unknown wood, gregarious, scattered, 22.viii.2022, Bornak, S.I., Patil, Y.S. & Biranje, S.S. (Y22V9C5); Karvir, Parite, Kolhapur-Radhanagari road, (16.539^0 N, 74.105^0 E), on wood, gregarious, scattered, 16.vii.2023, Bornak, S.I. (Y23V6C6); Karvir, Rajaram College Campus, (16.686^0 N, 74.259^0 E), on dead wood, in cluster, 24.vii.2023, Bornak, S.I. (Y23V5C1).

Remarks

Schizophyllum commune is saprobic on dead wood or occasionally parasitic on living wood; growing alone, gregarious, sometimes clustered; on decaying hardwood sticks and logs grows throughout year. This species is widely distributed in North America, South America, Europe, Asia, Africa, Ireland, and Great Britain, Bay area, India. *S. commune* is a wood decaying fungus that causes a white rot, by using enzymes to decay. The lignin and cellulose left behind on the decaying wood is white. There are also reports of this species being found in humans and other animals. This fungus is known to cause a human mycoses in a few cases involving immune incompetent people, brain abscess especially in children. This is also an edible species and is a very good source of protein, vitamins, lipids and minerals and widely consumed in many parts of world. In northeastern India it is a traditional food species (Verma & Verma 2017). This species has been a reported from Mahabaleshwar and Mulashi, Maharashtra (Senthilarasu 2014). This is a first report from the study area.

***Termitomyces heimii* Natarajan**
(Image 9 a–j)

Mycologia 71 (4): 853 (1979).

Pileus 5–11 cm diam., surface smooth, convex to planoconvex, when young prominently sub-umbonate,

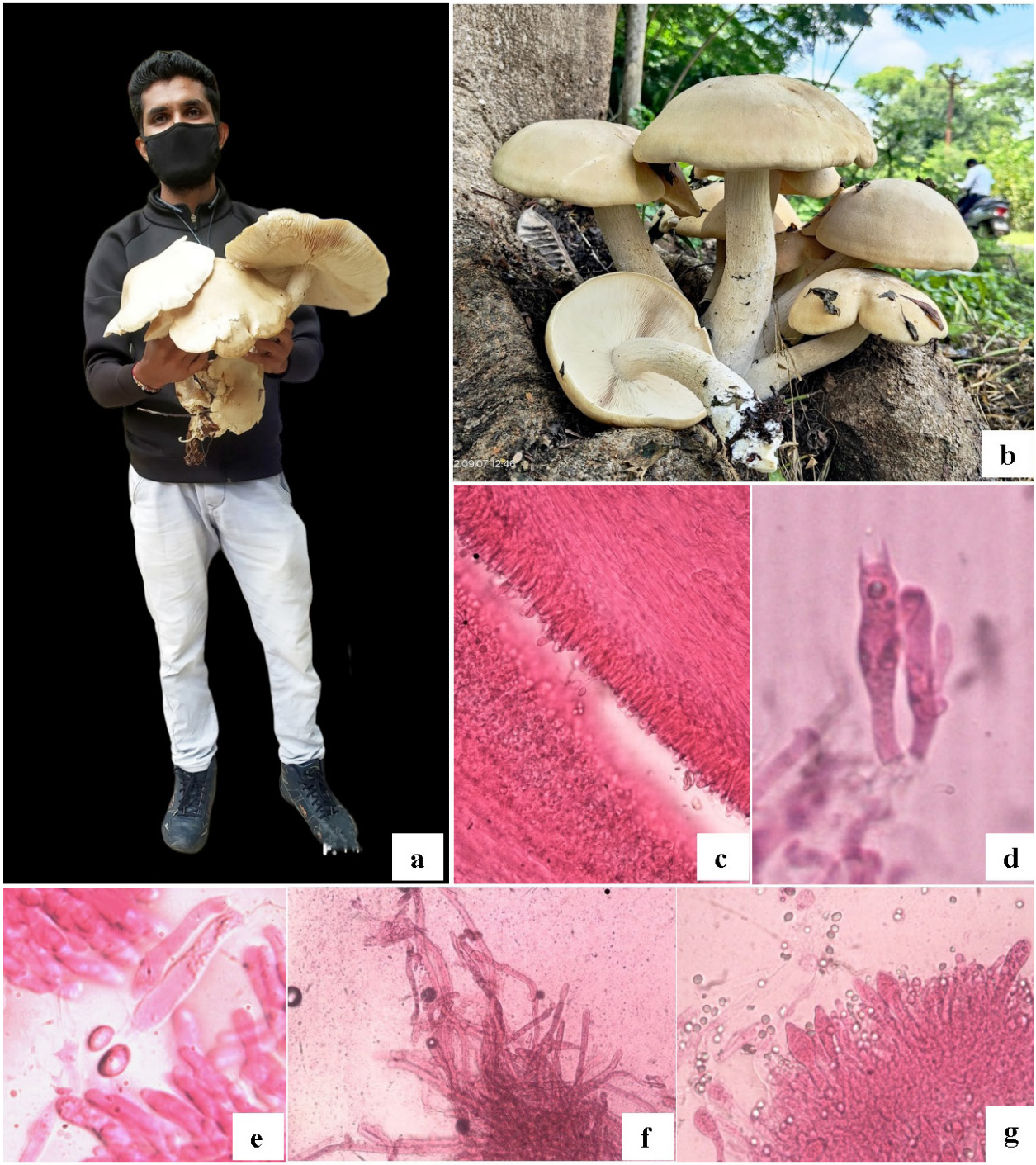

Image 7. ***Macrocybe gigantea*** **(Massee) Pegler & Lodgel.: a—Fruiting body | b—Basidiomes in their natural habitat | c—Lamellae margin 10x | d—Basidia 40x | e—Basidia with basidioles 40x | f—Pileipellis 40x | g—Cheilocystidia 40x. © Sushant Ishwar Bornak.**

margin incurved, white, striate with greyish to greyish-brown umbo, splits when mature. **Context** fleshy, white. **Lamellae** free, crowded, white, becoming pink, up to 6–8 mm broad, margin serrate, lamellulae present. **Stipe** 13–18 cm long and 1.5–2 cm wide, white, surface smooth, cylindrical, solid, with a thick annulus, pseudorhiza present, 13–20 cm below the ground level. **Pileal** surface an epicutis hyphae 4–5 µm wide. **Hymenophoral trama** regular, thin–walled parallel hyphae, 10–12 µm wide. **Basidia** clavate, 16.5–20.8 × 5.7–7.0 µm, with four sterigmata. **Pleurocystidia** broadly clavate, 44 × 17 µm. **Cheilocystidia** not observed. **Basidiopores** 7.2–8.5 ×

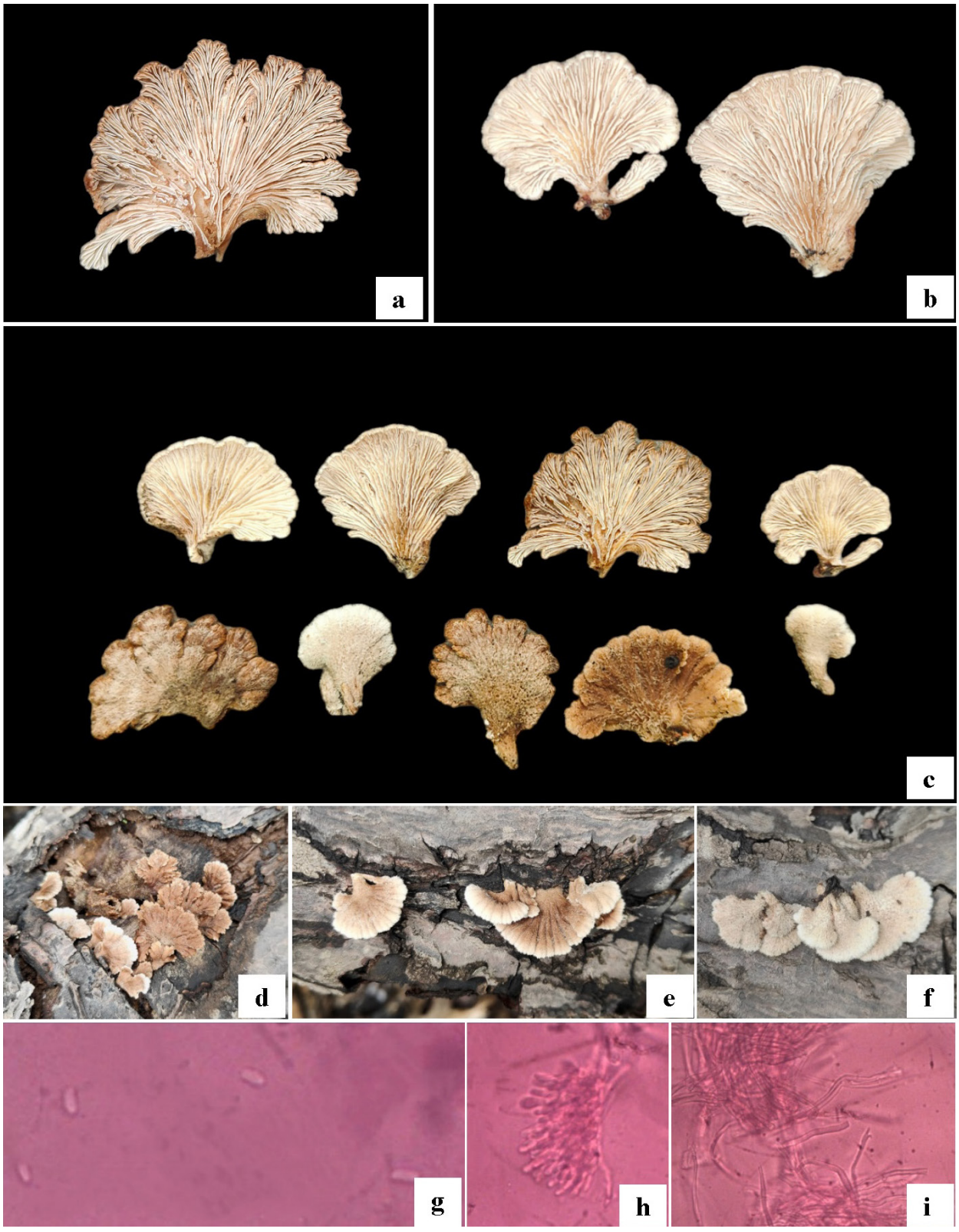

Image 8. *Schizophyllum commune* Fr.: a–f—Basidiomata and basidiomes in their natural habitat | g—Basidiospores 40x | h—Basidia with basidioles 40x | i—Pileipellis 40x. © Sushant Ishwar Bornak.

4.0–5.4 µm, ellipsoid, smooth, hyaline, nonamyloid. **Clamp connections** absent. **Spore deposit** pink**.**

Collection examined

India, Maharashtra, Kolhapur, Jyotiba (16.787^0 N, 74.176^0 E), on open ground, gregarious, scattered, 19.vii.2022, Bornak, S.I. & Subhedar, V. (Y20V10C1).

Remarks

The diagnostic feature of this species is the large, white, smooth, sub-umbonate pileus and smooth annulate stipe with a long pseudorrhiza. Other large annulate species of *Termitomyces* differ from this significantly. In *T. eurrhizus* (Berk.) Heim, the fruit bodies are larger, the pseudorhiza black and the viscid pileus surface dark gray brown to fuliginous; the perforatorium is pointed. In *T. lanatus* Heim the pileus is covered by a thick grayish woolly veil and the annulus and stipe are covered with woolly scales. In *T. striatus* (Beeli) Heim the pileus is ochraceous to gray brown and distinctly striate (Natarajan 1979).

T. heimii has ethno-medicinal importance as it can be used in treatment for fever, cold, and fungal infections, used in blood tonics during wound healing and blood coagulation, syrup is used for jaundice and diarrhea and also shows antimicrobial, anticancer, and antioxidant properties. Water soluble solvents of *T. heimii* shows antimicrobial activity against *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas* sp., *Staphylococcus aureus*, and *Streptococcus pyogenes* (Paloi et al. 2023). The species has been reported from Maharashtra (Borkar et al. 2015).

***Termitomyces microcarpus* (Berk. & Broome) R.Heim (Image 10a–e)**

Arch. Mus. Hist. Nat. Paris, ser. 6 18: 128 (1942).

Fruiting body small to medium. **Pileus** 1.5–3 cm, at first companulate becoming e×panded convex on maturity with shield-shaped acute umbo, margins splitting at maturity, pale to creamish-white, yellowish-white, smooth, silky, shiny, viscid or slimy when wet. **Lamellae** free to adnexed, narrow, less crowded, with lamellulae, cream turns into light brown on maturity. **Stipe** 3.2–8 × 0.1–0.3 cm, creamish, central, cylindrical, thin, fibrillose, smooth, silky, hollow and tapering towards the base, devoid of annulus and without pseudorhiza. **Basidiospores** 5.0–7.2 × 3.4–4.5 µm, hyaline, ovoid to broadly ellipsoid, thin walled. **Basidia** 11.6−16.2 × 4.3–6.6 µm, with four sterigmata.

Collection examined

India, Maharashtra, Kolhapur, Shahuwadi, Amba, (16.942^0 N, 73.791^0 E), on soil, in cluster, gregarious, 30.vi.2023, Bornak, S.I. & Vedpathak, M.A. (Y23V4C3).

Remarks

T. microcarpus is closely related to *T. medius* in shape of pileus as well as umbo, but *T. microcarpus* differs for being devoid of pseudorhiza. In India along with *T. heimii, T. microcarpus* was used to alleviate fever, colds, and fungal infections (Nhi et al. 2022). This is an edible species and can be used to treat gonorrhea (Pavithra et al. 2017). Despite of all this species has ample medicinal usage, viz, lowers the total serum cholesterol, LDL–cholesterol and triglycerides in rats, used in wound healing, used in treatment of diarrhoea, muscular pain, delivery pain, stomachache, laziness, stiffness of joints, cough/cold, venereal diseases, used for fever treatment and bone strengthening (Kumari et al. 2022).

The species has many vernacular names, viz: Katola kum/Akki kum, Nuchikum, Pullaekum, Uei Chhatu, Choto karane, (Kerala and Karnataka); Bhat Pihari, (Nei kalan, Ari Kumizh, Arishi Kalan (Tamil Nadu); Bada bali chatu (Odisha); Jhari chewn, Mulchewn (Uttrakhand); Kanki Phutu, Chowk Phutu, Chapat phutu (Chattisgarh); Shiti or Shitol olamis (Goa); Inyak (Arunachal Pradesh); Balu khukhdi (Jharkhand); Mikhumu khapolok (Tripura); Bhatoli, Mohtran (Himachal Pradesh) (Kumari et al. 2022). The previous reports of *T. microcarpus* are from Karnataka, Kerala, Tamil Nadu and Pune in Maharashtra (Pavithra et al. 2017).

DISCUSSION

In the present investigation 10 species belonging to eight genera and eight families from order Agaricales have been enumerated. Among these, five species have been described for the first time from Maharashtra State. *Agrocybe pediades*, *Hymenopellis radicata*, *Macrocybe gigantea*, *Schizophyllum commune*, *Termitomyces heimii* and *T. microcarpus* are edible and *Entoloma serrulatum* is a poisonous species (Ediriweera et al. 2015; Razaq et al. 2016; Mishra et al. 2021; Niego et al. 2021).

The edible species such as *M. gigantea* and *S. commune*, which are used in traditional dishes in some parts of India, are commonly distributed in Kolhapur District. In addition to their edibility, species such as *A. pediades*, *H. radicata*, *T. heimii*, and *T. microcarpus* are also known for their medicinal properties. These fungi exhibit a wide range of bioactivities including antimicrobial,

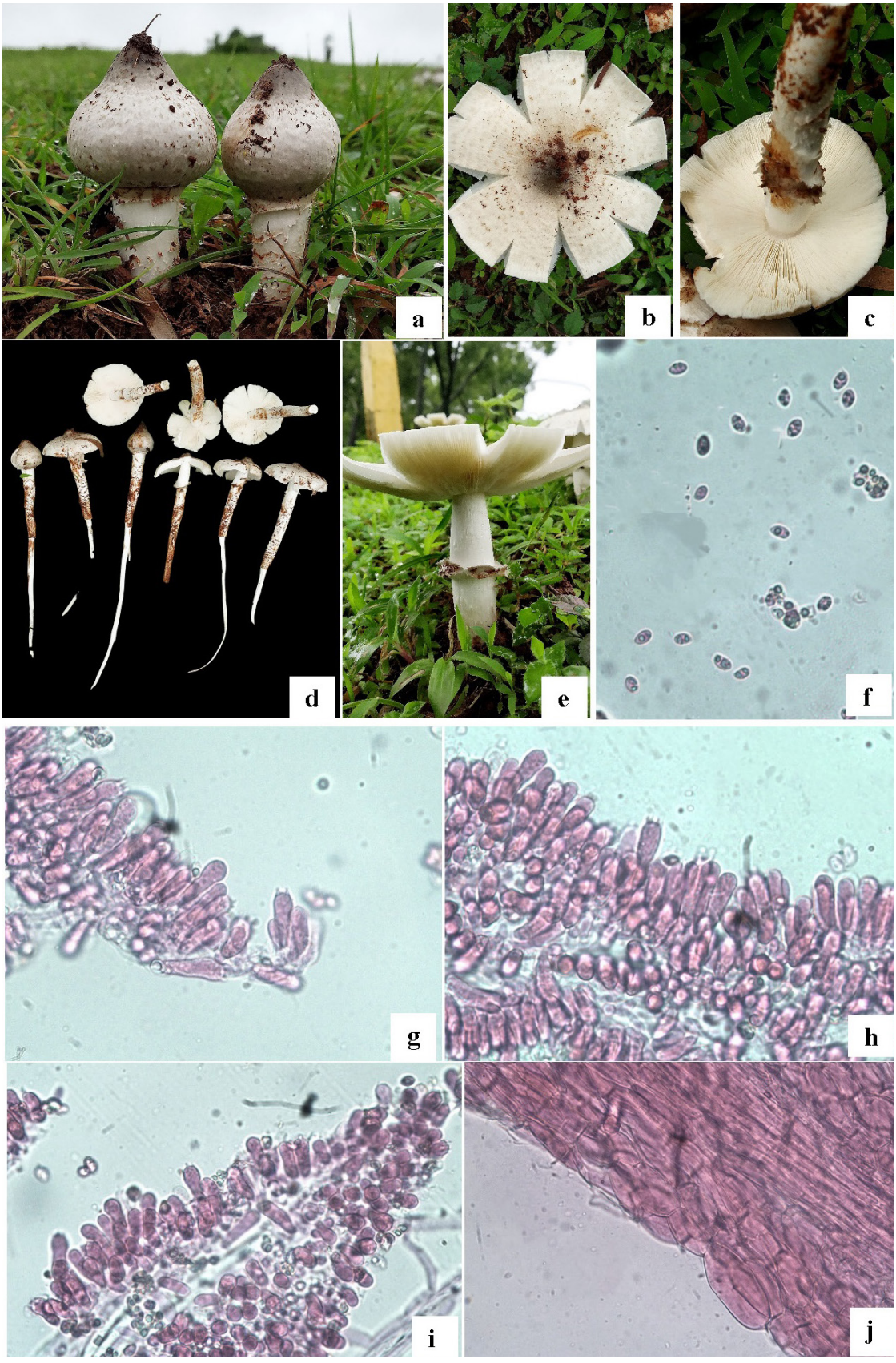

Image 9. *Termitomyces heimii* Natarajan: a–e—Basidiomata and basidiomes in their natural habitat | f—Basidiospores 40x | g–i—Basidia with basidioles 40x | j—Pileipellis 40x. © Sushant Ishwar Bornak.

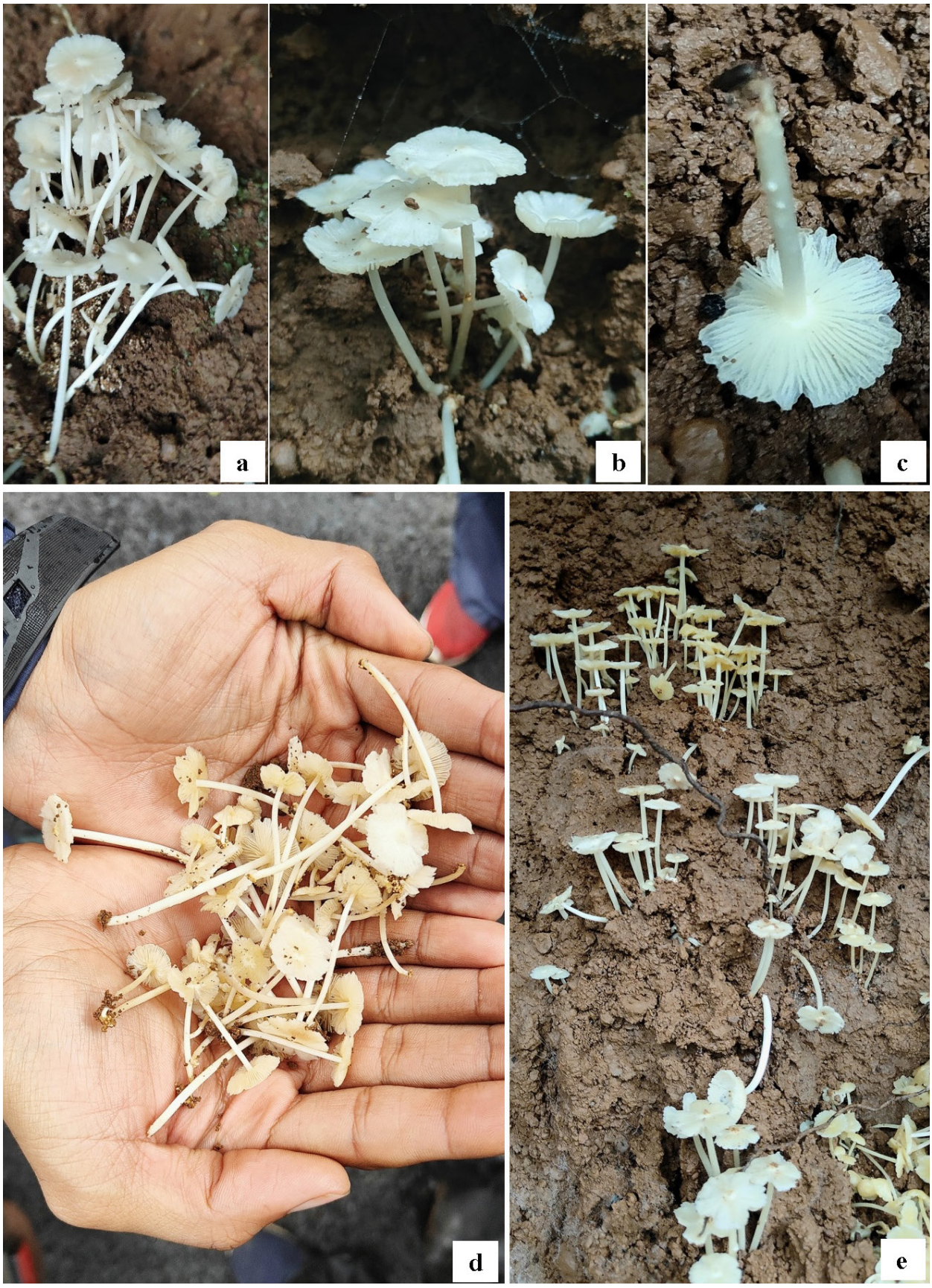

Image 10. *Termitomyces microcarpus* (Berk. & Broome) R.Heim.: a–e—Basidiomes in their natural habitat. © Sushant Ishwar Bornak.

antiviral, antifungal, antioxidant, anti-inflammatory, anticancer, wound-healing, and lung-protective effects. Such therapeutic potential is attributed to the presence of various bioactive compounds, emphasizing the nutritional and pharmacological significance of wild mushrooms in rural communities.

In rural areas of Kolhapur District, *Termitomyces* and *Pleurotus* species are among the most commonly consumed wild edible mushrooms during the monsoon season. *Termitomyces* species are typically found in forested regions and near agricultural lands, often associated with termite mounds. These mushrooms are relatively easy to recognize due to their long, slender pseudorhiza extending into the soil, a distinguishing characteristic in most species, except *Termitomyces microcarpus*, which lacks a prominent pseudorhiza. Similarly, *Pleurotus* species are widely collected and consumed across various parts of the district. Members of this genus can be identified by their fan-shaped pileus, lateral or absent stipe, and often white to off-white basidiocarps. Despite the familiarity of these genera to local populations, accurate mushroom identification remains a challenging task. Distinguishing between edible and toxic species based solely on macroscopic features can be unreliable and may pose significant health risks. Therefore, while some genera may have recognizable traits, caution and expert verification are essential for safe wild mushroom consumption.

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