DOI: 10.36036/MR.31.1.2022.326396
***Mushroom Research* 31 (1) : 1-24, 2022**

Wood inhabiting fungi (Agaricomycetes) new for India

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ABSTRACT

This paper is focused on the descriptions of twenty four agaricomyceteous fungal species, which have been recorded for the first time from different regions of India. The paper includes the taxonomic descriptions, distribution and identification key of the species. Also the previous reports of these fungi from other parts of the world have been included.

Keywords: Agaricomycetes, phylogeny, gymnocarpic, Uttarakhand

Agaricomyctes is a diverse class within kingdom fungi (sub–phylum– Agaricomycotina and phylum–Basidiomycota). It includes true corticioid fungi (members with smooth, reticulate, grandinioid, tuberculate, warted, merulioid, and toothed hymenial surfaces), resupinate as well as pileate poroid form agarics (*Lentinus, Panus*), stipitate stereoid forms (*Podoscypha*) and the 'cauliflower fungus' *Sparassis*. All the members have gymnocarpic hymenium with 2–8 spored basidia. As per classifications given by Kirk et. al. 2008, the class includes 1147 genera and 20951 species. The class includes genera of diverse economic importance which plays a vast role in human welfare by providing ecological balance, food and medicine. Majority of the members are recyclers and play important role in carbon balancing by decomposing the forest litter. The present work includes the taxonomic descriptions of twenty four agaricomyceteous fungal species (*Antrodia sinuosa*, *Ceraceomyces eludens*, *Ceriporiopsis balaenae*, *Coniophora hanoiensis*, *Cystidiodontia isabellina*, *Cystidiodontia laminifera*, *Cystidiophorus castaneus*, *Gelatoporia pannocincta*, *Hyphodermella corrugata*, *Hypochnicium pini*, *Intextomyces contiguus*, *Intextomyces cystidiatus*, *Ischnoderma benzoinum*, *Lawrynomyces capitatus*, *Megasporoporia setulosa*, *Meruliopsis hirtella*, *Peniophora boidinii*, *Phlebia lilascens*, *Tubulicrinis medius*, *Xenasma praeteritum*, *Xenasma rimicola*, *Xylodon nesporina*, *Xylodon niemelaei* and *Xylodon subtropicus*).

MATERIALS AND METHODS

Specimens have been collected from the various localities of the Uttarakhand and Himachal Pradesh during the various fungal forays conducted from 2009 to 2018. Microscopic details related to various structures (hyphae, cystidia, basidia, and basidiospores) of the specimens, were studied by making crush mounts and hand cut sections in water, 3–5% KOH solutions and staining in various reagents like Congo red, Phloxine, Cotton Blue, Melzer's Reagent, and Sulphovanillin. Line diagrams were made by using camera lucida attached to the compound microscope at various magnifications and lens combinations. Color standards were used as per Methuen's Handbook of Color by Kornerup and

Recieved on 02-12-2021; Accepted on 25-06-2022

Wanscher (1978). Specimens have been deposited in the Herbarium of Department of Botany, Punjabi University, Patiala, India (PUN). Nomenclature follows Blackwell *et al.* (2006), James *et al.* (2006), Hibbett *et al.* (1995, 2001, 2007), Kirk *et al.* (2008), Bernicchia and Gorjón (2010) and http://www.mycobank.org as far as possible.

Study Area

The present taxa have been collected from two states (Himachal Pradesh and Uttarakhand) in the North West Himalayan region of India. Uttarakhand is situated in the Northern part of India between 28°43'N to 31°28'N latitude and 77°34'E to 81°03'E longitude. It has a total geographical area of 53,483 km^2. The recorded forest area of the state is 34,651 km^2, which constitutes 64.79% of its geographical area, (reserved forests 71.11%, protected forests 28.52%, and un-classed forests 0.35%). Himachal Pradesh is a mountainous state situated in the Northwest Himalayan ranges of India and lies between 30°22' 40" North to 33°12'40" North latitude and 75°45' 55" East to 79°04' 20" East longitude. Most of the study areas parts are hilly regions, the climate in general is cold and humid and of temperate type but varies with altitude. The different zones are classified as warm temperate (400 m–1800m), cool temperate (1800m–2400m), cold zone (2400m–3000m), alpine zone (3000m–4000m), glacier zone (4000m–4800m), and perpetually frozen zone (above 4800m). The valleys are hot in summer and much colder in winter (http://www.fsi.org.in). The average temperature ranges between >0°C to 42°C during the whole year with an average annual rainfall of 104 cm approx (India meteorological department report, 2021)

Key to the species:

1. Basidiocarps poroid.....2
1. Basidiocarps non–poroid.....9
2. Basidiocarps pileate.....*Ischnoderema benzoinum*
2. Basidiocarps non–pileate.....3
3. Cystidia present.....4
3. Cystidia absent.....6
4. Generative hyphae simple–septate.....*Cystidiophorus castaneus*
4. Generative hyphae with clamps.....5
5. Cystidia of one kind..... *Xylodon subtropicus*
5. Cystidia of two kinds.....*Xylodon niemelaei*
6. Hyphal system monomitic.....7
6. Hyphal system dimitic.....8
7. Basidiospores allantoid.....*Gelatoporia pannocincta*
7. Basidiospores ellipsoid to subcylindrical.....*Ceriporiopsis balaenae*
8. Basidiospores up to 5.5 µm.....*Antrodia sinuosa*

8. Basidiospores larger than 5.5 µm, up to 16 µm.....*Megasporoporia setulosa*

9. Basidiospores cyanophilous.....10

9. Basidiospores acyanophilous.....12

10. Basidiospores echinulate, broadly ellipsoid to subglobose.....*Hypochnicium pini*

10. Basidiospores smooth, ellipsoid, subangulate.....11

11. Cystidia present..... *Intextomyces cystidiatus*

11. Cystidia absent..... *Intextomyces contiguus*

12. Basidia generally pleural.....13

12. Basidia of other kind.....14

13. Cystidia present.....*Xenasma rimicola*

13. Cystidia absent.....*Xenasma praeteritum*

14. Basidiospores amyloid.....*Coniophora hanoiensis*

14. Basidiospores inamyloid.....15

15. Cystidia present.....16

15. Cystidia absent.....22

16. Basidiospores allantoid.....*Peniophora boidinii*

16. Basidiospores of different kind.....17

17. Hyphal system monomitic.....18

17. Hyphal system dimitic.....21

18. Cystidia with obtuse apex.....19

18. Cystidia not as above.....20

19. Basidiospores up to 6.5 µm.....*Ceraceomyces eludens*

19. Basidiospores larger than 6.5 µm, up to 12.2 µm.....*Lawrynomyces capitatus*

20. Hymenial surface odontoid.....*Hyphodermella corrugata*

20. Hymenial surface merulioid.....*Meruliopsis hirtella*

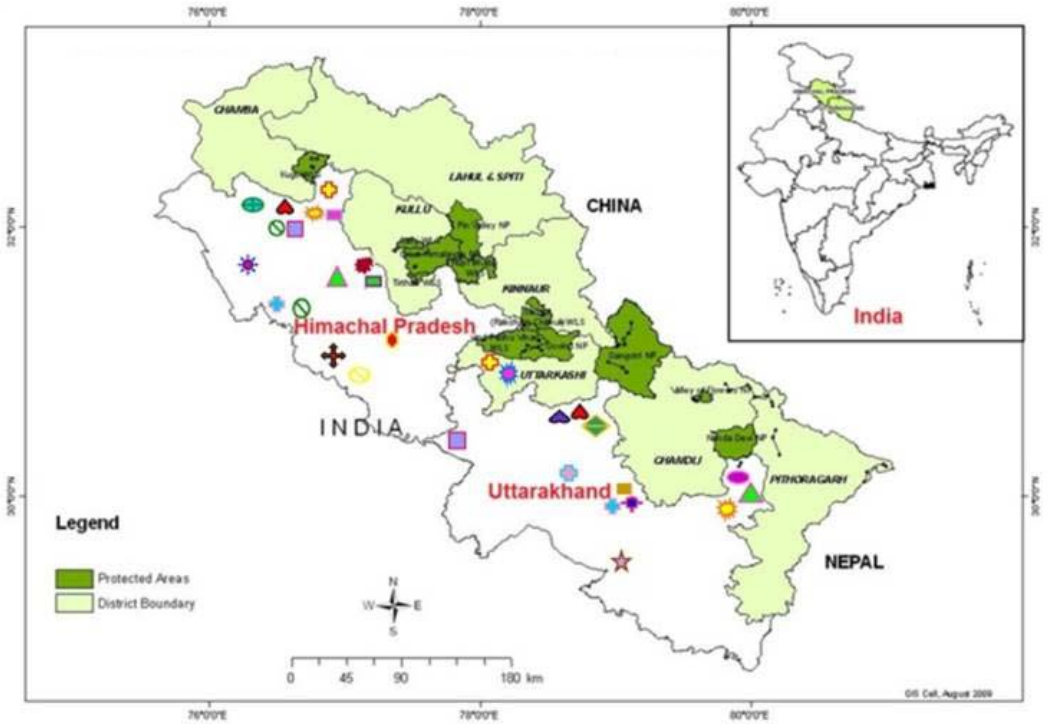
21. Cystidia up to 44 ìm.....*Cystidiodontia isabellina*

21. Cystidia longer than 44 ìm, up to 150 ìm.....*Cystidiodontia laminifera*

22. Hymenial surface smooth.....*Phlebia lilascens*

22. Hymenial surface aculeate.....*Xylodon nesporina*

MAP I



Antrodia sinuosa
Ceraceomyces eludens
Ceriporiopsis balaenae
Coniophora hanoiensis
Cystidiodontia isabellina
Cystidiodontia laminifera
Cystidiophorus castaneus
Gelatoporia pannocincta
Hyphodermella corrugata
Hypochnicium pini
Intextomyces contiguus
Intextomyces cystidiatus
Ischnoderma benzoinum
Lawrynomyces capitatus
Megasporoporia setulosa
Meruliopsis hirtella
Peniophora boidinii
Phlebia lilascens
Tubulicrinis medius
Xenasma praeteritum
Xenasma rimicola
Xylodon nesporina
Xylodon niemelaei
Xylodon subtropicus

Map I. Map showing distribution of taxa in different localities marked with different signs

Taxonomic descriptions:

1. *Antrodia sinuosa* (Fr.) P. Karst., Meddelanden af Societas pro Fauna et Flora Fennica 6: 10, 1881. – *Polyporus sinuosus* Fr., Systema Mycologicum 1: 381, 1821.

Plate–I, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 1.5 mm thick in section; hymenial surface poroid, grayish yellow to grayish orange when collected, grayish orange to brownish orange after drying; pores round to angular, 2–3 per mm; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system dimitic. Generative hyphae up to 3 µm wide, septate, clamped, thin–walled, branched. Skeletal hyphae up to 5.6 µm wide, unbranched, aseptate, thick–walled. Context constituted by horizontal, intertwined generative and skeletal hyphae; tramal zone by vertical, intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Basidia 10–15 × 3.8–5 µm, clavate, tetrasporic; length of sterigmata up to 3 µm. Basidiospores 4.5–5.5 × 1.4–2 ìm, suballantoid to allantoid, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Tatwali, log of *Pinus roxburghii*, Ritu 9379 (PUN), August 09, 2014.

Remarks– This species is characterized by suballantoid to allantoid basidiospores and being described for the first time from India. Earlier reports of this species are from Europe, North America, East Asia and North Africa.

2. *Ceraceomyces eludens* K.H. Larss., Folia Cryptogamica Estonica 33: 74, 1998.

Plate–I, Map–I

Morphological features

Basidiocarp resupinate, effused, loosely adnate, up to 210 µm thick in section; hymenial surface ceraceous, grandinoid under lens, yellowish gray when collected, yellowish orange after drying; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal sysytem monomitic. Generative hyphae up to 5 µm wide, septate, clamped, occasionally encrusted; thick–walled, less branched, horizontal in the basal zone; thin–walled, more branched, gradually becoming vertical towards the hymenium. Basidia 23–30 × 6.2–7.4 µm, clavate, somewhat sinuous, tetrasporic; length of sterigmata up to 5 µm. Cystidia 60–95 × 4–5 µm, hyphoid with obtuse apex, encrusted; projection out of the hymenium up to 34 µm. Basidiospores 5.5–6.5 × 3.3–4 µm, ellipsoid to broadly ellipsoid, smooth, thin–walled, uniguttulate, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Andreta, stick of *Morus alba*, Ritu 8864 (PUN), July 23, 2017.

Remarks– This species is being described for the first time from India and is characterized by long, encrusted cystidia with ellipsoid to broadly basidiospores. Previous reports as per Mycobank are from Estonia, France, Czech Republic, Germany, Poland, Ireland, Bosnia & Herzegovina, Montenegro, Croatia, Italy, Belgium, United Kingdom, Slovenia, Netherlands, Portugal and Spain.

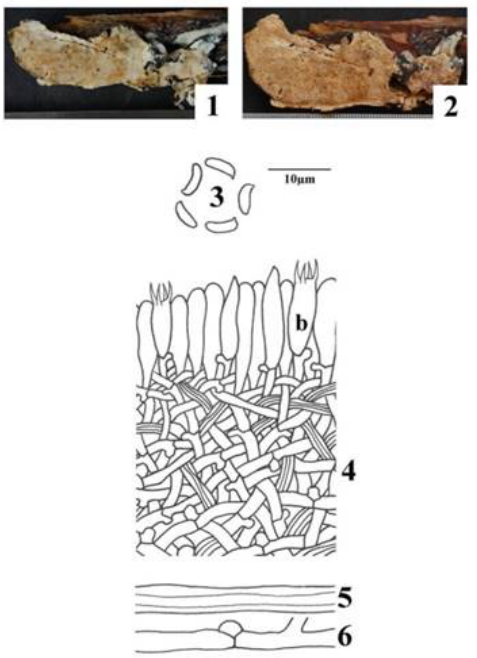
3. *Ceriporiopsis balaenae* Niemelä, Naturaliste Canadien 112: 449, 1985.

Plate–I, Map–I

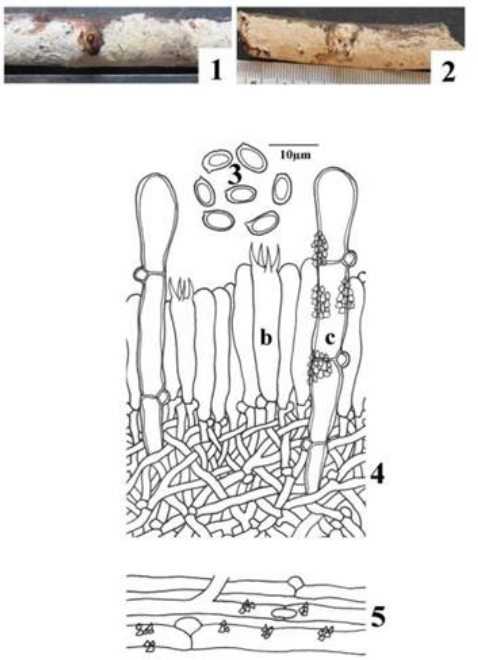
Morphological features

Basidiocarp resupinate, effused, adnate, up to 1.3 mm thick in section; hymenial surface poroid, orange white to pale orange when collected, grayish orange

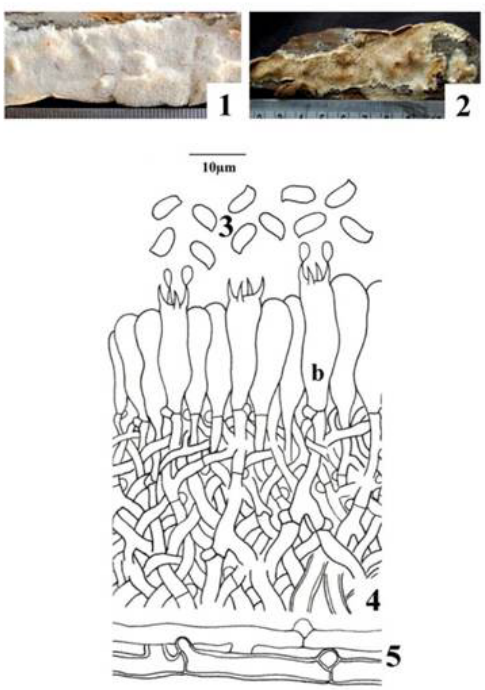
Plate-I



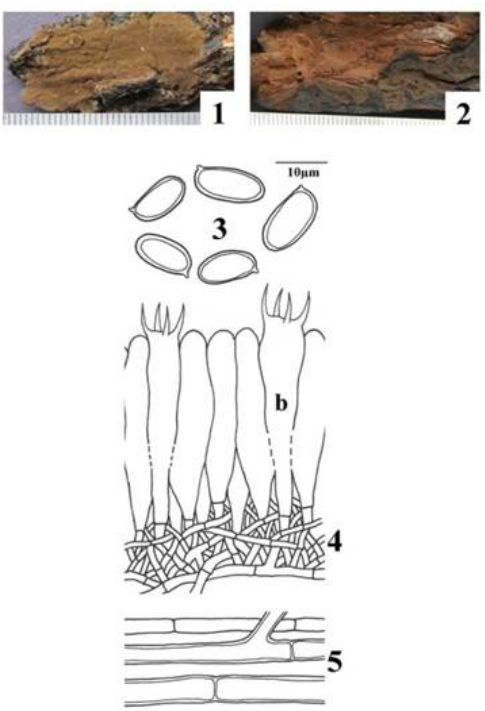
Figs 1-6. ***Antrodia sinuosa***
1-2. Basidiocarp (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. skeletal hypha, 6. generative hypha].



Figs 1-5. ***Ceraceomyces eludens***
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae].



Figs 1-5. ***Ceriporiopsis balaenae***
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. generative hyphae].



Figs 1-5. ***Coniophora hanoiensis***
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. generative hyphae].

after drying; pores round to angular, 1–3 per mm; margins thinning, irregular, sterile, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 4.8 ìm wide, branched, septate, clamped, thin– to thick–walled. Basidia 19.0–23.0 × 5.8–6.4 ìm, clavate to subclavate, somewhat sinuous, tetrasporic, with basal clamp; length of sterigmata up to 3.6 µm. Basidiospores 5.4–6.4 × 2.4–3.0 ìm, ellipsoid to subcylindrical, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Almora: Sitoli, stump of *Pinus roxburghii*, Sanyal 6636 (PUN), August 29, 2011.

Remarks– This species is characterized by round to angular, 1–3 per mm pores and ellipsoid to subcylindrical basidiospores. It has been described by Niemelä (1985) from Canada. Later, Niemelä *et al.* (1992) reported it several times from Finland (www.mycobank.org). Here, it is being described for the first time from India.

4. *Coniophora hanoiensis* Pat., Bulletin de la Société Mycologique de France 23 (1): 76, 1907.

Plate–I, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 3 mm thick in section; surface smooth, brownish orange when collected, dark brown after drying; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 6 µm wide, simple–septate; less branched, thick–walled, horizontal in the basal zone; branched, thin–walled, gradually becoming vertical towards the hymenium. Basidia 30–45 × 6–8 µm, clavate to cylindrical, tetrasporic; length of sterigmata up to 5 µm. Basidiospores 9–14.5 × 4.8–6.5 µm, ellipsoid, thick–walled, smooth, acyanophilous, dextrinoid.

Specimen examined– India, Himachal Pradesh, Kangra: Jasoor, stump of *P. roxburghii*, Ritu 8875 (PUN), July 10, 2015.

Remarks– *C. hanoiensis* is being described for the first time from India. Earlier reports of this species as per Mycobank are from South Africa, Singapore, Thailand, Australia and Hawaii.

5. *Cystidiodontia isabellina* (Berk. & Broome) Hjortstam & Ryvarden, Mycotaxon 25 (2): 549, 1986. – *Kneiffia isabellina* Berk. & Broome, Botanical Journal of the Linnean Society14: 62, 1875.

Plate–II, Map–I

Morphological features

Basidiocarps resupinate, effused, adnate, up to 450 ìm thick in section; hymenial surface finely aculeate, gray to brownish gray when collected, reddish gray after drying; margins thinning, irregular, paler concolorous, or indeterminate.

Microscopic features

Hyphal system dimitic. Generative hyphae branched, septate, thin–walled, with clamps; basal hyphae up to 3.2 ìm wide, loosely interwoven; subhymenial hyphae up to 2.4 ìm wide, compact, vertical. Skeletal hyphae up to 4.2 ìm wide, thick–walled, aseptate, unbranched. Context constituted by horizontal, intertwined generative and skeletal hyphae; tramal zone by vertical, intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Cystidia 32.0–44.0 × 6.0–8.4 ìm, subfusiform to subclavate, thin–walled, with basal clamp. Basidia 12.6–15.4 × 3.2–4.6 ìm, clavate, somewhat sinuous, tetrasporic, with basal clamp; length of sterigmata up to 4.6 µm. Basidiospores 2.8–3.6 × 2.2–2.8 ìm, subglobose to globose, thin–walled, smooth, acyanophilous, inamyloid, with oily contents.

Specimens examined– India, Uttarakhand, Bageshwar: Kausani, bark of *Quercus leucotrichophora*, Sanyal 6598 (PUN), September 03, 2011; Himachal Pradesh, Kangra: Chetru, stump of *Carissa spinarum*, Ritu 9377 (PUN), July 11, 2015.

Remarks– This species is characteristic in having finely aculeate hymenial surface, subfusiform to subclavate cystidia and subglobose to globose basidiospores. Berkeley and Broome (1874) were the first to describe it as *Kneiffia isabellina*, Hjortstam and Ryvarden (1986) shifted it to genus *Cystidiodontia*. This species has earlier been reported from Eastern Africa and Sri Lanka (www.mycobank.org). Here, it is being described as a new record for India.

6. *Cystidiodontia laminifera* (Berk. & M.A. Curtis) Hjortstam, Mycotaxon 39: 416, 1990. – *Hydnum laminiferum* Berk. & M.A. Curtis, Botanical Journal of the Linnean Society 10:325, 1869.

Plate–II, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 450 ìm thick in section; hymenial surface odontoid, orange white to grayish orange when collected, grayish brown to brown after drying; margins thinning, wavy, paler concolorous, or indeterminate.

Microscopic features

Hyphal system dimitic. Generative hyphae branched, septate, thin–walled, with clamps; basal hyphae up to 2.2 ìm wide, loosely interwoven; subhymenial hyphae up to 2.0 ìm wide, compact, vertical. Skeletal hyphae up to 3.2 ìm wide, thick–walled, aseptate, unbranched. Context constituted by horizontal, intertwined generative and skeletal hyphae; tramal zone by vertical, intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Cystidia 85–150 × 5.8–6.4 ìm, subfusiform with extended base, sinuous, thin– to thick–walled; projecting up to 38 ìm out of the hymenium. Basidia 16.4–23.6 × 4.8–5.4 ìm, clavate to subclavate, tetrasporic, with basal clamp; length of sterigmata up to 2.4 ìm. Basidiospores 3.6–4.4 × 2.2–2.4 ìm, ellipsoid, thin–walled, smooth, uniguttulate, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Uttarkashi: Chaurangi Khal, on log of *Quercus leucotrichophora*, Sanyal 6603 (PUN), September 31, 2011.

Remarks– This species is characteristic in having odontoid, orange white to grayish orange when fresh, grayish brown to brown on drying basidiocarps, dimitic hyphal system, subfusiform with extended base, sinuous cystidia and ellipsoid basidiospores. Berkeley and Curtis (1869) were the first to describe it as *Hydnum laminiferum*, Hjortstam (1990) shifted it to genus *Cystidiodontia*. This species has earlier been reported from South and Central America (www.mycobank.org,). Here, it is being described as a new record for India.

7. *Cystidiophorus castaneus* (Lloyd) Imazeki, Coloured illustrations of the fungi of Japan II: 125, 1965. – *Merulius castaneus* Lloyd, Mycological Writings 4 (40): 555, 1916.

Plate–II, Map–I

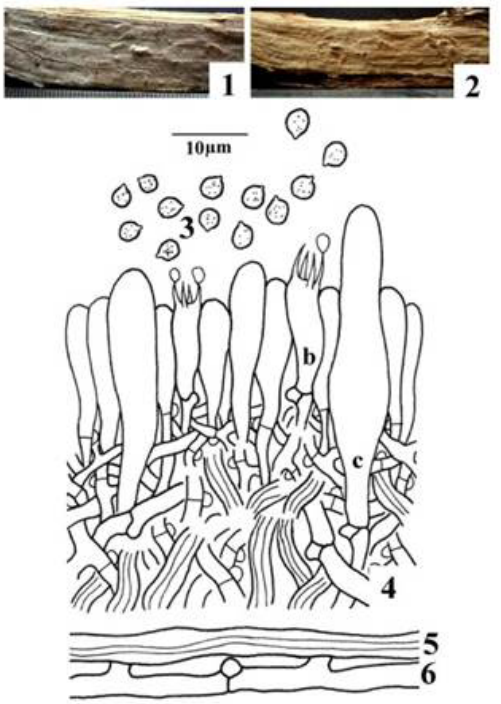
Morphological features

Basidiocarp resupinate, effused, closely adnate, up to 1 mm thick in section; hymenial surface poroid, orange white when collected, pale orange to grayish orange to brownish orange after drying; pores round to angular when young, becoming irregular to irpicoid with age, 1–2 per mm, tubes up to 4 mm long; margins thinning, paler concolorous, or indeterminate.

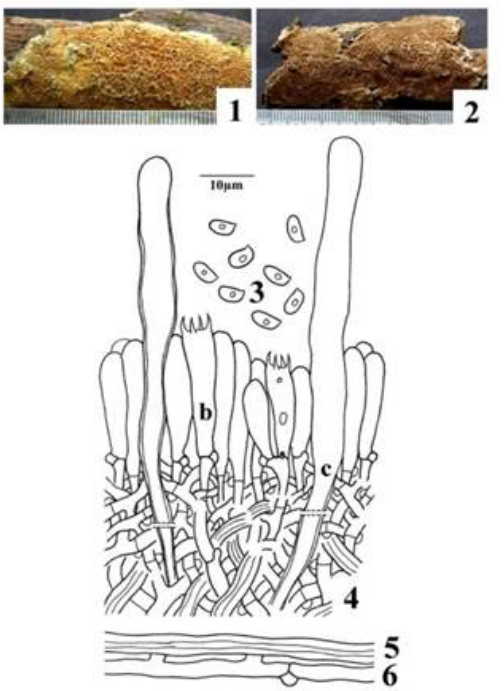
Microscopic features

Hyphal system monomitic. Generative hyphae branched, simple–septate, basal hyphae up to 7.2 ìm

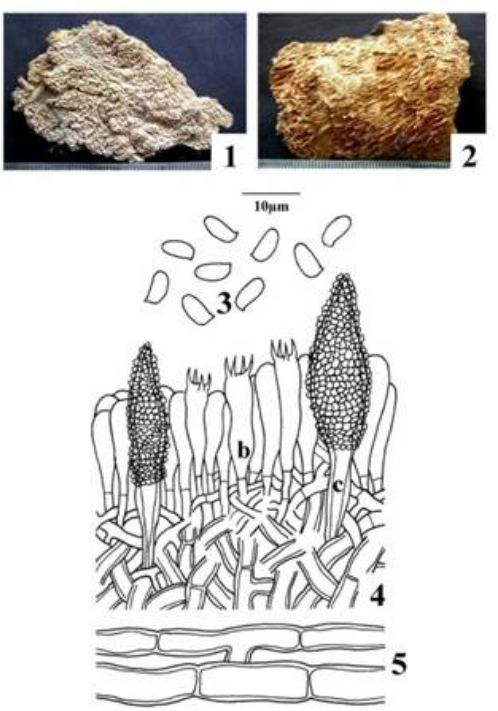
Plate-II



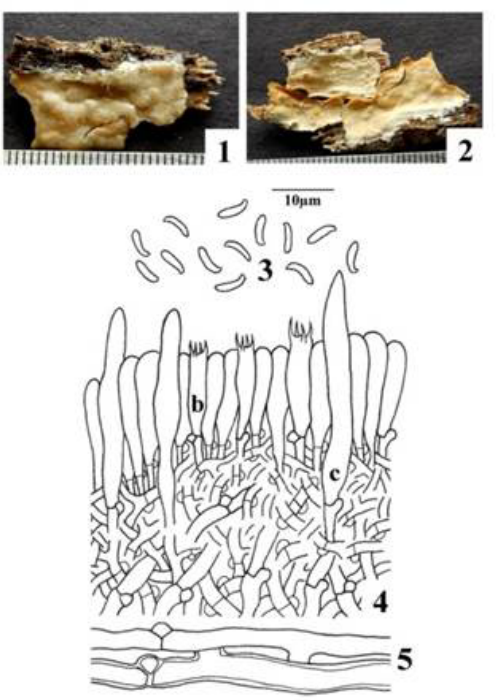
Figs 1-6. *Cystidiodontia isabellina*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. skeletal hypha, 6. generative hypha].



Figs 1-6. *Cystidiodontia laminifera*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium(b. basidium, c. cystidium), 5. skeletal hypha, 6. generative hypha].



Figs 1-5. *Cystidiophorus castaneus*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae].



Figs 1-5. *Gelatoporia pannocinta*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae].

wide, thick–walled, loosely interwoven; subhymenial hyphae up to 3.6 ìm wide, thin– to thick–walled, compact. Cystidia 38–46 × 6–10.6 ìm, subfusiform to fusiform, thick–walled, apically encrusted, without basal clamp; projecting up to 14.0 ìm out of the hymenium. Basidia 16–19.4 × 3.8–4.6 ìm, clavate, tetrasporic, without basal clamp; length of sterigmata up to 3.8 ìm. Basidiospores 5.6–6.6 × 2.8–3.2 ìm, ellipsoid to suballantoid, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Rudraprayag: Chopta, on decaying stump of *Rohdodencdron arboreum*, Sanyal 6645 (PUN), July 27, 2011.

Remarks– This species is characterized by round to angular when young, irregular to irpicoid with age, large pores, monomitic hyphal system, hyphae without clamps, subfusiform to fusiform, heavily encrusted cystidia and ellipsoid to suballantoid basidiospores. It has earlier been reported from China, Japan, East Russia, and Northern Thailand (www.mycobank.org), but is the first report from India.

8. *Gelatoporia pannocincta* (Romell) Niemelä, Karstenia 25: 23, 1985. – *Polyporus pannocinctus* Romell, Arkiv før Botanik 11 (3): 20, 1911.

Plate–II, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 0.5 mm thick in section; hymenial surface poroid, orange white to pale orange to light orange when collected, not changing much after drying; pores round to angular, 4–7 per mm; margins thinning, fibrillose, sterile, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae branched, septate, clamped, thin– to thick–walled; basal hyphae up to 4.4 ìm wide, loose; subhymenial hyphae up to 3.8 ìm wide, compact. Cystidioles 31–39 × 3.8–5 ìm, subfusiform, thin–walled. Basidia 15–21 × 3–4 ìm, clavate, tetrasporic, with basal clamp; length of sterigmata up to 3 ìm. Basidiospores 4.4–5.6 × 1 ìm, allantoid, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Nainital: Sattal, stump of *Betula utilis*, Sanyal 6655 (PUN), July 25, 2010.

Remarks– This species is characteristic in having monomitic hyphal system and allantoid basidiospores. Romell (1911) was the first to describe it as *Polyporus pannocinctus*. Niemelä (1985) shifted it to genus *Gelatoporia*. It has earlier been reported from Northern Norway (www.mycobank.org). Here, it is being described for the first time from India.

9. *Hyphodermella corrugata* (Fr.) J. Erikss. & Ryvarden, The *Corticiaceae* of North Europe 4: 579, 1976. – *Grandinia corrugata* Fr., *Hymenomycetes* europaei: 625, 1874.

Plate–III, Map–I

Morphological features

Basidiocarps resupinate, effused, adnate, up to 210 µm thick (without aculei) in section; hymenial surface odontoid to aculeate; aculei up to 1 mm long, grayish orange to brownish orange when collected, darkening after drying; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 6.5 µm wide, simple–septate, thin– to thick–walled; less branched, horizontal in the basal zone; branched, gradually becoming vertical towards the hymenium. Cystidia 45–55 × 5.5–6 µm, subcylindrical to subfusiform, encrusted; projection out of the hymenium up to 15 ìm. Basidia 27–42 × 5–7 µm, clavate, tetrasporic; length of sterigmata up to 5.2 µm. Basidiospores 8.6–9.8 × 3.5–4.2 µm, ellipsoid to subcylindrical, thin–walled, smooth, acyanophilous, inamyloid.

Specimens examined– India, Uttarakhand, Dehradun: Chakrata, stick of *Quercus leuchotricophora*, Sanyal 6839 (PUN), September 17, 2012; Himachal Pradesh, Kangra: Ghar Jarot, stump of *Albizia lebbek*, Ritu 9460 (PUN), August 08, 2015.

Remarks– This species is characteristic in having smooth to aculeate, orange white to pale orange to grayish orange to brownish orange basidiocarps, thick–walled, simple septate hyphae, encrusted hyphal ends, clavate basidia and ellipsoid to subcylindrical basidiospores. It was first described by Fries (1874) as *Grandinia corrugata*. Eriksson and Ryvarden (1976) shifted it to genus *Hyphodermella*. Earlier, it has been reported from Denmark and Norway (www.mycobank.org), but is being reported for the first time from India.

10. *Hypochnicium pini* Y. Jang & J–J. Kim, Mycotaxon 124: 211, 2013.

Plate III, Map–I

Morphological features

Basidiocarps resupinate, effused, loosely adnate, up to 200 ìm thick in section; hymenial surface hypochnoid, grayish white when collected, not changing much after drying; margins pruinose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 6.2 µm wide, septate, clamped, thin– to thick–walled; less branched, loosely interwoven, horizontal in the basal zone; branched, thin–walled, compact, gradually becoming vertical towards the hymenium. Cystidia 55 90 × 6 7 µm, subclavate to subcylindrical, thin–walled; projection out of the hymenium up to 30 µm. Basidia 21–30 × 6–7 µm, clavate, usually sinuous, tetrasporic; length of sterigmata up to 5 µm. Basidiospores 5.5–6.5 × 5–5.6 µm, broadly ellipsoid to subglobose, echinulate, thick–walled, cyanophilous, inamyloid.

Specimens examined– India, Uttarakhand, Bageshwar: Kausani, stump of *Alnus nepalensis*, Sanyal 6814 (PUN), September 01, 2011; Himachal Pradesh, Kangra: Rait, log of *Pinus roxburghii*, Ritu 8877 (PUN), September 11, 2016.

Remarks– *H. pini* is marked by the presence of subcylindrical to subfusiform cystidia and broadly ellipsoid to subglobose, verrucose, cyanophilous basidiospores. It differs from *H. cremicolor* in having shorter cystidia. It was first described by Jang and Kim (2013) from China and Korea. Here, it is being described as a new record for India.

11. *Intextomyces contiguus* (P. Karst.) Erikss. & Ryvarden, The *Corticiaceae* of North Europe 4: 37, 1976. – *Corticium calceum* subsp. *contiguum* P. Karst., Acta Societatis pro Fauna et Flora Fennica 2 (1): 39, 1881.

Plate III, Map–I

Morphological features

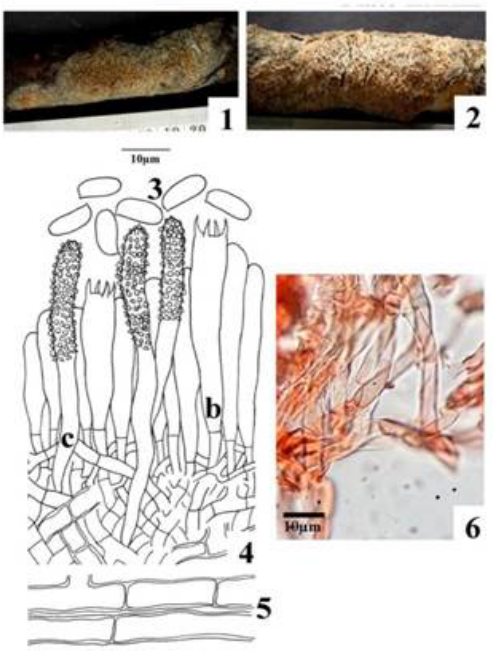
Basidiocarps resupinate, effused, adnate, up to 150 ìm thick in section; hymenial surface ceraceous, smooth, orange white to pale orange when collected, not changing much after drying; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

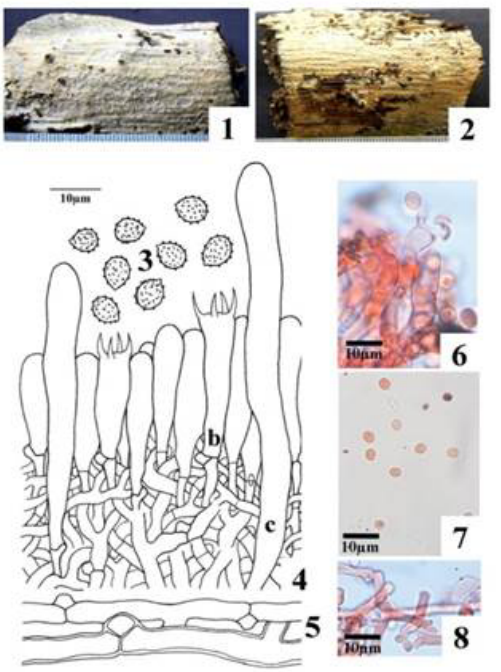
Hyphal system monomitic. Generative hyphae up to 3.2 µm wide, branched, septate, clamped; generally indistinct both in the basal and subhymenial zones due to agglutination. Basidia 17–33 × 4.8–6.2 µm, clavate to subclavate, sinuous, stalked, tetrasporic; length of sterigmata up to 6 µm. Basidiospores 5–6.4 × 3–4.5 µm, ellipsoid, subangulate, thick–walled, cyanophilous, inamyloid.

Specimens examined– India, Uttarakhand, Rudraprayag: Chopta, decaying angiospermous bark, Sanyal 6625 (PUN), July 26, 2011; Himachal Pradesh, Kangra: Tatwali, stump of *Melia azedarach*, Ritu 8900 (PUN), August 09, 2014.

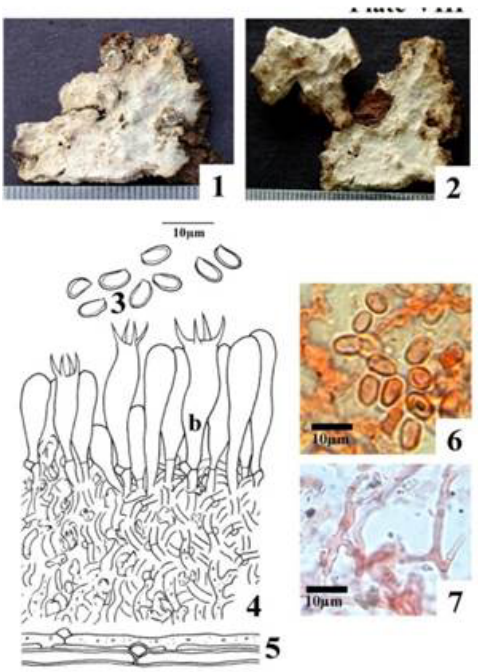
Plate-III



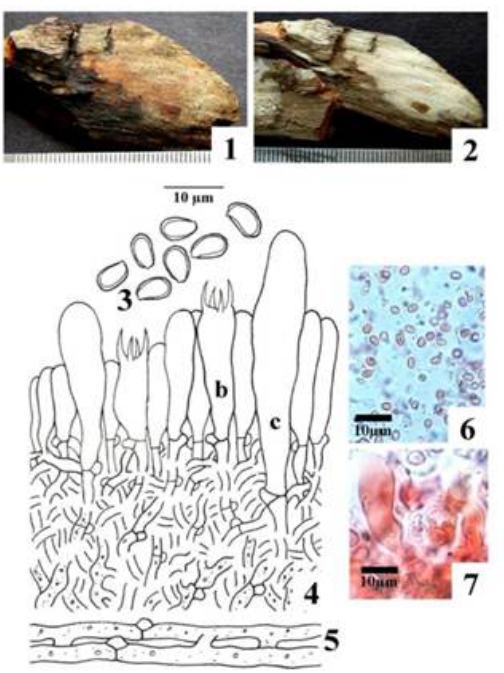
Figs 1-6. ***Hyphodermella corrugata***
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. encrusted hyphal end), 5. generative hyphae];
6. Photomicrograph (6. generative hyphae).



Figs 1-8. ***Hypochnicium pini***
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae];
6-8. Photomicrographs (6. basidium and basidiospore, 7. basidiospores, 8. generative hyphae).



Figs 1-7. ***Intextomyces contiguus***
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. generative hyphae];
6-7. Photomicrographs (6. basidiospores, 7. generative hyphae).



Figs 1-7. ***Intextomyces cystidiatus***
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae];
6-7. Photomicrographs (6. basidiospores, 7. cystidium).

Remarks– *I. contiguus* is characterized by subangulate, thick–walled, cyanophilous basidiospores and stalked, constricted basidia. It was first described by Karsten (1881) as *Corticium calceum* subsp. c*ontiguum*. Parmasto (1968) placed it in subgenus *Microhypochnicium*, within genus *Hypochnicium*. However, Eriksson and Ryvarden (1976) proposed the new genus *Intextomyces* for its placement. This species is earlier reported from North America, Finland, Norway, Russia, Scandinavia, Sweden and the Royal Kingdom of Bhutan (www.mycobank.org), but is a new record for India.

12. *Intextomyces cystidiatus* Hjortstam, Windahlia 17: 56 (1987).

Plate III, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 100 ìm thick in section; hymenial surface smooth to tuberculate, pale yellow to grayish yellow when fresh, yellowish white to pale yellow on drying; margins thinning, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.2 ìm wide, branched, septate, clamped, thin–walled, rich in protoplasmic contents; basal hyphae parallel to the substrate, loosely interwoven; subhymenial hyphae vertical, compact. Cystidia 29–46 × 7.2–8.6 ìm, subclavate to subfusiform, widened at the apex, with basal clamp, thin–to somewhat thick–walled. Basidia 14–22.8 × 5.8–6.4 ìm, clavate to subclavate, constricted, stalked (narrowing towards the base), tetrasporic, with basal clamp; length of sterigmata up to 5.4 ìm. Basidiospores 5.8–7 × 3.2–4 ìm, ellipsoid, subangulate, smooth, thick–walled, cyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Rudraprayag: Chopta, on stump of *Cedrus deodara*, Sanyal 6627 (PUN), July 26, 2011.

Remarks– It can be differentiated from *I. contiguus* on the basis of presence of cystidia and has earlier been reported from the Caucasus, Italy and Russia (www.mycobank.org). However, it is being described as a new record for India.

13. *Ischnoderma benzoinum* (Wahlenb.) P. Karst., Acta Societatis pro Fauna et Flora Fennica 2 (1): 32, 1879. – *Boletus benzoinus* Wahlenb., Flora suecica 2: 1076, 1826.

Plate–IV, Map–I

Morphological features

Basidiocarp annual, effused, reflexed to pileate, sessile; pilei up to 13 × 12 × 3 mm, dimidiate, solitary to imbricate; hymenial surface poroid, orange white to pale orange to grayish orange when collected, not changing much after drying; pores round to angular, 4–6 per mm, collapsed; dissepiments thin, entire; context up to 1 mm thick, concolorous to hymenial surface; pore tubes up to 2 mm long, concolorous to pore surface; abhymenial surface velvety, brown; margins irregularly lobed to incised, sterile up to 2 mm, paler concolorous on both hymenial as well as abhymenial surfaces.

Microscopic features

Hyphal system dimitic. Generative hyphae up to 6.2 µm wide, septate, clamped, thin– to thick–walled, branched. Skeletal hyphae up to 6 µm wide, aseptate, thick–walled, unbranched, yellowish brown. Context constituted by horizontal, intertwined generative and skeletal hyphae; tramal zone by vertical, intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Basidia 11–15 × 2.6–3.3 ìm, clavate, tetrasporic; length of sterigmata up to 3.1 µm. Basidiospores 4.3–6 × 1.6–2.3 ìm, subcylindrical, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Chetru, log of *Pinus roxburghii*, Ritu 8920 (PUN), September 09, 2017.

Remarks– This species has velvety, brown abhymenial surface and dimitic hyphal system. It is being described as a first report from India. Previous reports are from European countries, North Asia and North America (www.mycobank.org).

14. ***Lawrynomyces capitatus*** (J. Erikss. & Å. Strid) Karasiñski, Acta Mycologica (Warszawa) 48 (1): 6, 2013. **–** *Hyphoderma capitatum* J. Erikss. & Å. Strid, The *Corticiaceae* of North Europe 3: 461, 1975.

Plate–IV, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, thin, up to 120 µm thick in section; hymenial surface smooth, grayish white when collected, grayish brown after drying; margins fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.2 µm wide, simple–septate; thin–walled, less branched, horizontal in the basal zone; thin–walled, branched, gradually becoming vertical towards the hymenium. Cystidia 60–100 × 6–7.5 ìm, capitate, thin–walled; projection out of the hymenium up to 55 µm. Basidia 30–50 × 6–7 µm, clavate to cylindrical, sinuous, tetrasporic; length of sterigmata up to 4 µm. Basidiospores 10.4–12.2 × 7.3–7.8 µm, broadly ellipsoid to subglobose, smooth, somewhat thick–walled, with oily contents, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Andreta, log of *Morus alba*, Ritu 9427 (PUN), July 23, 2017.

Remarks– This species is characteristic in having simple–septate hyphae, capitate cystidia and large, broadly ellipsoid to subglobose, somewhat thick–walled basidiospores. Previously, it is reported from Sweden and Japan (www.mycobank.org), however, it is being described for the first time from India.

15. ***Megasporoporia setulosa*** (Henn.) Rajchenb., Mycotaxon 16 (1): 180, 1982. – *Poria setulosa* Henn., Botanische Jahrbücher für Systematik Pflanzengeschichte und Pflanzengeographie 28: 321, 1901.

Plate–IV, Map–I

Morphological features

Basidiocarps resupinate, effused, adnate, up to 500 ìm thick in section; hymenial surface poroid, pores angular, 1–2 per mm; orange white to grayish orange to brownish orange to brown when collected, not changing much after drying; margins fibrillose, sterile up to 2 mm, paler concolorous, or indeterminate.

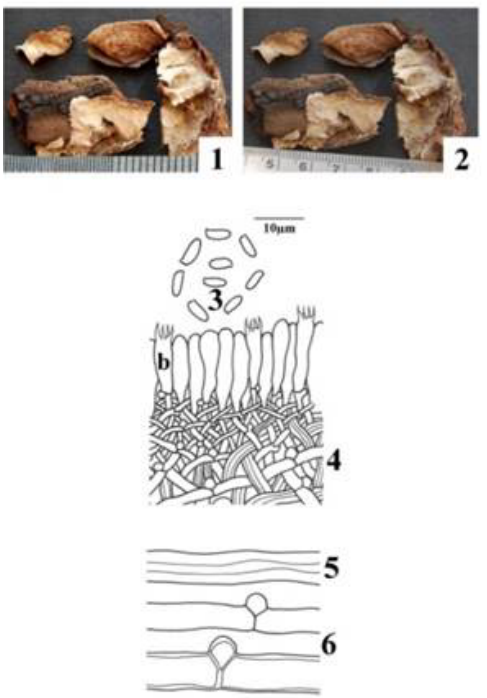
Microscopic features

Hyphal system dimitic. Generative hyphae up to 2.6 µm wide, branched, septate, clamped, thin–walled. Skeletal hyphae up to 5 µm wide, aseptate, unbranched, thick–walled, dextrinoid. Context constituted by horizontal, intertwined generative and skeletal hyphae; tramal zone by vertical intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Basidia 21–33 × 5–5.5 ìm, clavate, tetrasporic, with oily contents; length of sterigmata up to 5 ìm. Basidiospores 11.5–16 × 4.8–5.7 ìm, narrowly ellipsoid to subcylindrical, smooth, thin–walled, with oily contents, acyanophilous, inamyloid.

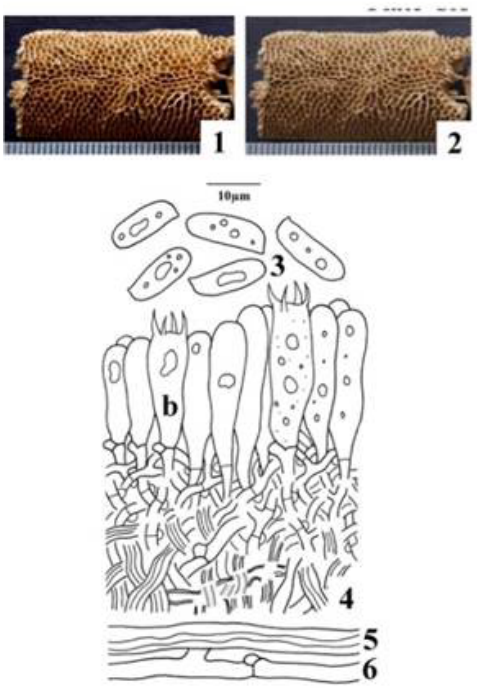
Specimens examined– India, Uttarakhand, Almora: Kantoli, angiospermous stump, Sanyal 6929 (PUN), August 31, 2011; Himachal Pradesh, Kangra: Chambi, angiospermous log, Ritu 9502 (PUN), July 31, 2016.

Remarks– This species is characteristic in having poroid, grayish orange basidiocarps, angular, 1–2 per mm pores, trimitic hyphal system and ellipsoid to subcylindrical, smooth, thin–walled, acyanophilous, inamyloid basidiospores. It was first described by Hennings (1901) as *Poria setulosa* and later shifted by Rajchenberg (1982) to *Megasoproporia*. It has

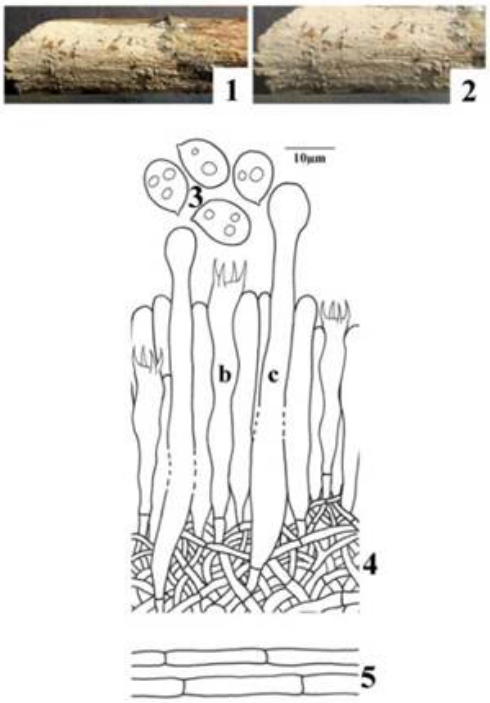
Plate-IV



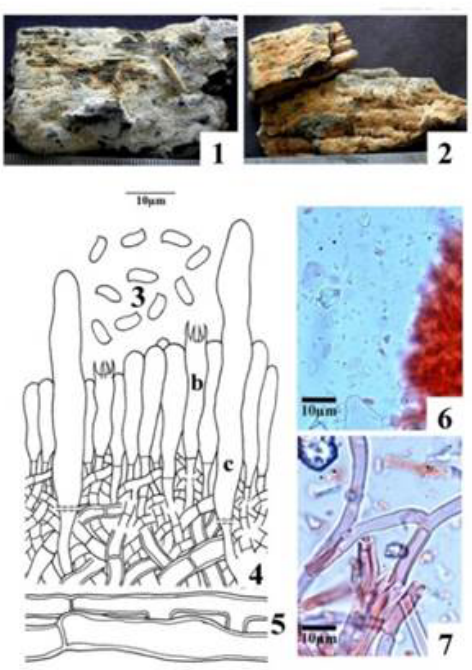
Figs 1-6. *Ischnoderma benzoinum*
1-2. Basidiocarps showing abhymenial & hymenial surfaces (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. skeletal hypha, 6. generative hyphae].



Figs 1-6. *Megasporoporia setulosa*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. skeletal hypha, 6. generative hypha].



Figs 1-5. *Lawrynomyces capitatus*
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae].



Figs 1-7. *Meruliopsis hirtella*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae];
6-7. Photomicrographs (6. basidiospores, 7. generative hyphae).

earlier been reported from Argentina (www.mycobank.org). Here, it is being described for the first time from India.

16. *Meruliopsis hirtella* (Burt) Ginns, Canadian Journal of Botany 54 (1–2): 132, 1976. – *Merulius hirtellus* Burt, Annals of the Missouri Botanical Garden 4 (4): 335, 1917.

Plate–IV, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 390 ìm thick in section; hymenial surface merulioid; brownish orange when collected, grayish orange to brownish orange after drying; margins thinning, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae branched, septate, without clamps, wall thickness up to 2 ìm, often encrusted; basal hyphae up to 8.6 ìm wide, thick–walled, loosely interwoven; subhymenial hyphae up to 4.8 ìm wide, thin– to thick–walled, compact. Cystidia up to 80 × 6.8 ìm, subcylindrical, sinuous, thin–walled; projecting up to 25 ìm out of the hymenium. Basidia 16–23 × 4 ìm, clavate, with narrow base, tetrasporic, without basal clamp; length of sterigmata up to 3.4 ìm. Basidiospores 4.4–5.8 × 2–2.8 ìm, ellipsoid to suballantoid, thin–walled, smooth, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Uttarkashi: Chaurangi Khal, log of *Quercus leucotrichophora*, Sanyal 6847 (PUN), September 31, 2011.

Remarks– *M. hirtella* is characteristic in having merulioid hymenial surface along with simple septate, thick–walled hyphae, subcylindrical, sinuous, thin–walled cystidia and ellipsoid to suballantoid basidiospores. Earlier, it has been reported from the Caucasus, Bosnia, Bulgaria, Denmark, Finland, France, Herzegovina, Italy, Macedonia, Norway, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Turkey and Ukraine (www.mycobank.org), but is being reported for the first time from India.

17. *Peniophora boidinii* D.A. Reid, Revista Biol. (Lisbon): 146, 1965.

Plate–V, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, crustaceous, up to 250 ìm thick in section; hymenial surface smooth, grayish yellow to grayish orange when collected, not changing much after drying; margins fibrillose, irregularly wavy, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3 µm wide, septate, clamped, thin– to thick–walled; less branched, light brown, horizontal in the basal zone; branched, subhyaline, gradually becoming vertical towards the hymenium. Sterile elements of 2 types: (i) Gloeocystidia 25 40 × 4 5.5 µm, subfusiform to fusiform, some with schizopapila, thin–walled, oily contents ve to sulphovaniline, basal clamp present. (ii) Metuloids 25 39 × 5 8 µm, conical to subfusiform, thick–walled, heavily encrusted, basal clamp present. Basidia 25–36 × 4.5–6 µm, clavate, sinuous, tetrasporic, basal clamp present; length of sterigmata up to 5 µm. Basidiospores 6–9 × 3–4 µm, allantoid to subcylindrical, smooth, thin–walled, acyanophilous, inamyloid.

Specimens examined– India, Himachal Pradesh, Kangra: Baroh, sticks of *Rosa moschata*, Ritu 8888 (PUN), September 10, 2017.

Remarks– This species is characteristic in having gloeocystidia with oily contents negative to sulphovaniline in combination with allantoid to subcylindrical basidiospores and being described for the first time from India. Previous reports of this species are from France, Irland, United Kingdom,

Spain, Portugal, Italy, Toscana, Sicilia, and Sardegna (www.mycobank.org).

18. *Phlebia lilascens* (Bourdot) J. Erikss. & Hjortstam, The *Corticiaceae* of North Europe 6: 1123, 1981. – *Corticium lilascens* Bourdot, Revue Scientifique du Bourbonnais et du Centre de la France 23: 13, 1910.

Plate–V, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 330 ìm thick in section; hymenial surface smooth, orange red when collected, light brownish after drying; margins thinning, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.6 ìm wide, branched, septate, clamped, thin–walled; basal hyphae running parallel to the substrate, rich in protoplasmic contents; subhymenial zone composed of compactly packed vertical hyphae. Basidia 20–28 × 5–5.6 ìm, subclavate to clavate, thin–walled, tetrasporic, with a basal clamp; length of sterigmata up to 3 ìm. Basidiospores 5.4–6.8 × 2.4–3 ìm, ellipsoid to cylindrical, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Uttarakhand, Bageshwar: Dumlot, log of *Quercus leucotrichophora*, Sanyal 6821 (PUN), September 01, 2011.

Remarks– *P. lilascens* is characterized by orange red to light brownish hymenial surface, absence of cystidia and ellipsoid to cylindrical basidiospores. Bourdot (1910) described it as *corticium lilascens*, but Eriksson and Hjortstam (1981) shifted it to genus *Phlebia*. It has earlier been reported from Carpatorossia, Denmark, Finland, France, Norway, Poland, Spain and Sweden (www.mycobank.org). Here, it is being reported for the first time from India.

19. *Tubulicrinis medius* (Bourdot & Galzin) Oberw., Zeitschrift für Pilzkunde 31: 26, 1966. *Peniophora glebulosa* subsp. media Bourdot & Galzin, Bulletin de la Société Mycologique de France 28 (4): 385, 1913.

Plate–V, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, up to 140 µm thick in section; hymenial surface smooth, grayish orange when collected, not changing much after drying; margins pruinose, paler concolorous, or indeterminate.

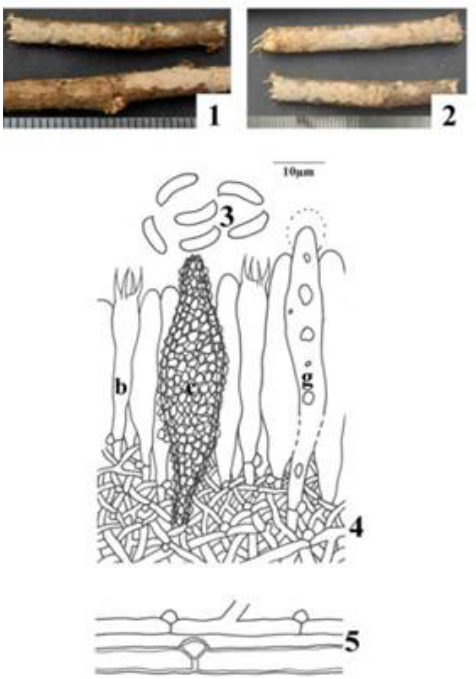
Microscopic features

Hyphal sysytem monomitic. Generartive hyphae up to 4.8 µm wide, septate, clamped, thin– to thick–walled; less branched, horizontal in the basal zone; more branched, gradually becoming vertical towards the hymenium. Hyphal vesicles usually present. Lyocystidia 60–95 × 7.5–9 µm, cylindrical with rooting base, obtuse apex, capillary lumen widens towards the neck part, encrusted, amyloid; projection out of the hymenium up to 32 ìm. Basidia 10–15 × 3.3–4.8 µm, clavate to subclavate, basaly thick–walled, amyloid, tetrasporic; length of sterigmata up to 4.5 µm. Basidiospores 6.5–10 × 1.5–2.3 µm, allantoid, smooth, thin–walled, acyanophilous, inamyloid.

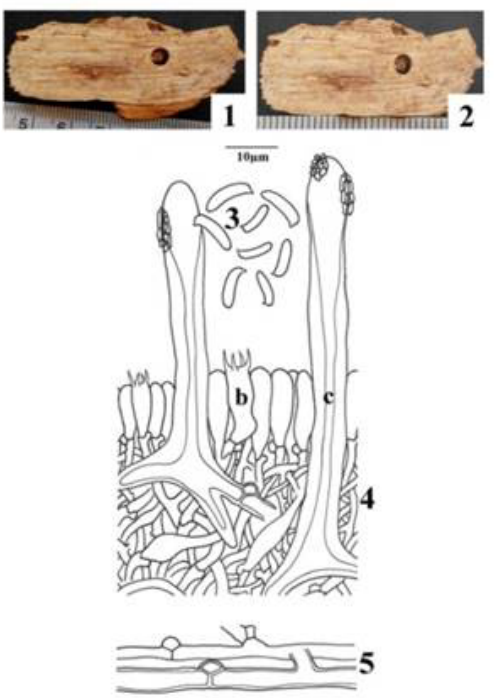
Specimen examined– India, Himachal Pradesh, Kangra: Dehra Gopipur, *P. roxburghii*, Ritu 8859 (PUN), July 30, 2017.

Remarks– This species is unique in having thick–walled at the base, amyloid basidia and being described as a new record for India. Earlier reports of this species are from Austria, Turkey, Estonia, France, Germany, Macedonia, Slovenia, United Kingdom, Belgium, Portugal, Sweden, Italy, Denmark, Norway, Finland, Spain, the Caucasus, Trentino Alto–Adige, Friuli Venezia–Giulia, Emilia–Romagna, Toscana, Sardegna Regions and Gulf Coast (www.mycobank.org).

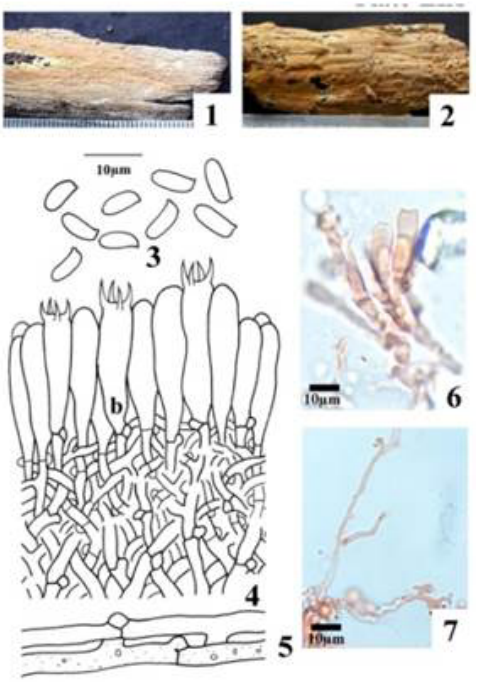
Plate-V



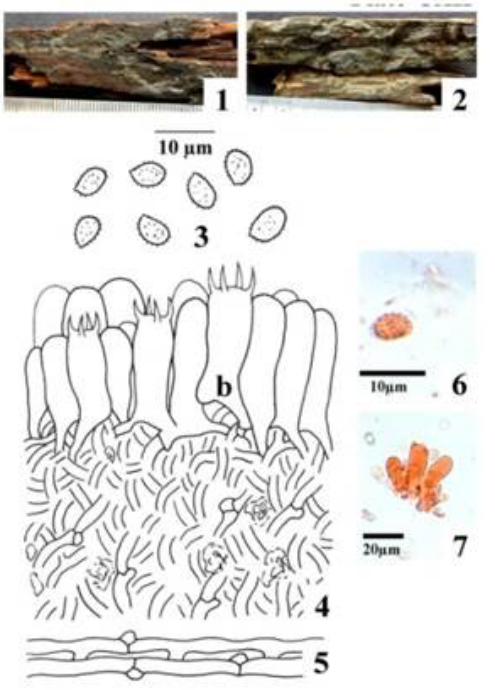
Figs 1-5. *Peniophora boidinii*
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium, g. gloeocystidium), 5. generative hyphae].



Figs 1-5. *Tubulicrinis medius*
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. leptocystidium), 5. generative hyphae].



Figs 1-7. *Phlebia lilascens*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. generative hyphae];
6-7. Photomicrographs (6. basidia, 7. generative hyphae).



Figs. 1-7. *Xenasma praeteritum*
1-2. Basidiocarps showing hymenial surfaces (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium), 5. generative hyphae];
6-7. Photomicrographs (6. basidiospore, 7. basidium).

20. *Xenasma praeteritum* (H.S. Jacks.) Donk, Fungus 25: 27, 1957. – *Peniophora praeterita* H.S. Jacks., Canadian Journal of Research 28 (5): 533, 1950.

Plate–V, Map–I

Morphological features

Basidiocarps resupinate, effused, adnate, up to 150 ìm thick in section; hymenial surface smooth, dull gray when collected, grayish yellow after drying; margins thinning, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3 ìm wide, branched, septate, clamped, thin–walled; basal hyphae parallel to substrate; subhymenial hyphae vertical. Basidia 16–26 × 6.2–7.6 ì m, cylindrical to subclavate, generally pleural, tetrasporic, with basal clamp; length of sterigmata up to 3.8 ìm. Basidiospores 5.6–7.4 × 3.8–4.4 ìm, broadly ellipsoid to subglobose, verrucose, thin–walled, acyanophilous, inamyloid.

Specimens examined– India, Uttarakhand, Rudraprayag: Humsari, log of *Cedrus deodara*, Sanyal 6933 (PUN), July 26, 2011; Himachal Pradesh, Kangra: Dada Siba, stump of *Mangifera indica*, Ritu 9524 (PUN), September 07, 2014.

Remarks– *Xenasma praeteritum* is characteristic in having broadly ellipsoid to subglobose, verrucose basidiospores. Jackson (1950) described it as *Peniophora praeterita* from Ontario (Canada). Donk (1957) shifted it to *Xenasma*. Here it is being described as a new record for India.

21. *Xenasma rimicola* (P. Karst.) Donk, Fungus 27: 26, 1957. – *Corticium rimicola* P. Karst., Hedwigia 35: 45, 1896.

Plate–VI, Map–I

Morphological features

Basidiocarp resupinate, effused, adnate, gelatinous, up to 150 ìm thick in section; hymenial surface smooth, yellowish gray when collected, not changing much after drying; margins thinning, somewhat fibrillose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.8 ìm wide, branched, septate, with clamps, thin–walled; basal hyphae parallel to substrate; subhymenial hyphae vertical. Sterile elements of two kinds: (i) Lyocystidia 64–75 × 7.4–10.6 ìm, subcylindrical to subfusiform, tapering towards the apex, widened at the base, base often bifurcate, thick–walled, often with encrustation in the apical region. (ii) Cystidioles 25–32 × 3–4.4 ìm, subcylindrical, often capitate, thin–walled, with basal clamp. Basidia 21–32 × 6.4–9.6 ì m, clavate to subclavate, tetrasporic, with basal clamp and oily contents; length of sterigmata up to 4.4 ìm. Basidiospores 8–13 × 7.4–9.4 ìm, broadly ellipsoid to ovate, appear smooth in 3% KOH solution, warted in Melzer's reagent and cotton blue, thin– to thick–walled, slightly dextrinoid, acyanophilous.

Specimen examined– India, Uttarakhand, Tehri Garhwal: Jaunpur, log of *Quercus floribunda*, Sanyal 6936 (PUN), August 20, 2010.

Remarks– *Xenasma rimicola* is characteristic in having cylindrical to subfusiform lyocystidia alongwith broadly ellipsoid to ovate, slightly dextrinoid basidiospores. Karsten (1896) described it as *Corticium rimicola*, later, Donk (1957) shifted it to genus *Xenasma*. This species has earlier been reported from Africa, North and South America, Europe, Japan and Nepal (www.mycobank.org). Here it is being described as a new record for India.

22. *Xylodon nesporina* (Hallenb. & Hjortstam) Hjortstam & Ryvarden, Synopsis Fungorum 26: 38, 2009. – *Hyphodontia nesporina* Hallenb. & Hjortstam, Mycotaxon 57: 121, 1996.

Plate–VI, Map–I

Morphological features

Basidiocarp resupinate, effused, loosely adnate, up to 300 ìm thick in section; hymenial surface aculeate, grayish orange to brownish orange when collected, not changing much after drying; margins fibrillose, paler concolorous or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.5 µm wide, clamped, thin– to thick–walled; less branched, horizontal in the basal zone; more branched, gradually becoming vertical towards the hymenium. Subulate hyphal ends present. Basidia 17–30 × 4–5.5 ìm, clavate to subclavate, sinuous, tetrasporic; length of sterigmata up to 5.5 µm. Basidiospores 6–7 × 2–2.5 ìm, narrowly ellipsoid to ellipsoid, smooth, thin–walled, with oily contents, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Garli, log of *Pinus roxburghii*, Ritu 8857 (PUN), September 17, 2017.

Remarks– This species is unique in having aculeate basidiocarps and being described here as a first report from India. Earlier report of this species is from Argentina (www.mycobank.org).

23. *Xylodon niemelaei* (Sheng H. Wu) Hjortstam & Ryvarden, Synopsis Fungorum 26: 38, 2009. – *Hyphodontia niemelaei* Sheng H. Wu, Acta Botanica Fennica 142: 98, 1990.

Plate–VI, Map–I

Morphological features

Basidiocarp resupinate, effused, loosely adnate, up to 200 ìm thick in section; hymenial surface poroid, orange white to pale orange when collected, grayish orange after drying; pores round to angular, 6–8 per mm; margins pruinose, paler concolorous, or indeterminate.

Microscopic features

Hyphal system monomitic. Generative hyphae up to 3.2 µm wide, clamped, thin– to thick–walled; less branched in the basal zone as well as trama; more branched in the subhymenium. Sterile elements of two types: (i) Capitae cystidia 25–46 × 5–6 ìm, capitate, thin–walled; enclosed to projecting. (ii) Leptocystidia 26–55 × 5–6 ìm, subulate to subfusiform, thin–walled, projecting; projection out of hymenium up to 20 ì m. Basidia 15–20 × 4.5–5 ìm, clavate to subclavate, tetrasporic; length of sterigmata up to 3 µm. Basidiospores 5–7 × 4–5.1 ìm, broadly ellipsoid, smooth, thin–walled, acyanophilous, inamyloid, guttulate.

Specimen examined– India, Himachal Pradesh, Kangra: Haripur, bark of *Melia azedarach*, Ritu 8855 (PUN), August 28, 2015.

Remarks– This species is characterized by the presence of two types of sterile elements and guttulate basidiospores. It is being described here as first report from India. Earlier reports are from Cameroon, Colombia and Taiwan (www.mycobank.org).

24. *Xylodon subtropicus* (C.C. Chen & Sheng H. Wu) C.C. Chen & Sheng H. Wu, Mycoscience 59 (5): 349, 2018. – *Hyphodontia subtropica* C.C. Chen & Sheng H. Wu, Mycological Progress 16 (5): 561, 2017.

Plate–VI, Map–I

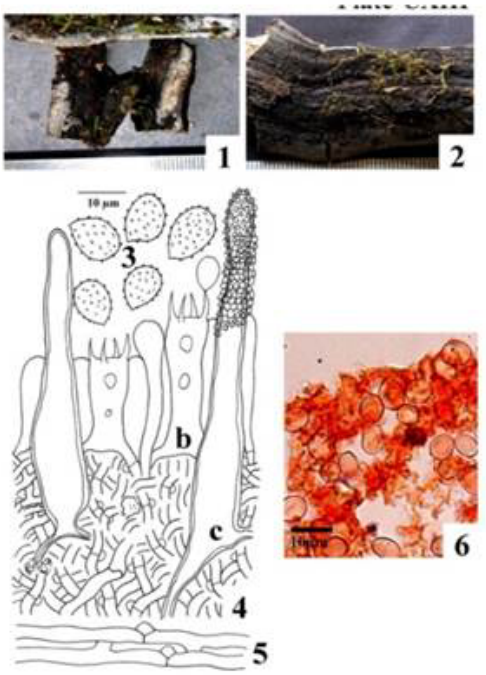
Morphological features

Basidiocarps resupinate, effused, loosely adnate, up to 320 ìm thick in section; hymenial surface poroid, orange white to pale orange when collected, grayish orange after drying; pores round to angular, 8–10 per mm; margins fibrillose, paler concolorous, or indeterminate.

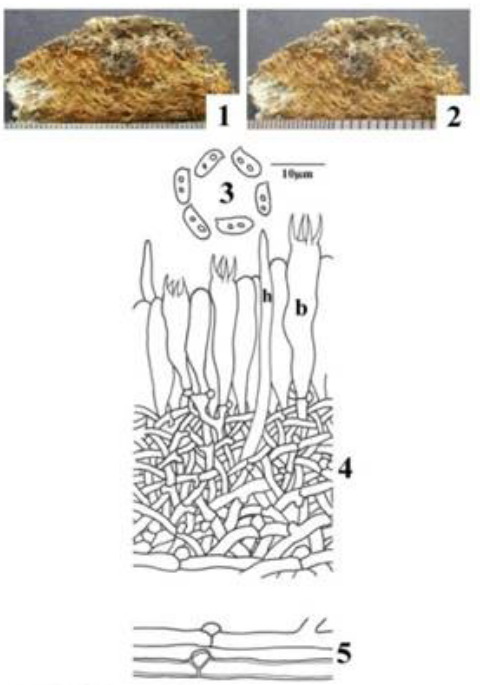
Microscopic features

Hyphal system dimitic. Generative hyphae up to 4.8 µm wide, septate, clamped, thin– to thick–walled,

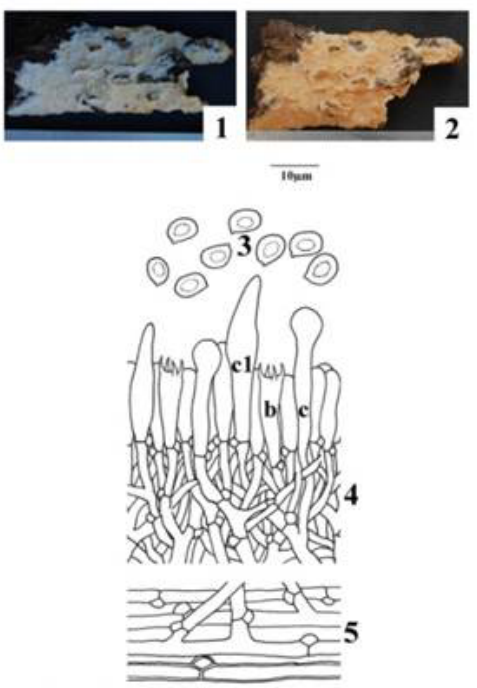
Plate-VI



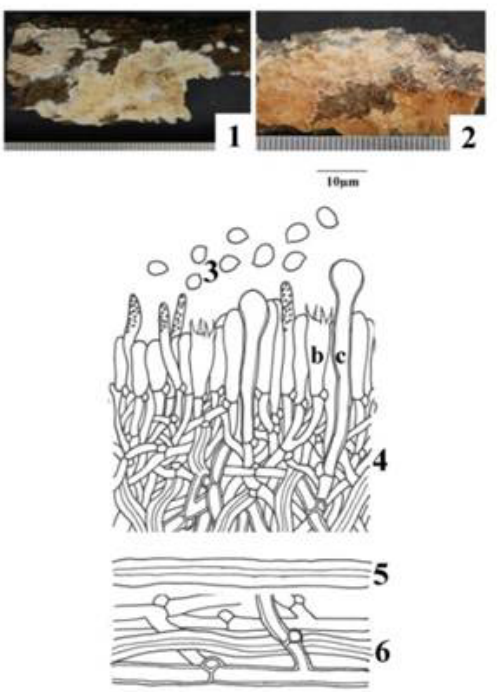
Figs 1-6. *Xenasma rimicola*
1-2. Basidiocarp showing hymenial surface (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. generative hyphae];
6. Photomicrograph (6. basidiospores).



Figs 1-5. *Xylodon nesporina*
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, h. hyphal end), 5. generative hyphae].



Figs 1-5. *Xylodon niemelaei*
1-2. Basidiocarp (1. fresh, 2. dry);
3-5. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. capitate cystidium, c1. leptocystidium), 5. generative hyphae].



Figs 1-6. *Xylodon subtropicus*
1-2. Basidiocarp (1. fresh, 2. dry);
3-6. Line diagrams [3. basidiospores, 4. reconstruction of hymenium and subhymenium (b. basidium, c. cystidium), 5. skeletal hypha, 6. generative hyphae].

branched. Skeletal hyphae up to 5.3 µm wide, aseptate, thick–walled, occasionally branched. Subicular zone constituted by intertwined generative and skeletal hyphae; tramal zone by vertical intertwined generative as well as skeletal hyphae and subhymenial zone usually by generative hyphae at right angles to the trama. Encrusted hyphal ends are present. Cystidia 31–45 × 5–6 ìm, capitate, thick–walled; enclosed to projecting. Basidia 12–16 × 3.5–4 ìm, clavate, tetrasporic; length of sterigmata up to 3.5 µm. Basidiospores 2.8–5 × 2.6–5 ìm, broadly ellipsoid to subglobose, smooth, thin–walled, acyanophilous, inamyloid.

Specimen examined– India, Himachal Pradesh, Kangra: Ghar Jarot, log of *Pinus roxburghii*, Ritu 9373 (PUN), August 08, 2015.

Remarks– This species is characterized by dimitic hyphal system, thick–walled capitate cystidia in combination with broadly ellipsoid to subglobose basidiospores and being described here as new record for India. Earlier report is from Taiwan (www.mycobank.org).

DISCUSSION

As per exploration and classification of these fungi, the work done by the workers across the globe is remarkable but still a huge amount and scope remains for the analysis of this group. Most of the genera are still pending for their exact taxonomic identity and hence kept under the subclass incertae sedis of Agaricomycetes. Recent classifications proposed by different workers (Hibbett and Donoghue, 1995; Kim and Jung, 2000; Larsson *et al*., 2004; Larsson, 2007 and Binder *et al*., 2013) on the basis of molecular work shows the polyphyletic nature of these fungi and distribution of these in all the clades of the tree of phylogenetic classification of fungi. Due to polyphyletic nature of these fungi and incomplete molecular classification, there is a need to study these fungi exhaustively and globally in a coordinated manner. The economic aspects of these fungi can be traced from different parts of world on a collaborative approach which can lead to the development of a systematic platform for social welfare.

ACKNOWLEDGMENTS

The authors thank Head of Department of Botany, Punjabi University, Patiala, for providing research facilities.

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