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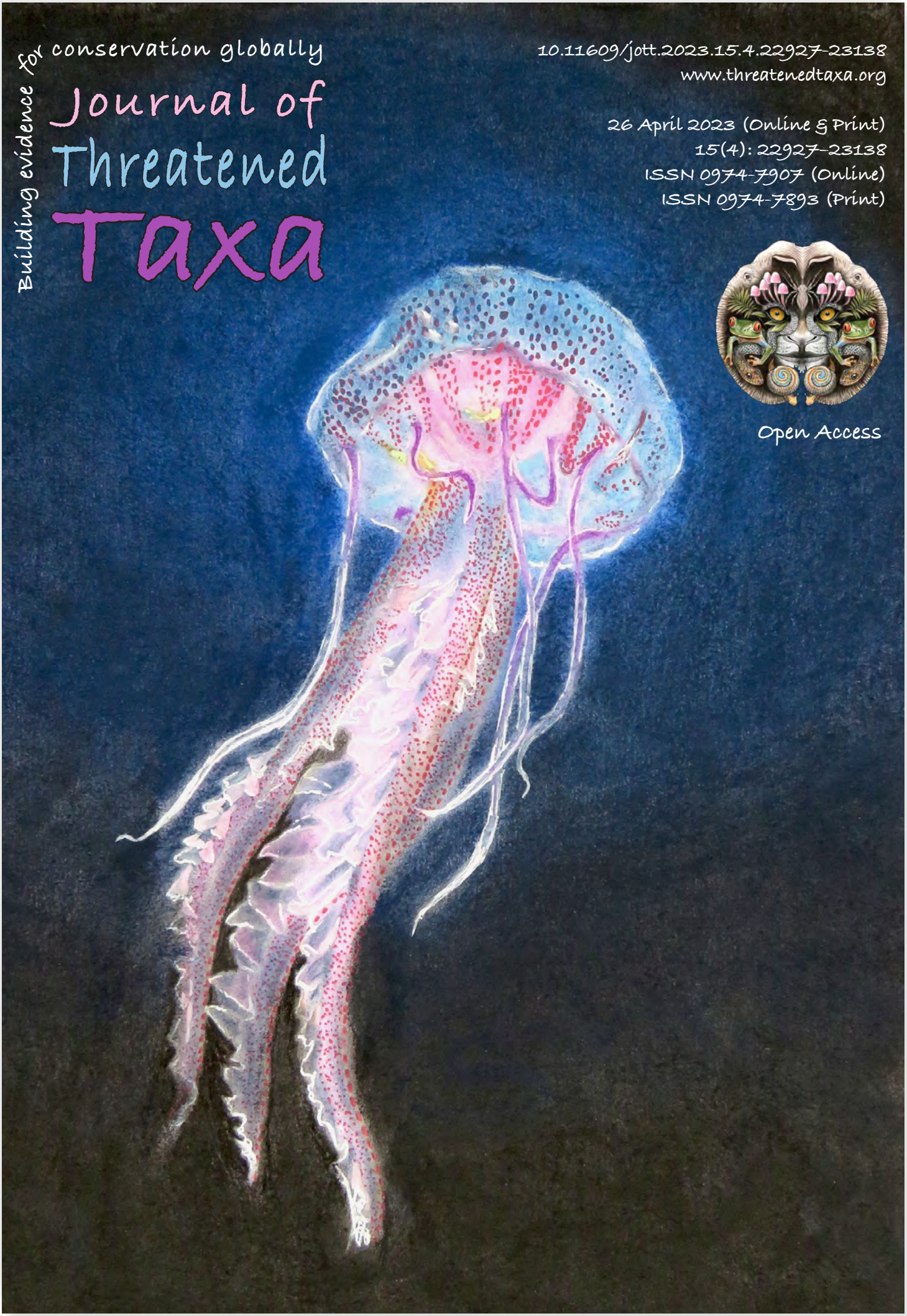

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Cover: Mauve Stinger *Pelagia noctiluca* by Swaathi Na. Medium used is soft pastels and gelly roll.

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ARTICLE

Diversity of bracket fungi (Basidiomycota: Agaricomycetes: Polyporaceae) in Jammu Division, Jammu & Kashmir, India

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Abstract: The 24 taxa comprising of 13 genera belonging to Polyporaceae (Basidiomycota, Agaricomycetes) are described and illustrated on the basis of basidiome collected during the rainy season in the years from 2014–2019 in Doda, Jammu, Kathua, Kishtwar, Ramban, and Udhampur districts of Jammu division of the Union Territory of Jammu & Kashmir. Of these, five (*Dichomitus campestris*, *Perenniporia adnata*, *Pilatoporus bondartsevae*, *Polyporus efibulatus*, and *Tyromyces amazonicus*) are new records for India, 14 (*Abortiporus biennis*, *Cerrena zonata*, *Favolus glaber*, *Fuscopostia leucomallella*, *Hexagonia nitida*, *Lenzites elegans*, *Lenzites warnieri*, *Perreniporia fraxniea*, *P. ochroleuca*, *Poriella subacida*, *Polyporus alveolaris*, *Pycnoporus sanguineus*, *Tyromyces chioneus*, and *Trichaptum biforme*), are new records for the Union territory of Jammu & Kashmir, two (*Pycnoporus cinnabarinus* and *Polyporus squamosus*), and the remaining three (*Fomes fomentarius*, *Lenzites betulina*, and *Trichaptum abietinum*) are re-recorded from the study area.

Keywords: Brown rot, northwestern Himalaya, poroid fungi, white rot.

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INTRODUCTION

Polyporaceae (Agaricomycetes, Basidiomycota) is featured by annual to perennial, resupinate to effused-reflexed to pileate, sessile to stipitate basidiomes, having unilateral hymenium which forms the fertile layer surrounding the tubes that open on the hymenial surface in the variable shapes (circular, angular, daedaleoid, lamellate or irregular) of pores. Polypores act as decomposers and play an important role in the forest ecosystem (recycling the carbon and other nutrients) because of the secretion of lignolytic and cellulase enzymes causing white rot and brown rot, respectively. Along with this, some of these fungi show medicinal properties (Stavinoha 1991; Galor et al. 2011; Badalyan & Gharibyan 2016; Ján et al. 2016).

The Jammu division shows a wide spectrum of variation in altitude and climate. The forests in the Jammu division are categroised into six types, according to Champion & Seth (1968) they range from subtropical dry evergreen forests (*Acacia catechu*, *Eucalyptus* spp., *Olea ferruginea*, *Quercus baloot*, *Albizzia* spp., and *Nerium indicum*) to subtropical pine forests (dominated by *Pinus roxburghii*), other plant species also predominate (*Albizzia* spp., *Murraya indica*, *Olea cuspidata*, *Acacia catechu*, *Dalbergia sissoo*, *Emblica officinalis*, and *Rosa moschata*) to Himalayan dry temperate forests (*Acer* spp., *Abies pindrow*, *Aesculus indicus*, *Juglans regia, Cedrus deodara*, *Emblica officinalis*, and *Rosa moschata*) to Himalayan moist temperate forests (*Cedrus deodara*, *Abies pindrow*, *Pinus wallichiana*, *Picea smithiana*, *Fraxinus floribunda*, *Quercus leucotrichophora*, and Q. *dilata*) to subalpine forests (*Abies pindrow*, *Betula utilis*, *Rhododendron* spp., *Populus ciliata*, and *Quercus* spp.), and alpine vegetation (*Lonicera*, *Berberis* spp., and *Geranium* spp.).

MATERIAL AND METHODS

The polypore basidiomes were collected during excursions carried out in Doda, Jammu, Kathua, Kishtwar, Ramban, and Udhampur districts of Jammu Division in the rainy months (July–September) in the years 2014–2019. These basidiomes were detached from their substratum using a hammer and chisel. The macromorphological details, i.e., nature of the basidiome, mode of attachment, hymenial and abhymenial surface, and margins, were recorded. A piece of the fertile portion of the basidiome was used for getting the spore print on a micro slide. After drying (sun or electric drier), the collected basidiome were packed in zip-lock airtight bags. The micro morphological characters were studied by making preparations in water, 3%/5%/10% KOH, 1% phloxine, 1% Congo red, and 1% cotton blue (in distilled water/lactophenol). The cyanophilous and amyloid reaction of different microscopic structures were studied in 1% cotton blue and Melzer's reagent (Iodine 0.5 g, Potassium Iodide 1.5 g, Chloral hydrate 20.0 g, and distilled water 20.0 ml) respectively. The line diagrams of the microscopic structures were drawn with the help of a Camera Lucida mounted on a compound microscope at 100x, 400x, and 1,000x magnification. Finally, the specimens were identified on the basis of comparison of the description with the literature and online repository (Bakshi 1971; Dhanda 1977; Rattan 1977; Thind & Dhanda 1979, 1980a,b; Roy & De 1996; Leelavathy & Ganesh 2000; Sharma 2012; Kaur 2013; Ryavrden & Melo 2014; Kaur et al. 2017; Mycobank 2022). The identified specimens were finally submitted to the Herbarium, Department of Botany, Punjabi University, Patiala (PUN) using standard packing protocol.

RESULTS

The 24 described species are classified under 13 genera of family Polyporaceae; the key to the all genera pertaining the described species is given here.

Abortiporus biennis (Bull.: Fr) Singer, Mycologia 36: 68, 1944.

≡ *Boletu biennis* Bull., Herbier de la France 10: t. 449:1 (1790). (Image 1–7)

Basidiome annual, pileate, solitary, laterally stipitate; pilei flabelliform, up to 4×3×1.5 cm.

Abhymenial surface azonate, tomentose, dark brown to light brown when fresh, not changing much on drying; margin acute, concolorus, entire.

Hymenial surface poroid, pale buff to brown when fresh, not changing much on drying; margin concolorus, sterile up to 3 mm.

Pores angular to daedeloid, 3–4 per mm; dissepiments entire/lacerate, up to 75 µm in thickness.

Tube layer greyish-brown, up to 0.5 cm deep.

Context duplex; outer zone soft and fibrous, greyish-brown; inner zone corky and firm, lighter than outer zone; each zone up to 0.5 cm in thickness.

Stipe dorso-lateral, cylindrical, solid, tomentose, up to 2 × 0.7 cm.

Hyphal system monomitic. Generative hyphae

Key to the genera

1. Hyphal system strictly monomitic 2
1. Hyphal system mono/di/tri 3

2. Basidiospores cylindrical to allantoid ..... *Fuscopostia*
2. Basidiospores subglobose to ellipsoid-rarely cylindrical ..... *Abortiporus*

3. Basidiome strictly annual 4
3. Basidiome annual to perennial 6

4. Pores irpiciform ..... *Cerrena*
4. Pores angular to polygonal 5

5. Generative hyphae simple septate/clamped ..... *Pilatoporus*
5. Generative hyphae always clamped ..... *Favolus*

6. Basidiome strictly pileate 7
6. Basidiome resupinate/effused/effused reflexed 10

7. Basidiome orange red to bright red ..... *Pycnoporus*
7. Basidiome not as above 8

8. Hymenial surface comprises lamellate to somewhat deadeloid pores .....*Lenzites*
8. Hymenial surface comprises circular/round/elongated 9

9. Basidiome harder, woody; context duplex or homogenous ..... *Fomes*
9. Basidiome comparatively softer; context always homogenous ..... *Nigrofomes*

10. Basidiospores truncate ..... *Perenniporia*
10. Basidiospores convex but not flat or truncate 11

11. Generative hyphae generally dichotomously branched ..... *Dichomitus*
11. Generative hyphae randomly branched 12

12. Basidiome usually in shade brown; pores hexagonal to polygonal ..... *Hexagonia*
12. Basidiome usually whitish; pores circular to angular ..... *Poriella*

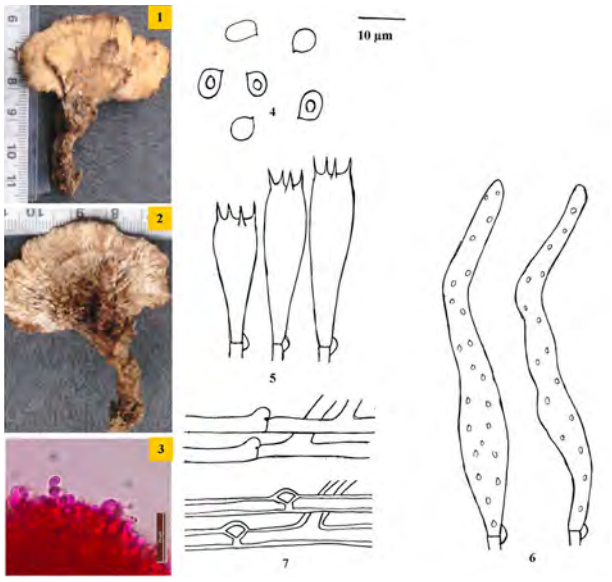

Image 1–7. *Abortiporus biennis*: 1–2—Basidiome showing abhymenial and hymenial surface | 3—Photomicrograph showing portion of hymenium with basidiospores | 4—Basidiospores | 5—Basidia | 6—Gloeocystidia | 7—Generative hyphae.

hyaline, thin- to thick-walled, clamped, branched, up to 5 µm in width.

Hyphal arrangement: subhymenium dominated by thin-walled, irregularly branched, loosely arranged generative hyphae. Trama composed of thick-walled, loosely to moderately compact generative hyphae. Context formed of thick-walled, rarely clamped, rarely branched, compactlypacked generative hyphae.

Gloeocystidia cylindrical to irregular, clamped at the base, smooth, originate in the hymenium, 50–85 ×7–10 µm; projecting up to 30 µm from hymenial surface,.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 25–40× 7–10 µm; sterigmata up to 3 µm in length.

Basidiospores broadly ellipsoid to ovoid, thin-walled, smooth, hyaline, no reaction in Melzer's reagent and cotton blue, 5–7.5 × 3.5–5 µm.

Material examined: 11222(PUN), 10.ix.2016, Jammu & Kashmir, Jammu, Patnitop on gymnospermous wood, coll. Brij Bala.

Notes: *Abortiporus bieenis* is characertized by laterally stipitate pilei, duplex context, monomitic hyphal system, cylindrical gloeocystidia, and broadly ellipsoid to ovoid basidiospores. It is being reported for the first time from Jammu & Kashmir. The only earlier record is from Himachal Pradesh (Thind & Rattan 1971; Sharma 2012).

Cerrena zonata (Berk.) Ryvarden, Boletín de la Sociedad Argentina de Botánica 28: 228 (1992).

≡ *Irpex zonatus* Berk., Hooker's Journal of Botany and Kew Garden Miscellany 6: 168 (1854). (Image 8–14)

Basidiome annual, pileate, imbricate, sessile, narrowly attached; pileidimidiate, applanate, up to 5 × 4 × 0.6 cm.

Abhymenial surface glabrous, smooth, faintly zonate, pale orange to greyish-orange when fresh, not changing much on drying; margin concolorus, acute, entire, curved inside on drying.

Hymenial surface poroid, becoming irpicoid with age, yellowish-white when fresh, not changing much on drying; marginwavy, entire, concolorus, curved inside after drying.

Pores round to angular, 2–3 per mm; dissepiments lacerate, up to 50 µm thickness.

Tube layer orange white, up to 0.3 cm deep.

Context homogenous, yellowish-white, up to 0.3 cm deep.

Hyphal system dimitic. Generative hyphae hyaline, clamped, thin-walled, branched, up to 3.5 µm in width. Skeletal hyphae pale-yellowish, thick-walled, unbranched, aseptate, up to 5.5 µm in width.

Hyphal arrangement: subhymenium composed of thin-walled, loosely arranged, irregularly branched generative hyphae. Trama contains loosely to moderately compact, generative hyphae and skeletal hyphae. Context dominated by moderately to compactly arranged generative and skeletal hyphae.

Cystidia subventricose to ventricose, hyaline, thin-walled, smooth, clamped at the base, originate in the hymenium and subhymenium, 35–60 × 5–7.8 µm; embedded in hymenium.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 15.5–24 × 5.5–10.5 µm; sterigmata up to 2 µm in length.

Basidiospores ellipsoid, hyaline, smooth, thin-walled, no reaction in Melzer's reagent and cotton blue, 5–6.7 × 2.7–3.5 µm.

Material examined: 11201 (PUN), 27.ix.2017 Jammu & Kashmir, Kathua, Billawar, Mandli, on angiospermous stump, Brij Bala; 11202 (PUN), 3.x.2017, Kathua, Billawar, Sukrala, on angiospermous stump, Brij Bala; 11203 (PUN), 26.ix.2015, Kathua, on angiospermous stump, Brij Bala.

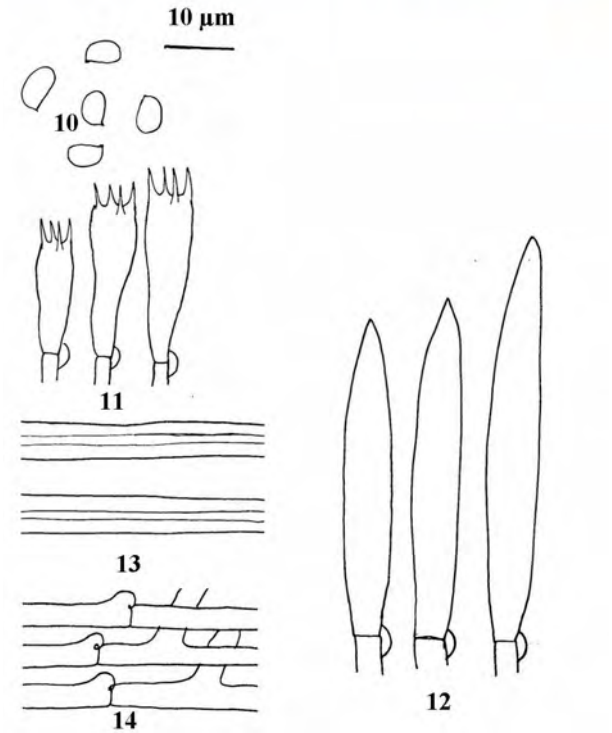

Image 8–14. *Cerrena zonata*: 8–9—Basidiome showing abhymenial and hymenial suface | 10—Basidiospores | 11—Basidia | 12—Cystidia | 13—Skeletal hyphae | 14—Generative hyphae.

Notes: It is unique in having adimitic hyphal system,

subventricose to ventricose cystidia and oblong ellipsoid basidiospores. It is being reported for the first time from Jammu & Kashmir.

Dichomitus campestris (Quél.) Domanski & Orlicz, Acta Soc. Bot. Pol.: 627 (1966).

≡*Trametes campestris* Quél., Mémoires de la Société d'Émulation de Montbéliard ser. 2, 5: 286 (1872). (Image 15–19)

Basidiome annual, resupinate, adnate, effused, cushion shaped, soft when fresh, becomes coriaceous on drying, easily separable from the substrate; up to 4 mm thick in cross-section.

Hymenial surface poroid, yellowish-white when fresh, not changing much on drying; margin concolorus, adnate, entire, sterile up to 2 mm.

Pores round to angular to elongated, 2–3 per mm; dissepiments entire, up to 50 µm in thickness.

Tube layer orange white, up to 2 mm deep.

Subiculum homogenous, yellowish-white, up to 2 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, branched, clamped, up to 3 µm in width. Skeletal hyphae pale yellowish, thick-walled, aseptate, unbranched, up to 4.5 µm in width.

Hyphal arrangement: subhymenium dominated by loosely arranged, branched generative hyphae. Trama formed of loosely to moderately compact, branched generative hyphae and skeletal hyphae. Subiculum composed of moderately compact, branched generative hyphae and skeletal hyphae.

Basidia sub-clavate to clavate, thin-walled, with oil contents, tetrasterigmate, clamped at the base, 25–28 × 4–9 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, with oil droplets, no reaction in Melzer's reagent and cotton blue, 8.8–11.6 × 4.4–5.8 µm.

Material examined: 11361 (PUN), 16.ix.2015, Jammu & Kashmir, Doda, Attalgarh, on *Cedrus deodara* branch, Brij Bala.

Notes: *Dichomitus campestris* differs in having a cushion like resupinate basidiome with cylindrical basidiospores. It is being reported for the first time from India. Earlier it was reported from Norway, Arizona, New Mexico, and Idhao (Ryvarden & Melo 2014; Mycobank 2022).

Favolus glaber (P. Brauv.) Ryvaden, Mycotaxon 72: 216, 1999.

≡*Favolus glaber* P. Beauv., Fl. Oware et Benin 2:76, 1819. (Image 20–26)

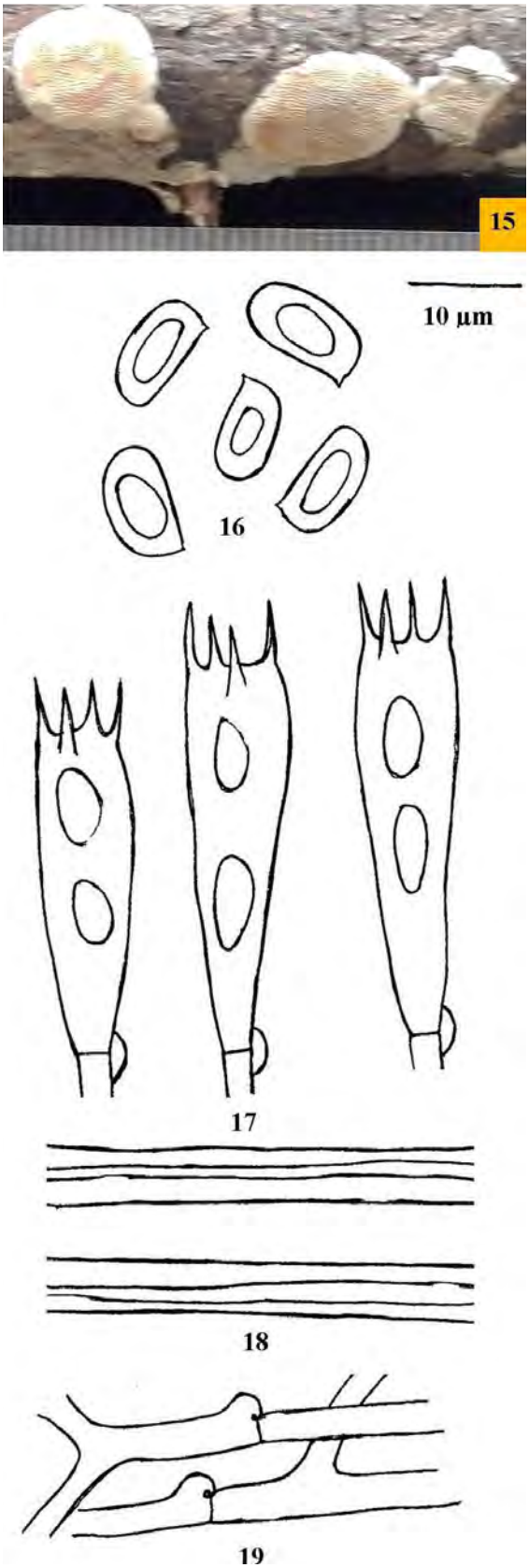

Image 15–19. *Dichomitus campestris*: 15—Basidiome showing hymenial surface | 16—Basidiospores | 17—Basidia | 18—Skeletal hyphae | 19—Generative hyphae.

Basidiome annual, pileate, sessile, broadly attached, solitary, coriaceous, thin; pilei semicircular, dimidiate, up to 4.2 × 2 × 0.2 cm.

Abhymenial surface glabrous, smooth, concentrically zonate, reddish brown to dark brown when fresh, not changing much on drying; margin light brown when fresh, not changing much on drying, acute, entire.

Hymenial surface poroid, brownish-grey to greyish-brown when fresh, not changing much on drying; margin light brown when fresh, not changing much on drying, sterile up to 2 mm.

Pores polygonal, 1–2 per mm; dissepiments entire, up to 20 mm in thickness.

Tube layer greyish-brown, up to 1 mm deep.

Context homogenous, light brown, up to 1 mm in thickness.

Hyphal system trimitic. Generative hyphae hyaline to sub hyaline, thin-walled, branched, clamped, up to 3.7 µm in width. Binding hyphae subhyaline, irregularly branched, thick-walled, aseptate, up to 4 µm in width. Skeletal hyphae dark brown, thick-walled, aseptate, unbranched, up to 5 µm in width.

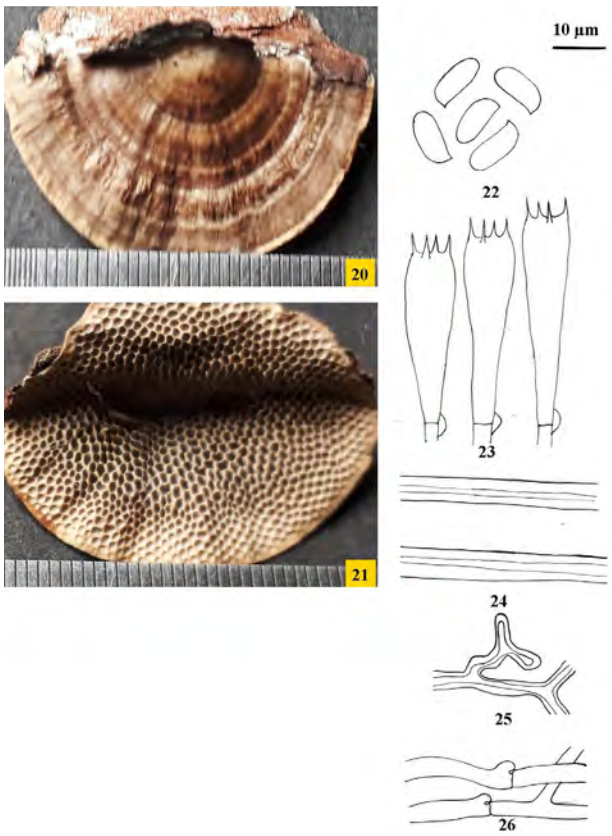

Image 20–26. *Favolus glaber*: 20–21—Basidiome showing abhymenial and hymenial surface | 22—Basidiospores | 23—Basidia | 24—Skeletal hyphae | 25—Binding hyphae | 26—Generative hyphae.

Hyphal arrangement: Subhymenium contains, thin-walled, moderately compact, branched generative hyphae. Trama composed of comparatively compactly arranged generative hyphae, binding hyphae and skeletal hyphae. Context formed of compactly arranged generative and skeletal hyphae.

Basidia clavate to sub-clavate, hyaline, thin-walled, tetrasterimate, clamped at the base, 32.5–40 × 8.5–10 µm; sterigmata up to 2.5 µm in length.

Basidiospores cylindrical, subhyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 10.5–14 × 3.8–5.4 µm.

Material examined: 11232 (PUN), 16.ix.2015 Jammu & Kashmir, Jammu, Roop nagar, on an angiospermous stump, Brij Bala .

Notes: *Favolus glaber* is distinct in having coriaceous, comparatively thinner glabour basidiome with larger polygonal pores and cylindrical basidiospores. Previously, Kaur (2013) reported it as *Hexagonia glaber* from Himachal Pradesh. It is a new addition to the list of polypores of Jammu & Kashmir.

Fomes fomentarius (L.) Fr., Summa vegetabilium Scandinaviae: 321, 1849.

≡*Boletus fomentarius* L., Species Plantarum: 1176, 1753. (Image 27–36)

Basidiome perennial, pileate, sessile, solitary, broadly attached; pilei ungulate, up to 10 × 8 × 8 cm.

Abhymenial surface concentrically zonate, sulcate, tomentose, crustose, yellowish-grey when fresh, changing to brownish grey on drying; margin, slightly lighter, obtuse, entire.

Pilear crust up to 2 mm in thickness, dominated equally with generative hyphae and skeletal hyphae.

Hymenial surface poroid, grey when fresh, changing to brownish-orange on drying; margin slightly lighter, sterile up to 1 mm.

Pores round to angular, 4–5 per mm; dissepiments entire, up to 95 µm in thickness.

Tube layer stratified, greyish-brown, two layered, each layer up to 3 cm deep.

Context duplex; outer zone greyish brown, corky, up to 0.8 cm thick; inner zone brown, fibrous, up to 1.2 cm thick.

Hyphal system trimitic. Generative hyphae hyaline to pale yellowish, thinto thick-walled clamped, branched, up to 4 µm in width. Binding hyphae hyaline to subhyaline, arboriform thick-walled, up to 5 µm in width. Skeletal hyphae rusty brown to pale yellowish, thick-walled, unbranched, up to 6 µm in width.

Hyphal arrangement: Subhymenium formed of

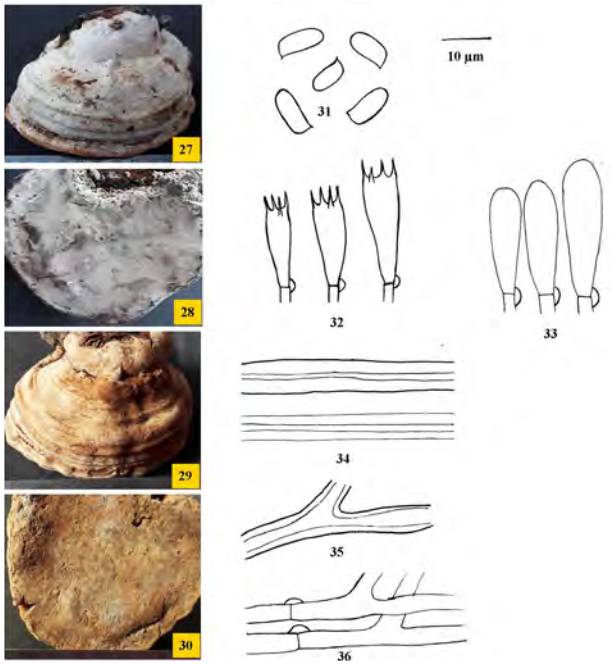

Image 27–36. *Fomes fomentarius*: 27–28—Basidiome showing abhymenial and hymenial surface (fresh) | 29–30—Basidiome showing abhymenial and hymenial surface (dry) | 31—Basidiospores | 32—Basidia | 33—Cystidia | 34—Skeletal hyphae | 35—Binding hyphae | 36—Generative hyphae.

loosely arranged irregularly branched generative hyphae and binding hyphae. Trama composed of somewhat compactly arranged generative, binding and skeletal hyphae. Context consitituted compactly arranged generative, binding and skeletal hyphae.

Cystidioles fusoid, thin-walled, tetrasterigmate, clamped at the base, 18–24.5 × 5–7 µm, originate in the subhymenium; projecting slightly outward from the hymenium.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 16–25 × 6–7; sterigmata up to 3 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 8–14 × 3–4µm

Material examined: 11319 (PUN), 12.ix.2016, Jammu & Kashmir, Doda, Bhaderwah, Attalgarh, on angiospermous wood, Brij Bala; 11363 (PUN), 13.ix.2016 Attalgarh, on angiospermous wood, Brij Bala.

Notes: *Fomes fomentarius* is peculiar in having ungulate pilei with a hard glabrous, sulcate crust, trimitic hyphal system and cylindrical larger basidiospores. It is recorded from the study area.

Fuscopostia leucomallella (Murrill) B.K. Cui, L.L. Shen & Y.C. Dai, Persoonia 42: 119 (2018).

≡ *Tyromyces leucomallellus* Murrill, Bulletin of the Torrey Botanical Club 67(1): 63 (1940). (Image 37–43)

Basidiome annual, pileate, solitary, sessile, broadly attached, soft and fleshy when fresh, becoming hard and brittle on drying; pilei dimidiate, applantae, up to 5 × 1.5 × 0.5 cm.

Abhymenial surface sulcate, faintly zonate, glabrous, light brown to brownish-orange when fresh, not changing much on drying; margin concolorus, acute, wavy, entire.

Hymenial surface poroid, greyish white when fresh, changing to pale yellowish on drying, margin concolorus, sterile up to 1 mm.

Pores angular to round, 4–6 per mm; dissepiments entire, up to 45 µm in thickness.

Tube layer yellowish-white, up to 0.2 mm deep.

Context homogenous, orange white, up to 0.3 cm thick.

Hyphal system monomitic. Generative hypahe hyaline, thin-to thick-walled, clamped, richly branched, up to 4.5 µm in width.

Hyphal arrangement: subhymenium consists of loose to moderately compactly arranged, generative hyphae. Trama formed of moderately compact generative hyphae. Context formed of compactly arranged generative hyphae.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 12–25 × 4–6 µm; sterigmata up to 2 µm in length.

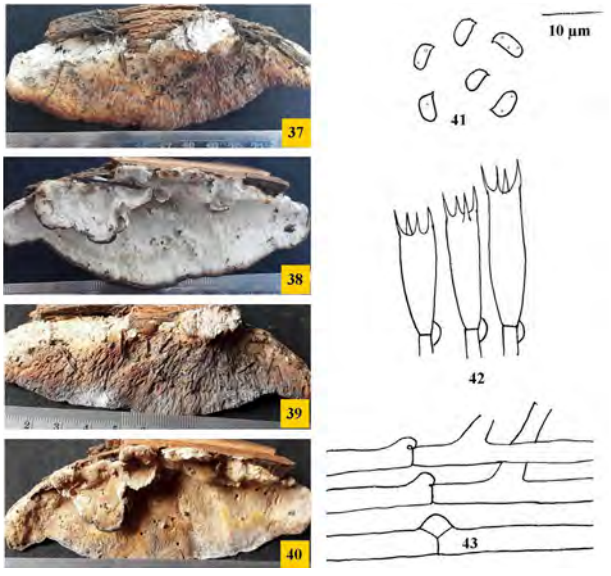

Image 37–43. *Fuscopostia leucomallella*: 37–38—Basidiome showing abhymenial surface and hymenial surface (fresh) | 39–40—Basidiome showing abhymenial and hymenial surface (dry) | 41—Basidiospores | 42—Basidia | 43—Generative hyphae.

Basidiospores cylindrical to suballantoid, hyaline, thin-walled, smooth, with oily contents, no reaction in Melzer's reagent and cotton blue, 3.5–6.5 × 1.4–2.4 µm.

Material examined: 11273 (PUN), 21.viii.2017, Jammu and Kashmir, Doda, Shunushir, on *Cedrus deodara* stump, Brij Bala, 21.viii. 2017.

Notes: *Fuscopostia leucomallella* is unique in having soft and fleshy basidiome, monomitic hyphal system and cylindrical to suballantoid basidiospores. Earlier it was reported from Himachal Pradesh by Kaur (2013) as *Tyromyces leucomallus*. It is a new record for Jammu & Kashmir.

Hexagonia nitida Durieu & Mont., Exploration scientifique de l'Algérie 1–5: t.33: 1 (1846). (Image 44–49)

Basidiome annual, resupinate to rarely effused-reflexed, soft and corky when fresh, not changing much on drying; up to 2 mm thick in cross-section.

Hymenial surface poroid, light brown when fresh, not changing much on drying, margin sterile up to 3 mm.

Pores polygonal, 2–3 per mm; dissepiments entire, up to 85 µm in thickness.

Tube layer light brown, up to 1 mm deep.

Subiculum homogenous, greyish-brown, up to 1 mm in thickness.

Hyphal system trimitic. Generative hyphae subhyaline, thin-to thick-walled, clamped, branched, up to 3.5 µm in width. Binding hyphae subhyaline, thick-walled, aseptate, strongly branched, tortuous in context and with sword like side branches in the trama, never projecting in the hymenium, up to 4 µm in width. Skeletal hyphae subhyaline, thick-walled to solid, aseptate, unbranched, up to 5.5 µm in width.

Hyphal arrangement: subhymenium formed of thin-walled, moderately compact, irregularly branched generative hyphae. Trama composed of loosely arranged, generative hyphae, strongly branched binding hphae with sword like branchessand skeletal hyphae. Context dominated with compactly arranged generative hyphae, tortuous binding hyphae, and skeletal hyphae.

Basidiaclavate to sub-clavate, hyaline, thin-walled, tetrasterigmate, clamped at the base, 16–28 × 5–9.5 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 7–14 × 3.2–4.6 µm.

Material examined: Jammu & Kashmir, Jammu, Roop Nagar, on an angiospermous stump, Brij Bala 11227(PUN), 16.ix.2015; Doda, Bhaderwah, Nalthi, on angiospermous stump, Brij Bala 11235 (PUN), 12.ix.2016.

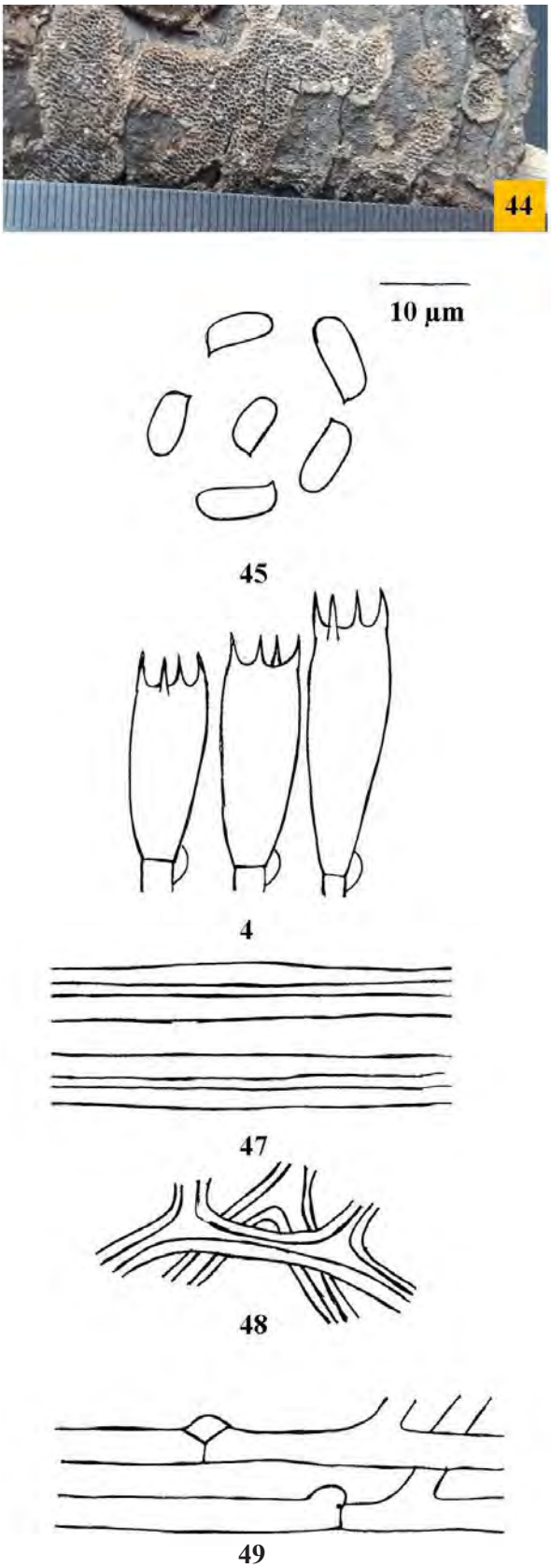

Image 44–49. *Hexagonia nitida*: 44—Basidiome showing hymenial surface | 45—Basidiospores | 46—Basidia | 47—Skeletal hyphae | 48—Binding hyphae | 49—Generative hyphae.

Notes: *Hexagonia nitida* is characterized by resupinate to effused-reflexed basidiome with trimitic hyphal system and cylindrical basidiospores. It is reported for the first time from Jammu & Kashmir.

Lenzites betulina (L.) Fr., Epicrisis Systematis Mycologici: 405 (1838).

≡ *Agaricus betulinus* L., Species Plantarum: 1176 (1753). (Image 50–58)

Basidiome annual, pileate, solitary, sessile, broadly attached; pilei applanate, dimidiate, up to 3 × 2 × 0.8 cm.

Abhymenial surface tomentose, concentrically zonate, greyish when fresh, not changing much on drying; margin white when fresh, changing to pale yellowish on drying, acute, entire.

Hymenial surface lamellate, white when fresh, changing to pale yellowish on drying; margin concolorus, sterile up to 1 mm.

Pores lamellate, 1–1.5 per mm; dissepiments entire, up to 200 µm in thickness.

Tube layer orange white, up to 2 mm deep.

Context homogenous, yellowish-white, azonate, up to 4 mm thick.

Hyphal system trimitic. Generative hyphae hyaline to pale yellowish, thin- to thick-walled, clamped, up to 4 µm in width. Binding hyphae subhyaline, sword like, thick-walled, asepatate, branched up to 4.5 µm in width. Skeletal hyphae rusty brown to pale yellowish, thick walled, aseptate, unbranchedup to 5 µm in width.

Hyphal arrangement: Subhymenium consists of branched generative and binding hyphae. Trama formed of moderately compactly arranged generative hyphae, sword like bindinghyphae and skeletal hyphae. Context composed of compactly arranged binding and skeletal hyphae.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 33.5–41 × 6–8; sterigmata up to 3 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 5–8.5 × 2–3.5 µm.

Material examined: 11338 (PUN), 21.ix.2015, Jammu & Kashmir, Jammu, Doda, Chinta, on gymnospermous wood, Brij Bala; 11339 (PUN), 21.viii.2017, Kishtwar, on way to Sinthon top, on gymnospermous wood, Brij Bala.

Notes: *Lenzites betulina* is peculiar in having lamellate pores, binding hyphae with sword like branches and comparatively smaller basidiospores. It is being re-reported from Jammu division as Dhanda (1977) described it from Ramban District.

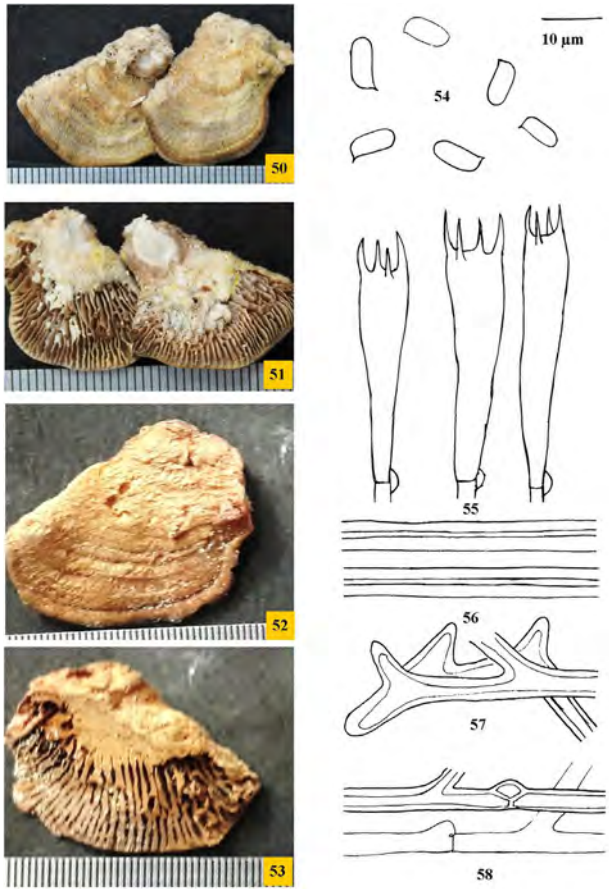

Image 50–58. *Lenzites betulina*: 50–51—Basidiome showing abhymenial and hymenial surface (fresh) | 52–53—Basidiome showing abhymenial and hymenial surface (dry) | 54—Basidiospores | 55—Basidia | 56—Skeletal hyphae | 57—Binding hyphae | 58—Generative hyphae.

Lenzites elegans (Spreng.) Pat., Essai taxonomique surles familles et les genres des Hyménomycètes: 89 (1900).

≡ *Daedalea elegans* Spreng., Kongliga Svenska Vetenskapsakademiens Handlinger Ser. 3, 8: 51 (1820). (Image 59–68)

Basidiome annual, pileate, sessile, solitary, narrowly attached, somewhat flexible when fresh, becomes harder on drying; pilei ungulate, up to 7 × 3.5 × 3.5 cm.

Abhymenial surface glabrous, tuberculate, concentrically zonate, sulcate, white when fresh, changing to pale yellowish on drying; margin paler concolorus, acute, entire.

Hymenial surface deadeloid to sinuous to lamellate, white when fresh, changing to brownish-orange to greyish-brown on drying; margin paler concolorus, sterile up to 2 mm.

Pores daedeloid to sinuous to lamellate, 0.5 to 1 per

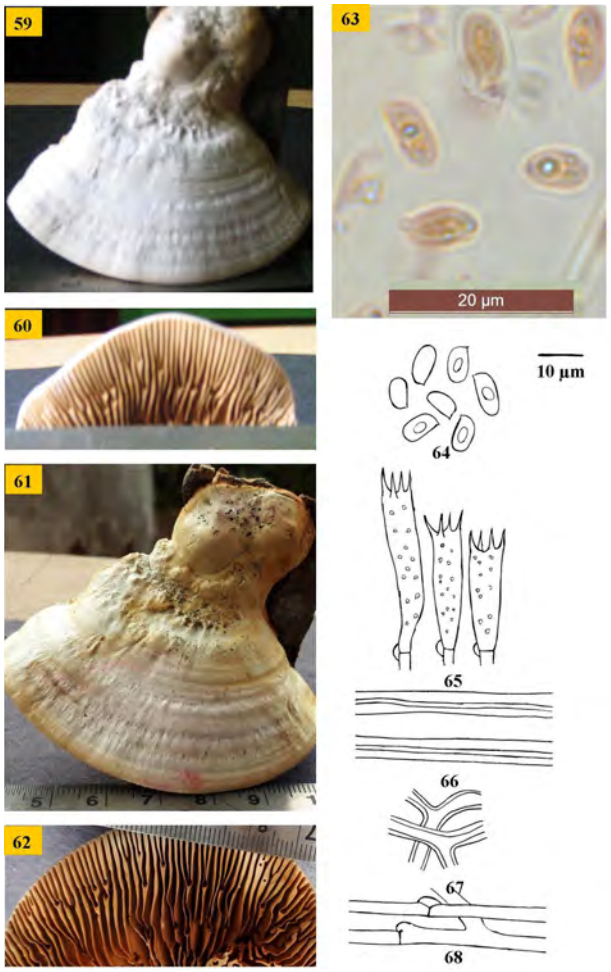

Image 59–68. *Lenzites elegans*: 59–60—Basidiome showing abhymenial and hymenial surface (fresh) | 61–62—Basidiome showing abhymenial and hymenial surface (dry) | 63—Photomicrograph showing basidiospores | 64—Basidiospores | 65—Basidia | 66—Skeletal hyphae | 67—Binding hyphae | 68—Generative hyphae.

mm; dissepiments entire, up to 250 µm in thickness.

Tube layer yellowish-white, up to 1 cm deep.

Context homogenous, yellowish white, fibrous, azonate, up to 1.5 cm in thickness.

Hyphal system trimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 2.5 µm in width. Binding hyphae subhyaline, thick-walled, aseptate, branched up to 5 µm in width. Skeletal hyphae light brown, thick-walled, aseptate, unbranched, up to 8.3 µm in width.

Hyphal arrangement: Subhymenium contains loosely arranged, irregularly branched generative hyphae and projecting binding hyphae. Trama formed of loosely arranged, generative, binding and skeletal hyphae. Context mainly composed of compactly arranged binding and skeletal hyphae.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 21.5–43.5 × 3.5–7 µm; sterigmata up to 3 µm in length.

Basidiospores ellipsoid to cylindrical, thin-walled, guttulate, smooth, no reaction in Melzer's reagent and cotton blue, 6–9.5 × 2.5–4.4 µm.

Material examined: 11368 (PUN), 22.ix.2016, Jammu & Kashmir, Udhampur, on way from Patnitop to Sanasar, on *Abies pindrow* stump, Brij Bala

Notes: *Lenzites elegans* is characterized by daedeloid to sinuous to lamellate pores and ellipsoid to cylindrical basidiospores. It is described for the first time from Jammu & Kashmir.

Lenzites warnieri Durieu & Mont., Annales des Sciences Naturelles Botanique 14: 182 (1860). (Image 69–77)

Basidiome annual, pileate, sessile, broadly attached, soft and flexible when fresh, becomes hard and stiff on drying; pileidimidiate, applanate, semicircular, up to 5 × 2 × 0.7 cm.

Abhymenial surface tomentose, sulcate, concentrically zonate, tuberculate, orangish brown (towards proximal end) to yellowish white (towards distal end) when fresh, changing to brownish orange towards (proximal end) to pale yellowish (towards distal end) on drying; margin concolorus, acute, entire.

Hymenial surface lamellate, yellowish white when fresh, not changing much on drying; margin concolorus, sterile up to 1 mm.

Pores lamellate, lamellae bifurcating, 1–1.5 per mm, dissepiments entire, up to 150 µm in thickness.

Tube layer yellowish-white, up to 2 mm deep.

Context homogenous, light brown, up to 5 mm in thickness.

Hyphal system trimitic. Generative hyphae hyaline, thinto thick-walled, clamped, branched, up to 4.2 µm in width. Binding hyphae subhyaline, thick-walled, aseptate, branched, arboriform, up to 6 µm in width. Skeletal hyphae rusty brown to pale yellowish, thick walled, aseptate, unbranched, up to 5.6 µm in width.

Hyphal arrangement: Subhymenium composed of irregularly branched generative and binding hyphae. Trama constituted of loosely to compactly arranged generative, binding and skeletal hyphae. Context mainly formed loosely arranged binding and skeletal hyphae. Basidia sub-clavate to subcylindrical, thin-walled, tetrasterigmate, clamped at the base, 23.5–35 × 5.5–7.1; sterigmata up to 3 µm in length.

Basidiospores cylindrical to subcylindrical, hyaline, smooth, thin-walled, no more reaction in Melzer's

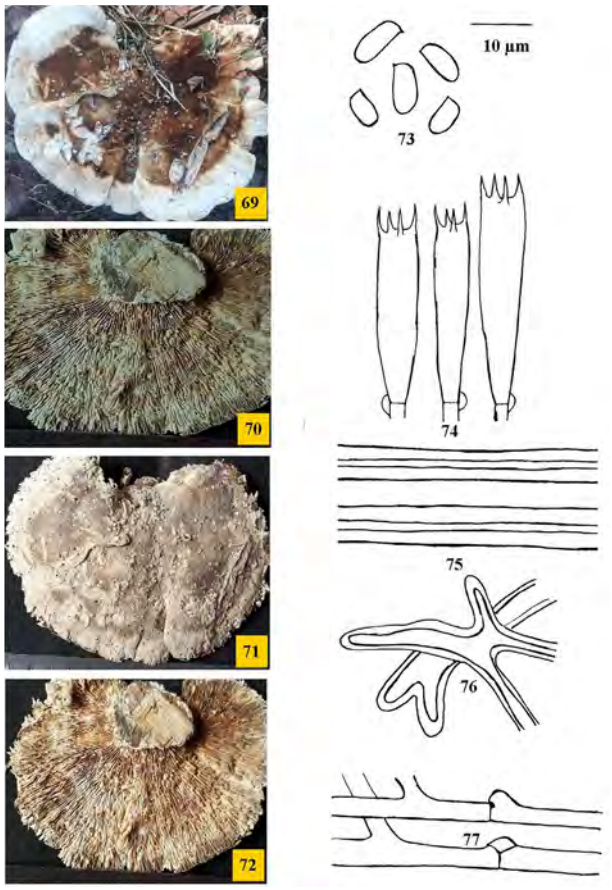

Image 69–77. *Lenzites warnieri*: 69–70—Basidiome showing abhymenial and hymenial surface (fresh) | 71–72—Basidiome showing abhymenial and hymenial surface (dry) | 73—Basidiospores | 74—Basidia | 75—Skeletal hyhae | 76—Binding hyphae | 77—Generative hyphae.

reagent and cotton blue, 5.5–8.5 × 3-–4.2 µm.

Material examined: 11267 (PUN), 27.ix.2014, Jammu and Kashmir, Doda, Bhaderwah, Duggi, on angiospermous wood, Brij Bala.

Notes: *Lenzites warnieri* is characteristic in having tomentose, tuberculate abhymenial surface and frequently bifurcating lamellae. It is being described as new to Jammu & Kashmir.

Perenniporia adnata Corner, Beiheftezur Nova Hedwigia 96: 101 (1989). (Image 78–82)

Basidiome annual, resupinate, adnate, effused, soft when fresh, becomes coriaceous after drying, easily separable from the substrate; up to 3 mm thick in cross-section.

Hymenial surface poroid, whitish-grey when fresh, not changing much on drying; margin concolorus, adnate, sterile up to 2 mm.

Pores round to angular, 8–10 per mm; dissepiments entire, up to 65 µm in thickness.

Tube layer whitish grey, up to 2 mm deep.

Subiculum homogenous, concolorus to tube layer, up to 1mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 4 µm in width. Skeletal hyphae pale-yellowish, thick-walled, aseptate, unbranched, up to 6.5 µm in width.

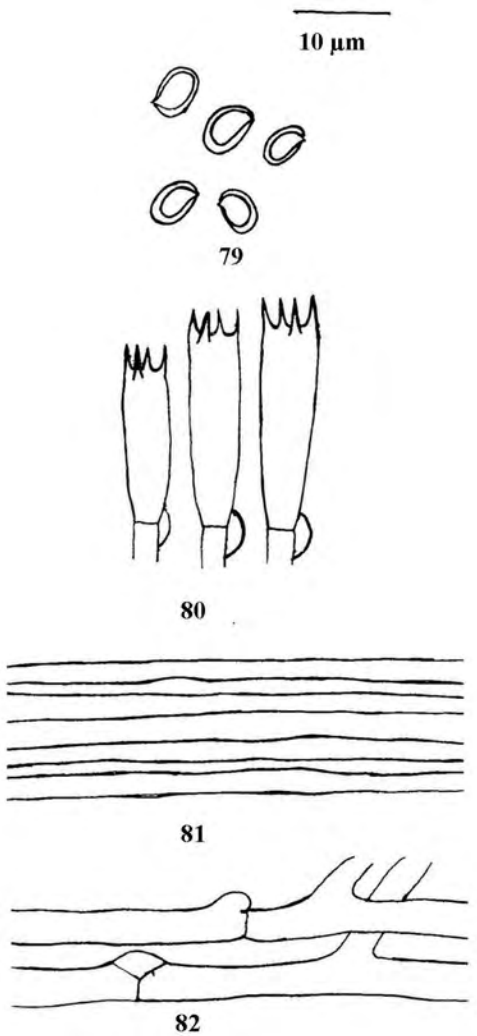

Image 78–82. *Perreniporia adnata*: 78—Basidiome showing hymenial surface | 79—Basidiospores | 80—Basidia | 81—Skeletal hyphae | 82—Generative hyphae.

Hyphal arrangement: Subhymenium mainly composed of loosely arranged, irregularly branched generative hyphae. Trama formed by moderately compact generative and skeletal hyphae. Subiculum composed of compactly packed generative and skeletal hyphae.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 14–21.5 × 4.5–6 µm, sterigmata up to 3 µm in length.

Basidiospores broadly ellipsoid, hyaline, thick-walled, smooth, no reaction in Melzer's reagent and cotton blue, 4.5–6.5 × 2.5–4 µm.

Material examined: 11241(PUN), 12.ix.2016, Jammu & Kashmir, Jammu, Doda, Bhaderwah, Nalthi, on angiospermous wood, Brij Bala; 11341(PUN), 5.x.2017, Kathua, Dyalchak, on angiospermous wood, Brij Bala .

Notes: *Perreniporia adnata* is characterized by resupinate basidiome, dimitic hyphal system and broadly ellipsoid, thick-walled basidiospores. It is recorded as new to India and was earlier described from Singapore (Mycobank 2022).

Perreniporia fraxniea (Bull.) Ryvarden, Nova Hedwigia 27: 158 (1976).

≡*Boletus fraxineus* Bull., Herbier de la France 10: t. 433: 2 (1790). (Image 83–89)

Basidiome annual, pileate, imbricate, sessile, broadly attached, corky when fresh, becoming woody on drynig; pilei ungulate, triquetrous, up to 8 × 4.6 × 4.5 cm.

Abhymenial surface azonate, sulcate, velutinate to smooth, white when fresh, changing to pale yellowish on drying; margin concolorous, obtuse, entire.

Hymenial surface poroid, white when fresh, changing to pale yellowish on drying, margin concolorous, sterile up to 2 mm.

Pores round to angular, 4–5 per mm; dissepiments entire, up to 54 µm in thickness.

Tube layer yellowish-white, separated by thin gelatanious layer from context, up to 2 cm deep.

Context homogenous, pale yellowish, tough, fibrous, up to 2.5 cm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 4.5 µm in width. Skeletal hyphae subhyaline, thick-walled, aseptate, unbranched, strongly dextrinoid, up to 5 µm in width.

Hyphal arrangement: Subhymenium chiefly formed of loose to somewhat compact generative hyphae. Trama consists of moderately compact generative and skeletal hyphae. Context usually formed of comparatively narrower, compactly arranged generative and skeletal hyphae.

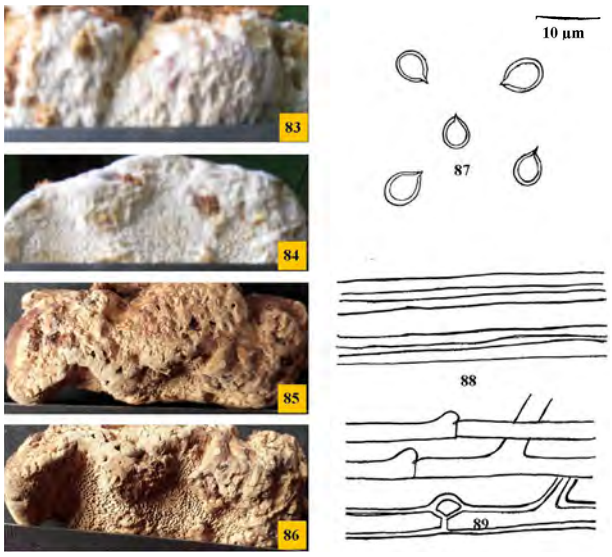

Image 83—89. *Perreniporia fraxinea*: 83–84—Basidiome showing abhymenial and hymenial surface (fresh) | 85–86—Basidiome showing abhymenial and hymenial surface (dry) | 87—Basidiospores | 88—Skeletal hyphae | 89—Generative hyphae.

Basidia not seen.

Basidiospores subglobose, pale yellowish, thick-walled, smooth, spore wall slightly stained in Melzer's reagent, no reaction in cotton blue, 5.4–8.4 × 3.5– 4.0 µm.

Material examined: 11370 (PUN), 21.ix.2016, Jammu and Kashmir, Doda, Sanasar on Abies pindrow stump, Brij Bala.

Notes: *Perreniporia fraxinea* is distinct in having hard basidiome, strongly dextrinoid skeletal hyphae and subglobose, thick-walled basidiospores. It is a new record for Jammu & Kashmir.

Perenniporia ochroleuca (Berk.) Ryvarden, Norwegian Journal of Botany 19: 143 (1972).

≡ *Polyporus ochroleucus* Berk., London Journal of Botany 4: 53 (1845). (Image 91–98)

Basidiome perennial, pileate, solitary, sessile, narrowly attached; pilei applantae, ungulate, up to 4 × 3 × 1 cm.

Abhymenial surface azonate, glabrous, sulcate, white when fresh, changing to pale yellowish on drying; margin concolorous, obtuse, entire.

Hymenial surface poroid, white when fresh, changing to pale yellowish on drying; margin concolorous, sterile up to 2 mm.

Pores round to angular, 2–4 per mm; dissepiments entire, up to 60 µm in thickness.

Tube layer yellowish-white, two layered, each layer up to 2 mm deep separated by a thin layer of 1 mm thick

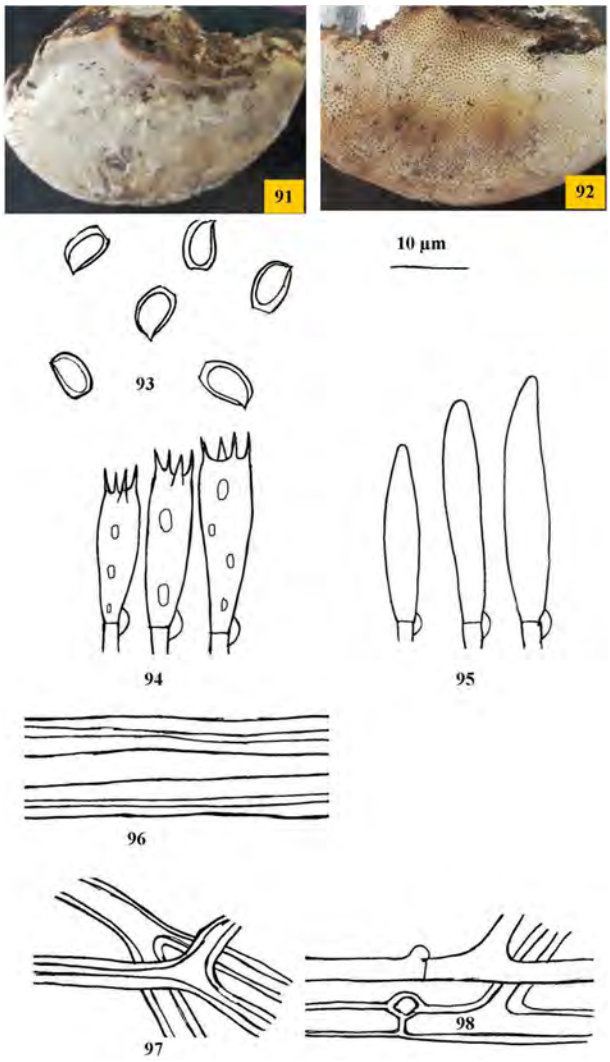

Image 91–98. *Perreniporia ochroleuca*: 91–92—Basidiome showing abhymenial and hymenial surface | 93—Basidiospores | 94—Basidia | 95—Cystidia | 96—Skeletal hyphae | 97—Binding hyphae | 98—Generative hyphae.

context.

Context homogenous, orange white, weakly zonate, with a thin cuticle, up to 0.5 cm thick.

Hyphal system trimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 5 µm in width. Binding hyphae subhyaline, thick-walled, aseptate, branched, up to 4.5 µm in width. Skeletal hyphae golden brown, thick-walled, aseptate, unbranched, up to 6 µm in width. Hyphal wall slightly stained in Melzer's reagent.

Hyphal arrangement: subhymenium composed of loosely to moderately compact, irregularly branched generative hyphae. Trama consists of loose to moderately compact generative, binding and skeletal hyphae. Context formed of moderately to compactly arranged binding and skeletal hyphae.

Cystidioles fusoid, thin-walled, smooth, clamped at the base, originate in the subhymenium, 14–28 × 7.2–8.8 µm; projecting slightly from the hymenium.

Basidia clavate, thin-walled, with oily contents, clamped at the base, tetrasterigmate, 17.5–27 × 5–8.8 µm; sterigmata up to 3 µm in length.

Basidiospores ellipsoid, truncate at the apex, hyaline, thick-walled, smooth, spore wall slightly stained in Melzer's reagent,no reaction in cotton blue, 7.5–15 × 4–7 µm.

Material examined: 9099 (PUN), 21.ix.2016, Jammu & Kashmir, Doda, Sanasar on *Abies pindrow* stump, Brij Bala.

Notes: *Perreniporia ochroleuca* differs from *P. fraxinea* in having smaller basidiomes, trimitic hyphal system and larger truncate, dextrinoid basidiospores. It is a new record for Jammu & Kashmir.

Pilatoporus bondartsevae (Spirin) Spirin, Mycotaxon 97: 78 (2006).

≡*Antrodia bondartsevae* Spirin, Mikol.Fitopatol.: 33 (2002). (Image 99–105)

Basidiome annual, resupinate, effused, soft when fresh, becomes coriaceous after drying, easily separable from the substrate; up to 3 mm thick in cross-section.

Hymenial surface poroid, white when fresh, not changing much on drying; margin adnate, sterile up to 2 mm.

Pores round to angular, 2–3 per mm, dissepiments entire, up to 75 µm in thickness.

Tube layer yellowish-white, up to 2 mm deep.

Subiculum homogenous, greyish-white, up to 1 mm deep.

Hyphal system trimitic. Generative hyphae hyaline, thin-walled, clamped, branched up to 4 µm in width. Binding hyphae subhyaline, branched, thick-walled, up to 5 µm in width. Skeletal hyphae pale yellowish, thick-walled, unbranched aseptate, up to 6 µm in width.

Hyphal arrangement subhymenium consitituted of moderately compact, irregularly branched generative hyphae. Trama composed of loose to moderately compact generative, binding and skeletal hyphae. Context dominated with compactly arranged binding and skeletal hyphae.

Basidia sub-clavate, thin-walled, wih oily contents, clamped at the base, tetrasterigmate, 21–35 × 6–10 µm; sterigmata up to 3 µm in length.

Basidiospores subcylindrical, thin-walled, guttulate, no reaction in Melzer's reagent and cotton blue 8.5–14.5 × 5–7 µm.

Material examined: 11224 (PUN), 21.viii.2017,

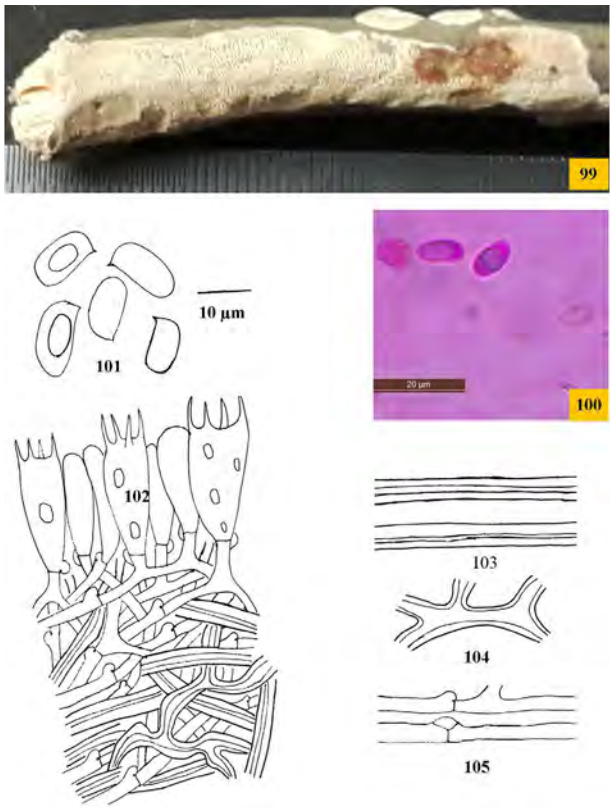

Image 99–105. ***Pilatoporus bondartsevae*****: 99—Basidiome showing hymenial surface | 100—Photomicrograph showing basidiospores | 101—Basidiospores | 102—Basidia | 103—Skeletal hyphae | 104—Binding hyphae | 105—Generative hyphae.**

Tube layer distinctly stratified, greyish-white, two layered, each layer up to 1 mm deep.

Hyphal system trimtic. Generative hyphae hyaline, thin-walled, clamped, branched, dextrinoid, up to 4 µm in width. Binding hyphae subhyaline, thick-walled, aseptate, branched, up to 4 µm in width. Skeletal hyphae golden brown, thick-walled, aseptate, unbranched, dextrinoid, up to 5 µm in width.

Hyphal arrangement: Subhymenium composed of loose to compactly arranged generative hyphae. Tramal zone consists of moderately compact generative and skeletal hyphae. Context consists of usually formed of compactly arranged generative and skeletal hyphae.

Subiculum homogenous, greyish-white, azonate, soft, up to 2 mm thick.

Cystidioles fusoid, thin-walled, smooth, clamped at the base, originate in the subhymenium, 14–28 × 4.5–5.5 µm; slightly projecting from the hymnenium.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 23–32 × 11–14 µm; sterigmata up to 3 µm in length.

Basidiospores broadly ellipsoid to subglobose, hyaline, thick-walled, smooth, with oily droplets, no reaction in Melzer's reagent and cotton blue, 6–7 ×4–6 µm.

Material examined: 11365 (PUN), 26.ix.2014. Jammu & Kashmir, Kathua, Dyalchak, on angiospermous wood, Jammu & Kashmir, Doda, Attalgarh, on Cedrus deodara branch, Brij Bala.

Notes: *Pilatoporus bondartsevae* is peculiar in having annual, resupinate basidiome, round to angular pores, trimitic hyphal system and larger, cylindrical basidiospores. It is being reported for the first time from India. The previous reports are from Russia and China (Mycobank 2022).

Poriella subacida (Peck) Donk, Persoonia 5(1): 76 (1967).

≡ *Polyporus subacidus* Peck, Annual Report on the New York State Museum of Natural History 38: 92 (1885). (Image 106–114)

Basidiome perennial, resupinate, effused-reflexed, difficult to separate from the substrate; up to 2 mm thick in cross-section.

Hymenial surface poroid, white when fresh, changing to pale yellowish on drying; margin concolorus, adnate, fimbriate, sterile up to 1 mm.

Pores round to angular, 3–4 per mm; dissepiments lacerate, up to 100 µm in thickness.

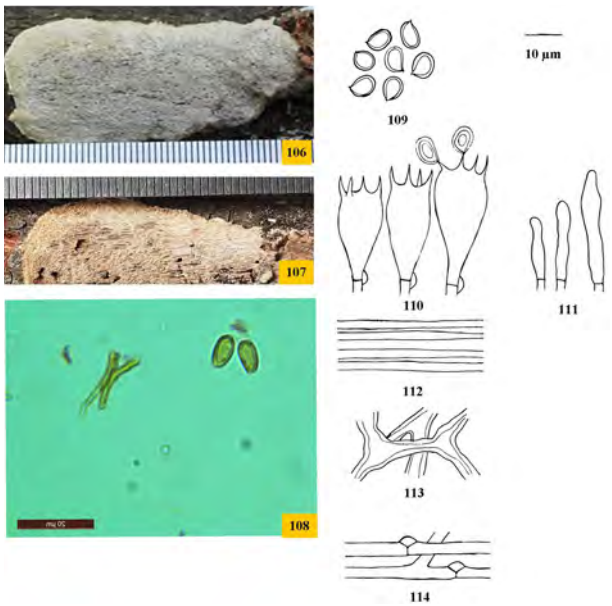

Image 106–114. ***Poriella subacida*****: 106–107—Basidiome showing hymenial surface (fresh and dry) | 108—Photomicrograph showing basidiospores | 109. Basidiospores | 110—Basidia | 111—Cystidioles | 112—Skeletal hyphae | 113—Binding hyphae | 114—Generative hyphae.**

Brij Bala.

Notes: The diagnostic features of *Poriella subacida* are resupinate, perennial basidiome, strongly dextrinoid hyphae, fusoid cystidioles and broadly ellipsoid to subglobose basidiospores. It is reported for the first time from Jammu & Kashmir.

Polyporus alveolaris (DC.) Bondartsev & Singer, Annales Mycologici 39(1): 58 (1941).

≡ *Merulius alveolaris* DC., Flore française 6: 43 (1815) (Image 115–120)

Basidiome annual, pileate, substipitate, solitary; pilei circular to dimidiate, flabelliform, up to 4 × 3 × 0.3 cm.

Abhymenial surface tomentose, faintly concentrically zonate, white when fresh, changing to pale yellowish on drying; margin concolorus, acute, wavy, entire.

Hymenial suface reddish-grey to brownish-grey when fresh, not changing much on drying; margin concolorus, sterile up to 2 mm.

Pores angular to hexagonal, 2–3 per mm; dissepiments entire, up to 150 µm in thickness.

Tube layer brownish-orange, up to 1 mm deep.

Context homogenous, greyish-red, up to 2 mm in thickness.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 4.4 µm in width.

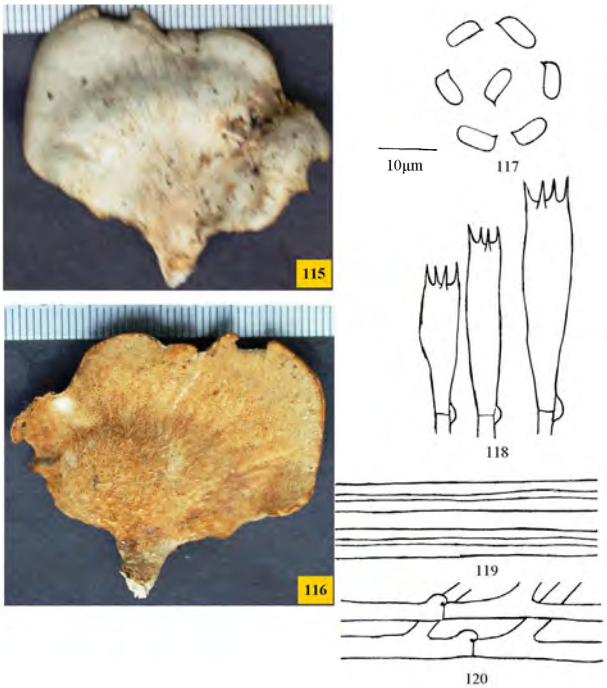

Image 115–120. *Polyporus alveolaris*: 115–116—Basidiome showing abhymenial and hymenial surface | 117—Basidiospores | 118—Basidia | 119—Skeletal hyphae | 120—Generative hyphae.

Skeleto-binding hyphae, golden brown to dark brown, thick-walled, aseptate, unbranched, up to 5.5 µm in width.

Hyphal arrangement: Subhymenium formed of branched generative hyphae only. Trama formed of loosely arranged generative and skeleto-binding hyphae. Context consists of compact generative and skeleto-binding hyphae.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 22–42 × 6.6–9.9; sterigmata up to 2 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 6.8–8.7 × 2.6–3.2 µm.

Material examined: 9103 (PUN), 26.viii.2016, Jammu & Kashmir, Doda, Dacchin, on *Cedrus deodara* stump, Brij Bala.

Notes: *Polyporus alveolaris* characterized bycircular to dimidiate, substipitate pilei, and cylindrical basidiospores. It is being reported for the first time from Jammu & Kashmir.

Polyporus efibulatus (A.M. Ainsw. & Ryvarden) Melo & Ryvarden, Synopsis Fungorum 37: 335 (2017)

≡ *Dichomitus efibulatus* A.M. Ainsworth & Ryvarden, Synopsis Fungorum 25: 48 (2008). (Image 121–127)

Basidiome annual, resupinate, effused, soft when fresh, becomes coriaceous after drying, easy to separate from the substrate; up to 3 mm thick in cross-section.

Hymenial surface poroid, white when fresh, changing to pale yellowish on drying; margin concolorus, adnate, sterile up to 2 mm.

Pores round to angular, 2–3 per mm; dissepiments entire, up to 50 µm in thickness.

Tube layer orange white, up to 2 mm deep.

Subiculum homogenous, yellowish white, up to 1 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, simple-septate, branched up to 4 µm in width. Skeletal hyphae pale yellowish, thick-walled, unbranched, up to 6 µm in width.

Hyphal arrangement subhymenium formed of loosely arranged, regularly to irregularly branched generative hyphae. Trama dominated with loose to moderately compact generative and skeletal hyphae. Context composed of moderately arranged generative and skeletal hyphae.

Cystidioles fusoid, thin-walled, smooth, simple-septate at the base, originate in the hymenium, 15–17 × 5–6 µm; projecting up to 10 µm from the hymenium.

Basidia sub-clavate, thin-walled, tetrasterigmate,

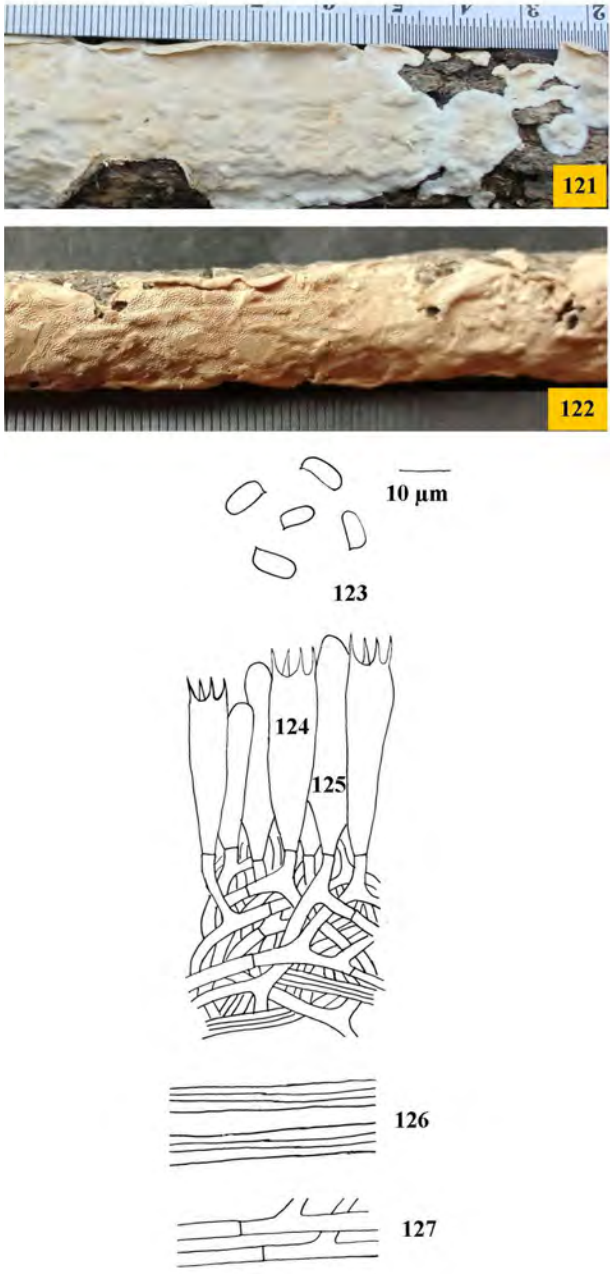

Image 121–127. *Polyporus efibulatus*: 121—Basidiome showing hymenial surface (fresh) | 122—Basidiome showing hymenial surface (dry) | 123—Basidiospores | 124—Basidia | 125—Cystidiole | 126—Skeletal hyphae | 127—Generative hyphae.

simple-septate at the base, 22–35 × 5–8 µm; sterigmata up to 2 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, 7–11 × 2.8–4.5 µm, no reaction in Melzer's reagent and cotton blue.

Material examined: 11235(PUN), 21.ix.2015, Jammu & Kashmir, Jammu, Doda, Chinta, on angiospermous wood, Brij Bala.

Notes: *Polyporus efibulatus* differs in having resupinate basidiome, fusoid cystidioles and thin-walled cylindrical basidiospores. It is reported for the first time from India. Earlier it has been reported from southern and western England (Ryvarden & Melo 2014).

Polyporus squamosus (Huds.) Fr., Systema Mycologicum 1: 343–1821.

≡ *Boletus squamosus* Huds., Flora anglica: 626 (1778). (Image 128–136)

Basidiome annual, pileate, solitary, laterally stipitate, soft and fleshy when fresh, changing to corky after drying; pilei reniform, dimidiate, up to 8 × 5 × 0.5 cm.

Abhymenial surface glabrous, azonate, with blackish-brown scales, white when fresh, changing to pale yellowish on drying; margin concolorus, acute, curved inside after drying.

Hymenial surface poroid, pale yellowish when fresh, changing to light brownish on drying; margin concolorus, sterile up to 1 mm.

Pores round to angular, 0.5–1 per mm; dissepiments lacerate, up to 150 µm in thickness.

Tube layer brownish-orange, up to 0.2 cm deep.

Context homogenous, greyish-red, up to 0.3 cm in thickness.

Stipe lateral, cylindrical, solid, greyish-black, tomentose at the base, up to 3 cm and 2 cm.

Hyphal system dimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, branched, up to 3 µm

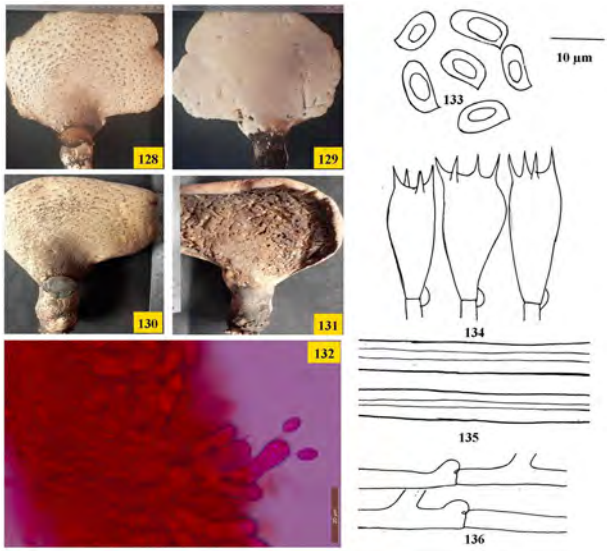

Image 128–136. *Polyporus squamosus*: 128–129—Basidiome showing abhymenial and hymenial surface (fresh) | 130–131—Basidiome showing abhymenial and hymenial surface (dry) | 132—Photomicrograph showing basidium and basidiospores | 133—Basidiospores | 134—Basidia | 135—Skeletal hyphae | 136—Generative hyphae.

in width. Skeletal hyphae subhyaline, thick-walled, aseptate, unbranched, up to 6 µm in width.

Hyphal arrangement: Subhymenium consists mainly of branched generative hyphae. Trama composed of moderately compact generative and skeletal hyphae. Context formed of compactly packed generative and skeletal hyphae.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 17–23 × 7–9.5 µm; sterigmata up to 3 µm in length.

Basidiospores ellipsoid to cylindrical, hyaline, thin-walled, smooth, with oil droplets, no reaction in Melzer's reagent and cotton blue, 7–10.5 × 4–5 µm.

Material examined: 11362 (PUN), 22.ix.2018, Jammu & Kashmir, Doda, Attalgarh, on *Morus alba* branch, Brij Bala .

Notes: *Polyporus squamosus* is characterized by reniform pilei with greyish black stipe, blackish-brown scales on abhymneial surface and ellipsoid to cylindric basidiospores. Bakshi (1971) described it from Srinagar District of Kashmir division. This is the first report of *P. squamosus* from Jammu division.

Pycnoporus cinnabarinus (Jacq.) P. Karst., Revue Mycologique Toulouse 3(9): 18 (1881).

≡*Boletus cinnabarinus* Jacq., Flora Austriaca 4: 2, tab. 304 (1776). (Image 137–145)

Basidiome annual, pileate, solitary, sessile, broadly attached; pilei elongated, applanate, dimidiate, somewhat leathery when fresh, up to 3 × 3 × 1 cm.

Abhymenial surface smooth, azonate to faintly zonate, reddish-orange when fresh, not changing much on drying; margin acute, entire, wavy, light orange when fresh, not changing much on drying.

Hymenial surface poroid, greyish-red when fresh, not changing much on drying; margin light orange when fresh, not changing much on drying, sterile up to 2 mm.

Pores round to angular, 4–5 per mm; dissepiments entire, up to 45 µm in thickness.

Tube layer orange red, up to 0.5 cm deep.

Context homogenous, greyish-red, up to 0.5 cm in thickness.

Hyphal system trimitic. Generative hyphae hyaline to subhyaline, thin-walled, branched, clamped, up to 4 µm in width. Binding hyphae subhyaline to yellowish-brown, thick-walled, aseptate, branched, up to 4.5 µm in width. Skeletal hyphae yellowish-brown, thick-walled, aesptate, unbranched, up to 5.2 µm in width.

Hyphal arrangement: subhymenium contains thin-walled, moderately compact, irregularly branched generative and binding hyphae. Trama formed of loosely

Image 137–145. *Pycnoporus cinnabarinus*: 137–138—Basidiome showing abhymenial and hymenial surface | 139–140—Photomicrograph showing | 139—hymenium | 140—basidiospores | 141—Basidiospores | 142—Basidia | 143—Skeletal hyphae | 144—Binding hyphae | 145—Generative hyphae.

to moderately compact, generative, binding and skeletal hyphae. Context consists of compactly arranged binding and skeletal hyphae.

Cystidia absent.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 15–28 × 4–5.5; sterigmata up to 3 µm in length.

Basidiospores ellipsoid to cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 5.5– 6.5 × 2.3–2.8 µm.

Material examined: 11263 (PUN), 17.viii.2017, Jammu & Kashmir, Doda, Bhaderwah, Shunushir, on *Cedrus deodara* log, Brij Bala; 11327 (PUN), 21.viii.2017, Kishtwar, Dacchin, on *C. deodara* log, Brij Bala.

Notes: *Pycnoporus cinnabarinus* is characterized by reddish-orange basidiome with thin-walled, ellipsoid to cylindrical basidiospores. It is reported for the first time from the study area. Earlier Murril (1924) and Roy & De (1996) reported it from the Gulmarg District of Kashmir.

Pycnoporus sanguineus (L.) Murrill, Bulletin of the Torrey Botanical Club 31(8): 421(1904).

≡ *Boletus sanguineus* L., Species Plantarum: 1646 (1763). (Image 146–154)

Basidiome annual, pileate, solitary, sessile, broadlyattached; pilei dimidiate, applanate, up to 5 × 4 × 0.4 cm.

Abhymenial surface glabrous, azonate, smooth, reddish-orange when fresh, brownish-red to reddish brown on drying; margin acute, entire, wavy, light orange when fresh, not changing much on drying.

Hymenial surface poroid, light orange when fresh, not changing much on drying; margin concolorus, sterile up to 2 mm.

Poresround to angular, 5–6 pores per mm; dissepiments entire, up to 45 µm in thickness.

Tube layer orangish-white to orange grey, up to 0.2 cm deep.

Context homogenous, orange grey, up to 0.2 cm in thickness.

Hyphal system trimitic. Generative hyphae hyaline, thin-walled, branched, clamped, up to 3.5 µm in width. Binding hyphae subhyaline, thick-walled, branched, aseptate, up to 3.5 µm in width. Skeletal hyphae subhyaline, thick-walled, unbranched, aseptate, up to 5 µm in width.

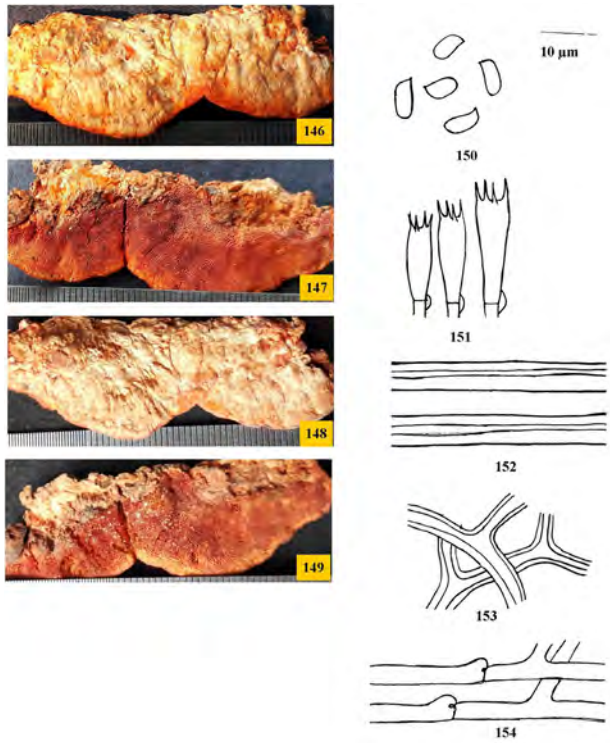

Image 146–154. *Pycnoporus sanguienus*: 146–147—Basidiome showing abhymenial and hymenial surface (fresh) | 148–149—Basidiome showing abhymenial and hymenial surface (dry) | 150—Basidiospores | 151—Basidia | 152—Skeletal hyphae | 153—Binding hyphae | 154—Generative hyphae.

Hyphal arrangement: Subhymenium formed thin-walled, loosely arranged, irregularly branched generative hyphae. Trama dominated with loosely arranged, generative hyphae and skeletal hyphae. Context composed of compactly arranged generative and skeletal hyphae.

Cystidia absent.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 11–19 × 4–3.6 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical to slightly bent, hyaline, smooth, thin-walled, no reaction in Melzer's reagent and cotton blue, 4–7.5 × 2.5–3.5 µm.

Material examined: 11263 (PUN), 17.viii.2017, Jammu & Kashmir, Doda, Bhaderwah, Shunushir, on *Cedrus deodara* log, Brij Bala; 11327(PUN), 21.viii.2017, Kishtwar, Dacchin, on *C. deodara* log, Brij Bala,.

Notes: *Pycnoporus sanguineus* is unique in having reddish basidiome with comparatively smaller pores and cylindrical to slightly bent basidiospores. It is a new record for Jammu & Kashmir.

Tyromyces amazonicus A.M.S. Soares & Ryvarden, Fungal Diversity 87: 195 (2017). (Image 155–164)

Basidiome annual, pileate, solitary, sessile, broadly attached; pilei dimidiate, applanate; up to 2 × 0.05 × 0.5 cm.

Abhymenial surface sulcate, azonate, white when fresh, changing to pale yellow to orange white on drying; margin acute, concolorus, wavy, entire.

Hymenial surface poroid, brownish white to orange white when fresh, changing to reddish-white to greyish-red on drying; margin concolorus, sterile up to 1 mm.

Pores angular to round, 3–4 per mm; dissepiments entire, up to 45 µm in thickness.

Tube layer orange white, up to 0.2 mm deep.

Context homogenous, yellowish-white, azonate, up to 0.3 cm thick.

Hyphal system dimitic. Generative hypahe hyaline, thin- to thick-walled, clamped, branched up to 3 µm in width. Skeletal hyphae golden brown, thick-walled, aseptate, unbranched, up to 5.5 µm in width.

Hyphal arrangement: Subhymenium composed of loosely arranged irregularly branched generative hyphae. Trama composed of loosely to moderately compact generative and skeletal hyphae. Context formed of compactly arranged generative and skeletal hyphae.

Cystidioles fusoid, thin-walled, clamped at the base, 19–25 × 3–5 µm; originate in the hymenium; projecting 10 µm from hymenium.

Basidia clavate, thin-walled, tetrasterigmate,

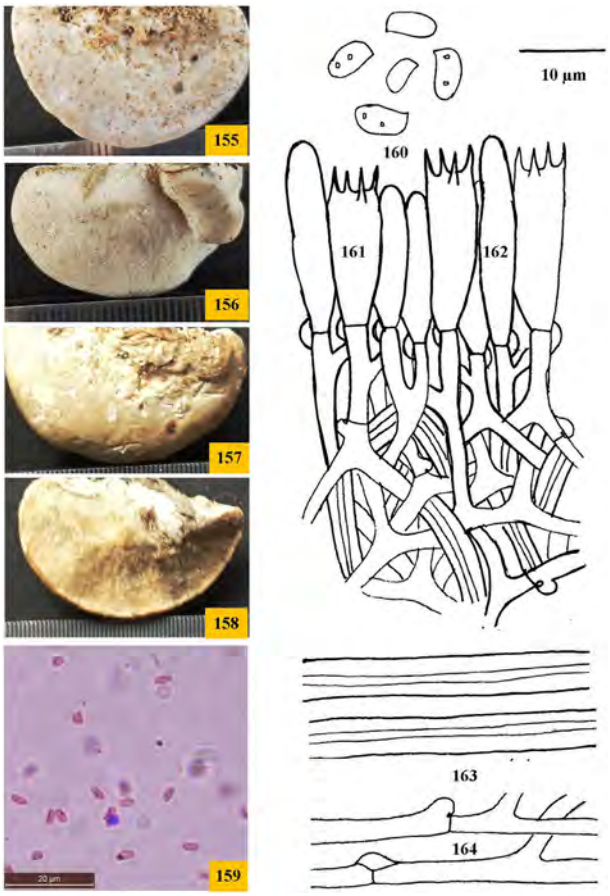

Image 155–164. *Tyromyces amazonicus*: 155–156—Basidiome showing abhymenial and hymenial surface (fresh) | 157–158—Basidiome showing abhymenial and hymenial surface (dry) | 159—Photomicrograph showing basidiospores | 160—Basidiospores | 161—Basidia | 162—Cystidiole | 163—Skeletal hyphae | 164—Generative hyphae.

clamped at the base, 15–18.6 × 5–6.2 µm; sterigmata up to 2 µm in length.

Basidiospores ellipsoid to broadly ellipsoid, hyaline, thin-walled, smooth, with oily contents, no reaction in Melzer's reagent and cotton blue, 3–5.7 × 2–3 µm.

Material examined: Jammu & Kashmir, Kishtwar, Dacchin, on Cedrus deodara stump, Brij Bala 11330 (PUN), 21.ix.2017.

Notes: *Tyromyces amazonicus* is characterized by applanate, basidiome, fusoid cystidioles and ellipsoid to broadly ellipsoid basidiospores. It is reported for the first time from India. Earlier it has been recorded from Brazil by Hyde at al. (2017).

Tyromyces chioneus (Fr.) P. Karst., Revue Mycologique Toulouse 3(9): 17 (1881).

≡ *Polyporus chioneus* Fr., Observationes mycologicae 1: 125 (1815). (Image 165–170)

Basidiome annual, pileate, solitary, subsessile, soft and fleshy when fresh, becoming hard and brittle on drying, somewhat aromatic when fresh; pilei dimidiate, up to 4 × 3.2 × 0.6 cm.

Abhymenial surface sulcate, faintly concentrically zonate, finely tomentose to glabrous, scrupose, white when fresh, changing to pale yellowish on drying; margin concolorus, obtuse, wavy, entire.

Hymenial surface poroid, brownish white to orange white when fresh, changing to reddish white to greyish red on drying; margin concolorus, sterile up to 2 mm.

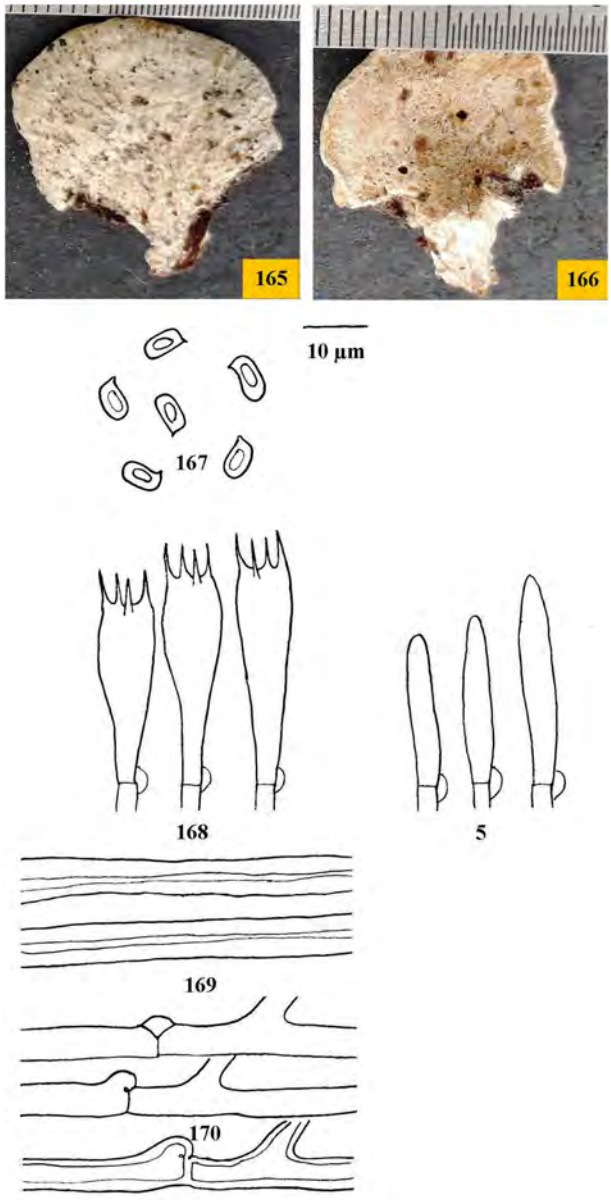

Image 165–170. *Tyromyces chioneus*: 165–166—Basidiome showing abhymenial and hymenial surface | 167—Basidiospores | 168—Basidia | 168—Cystidioles | 169—Skeletal hyphae | 170—Generative hyphae.

Pores angular to round, 5–6 per mm; dissepiments entire, up to 350 µm in thickness.

Tube layer yellowish-white, up to 0.3 mm deep.

Context homogenous, greyish-white, azonate, up to 0.3 cm thick.

Hyphal system dimitic. Generative hypahe hyaline, branched, thin- to thick-walled, clamped, branched, up to 5.5 µm in width. Skeletal hyphae pale-yellowish, thick-walled, aseptate, unbranched, up to 6.6 µm in width.

Hyphal arrangement: subhymenium dominated by generative hyphae. Trama formed of loosely arranged to moderately compact generative and skeletal hyphae. Context consists of moderately compact generative and skeletal hyphae.

Cystidioles fusoid, clamped at the base, originate in the subhymenium, 20.5–33.5 × 2.5–4.5 µm; projecting slightly from the hymenium.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 24–33 × 7.5–8 µm; sterigmata up to 2 µm in length.

Basidiospores cylindrical to slightly bent, thin-walled, smooth, 4.4–6.6 × 2–3.5 µm, no reaction in Melzer's reagent and cotton blue.

Material examined: 9103 (PUN), 26.viii.2016, Jammu & Kashmir, Doda, Bhaderwah, on *Cedrus deodara* stump, Brij Bala; 11276 (PUN), 17.viii.2017, Bhaderwah, on *C. deodara* stump, Brij Bala.

Notes: *Tyromyces chioneus* differs in having subsessile basidiome, which are somewhat aromatic in the field, finely tomentose to glabrous abhymenial surface and cylindrical to slightly bent basidiospores. Earlier it has been reported by Lloyd (1922) from southern India, Sharma (2012) and Kaur (2013) from Himachal Pradesh. This is the first record of *T. chioneus* from Jammu & Kashmir.

Trichaptum abietinum (Pers. ex J.F. Gmel.) Ryvarden, Norwegian Journal of Botany 19: 237 (1972).

≡ *Boletus abietinus* Pers. ex J.F. Gmel., Systema Naturae 2(2): 1437 (1792). (Image 171–176)

Basidiome annual, effused-reflexed to pileate, imbricate, sessile, narrowly attached; pilei applanate, up to 2.2 × 0.4 × 0.4 cm.

Abhymenial surface faintly concentrically zonate, hirsute, greyish white when fresh, not changing much on drying; margin concolorus, acute, entire.

Hymenial surface poroid, purplish-grey when fresh, not changing much on drying; margin concolorus, sterile up to 4 mm.

Pores angular to elongated, 4–6 per mm; dissepiments lacerate, up to 90 µm in thickness.

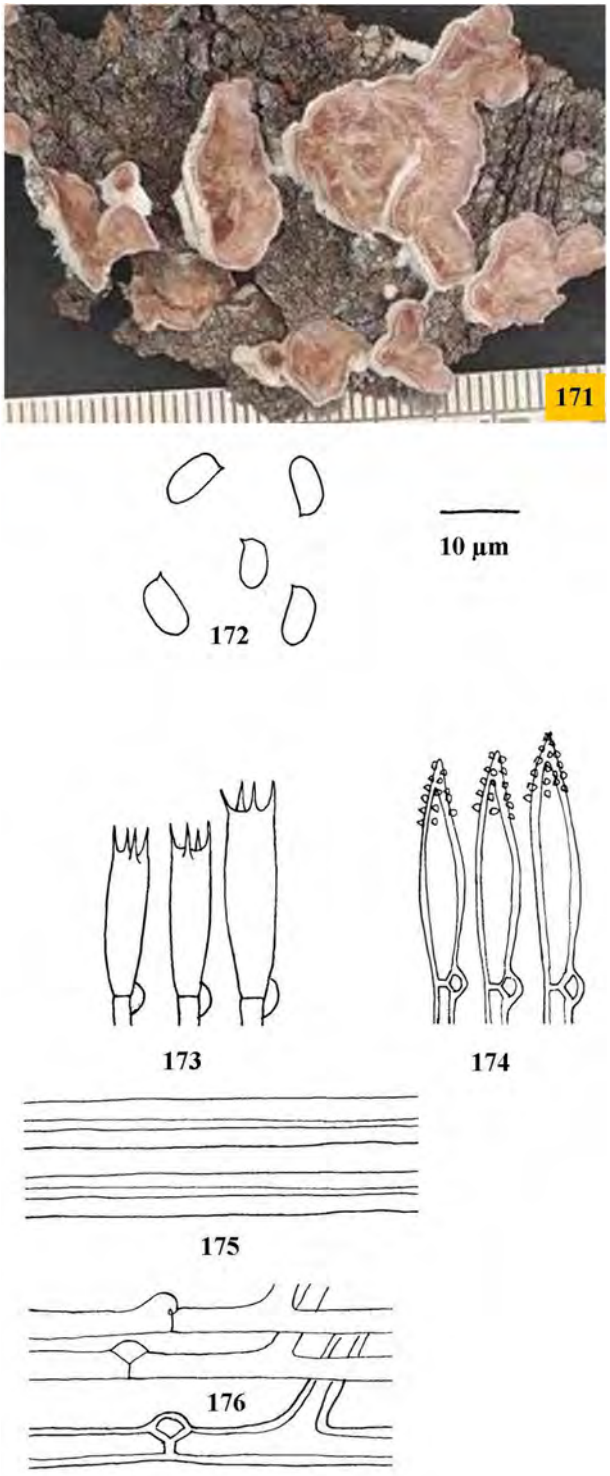

Image 171–176. *Trichaptum abietinum*: 171—Basidiome showing hymenial surface | 172—Basidiospores | 173—Basidia | 174—Cystidia | 175—Skeletal hyphae | 176—Generative hyphae.

Tube layer purplish-grey, separated by thin gelatinous layer from context; up to 1 mm deep.

Context duplex; outer zone whitish-grey, soft, up to

1 mm thick; inner zone orange white, fibrous, up to 2 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, branched, up to 5.5 µm in width. Skeletal hyphae subhyaline, thick- walled, aseptate, unbranched, up to 6 µm in width.

Hyphal arrangement: Subhymenium dominated by branched generative hyphae. Trama constituted of loosely arranged generative and skeletal hyphae. Context mainly composed of somewhat loose to compactly arranged generative and skeletal hyphae.

Cystidia sub-clavate, thick-walled, apically encrusted, clamped at the base, originate in the subhymenium, 27.5–33 × 4.6–6.6 µm; projecting up to 10 µm from the hymenium.

Basidia sub-clavate, thin-walled, clamped at the base, tetrasterigmate, 19.8–24.2 × 5–6.6 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical, slightly bent, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 6–8 × 2.5–4 µm.

Material examined: 9102 (PUN), 26.ix.2016, Jammu & Kashmir, Doda, Bhaderwah, Attalgarh, on pinus stump, Brij Bala.

Notes: *Trichaptum abietinum* is amongst the early colonizers of fallen twigs, logs, and stumpsIt is unique in having effused-reflexed to pileate basidiome with somewhat narrower base. It is reported for the second time from the study area. Previously, Dhanda (1977) described it from Ramban District of Jammu Division.

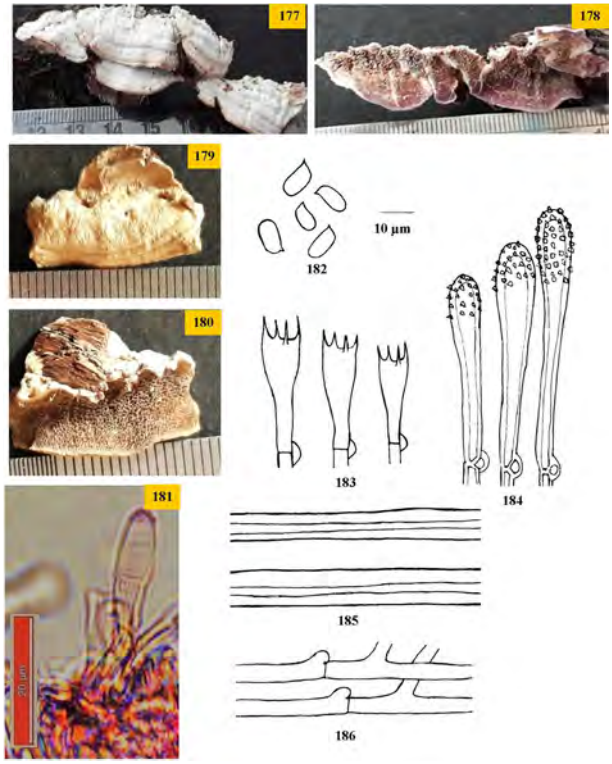

Image 177–186. *Trichaptum biforme*: 177–178—Basidiome showing abhymenial surface and hymenial surface (fresh) | 179–180—Basidiome showing abhymenial and hymenial surface (dry) | 181—Photomicrograph showing cystidium | 182—Basidiospores | 183—Basidia | 184—Cystidia | 185—Skeletal hyphae | 186—Generative hyphae.

Trichaptum biforme (Fr.) Ryvarden, Norwegian Journal of Botany 19: 237,1972.

≡*Polyporus biformis* Fr., Linnaea 8: 486, 1833. (Image 177–186)

Basidiome annual, pileate, imbricate, sessile, broadly attached; pilei dimidiate, flabelliform, up to 4 × 0.3 × 0.2 cm.

Abhymenial surface faintly concentrically zonate, hirsute, greyish-white when fresh, not changing much on drying; margin concolorus, acute, entire.

Hymenial surface poroid, purplish-grey to reddish-grey when fresh, not changing much on drying; margin concolorus, sterile up to 4 mm.

Pores round to angular to elongated, 3–5 per mm; dissepiments lacerate, up to 45 µm in thickness.

Tube layer brownish-orange, up to 1 mm deep.

Context homogeneous, azonate, fibrous, greyish red, up to 1 mm in thickness.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 5 µm in width. Skeletal hyphae subhyaline, thick- walled, aseptate, unbranched, up to 8.4 µm in width.

Hyphal arrangement: subhymenium formed of moderately compact, regularly branched generative hyphae. Trama dominated with generative and skeletal hyphae. Context constituted of compactly arranged generative and skeletal hyphae.

Cystidia fusoid, thick-walled, apically encrusted, clamped at the base, originate in the hymenium, 40–80 × 5–10 µm; projecting up to 20 µm from the hymenium.

Basidia sub-clavate, thin-walled, tetrasterigmate, clamped at the base, 18–35 × 5.5–11.5 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical, somewhat curved, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 5–10 × 2.5–5 µm.

Material examined: 11254 (PUN), 21.ix.2017, Jammu & Kashmir, Kishtwar, Chatroo, on *Cedrus deodara* branch, Brij Bala; 11275 (PUN), 21.ix.2017, Dacchin, on *C. deodara* log, Brij Bala .

Notes: *Trichaptum biforme* is diffentitated from *T. abietinum* by the absence of a gelatinous layer separating

context from tube layer. It is being reported for the first time from Jammu & Kashmir.

DISCUSSION

About 54 species of polyporoid fungi are reported from the Union Territory of Jammu & Kashmir by earlier workers (Dhanda 1977; Rattan 1977; Thind & Dhanda 1979, 1980a,b; Bala 2022a,b) which are categorised under 24 genera, eight families and four orders of *Agaricomycetes* (Basidiomycota). The present contribution adds five new records for India, 14 new to the Union Territory of Jammu & Kashmir, two new records for Jammu division, thus increasing the number of polypores in Jammu & Kashmir from 54 to 71.

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