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## Some Noteworthy Additions To Family *Phanerochaetaceae* From District Shimla (Himachal Pradesh)

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### ABSTRACT

Nine resupinate, non-poroid species namely, *Byssomerulius corium* (Pers.) Parmasto, *Candelabrochaete verruculosa* Hjortstam, *Phanerochaete leptoderma* Sheng H. Wu, *Phanerochaete singularis* (G. Cunn.) Burds., *Phanerochaete sordida* (P. Karst.) J. Erikss. & Ryvarden, *Phlebiopsis flavidoalba* (Cooke) Hjortstam, *Steccherinum albofibrillosum* (Hjortstam & Ryvarden) Hallenb. & Hjortstam, *Steccherinum bourdtii* Saliba & A. David and *Steccherinum cremicolor* H.S. Yuan & Sheng H. Wu are described and illustrated from district Shimla (Himachal Pradesh). Of the described species, eight i.e. *Byssomerulius corium*, *Candelabrochaete verruculosa*, *Phanerochaete leptoderma*, *Phanerochaete singularis*, *Phlebiopsis flavidoalba*, *Steccherinum albofibrillosum*, *Steccherinum bourdtii* and *S. cremicolor* are being described for the first time from Himachal Pradesh. All the nine species are new records for the study area. It is pertinent to mention that *Steccherinum cremicolor* is being described as a new record for India. A key to the genera and species, including earlier reports, of family *Phanerochaetaceae* from district Shimla is also provided.

**Key words:** Basidiomycota, Agaricomycetes, *Phanerochaetaceae*, Polyporales, North- West Himalaya.

### INTRODUCTION

Family *Phanerochaetaceae* (Polyporales, Agaricomycetes) is characterized by resupinate to pileate, closely adnate, ceraceous, membranaceous, waxy or soft basidiocarps; smooth to tuberculate to graninoid to odontoid or velutinous hymenial surface; monomitric or dimitic hyphal system with branched, thin- to thick-walled, simple-septate or clamped generative hyphae; cystidia generally present, smooth or encrusted; clavate to cylindrical, thin-walled, 4-sterigmate, basidia and ellipsoid, allantoid, cylindrical to subglobose, smooth, thin-walled, inamyloid, acyanophilous basidiospores. Earlier workers i.e. Rattan (1977), Singh (2007), Priyanka (2012), Sharma (2012) and Dhirra et al. (2014) reported/listed 11 taxa of the family

*Phanerochaetaceae* from district Shimla (Himachal Pradesh).

During the fugal explorations conducted in different localities of district Shimla (Himachal Pradesh) during the years 2012-2015, authors made some interesting collections of resupinate, non-poroid Agaricomycetous fungi of family *Phanerochaetaceae*. On the basis of macro- and micromorphological details and comparison with the published literature (Bakshi 1971, Eriksson et al. 1978, Hjortstam and Ryvarden 1984, Thind and Dhirra 1985, Hallenberg and Hjortstam 1988, Bernicchia and Gorjón 2010, Sharma 2000 & 2012, Prasher & Ashok 2013, Dhirra et al. 2014, Kaur et al. 2016 and Sanyal et al. 2016) these were identified as *Byssomerulius corium* (Pers.) Parmasto, *Candelabrochaete verruculosa*

Hjortstam, *Phanerochaete leptoderma* Sheng H. Wu, *Phanerochaete singularis* (G. Cunn.) Burds., *Phanerochaete sordida* (P. Karst.) J. Erikss. & Ryvarden, *Phlebiopsis flavidoalba* (Cooke) Hjortstam, *Steccherinum albofibrillosum* (Hjortstam & Ryvarden) Hallenb. & Hjortstam, *Steccherinum bourdtii* Saliba & A. David and *Steccherinum cremicolor* H.S. Yuan & Sheng H. Wu. Of these, eight species namely, *Byssomerulius corium*, *Candelabrochaete verruculosa*, *Phanerochaete leptoderma*, *Phanerochaete singularis*, *Phlebiopsis flavidoalba*, *Steccherinum albofibrillosum*, *Steccherinum bourdtii* and *S. cremicolor*, are being described for the first time from Himachal Pradesh with *Steccherinum cremicolor* as a new record for India. The material of all the specimens has been deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN). The colour standards used are as per Kornerup and Wanscher (1978).

## MATERIAL AND METHODS

Basidiocarps of members of family *Phanerochaetaceae* were collected during the field trips conducted in different localities of district Shimla (Himachal Pradesh) during the monsoon months of years 2012-2015. Field observations regarding the locality/forest type, host/substrate, texture of basidiocarp, colour and type of hymenial surface, margins, etc. for the collected specimens were recorded in the field. The collected specimens were cleared of any extraneous matter and were dried either in sun or using a portable electric drier. The dried specimens were deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN) with all essential details.

Crush mounts and free hand sections were used to study the micromorphological details (hyphae, cystidia, basidia, basidiospores, etc.) in water and 3%, 5% and 10% KOH solutions and stained in Cotton blue (1% in Lactophenol), Congo red (1% in distilled water), Phloxine (1% in distilled water) and Melzer's reagent (0.5gm Iodine + 1.5gm KI + 20gm Chloral hydrate + 20ml distilled water). Line diagrams of various microscopic structures were drawn with a camera lucida at different magnifications of the compound microscope. The data was compiled in the form of description and was compared with the published literature for identification.

## RESULTS AND DISCUSSION

The present account of nine species spread over five genera of family *Phanerochaetaceae* includes one new record for India and eight new reports for the state of Himachal Pradesh.

**1. *Byssomerulius corium*** (Pers.) Parmasto, Eesti NSV Teaduste Akadeemia Toimetised 16: 383,

1967. – *Thelephora corium* Pers., Synopsis methodica fungorum: 574, 1801. **Figs. 1-3**

**Basidiocarp** resupinate, effused, loosely adnate, reflexed at the margins,  $\leq 370$   $\mu\text{m}$  thick in section; hymenial surface merulioid, pale orange to grayish orange to brownish orange to reddish brown when fresh, not changing much on drying; abhymenial surface orange white, tomentose under lens; margins thinning, somewhat fimbriate in younger basidiocarps to reflexed, paler concolorous, or indeterminate. **Hyphal system** monomitic. Generative hyphae branched at wide angles, septate, without clamps; basal and context hyphae  $\leq 4.0$   $\mu\text{m}$  wide, thick-walled; basal hyphae parallel to the substrate, forming a very narrow zone; context hyphae loosely interwoven, differentiating into two zones, lower of smooth hyphae, upper of encrusted hyphae; subhymenial hyphae  $\leq 3.1$   $\mu\text{m}$  wide, thin-walled, vertical, compact, encrusted. **Cystidia** none. **Basidia**  $22-32 \times 4-7$   $\mu\text{m}$ , narrowly clavate, 4-sterigmate, without basal clamp; sterigmata  $\leq 3.7$   $\mu\text{m}$  long. **Basidiospores**  $5-6.2 \times 2.5-3$   $\mu\text{m}$ , subcylindrical to ellipsoid, thin-walled, smooth, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Tara Devi guest house road, on sticks of *Cedrus deodara*, Maninder 7905 (PUN), April 14, 2014.

**Remarks:** It is the first report of this species from Himachal Pradesh. Earlier, it has been described from India by Bakshi (1971) as *Merulius corium* from Uttarakhand. Later, Sharma (2000, 2012) and Sanyal (2014) re-reported it from the same state, where as Thind & Dhingra (1985) from the Eastern Himalaya. It has also been listed by Dhingra et al. (2011) from the Eastern Himalaya and Ranadive (2013) without specifying the localities.

**2. *Candelabrochaete verruculosa*** Hjortstam, Mycotaxon 17: 566, 1983. **Figs. 4-6**

**Basidiocarp** resupinate, effused, adnate,  $\leq 110$   $\mu\text{m}$  thick in section; hymenial surface smooth, finely aculeate under lens, orange white when fresh; grayish orange on drying; margins thinning, pruinose, paler concolorous, or indeterminate. **Hyphal system** monomitic. Generative hyphae septate, without clamps, branched at wide angles; basal hyphae  $\leq 5$   $\mu\text{m}$  wide, thick-walled, parallel to the substrate, less branched; subhymenial hyphae  $\leq 3.4$   $\mu\text{m}$  wide, thin-walled, vertical, more branched. **Cystidia**  $46-72 \times 3-5$   $\mu\text{m}$ , cylindrical, hyphoid, thick-walled, septate, without clamps. **Basidia**  $10-14 \times 3.4-4.6$   $\mu\text{m}$ , clavate to subclavate, 4-sterigmate, without basal clamp; sterigmata  $\leq 3.4$   $\mu\text{m}$  long. **Basidiospores**  $5.2-6.6 \times 3.4-4.4$   $\mu\text{m}$ , ellipsoid, smooth, thin-walled, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Jakhu Temple, on angiospermous sticks, Avneet 7893 (PUN), July 31, 2013.

**Remarks:** This species is being described for the first time from Himachal Pradesh. Earlier, from India, it has been reported by Sanyal (2014) from Uttarakhand and listed by Ranadive (2013) (localities not specified).

**3. *Phanerochaete leptoderma*** Sheng H. Wu, Acta Botanica Fennica 142: 45, 1990. **Figs. 7-9**

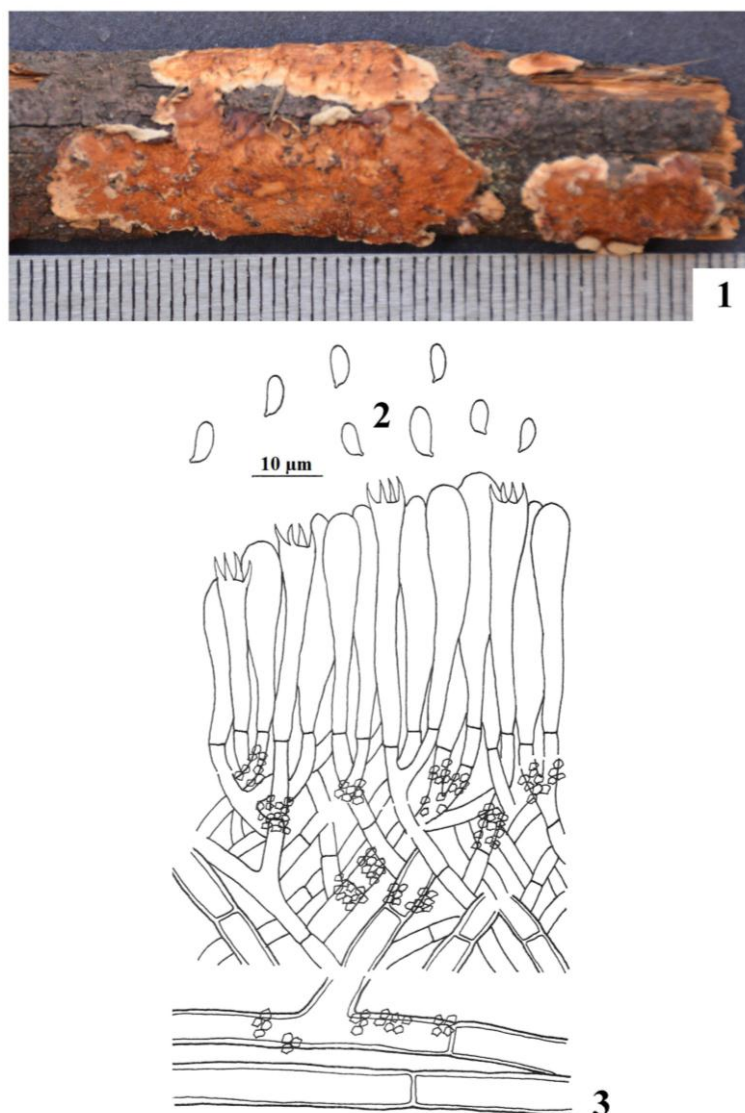
**Basidiocarp** resupinate, effused, adnate,  $\leq 150$   $\mu\text{m}$  thick in section; hymenial surface smooth, orange white to pale orange, somewhat cracking on drying; margins thinning, fibrillose, paler concolorous, or indeterminate. **Hyphal system** monomitic. Generative hyphae septate, without clamps; basal hyphae  $\leq 3.1$   $\mu\text{m}$  wide, parallel to the substrate, less branched, thick-walled; subhymenial hyphae  $\leq 2.4$

$\mu\text{m}$  wide, vertical, more branched, thin-walled.

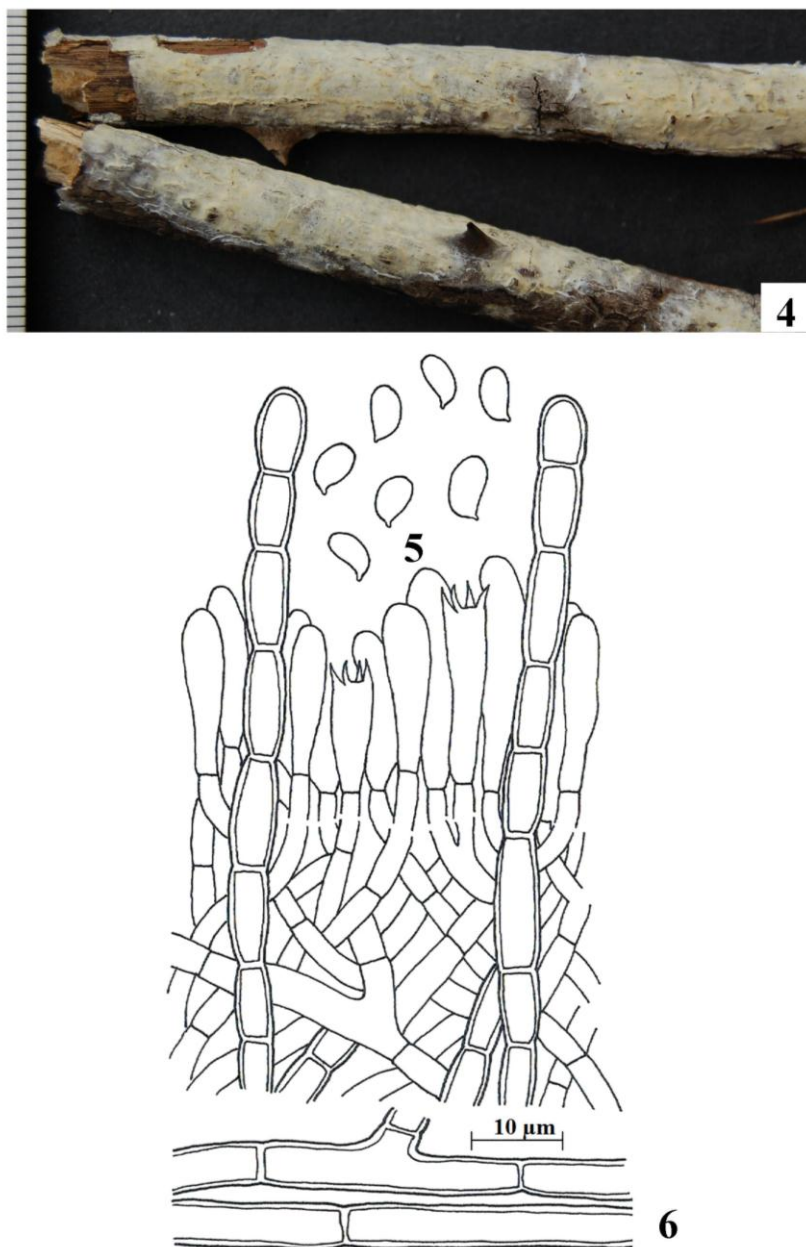
**Cystidia** 33–62  $\times$  3.7–6.2  $\mu\text{m}$ , cylindrical to subcylindrical, thick-walled, encrusted, without basal clamp. **Basidia** 30–46  $\times$  3–5  $\mu\text{m}$ , narrowly clavate, somewhat sinuous, 4-sterigmate, with oily contents, without basal clamp; sterigmata  $\leq 5$   $\mu\text{m}$  long. **Basidiospores** 6.2–8  $\times$  3–3.7  $\mu\text{m}$ , ellipsoid to subcylindrical, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, 8 kms from Narkanda towards Rampur, on sticks of *Pinus wallichiana*, Maninder 9002 (PUN), September 2, 2014.

**Remarks:** This species is characteristic in having cylindrical to subcylindrical, thick-walled, encrusted cystidia and ellipsoid to subcylindrical basidiospores. It has earlier been described from India by Sanyal (2014) from Uttarakhand. However, it is being the first report of this species from Himachal Pradesh.



**Figs 1-3. *Byssomerulius corium*:** 1. Basidiocarp showing hymenial surface; 2. Basidiospores; 3. Reconstruction showing a portion of hymenium and subhymenium.



**Figs 4-6.** *Candelobrochaete verruculosa*: 4. Basidiocarp showing hymenial surface; 5. Basidiospores; 6. Reconstruction showing a portion of hymenium and subhymenium.

**4. *Phanerochaete singularis*** (G. Cunn.) Burds., Mycologia Memoirs 10: 121, 1985. – *Corticium singulare* G. Cunn., Transactions and proceedings of the Royal Society of New Zealand 82(2): 325, 1954.

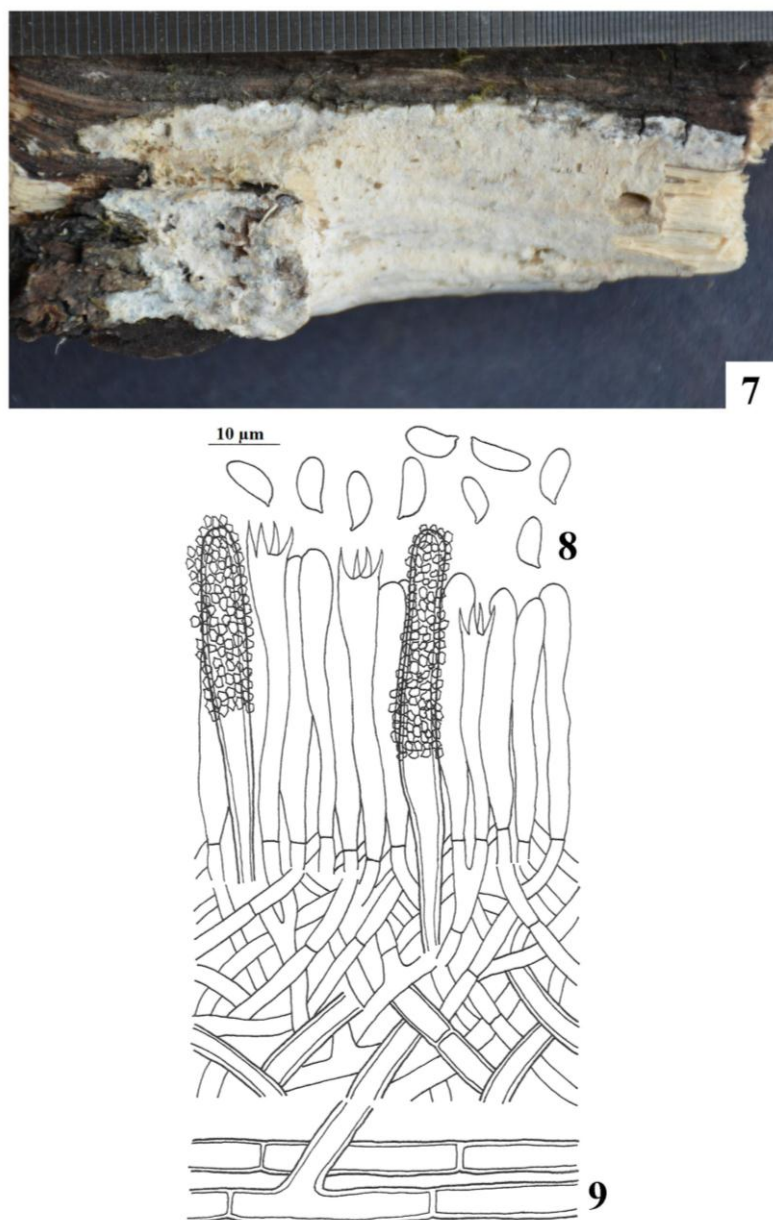
**Figs. 10-12**

**Basidiocarp** resupinate, adnate, effused,  $\leq 400 \mu\text{m}$  thick in section; hymenial surface smooth, grayish red to brownish red when fresh, cracked, orange white to pale orange to grayish orange on drying; margins thinning, paler concolorous, or indeterminate. **Hyphal system** monomitic. Generative hyphae septate, without clamps; basal hyphae  $\leq 6.2 \mu\text{m}$  wide, horizontal, less branched, loosely interwoven, thick-walled, dark brown, with

occasional single or multiple clamps, encrusted; subhymenial hyphae  $\leq 2.8 \mu\text{m}$  wide, more branched, vertical, thin-walled, compact. **Cystidia**  $28\text{--}40 \times 2.3\text{--}5 \mu\text{m}$ , clavate to subfusiform, acute apex, thin-walled, without basal clamp; projecting  $\leq 10 \mu\text{m}$  out of the hymenium. **Basidia**  $20\text{--}25 \times 4.6\text{--}6.2 \mu\text{m}$ , clavate, somewhat sinuous, 4-sterigmate, without basal clamp; sterigmata  $\leq 3 \mu\text{m}$  long. **Basidiospores**  $4.6\text{--}6.2 \times 2.8\text{--}3.4 \mu\text{m}$ , ellipsoid to subcylindrical, smooth, thin-walled, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Tara Devi guest house road, on decaying stump of *C. deodara*, Maninder 8960 (PUN), April 14, 2014.





**Figs 7-9. *Phanerochaete leptoderma*:** 7. Basidiocarp showing hymenial surface; 8. Basidiospores; 9. Reconstruction showing a portion of hymenium and subhymenium.

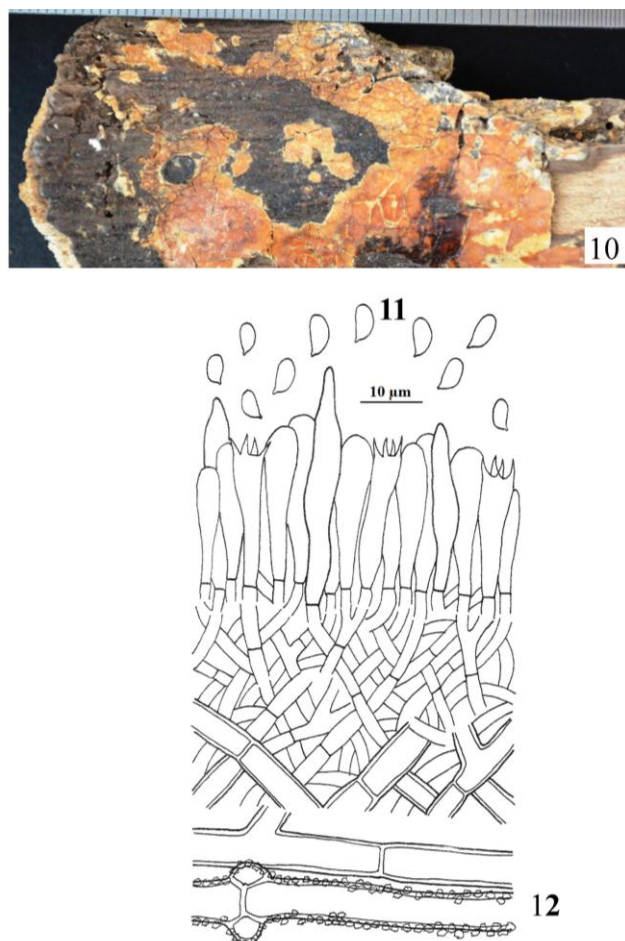
**Remarks:** This species is marked by the presence of dark brown thick walled basal hyphae and clavate to subfusiform cystidia. From India, it has earlier been described by Sanyal (2014) from district Dehradun (Uttarakhand). However, it is being reported for the first time from Himachal Pradesh.

**5. *Phanerochaete sordida*** (P. Karst.) J. Erikss. & Ryvarden, The Corticiaceae of North Europe 5: 1023, 1978. *Corticium sordidum* P. Karst., Meddelanden of Societas pro Fauna et Flora Fennica 9: 65, 1882. **Figs. 13-15**

**Basidiocarp** resupinate, effused, adnate,  $\leq 230$   $\mu\text{m}$  thick in section; hymenial surface cracked, orange white to pale orange when fresh, orange white to grayish red on drying; margins thinning, pruinose,

paler concolorous, or indeterminate. **Hyphal system** monomitic. Generative hyphae septate, without clamps; basal hyphae  $\leq 4.7$   $\mu\text{m}$  wide, parallel to the substrate, less branched, thick-walled; subhymenial hyphae  $\leq 2.4$   $\mu\text{m}$  wide, vertical, more branched, thin-walled. **Cystidia**  $33\text{--}54 \times 6\text{--}11$   $\mu\text{m}$ , subcylindrical to subfusiform, thin to thick-walled, with oily contents, without basal clamp. **Basidia**  $13\text{--}25 \times 4\text{--}7$   $\mu\text{m}$ , clavate, 4-sterigmate, without basal clamp; sterigmata  $\leq 4.3$   $\mu\text{m}$  long. **Basidiospores**  $5\text{--}6.6 \times 3.3\text{--}3.7$   $\mu\text{m}$ , ellipsoid to subcylindrical, smooth, thin-walled, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Chaupal, on sticks of *C. deodara*, Dhingra 8961 (PUN), August 16, 2012.



**Figs 10-12. *Phanerochaete singularis*:** 10. Basidiocarp showing hymenial surface; 11. Basidiospores; 12. Reconstruction showing a portion of hymenium and subhymenium.

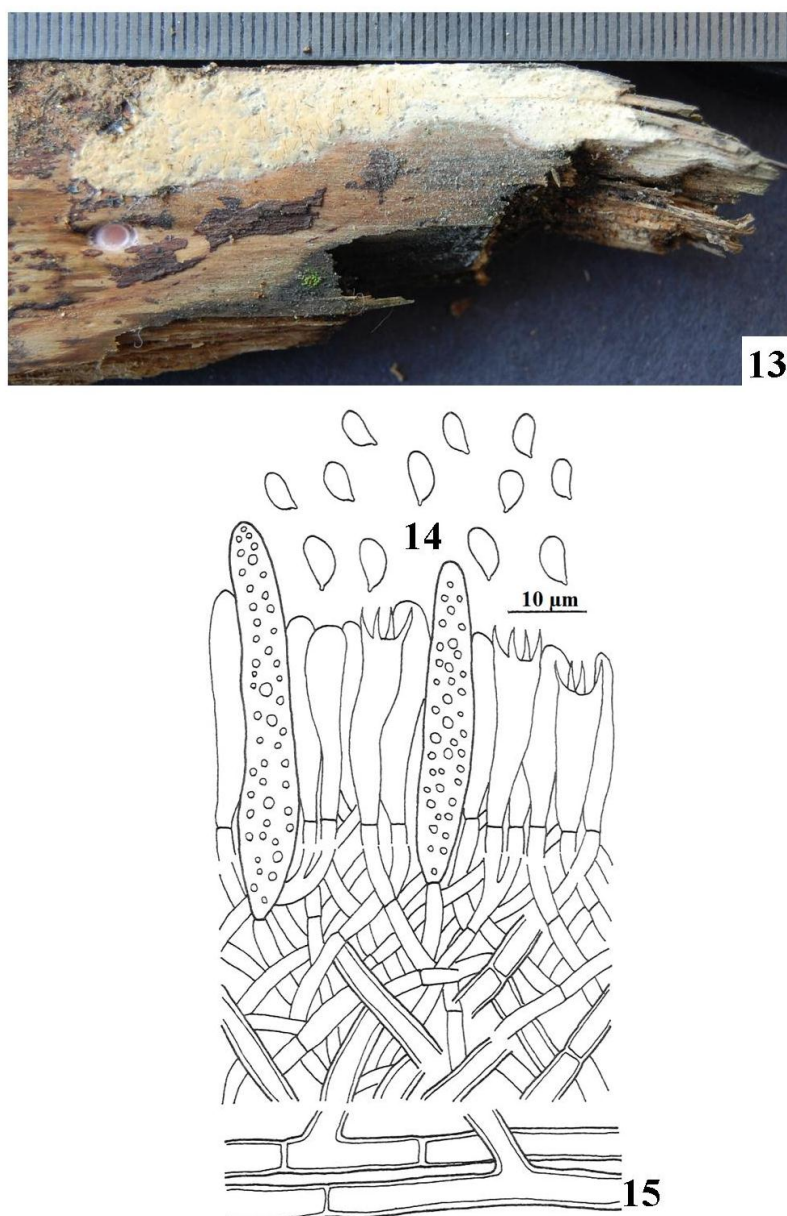
**Remarks** – This species differs from *P. singularis* in having subcylindrical to subfusiform cystidia with oily contents and is being reported for the first time from district Shimla. From India, it has earlier been reported by Dhingra (2005) from the Eastern Himalaya, Singh (2007) and Sharma (2012) from district Chamba (Himachal Pradesh), Priyanka (2012) from districts Solan and Kinnaur (Himachal Pradesh), Sharma (2012) and Sanyal (2014) from Uttarakhand. It has also been listed by Dhingra et al. (2011) from the Eastern Himalaya, Ranadive (2013) localities not mentioned and Dhingra et al. (2014) from Himachal Pradesh.

**6. *Phlebiopsis flavidoalba*** (Cooke) Hjortstam, Windahlia 17: 58 (1987). – *Peniophora flavidoalba* Cooke, Grevillea 8(45): 21, 1879. **Figs. 16-18**

**Basidiocarp** resupinate, effused, adnate,  $\leq 240$  µm thick in section; hymenial surface smooth to tuberculate, orange white to pale orange to grayish orange to brownish orange when fresh, pale orange to grayish orange on drying; margins thinning, pruinose, paler concolorous, or indeterminate.

**Hyphal system** monomitic. Generative hyphae septate, without clamps; basal hyphae  $\leq 5$  µm wide, parallel to the substrate, less branched, thick-walled; subhymenial hyphae  $\leq 2.8$  µm wide, vertical, more branched, denser, thin-walled. **Cystidia** 60–86  $\times$  6.8–9 µm, fusiform, thick-walled, heavily encrusted, without basal clamp; projecting  $\leq 25$  µm out of the hymenium. **Basidia** 25–31  $\times$  5–6 µm, clavate, sinuous, 4-sterigmate, without basal clamp, with oily contents; sterigmata  $\leq 3.7$  µm long. **Basidiospores** 4.6–6.2  $\times$  2.8–3.1 µm, ellipsoid to subcylindrical, smooth, thin-walled, with oil droplets, inamyloid, acyanophilous. **Specimen examined** – India: Himachal Pradesh, Shimla, 25 km from Shimla towards Bilaspur, on stump of *P. roxburghii*, Maninder 9001 (PUN), August 1, 2015.

**Remarks:** This species is being described for the first time from Himachal Pradesh. Earlier, from India, it has been reported by Thind and Rattan (1973) as *Peniophora flavidoalba* from Punjab, Dhingra (1983) as *Phanerochaete flavidoalba* from West Bengal and Sanyal (2014) as *Phlebiopsis flavidoalba* from Uttarakhand. Later, it has also been listed by Ranadive et al. (2011) and Dhingra et al. (2011) from Maharashtra and Eastern Himalaya respectively.



**Figs 13-15. *Phanerochaete sordida*:** 13. Basidiocarp showing hymenial surface; 14. Basidiospores; 15. Reconstruction showing a portion of hymenium and subhymenium.

**7. *Steccherinum albobrillosum*** (Hjortstam & Ryvarden) Hallenb. & Hjortstam, Mycotaxon 31 (2): 443, 1988. – *Phlebia albobrilloso* Hjortstam & Ryvarden, Mycotaxon 20 (1): 139, 1984.

**Figs. 19-21**

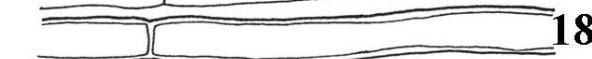
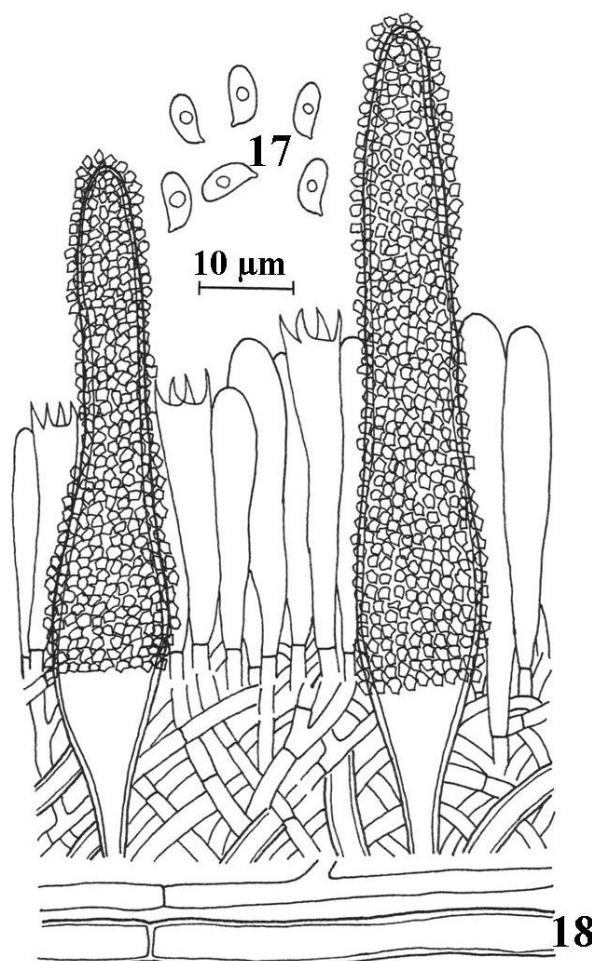
**Basidiocarps** resupinate, effused, adnate,  $\leq 300$   $\mu\text{m}$  thick in section; hymenial surface odontoid, aculei up to 200  $\mu\text{m}$  long, orange white to pale orange to grayish orange when fresh, not changing much drying; margins thinning, fibrillose, paler concolorous or indeterminate. **Hyphal system** monomitic. Generative hyphae branched, septate, clamped, thin- to thick-walled, somewhat encrusted; basal hyphae  $\leq 3.7$   $\mu\text{m}$  wide, parallel to the substrate, loosely interwoven; subhymenial hyphae  $\leq 2.8$   $\mu\text{m}$  wide, vertical, compact. **Cystidia**

50–124  $\times$  6–8  $\mu\text{m}$ , subcylindrical to subfusiform, thick-walled, encrusted, projecting  $\leq 50$   $\mu\text{m}$  out of the hymenium. **Basidia** 17–22  $\times$  5–6  $\mu\text{m}$ , clavate to subclavate, 4-sterigmata, with basal clamp, with oily contents; sterigmata  $\leq 3.1$   $\mu\text{m}$  long. **Basidiospores** 4.3–5.5  $\times$  3.4–4.3  $\mu\text{m}$ , broadly ellipsoid, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Kufri, on log of *C. deodara*, Avneet 8928 (PUN), September 04, 2014.

**Remarks:** This species is being described for the first time from Himachal Pradesh. Earlier, it has been reported from Nepal (Hjortstam & Ryvarden, 1984), Costa Rica (Hallenberg & Hjortstam, 1988) and Uttarakhand in India (Sanyal et al., 2016).





**Figs 16-18. *Phlebiopsis flavidoalba*:** 16. Basidiocarp showing hymenial surface; 17. Basidiospores; 18. Reconstruction showing a portion of hymenium and subhymenium.

**8. *Steccherinum bourdotii*** Saliba & A. David, Cryptogamie Mycologie 9 (2): 100, 1988.

**Fig. 22-24**

**Basidiocarp** resupinate, effused, loosely adnate, reflexed,  $\leq 200 \mu\text{m}$  thick in section (without aculei); hymenial surface odontoid, with conical aculei,  $\leq 1 \text{ mm}$  long, pale orange to brownish orange to brown; abhymenial surface pale orange to grayish brown, smooth to tomentose; margins thinning, irregularly wavy in the reflexed portion, pale

orange. **Hyphal system** dimitic. Generative hyphae  $\leq 2.5 \mu\text{m}$  wide, branched, septate, clamped, thin-walled; basal hyphae parallel to the substrate, loosely interwoven; subhymenial hyphae densely packed, vertical. Skeletal hyphae  $\leq 5.0 \mu\text{m}$  wide, thick-walled, without septa and clamps; extending as Skeletocystidia in the subhymenium as well as hymenium. **Skeletocystidia**  $80\text{--}120 \times 5\text{--}9 \mu\text{m}$ , subcylindrical, heavily encrusted, thick-walled, projecting  $\leq 52 \mu\text{m}$  out of the hymenium. **Basidia**  $12\text{--}21 \times 5\text{--}7 \mu\text{m}$ , subclavate, 4-sterigmate, with



basal clamp; sterigmata  $\leq 4 \mu\text{m}$  long. **Basidiospores**  $3.4\text{--}4.3 \times 3.1\text{--}4.0 \mu\text{m}$ , subglobose to globose, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, Chaupal, on bark of *C. deodara*, Maninder 8998 (PUN), August 16, 2012.

**Remarks:** This species differs from *S. albofibrillosum* in having effused reflexed basidiocarp and subglobose to globose basidiospores. From India, it has earlier been described by Sanyal et al. (2016) from district Pithoragarh (Uttarakhand). However, it is being reported for the first time from Himachal Pradesh.

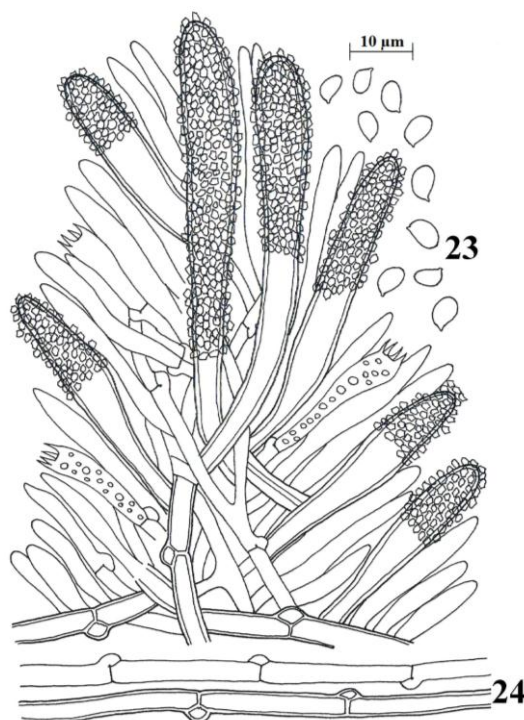
**9. *Steccherinum cremicolor*** H.S. Yuan & Sheng H. Wu, Mycoscience 53(2): 134, 2012. **Figs. 25-27**

**Basidiocarp** resupinate, effused, adnate,  $\leq 500 \mu\text{m}$  thick in section (with aculei); hymenial surface odontoid (aculei conical, up to  $350 \mu\text{m}$  long), orange white to pale orange to grayish orange when fresh, grayish orange to brownish orange on drying; margins thinning, fibrillose to fimbriate, paler

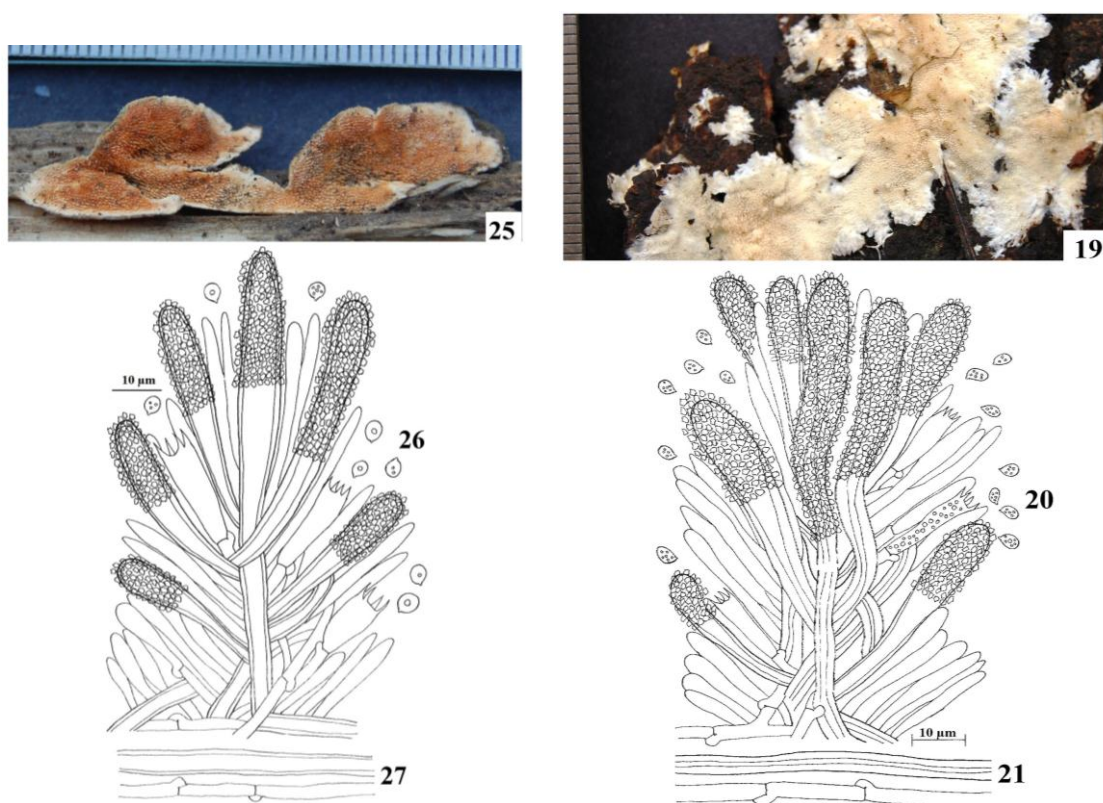
concolorous or indeterminate. **Hyphal system** dimitic. Generative hyphae  $\leq 3.4 \mu\text{m}$  wide, branched, septate, clamped, thin-walled; basal hyphae parallel to the substrate, loosely interwoven; subhymenial hyphae densely packed, vertical. Skeletal hyphae  $\leq 4.6 \mu\text{m}$  wide, thick-walled, without septa. **Skeletocystidia**  $40\text{--}60 \times 8\text{--}10 \mu\text{m}$ , subcylindrical, heavily encrusted, obtuse apex, projecting  $\leq 28 \mu\text{m}$  out of the hymenium. **Basidia**  $14\text{--}19 \times 4\text{--}5 \mu\text{m}$ , clavate to subclavate, with oily contents, 4-sterigmate, with basal clamp; sterigmata  $\leq 3.1 \mu\text{m}$  long. **Basidiospores**  $3\text{--}4 \times 1.8\text{--}2.8 \mu\text{m}$ , ellipsoid, smooth, thin-walled, with oily contents, inamyloid, acyanophilous.

**Specimen examined** – India: Himachal Pradesh, Shimla, about 2 km from Chail towards Kufri, on bark of *C. deodara*, Maninder 8999 (PUN), August 02, 2013.

**Remarks:** This species differs from *S. cremicolor* in having ellipsoid basidiospores and is being described for the first time from India. Earlier, it has been reported from Taiwan by Yaun & Wu (2012).



**Figs 19-21. *Steccherinum albofibrillosum*:** 19. Basidiocarp showing hymenial surface; 20. Basidiospores; 21. Reconstruction showing a portion of hymenium and subhymenium



**Figs 22-27. (22-24) *Steccherinum bourdtii*:** 22. Basidiocarp showing hymenial surface; 23. Basidiospores; 24. Reconstruction showing a portion of hymenium and subhymenium, **(25-27) *Steccherinum cremicolor*:** 25. Basidiocarp showing hymenial surface; 26. Basidiospores; 27. Reconstruction showing a portion of hymenium and subhymenium

#### Key to the genera of family *Phanerochaetaceae* of district Shimla

1. Hymenial surface meruloid.....*Byssomerulius*
1. Hymenial surface smooth to tuberculate to grandinoid or odontoid.....2
2. Hyphal system monomitic.....3
2. Hyphal system usually dimitic.....*Steccherinum*
3. Septate cystidia present.....*Candelabrochaete*
3. Cystidia otherwise.....4
4. Basal hyphae with simple or multiple clamps, subiculum not compact.....*Phanerochaete*
4. Basal hyphae with simple clamp, subiculum compact.....*Phlebiopsis*

#### Key to the species of genus *Phanerochaete* of district Shimla

1. Cystidia absent.....2
1. Cystidia present.....3
2. Basidiospores (4–5 × 2–2.5) narrowly ellipsoid to subcylindrical.....*P. galactites*\*
2. Basidiospores (6.2–7.4 × 4–5.6) ellipsoid.....*P. tuberculata*\*
3. Cystidia thin-walled, smooth.....4
3. Cystidia thick-walled, encrusted.....7
4. Basal zone of dark brown hyphae.....*P. singularis*
4. Hyphae in the basal zone not dark brown.....5
5. Cystidia clavate to cylindrical, basidiospores broadly ellipsoid.....*P. viticola*\*
5. Cystidia cylindrical to fusiform, Basidiospores ellipsoid to cylindrical.....6
6. Cystidia cylindrical to subcylindrical, basidiospores ellipsoid.....*P. deflactans*\*
6. Cystidia subcylindrical to subfusiform, basidiospores ellipsoid to subcylindrical.....*P. sordida*
7. Hyphal cordons present.....*P. filamentosa*\*
7. Hyphal cordons absent.....8
8. Cystidia cylindrical to subcylindrical (33–62 × 3.7–6.2).....*P. leptoderma*
8. Cystidia subcylindrical to subfusiform (66–101 × 9–10).....*P. velutina*\*

\* Species reported earlier from the study area but not collected during present studies.

**Key to the species of genus *Steccherinum* of district Shimla**

1. Hyphal system monomitic.....*S. albofibrillosum*
1. Hyphal system dimitic.....2
2. Hymenophore with rounded aculei.....*S. ochraceum*\*
2. Hymenophore with conical aculei.....3
3. Basidiocarp effused-reflexed, basidiospores subglobose to globose .....*S. bourdtii*
3. Basidiocarp effused, basidiospores ellipsoid to ovoid.....4
4. Basidiocarps orange white to pale orange to grayish orange, aculei  $\leq 350 \mu\text{m}$ .....*S. cremicolor*
4. Basidiocarps ochraceous, aculei  $\leq 1 \text{ mm}$  long.....*S. ciliolatum*\*

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