The Genus *Psathyrella* (Fr.) Quél. from India: New Records

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ABSTRACT

Four species of Genus *Psathyrella* viz. *Psathyrella naivashaiensis* Pegler, *P. longistriata* (Murrill) Smith, *P. obtusata* (Fr.) Smith and *P. pseudocandolleana* Smith are taxonomically described and illustrated for the first time from India. One new variety of *Psathyrella naivashaiensis* Pegler var. *macrospora* var. nov. is here by reported as new to science.

Key Words: apical pore, cheilocystidia, lageniform, *Psathyrella,* taxonomy, India.

INTRODUCTION

The genus *Psathyrella* (Fr.) Quél. (family Psathyrellaceae) is characterized by small to medium sized basidiocarps, dull colored, non-deliquescent; campanulate to convex pileus, typically with shade of brown, buff or gray; adnexed to adnate, dark brown to black lamellae; stipe fragile, white or pallid, veil present or absent. Spore deposit brown. Basidiospores small to large, ovoid to ellipsoidal, thick walled, smooth, usually with a truncate germ pore, bleaching in concentrated sulphuric acid. Cheilocystidia always present. Pleurocystidia present or absent. Pileus cuticle distinct, cellular to hymeniform. Clamp connections usually present. This genus is represented by 400 species the world over (Kirk *et al*., 2008). During the fungal forays to various localities of Punjab, collections belonging to genus *Psathyrella* were made, of which four species viz. *Psathyrella naivashaiensis* Pegler, *P. longistriata* (Murrill) Smith, *P. obtusata* (Fr.) Smith and *Psathyrella pseudocandolleana* Smith reported for the first time from India and one new variety of *Psathyrella naivashaiensis* Pegler var. *macrospora* var. nov. is reported as new to science are described in this paper.

MATERIALS AND METHODS

Standard methods for collection, preservation and description of agarics were followed, using the terminology given by (Atri *et al.* 2005). The terminology used for describing the color tone of carpophores parts and spore print is after Kornerup and Wanscher (1978). The specimens were hot air dried and preserved in cellophane bags containing 1-4 dichlorobenzene. Macroscopic examination was carried out on fresh specimens in the field. Microscopic details were studied from free hand sections mounted in 5% KOH, stained in cotton blue (0.16 g cotton blue dissolved in 100 ml lactic acid). The identified specimens have been deposited in the Herbarium, Department of Botany, Punjabi University, Patiala (Punjab) India, under the Accession No. PUN.

RESULTS AND DISCUSSION

Psathyrella naivashaiensis Pegler, *Kew Bull. Additional Series* VI. 434–435, 1977, **var. *macrospora*** H. Kaur, A. Kaur, M.K. Saini, N.S. Atri **var. nov. (Fig. 1. A–E).**

Mycobank no.: MB 803485
Etymology– The name of variety is based on the large spore size.
Carpophores 2.0–6.0 cm in height. Pileus 0.6 – 2.5 cm broad, conical, pointed apex; surface moist, orangish brown with brownish grey centre, few brownish black at maturity, with minute white velar squamules glabrous; margin appendiculate with veil remnants, not splitting at maturity; flesh membranous; taste sour; odour mild to none. Lamellae adnate, unequal, subdistant, lamellulae present, 3- sized, in series, up to 0.3 cm broad, grayish brown, fragile. Spore deposit brownish grey. Stipe 5–6 cm long, 0.2-0.4 cm broad, cylindric, slightly tapering upward, brittle, hollow; surface white; annulus absent.

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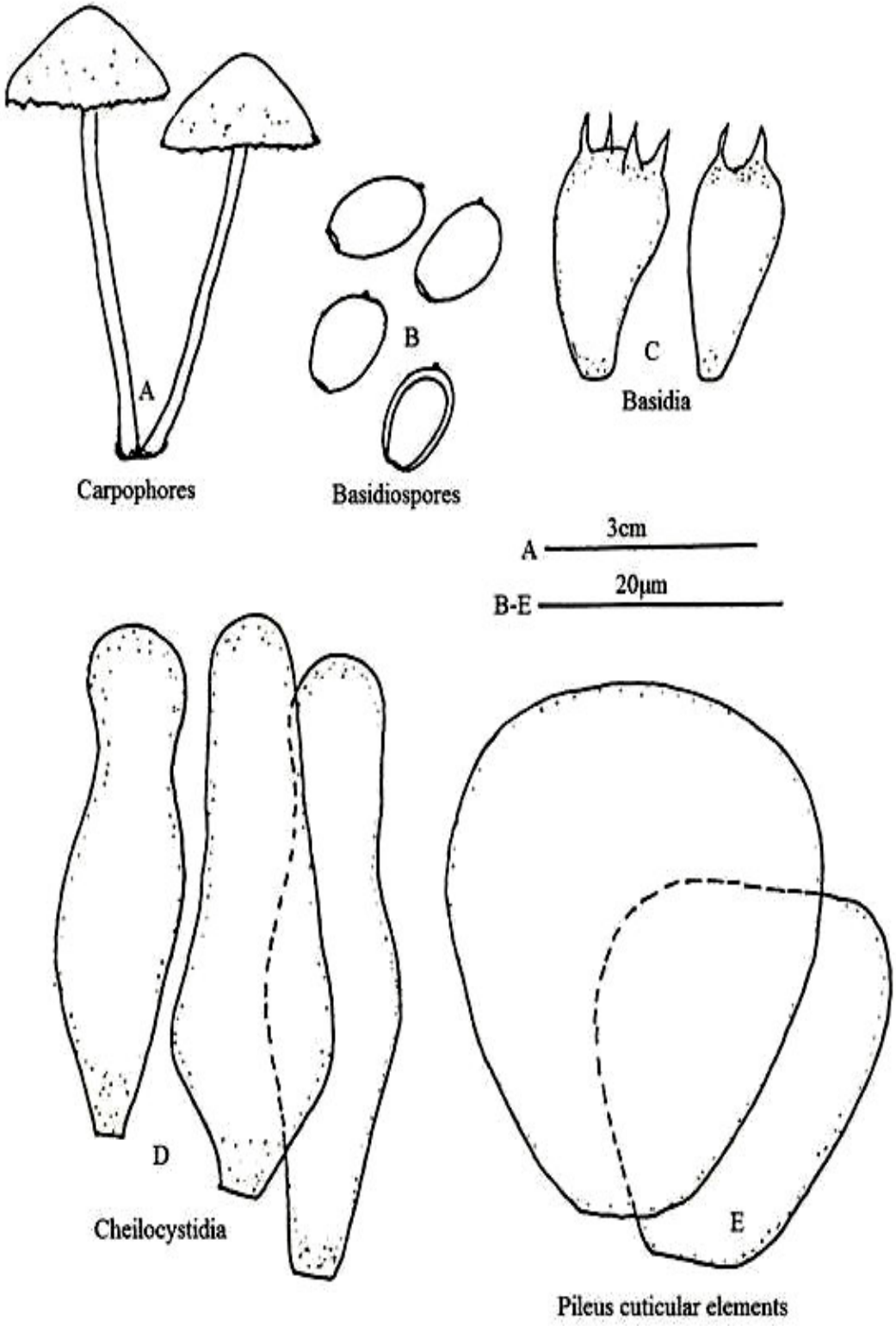

Fig. 1. A-E- ***Psathyrella naivashaiensis*** **var.** ***macrospora*** **var. nov.**

Basidiospores 6.75–9.75 × 4.5–6.0 µm (excluding apiculus), (Q=1.55) ellipsoid, thick walled, smooth, truncated by a narrow apical pore, with few contents. Basidia 16.5–19 × 7.5–10.5 µm, clavate to pyriform, 2–4 spored, sterigmata up to 3 µm in length. Pleurocystidia absent. Cheilocystidia 27–45 × 10.5–18.5 µm, utriform, cylindric to lageniform with an obtusely rounded apex, occasionally thick walled with few granular contents; lamellae edges sterile. Carpophore context homoiomerous. Pileus cuticle made up of epithelium formed of rounded hyaline elements, 19.5 – 33 × 15– 30 µm in size; context made up of hyaline thin walled hyphae measuring 10.5–21 µm in diameter. Hymenophoral trama regular made up of hyaline, thin walled inflated hyphae measuring 7.5–21 µm in width. Subhymenium pseudoparenchymatous. Stipe made up of horizontally arranged parallel mass of hyphae measuring 4.5 – 19.5 µm in diameter. Clamp connections present.

Chemical colour reaction: Basidiospores discoloured to pale state hue in concentrated sulphuric acid.

Distribution and ecology: Pegler (1977) found this species as growing common amongst roots and debris of *Acacia xanthophloea* at 1981 m in Rift Valley Province, Naivasha District in Kenya, 20 March 1968.

Collection examined: India, Punjab, Sirhind (250 m), growing scattered on humicolous soil and debris of *Eucalyptus nilotica* wood, Amanjeet Kaur, 27 July 1996, PUN 2846; Punjab, Patiala, Punjabi University Campus, Plant Conservatory (250 m), growing gregariously on rotten wood log of *Dalbergia sissoo*, Amanjeet Kaur, 9 August 1996, PUN 2843; Punjab, Sirhind (250 m), growing in groups on debris and rotting log of *Dalbergia sissoo* tree some growing in humicolous soil Amanjeet Kaur, 13 July 1998, PUN 2847; Sirhind (250 m) growing scattered and in small groups on rotting wood logs of *Eucalyptus nilotica* tree, Amanjeet Kaur, 7 August 1998, PUN 2842 (**Holotype**).

Remarks: The gross morphology and microscopic details of the above examined collection are in full agreement with the description given for *Psathyrella naivashaiensis* Pegler by Pegler (1977). According to him this species belongs to subsection *Flocculosae* Smith. In the presently examined collections basidiospores are much larger 6.5– 9.75 × 4.5–6.0 µm rather than 6.5–7.5 × 4.5–5.3 µm given for *P. naivashaiensis* by Pegler (1977). Also the Basidia are 4–spored in the type description rather than 2–4 spored in present collections. Due to the presence of such variation in the basidiospore size and basidia in all the four collections, presently worked out, a new variety *Psathyrella naivashaiensis* Pegler var. *macrospora* var. nov. is proposed. The collections were also compared with *Psathyrella canoceps* (Kauffm.) A.H. Smith. Although in *P. canoceps* the spores are larger in comparison to *P. naivashaiensis,* but in *P. canoceps* carpophores are white in color, also the stipe cuticle has caulocystidia which are lacking in *P. naivashaiensis* and in our collections also. *P. naivashaiensis* is not earlier known from India.

Psathyrella longistriata **(Murrill) Smith.** *Mushrooms in their Natural Habitats*, 552–554, 1949. (**Fig. 2. A–F)**

Carpophores 5.2–9.5 cm in height. Pileus up to 8 cm broad, conical campanulate, margin expanded to plane with broad umbo; surface moist, hygrophanous, centre grayish orange ($5B_3$), margin orange white ($6B_2$), covered with scattered patches of veil remnants, soon glabrous, finely striate, margin splitting at maturity; flesh thin, up to 0.1 cm in thickness, unchanging; taste mild; odour farinaceous. Lamellae adnate, unequal, crowded, up to 0.4 cm broad, brown ($7E_4$) at maturity. Spore deposit brown. Stipe 4.9–9.2 cm long, 0.2–0.5 cm broad, almost equal in diameter throughout, hollow, fragile; surface white, covered with fibrillose squamules below the annulus; annulus median, white membranous, attached above free below, persistent.

Basidiospores 6.0–9.0 × 3.75– 5.25 µm (excluding apiculus), (Q=1.6) ellipsoid, smooth, dark brown, with narrow to indistinct germ pore, apex obtuse. Basidia 16.5–19.5 × 6–7.5 µm, cylindric clavate, 4– spored, thin hyaline. Pleurocystidia 30–60 × 9–25.5 µm, saccate to fusoid ventricose with subacute apices, thin walled, hyaline, abundant. Cheilocystidia 19–30 × 7.5–13.5 µm, clavate, saccate to balloon shaped, thin walled, hyaline; Lamellae edges sterile. Carpophore context homoiomerous. Pileus cuticle, cellular, made up of hyaline, inflated pear-shaped elements, measuring 30–66 × 21–31.5 µm; context made up of interwoven hyphae, measuring 4.5–16 µm in diameter. Hymenophoral trama regular made up of 3–9 µm broad, thin walled, hyaline hyphae. Subhymenium pseudoparenchymatous. Stipe hyphae measuring 4.5– 30 µm in diameter and with prominent clamp connections.

Chemical colour reaction: Basidiospores discoloured in concentrated sulphuric acid**.**

Distribution and ecology: Smith (1949) found this species as growing scattered to gregarious under conifers and hardwoods along the Pacific Coast.

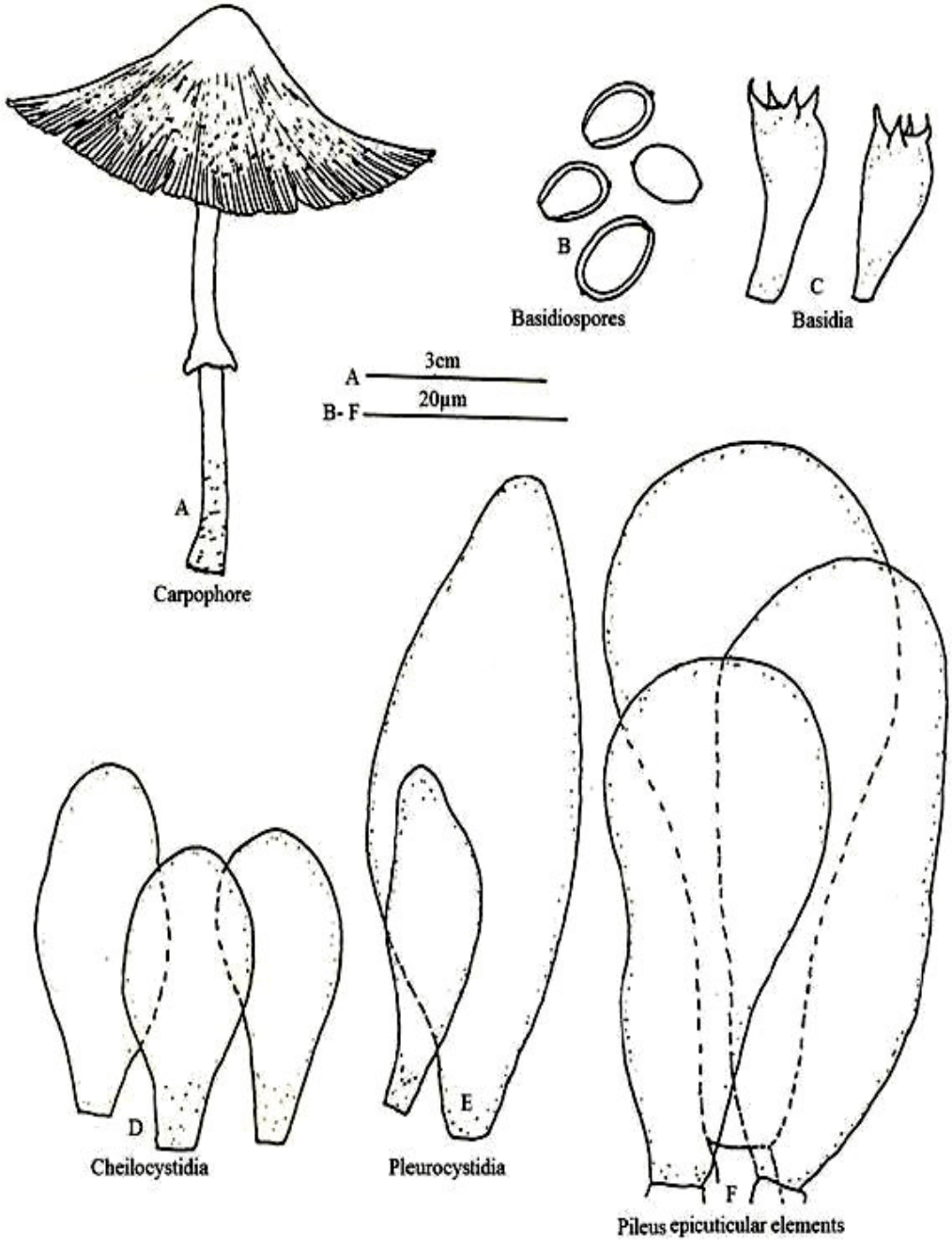

Fig. 2. A-F- ***Psathyrella longistriata*** **(Murrill) Smith**

Collection examined: India, Punjab, Chhatbir (255 m), growing scattered on humicolous soil under *Dalbergia sissoo*, Amanjeet Kaur, 26 August 1998, PUN 2830.

Remarks: The above examined taxa belongs to section *Pseudostropharia* of Genus *Psathyrella*. The macroscopic and microscopic details of the above examined collection agree well with the details given for *Psathyrella longistriata* (Murrill) Smith by Smith (1949, 1972). This species is characterized by large sized carpophores, pileus with translucent striations, persistent white membranous annulus and presence of both cheilocystidia and pleurocystidia, the only difference in the present taxa is of the absence of caulocystidia which are reported to be present by Smith (1972). It is being reported for the first time from India.

Psathyrella obtusata (Fr.) Smith. *Contrib. Univ. Mich. Herb.* **5**: 1–73 pl., 1–32, 1941. (**Fig. 3. A–F**)

Carpophores 2.3–4.2 cm in height. Pileus 2.8 – 4 cm broad, flattened convex, umbonate, surface dry, centre dark brown, margin light grayish brown when moist, paler tan and wrinkled when dry; margin finely striate up to half of pileus; flesh membranous, unchanging; taste and odour mild. Lamellae adanate, unequal 3– sized, subdistant, 0.2 cm broad, dark brown. Spore deposit brown. Stipe up to 3.5 cm long, 0.2 cm broad, equal in diameter throughout, hollow, white, silky with shiny smooth surface; annulus absent.

Basidiospores 6.0–9.0 × 3.75–4.5 µm (excluding apiculus), (Q=1.8) oblong, thick walled, base obtuse, apical pore minute to indistinct. Basidia 18.5–21.5 × 7.5– 9 µm, clavate, 4– spored. Pleurocystidia 16.5–22.5 × 9–15 µm, inflated, pyriform to clavate, thin walled, hyaline, abundant. Cheilocystidia 22.5–49.5 × 12– 15 µm, clavate to balloon shaped, thin walled hyaline; lamellae edges sterile. Pileus cuticle cellular, made up of pyriform inflated cells, measuring 27– 45 × 21.5– 28.5 µm; context made up of thin walled inflated hyphae, measuring 9 –37.5 µm in diameter. Hymenophoral trama regular. Subhymenium pseudoparenchymatous. Stipe hyphae hyaline thin walled measuring 4.5–30 µm broad, and clamp connections present in the stipe hyphae.

Chemical colour reaction: Basidiospores discoloured in concentrated sulphuric acid**.**

Distribution and ecology: This species found growing on the ground in woods, especially under oaks, in autumn in British Isles given by Wakefield & Dennis (1981).

Collection examined: India, Punjab, Chhatbir (255 m) scattered on humicolous soil and plant debris near roots of *Morus alba* tree, Amanjeet Kaur, 6 November 1997, PUN 2807.

Remarks: The external and internal details of the above examined collection resembles with those given by Wakefield & Dennis (1981) and Smith (1972) for *P. obtusata* (Fr.) Smith. It is characterized by flattened convex brown pileus which become pale tan and wrinkled at maturity and presence of balloon shaped cystidia. It is a new fungus record for India.

Psathyrella pseudocandolleana A. H. Smith *Mem. N.Y. bot. Gdn*. **24**:81 (1972). (**Fig. 4. A–E, 5. A-D)**

Carpophores 1.6–5.7 cm in height. Pileus 1.2–2.2 cm broad, campanulate; broadly umbonate; surface grayish orange ($5B_3$) on periphery and dark brown ($6F_4$) on drying, yellowish orange ($4A_6$) in center at maturity but light brown ($6D_5$) when immature, scaly, scales powdery, washed out at maturity, dry; margin irregular, splitting at maturity, translucent striations visible; cuticle not peeling; flesh 0.1–0.4 cm thick, membranous, light brown, unchanging; pileal veil present, patchy, grayish pale. Taste and odour mild. Lamellae adnate, unequal, subdistant, narrow, broad upto 0.2 cm, dark brown ($7F_5$), edges smooth, fragile. Stipe central, 2–5.5 cm long, 0.1–0.5 cm broad, white ($1A_1$), equal in diameter throughout, hollow; smooth; exannulate.

Basidiospores 6.8–8.5 × 3.4–5µm (excluding apiculus), (Q= 1.8) elongate, somewhat compressed in lateral view, guttulate, minute apical pore present; apiculate, apiculus upto 0.8 µm long. Basidia 17–23.8 × 5.1–8.5 µm, claviform. Pleurocystidia absent. Cheilocystidia 18.7–28.9 × 5–11.5 µm, urtiform to claviform, with blunt rounded tips, weakly granular; lamellae edges sterile. Carpophore context homoiomerous. Pileus cuticle cellular, made up of 18.9–37.8 × 14.2–37.8 µm cells, with few septate, clamped, 4.7–9.5 µm broad hyphae. Hymenophoral trama regular. parallel. Stipe cuticle hyphal, made up of longitudinally tangled 4.7–18.9 µm broad, septate hyphae; caulocystidia lacking. Clamp connections present.

Chemical colour reaction: Basidiospores looses color and changes to grayish in conc. H_2SO_4, no color change in KOH; but after 20 minutes spores get decolored.

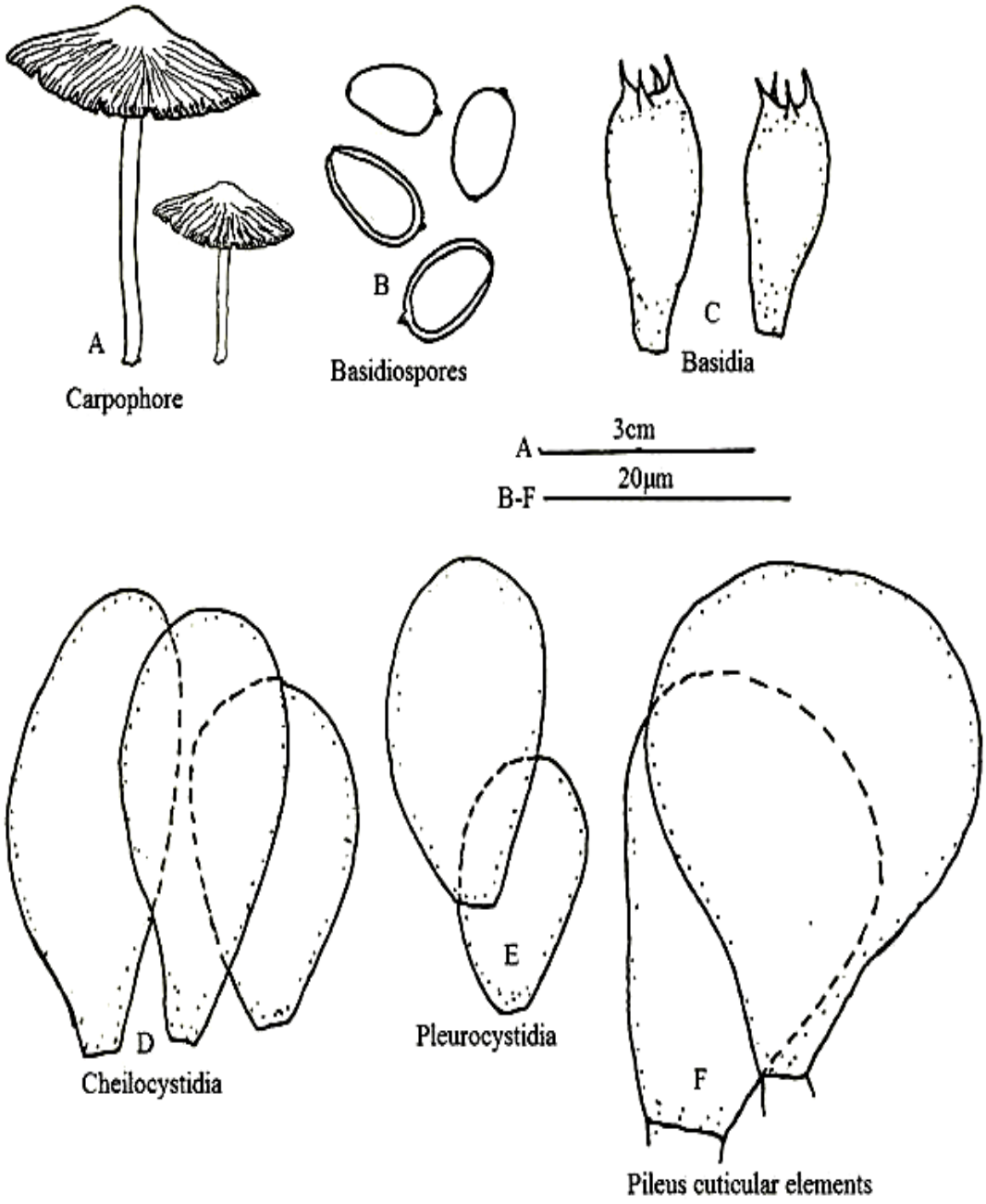

Fig.3. A-F- *Psathyrella obtusata* (Fr.) Smith

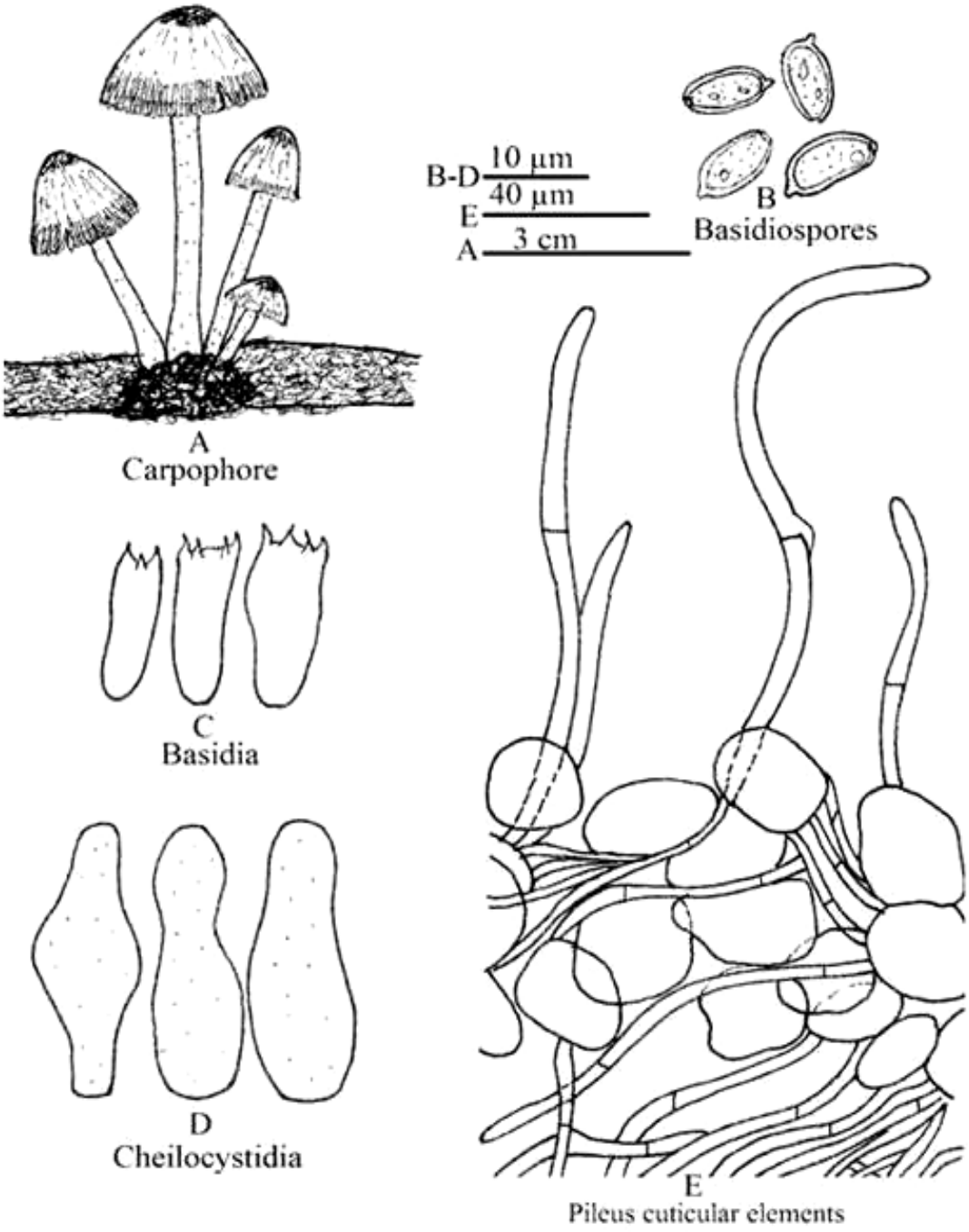

Fig.4. A-F- ***Psathyrella pseudocandolleana*** **A. H. Smith**

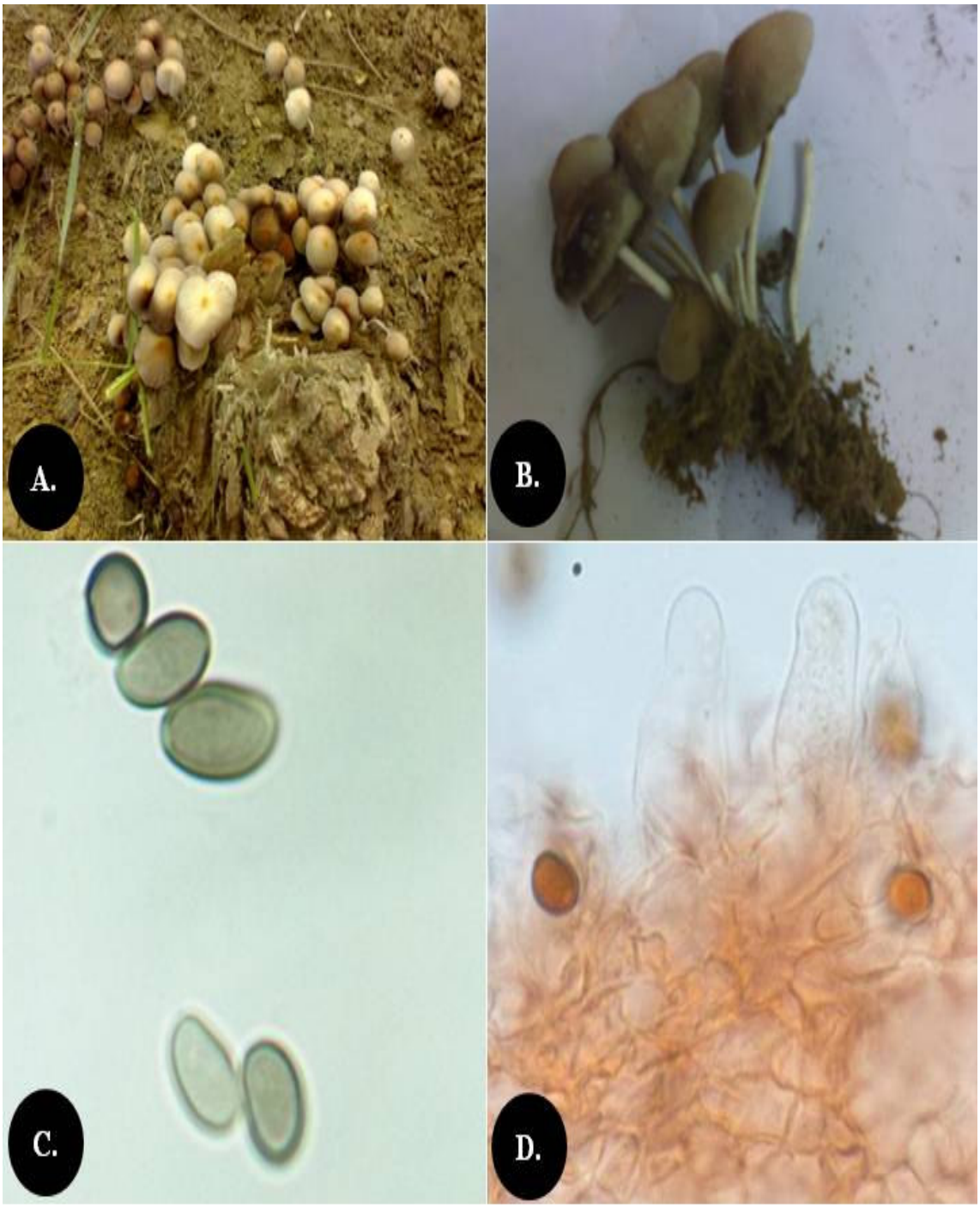

Fig.5. A-D. ***Psathyrella pseudocandolleana*** **A. H. Smith;** A-Photograph showing gregarious growth of carpophores on wooden log, B- Carpophores in caespitose cluster, C- Microphotograph showing fading of basidiopores in H_2So_4, D- C.S. through gill edges showing cheilocystidia.

Distribution and ecology: This species found in University of Michigan, as growing gregariously on sand at the edge of a wood during the month of July by A. H. Smith (1972).

Collection examined: India, Punjab, Sangrur, Nadampur (231m), growing gregarious in caespitose clusters on dead wood and on leaf litter, Harwinder Kaur and Jagdeep Kaur, 26 August 2009, PUN 4090.

Remarks: The details of above examined collection match with those given for *Psathyrella pseudocandolleana* A. H. Smith by A.H. Smith (1972). The distinctive features of this species are slightly compressed spores grayish orange ($5B_3$) pileus turning to dark brown ($6F_4$) on drying and dark brown lamellae. This is a new fungus record from India. Smith (1972) has reported the presence of caulocystidia which are of rare occurrence, but in the present collection the caulocystidia are lacking. This species is not earlier known from India.

CONCLUSION

As these four species of genus *Psathyrella* viz. *Psathyrella naivashaiensis* Pegler, *P. longistriata* (Murrill) Smith, *P. obtusata* (Fr.) Smith and *P. pseudocandolleana* A.H. Smith are not earlier known from India and one new variety of *Psathyrella naivashaiensis* Pegler var. *macrospora* var. nov. is here by reported as new to science. Hence, these are new records for the country.

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