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# The lichen genus *Parmentaria* from Indian subcontinent

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&  
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## RÉSUMÉ

UPRETI, D. K. & A. SINGH (1988). Le genre de lichens *Parmentaria* dans le subcontinent indien. *Candollea* 43: 109-121. En anglais, résumés français et anglais.

Onze espèces du genre *Parmentaria* sont décrites en détail pour le subcontinent indien. *Parmentaria anamalaiense*, *P. ceylonense* et *P. indica* sont décrites comme de nouvelles espèces.

## ABSTRACT

UPRETI, D. K. & A. SINGH (1988). The lichen genus *Parmentaria* from Indian subcontinent. *Candollea* 43: 109-121. In English, French and English abstracts.

Eleven species of the genus *Parmentaria* are described in detail from the Indian subcontinent. *Parmentaria anamalaiense*, *P. ceylonense* and *P. indica* are described as new species.

## Introduction

The first report of *Parmentaria* from the Indian subcontinent in form of *Pyrenastrum americanum* Sprengel (= *Parmentaria astroidea* Fée) from Carnatic, South India came from BÉLANGER (1834). LEIGHTON (1869) in his enumeration of lichens from Sri Lanka (Ceylon) included the same taxon as *Verrucaria aspistea* var. *astroidea* Fée (= *Parmentaria astroidea* Fée) and STIRTON (1876) added one more species, *Astrothelium interlatens* (Nyl.) Stirton (= *Parmentaria interlatens* (Nyl.) Müll. Arg.) to the list of lichens of that country. Lastly, in the 19th century, STIRTON (1881) discovered *Verrucaria assamiensis* Stirton, in a collection made by A. Watt from Assam, which was re-named by ZAHLBRUCKNER (1922) as *Parmentaria* (?) *assamiensis* (Stirton) Zahlbr. It was, however, transferred to *Anthracothecium* by SINGH (1982), proposing a new combination *Anthracothecium assamiensis* (Stirton) A. Singh. Till 1983, thus, only two species of *Parmentaria* from this vast region were on record.

On the basis of investigations of old as well as recent collections of lichens from the Indian subcontinent, it has been realized that this region is after all not that poor in the representation of *Parmentaria* species as projected by the literature.

This work includes eleven species of *Parmentaria* from the Indian subcontinent, that are keyed and described in detail.

## Taxonomic account

*Parmentaria* a stromatoid pyrenocarpous genus was placed in *Astrotheliaceae* by ZAHLBRUCKNER (1926). This family was characterized by radially arranged,  $\pm$  horizontally or obliquely placed perithecia opening laterally by their individual lateral ostiolar canals into a common central ostiole of the stroma or through individual separate ostioles converging to the centre of the stroma. This family could not sustain its identity in light of later works and the five rather

unrelated genera included in it were distributed to other families, to which they show affinity. Stroma, discarded as an important character at family level by Zahlbruckner (l.c.) seems to have lost its significance but remains the uniting factor of species at the generic level.

In recent classification, HALE (1967) placed *Parmentaria* along with *Anthracothecium* in family *Arthopyrenaceae*, the only family belonging to order *Pleosporales*, which is characterised by well defined pseudothecia, resembling perithecia and asci  $\pm$  regularly arranged in stromatic layer. VĚZDA (1968), POELT (1973) and HESSEN & JAHNS (1974) placed *Parmentaria* in *Pyrenulaceae*, that also includes *Anthracothecium*. *Parmentaria* and *Anthracothecium* exhibit similar basic character of ascocarps, paraphysoid threads, asci and spores and show close affinity to each other. It is also evident from the fact that they have been placed in the same family by later workers.

### Key to the *Parmentaria* species from the Indian subcontinent

1. Ostioles of different ascocarps in a stroma converging and uniting into one single ostiole of the stroma before communicating with the exterior ..... 2
- 1a. Ostioles of different ascocarps in a stroma converging at the centre of stroma but remaining separate and each ascocarp communicating independently with the exterior ..... 5
2. Asci 8-spored ..... **3. *P. astroidea***
- 2a. Asci 2-spored ..... 3
3. Stroma deeply embedded in thallus ..... **8. *P. keralensis***
- 3a. Stroma situated in  $\pm$  hemispherical thalline verrucae ..... 4
4. Spore cells parenchymatously arranged, i.e., primary septa indistinct.... **6. *P. indica***
- 4a. Spores with distinct 12-18 primary septa ..... **7. *P. interlatens***
5. Spores 60  $\mu$ m or more long ..... 6
- 5a. Spores 50  $\mu$ m or less long ..... 7
6. Stroma deeply embedded in thallus, spores with 14-18 transverse tiers of cells  
**1. *P. anamalaiense***
- 6a. Stroma situated in convex thalline verrucae, spores with 8-10 transverse tiers of cells  
**10. *P. oligocarpa***
7. Ostiolar plate mamillate to conico-depressed ..... 8
- 7a. Ostiolar plate flat ..... 10
8. Ascocarps covered with thallus and of thalline colour or covered with thick corticiform layer and blackish ..... **5. *P. immersa***
- 8a. Ascocarp naked and black..... 9
9. Ascocarps 1.0-1.2 mm in diam. .... **4. *P. ceylonense***
- 9a. Ascocarps up to 0.7 mm in diam. .... **9. *P. mamillata***
10. Stroma 2(-3)-carpous ..... **2. *P. andamanica***
- 10a. Stroma mostly 4-7-carpous ..... **11. *P. pluricarpa***

#### **1. *Parmentaria anamalaiense* Upreti & A. Singh, spec. nov.**

**Type:** India: Kerala, Anamalai hills, Thenmalai, 24.1.1976, Patwardhan & Nagarkar 76487B (AMH! Holotype) (growing along the holotype of *Anthracothecium megaspermum*, leg. Patwardhan & Nagarkar 76487A) (Figs. 1, 12 & 23).

Thallus corticolous, endophloedus, stramineus, laevigatus. Stromata 1-3 carpa, omnia thallina immersa, distingubilis 1-3 brunnene punctatus ostiolis in minutuae papillae in pagina thallina. Ascocarpia oblique ampulliformis, perithecium fuliginosum, asci clavatae, 8-spori; spora brunneolae, ellipsoidae vel nonnihil oblongo-ellipsoidae, murali divisae, cells 14-18 serie transversatis dispositis, 5-8-septatae, 60-90  $\mu\text{m}$  longae, 30-35  $\mu\text{m}$  crassae.

Thallus corticolous, endophloedal, straw-coloured, smooth, 60-80  $\mu\text{m}$  thick, K-, C-, KC-, P-, hypothallus indistinct.

Stromata 1-3-carpous, ca. 1.5 mm in diameter, immersed, discernible by 1-3 brown punctate ostioles situated at the centre of minute papillae on the thalline surface. Ascocarps 900  $\mu\text{m}$  long, 400  $\mu\text{m}$  broad, obliquely flask-shaped with a slightly curved neck, each opening independently, wall black and carbonaceous, 80-100  $\mu\text{m}$  thick at sides, colourless near ostiole and with heavy deposition of colourless crystals in this region; nucleus I + vinose red, without oil globules; paraphysoid threads simple; asci clavate, 8-spored, 290-320  $\times$  45-50  $\mu\text{m}$ ; spores uni- or sometimes biseriatae in ascus, brown, ellipsoid to somewhat oblong-ellipsoid, multicelled-muriform, cells arranged in 14-18 transverse tiers, with up to 7 cells in each, with 5-8 primary septa, 60-90  $\times$  30-35  $\mu\text{m}$ .

#### Remarks

*P. anamalaiense* resembles *P. oligocarpa* in thallus colour, independent ostiolar opening for each ascocarp in the stroma and spore size. The latter, however, has superficial and dull black ascocarps in contrast to those of the former that are deeply immersed in thallus and thus  $\pm$  vertical in orientation. Number of transverse tiers of cells in *P. oligocarpa* is 8-10 whereas in *P. anamalaiense* are 14-18 in number.

Known from the type collection only.

## 2. *Parmentaria andamanica* A. Singh, Feddes Repert. 96: 266. 1985.

**Type:** India: Andaman Islands, South Andaman Island, Port Blair, on twigs, *Singh 78802* (LWG! Holotype) (Figs. 2, 13 & 24).

Thallus corticolous, endophloedal, buff to straw-coloured, smooth, 80-100  $\mu\text{m}$  thick, K-, C-, KC-, P-, hypothallus as a black-line, bordering the thallus.

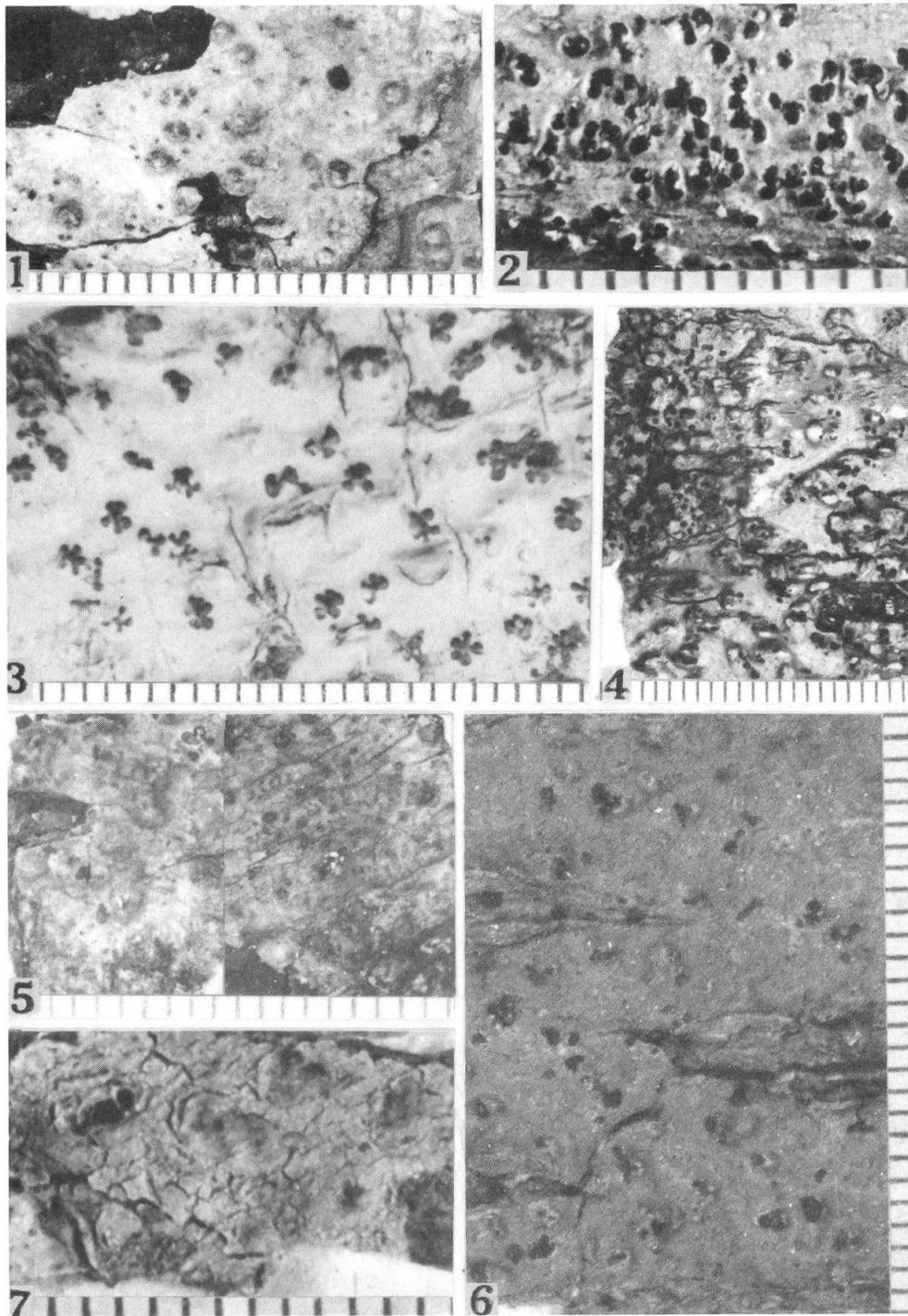
Stromata up to 1.5 mm in diameter, 2(-3)-carpous, ascocarps radially arranged, 0.6-0.7 mm in diameter, ca. 700  $\mu\text{m}$  long from bottom to top, immersed, later emerging and convex, becoming naked and black, ostioles converging at the centre of stroma but opening separately and situated on a plain to slightly raised, pale or brown to blackish, circular platform; perithecium black and carbonaceous, with or without moderate deposition of colourless crystals, 60-150  $\mu\text{m}$  thick at top and sides, 200-250  $\mu\text{m}$  thick at bottom (i.e. opposite ostiole); nucleus I + vinose red, without oil globules; paraphysoid threads simple; asci clavate to cylindrical, 8-spored, 174-200  $\times$  30-33  $\mu\text{m}$ ; spores uniseriate in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8-transverse tiers, with 1-3 cells in each, with 7 primary septa, 35-48  $\times$  15-20  $\mu\text{m}$ .

#### Remarks

*Parmentaria andamanica* resembles *Parmentaria ravenelii*, but the latter differs in having larger number (up to 5) of ascocarps in a stroma, that are invariably covered with corticiform layer of thallus, and in larger spores, measuring up to 60  $\mu\text{m}$  long.

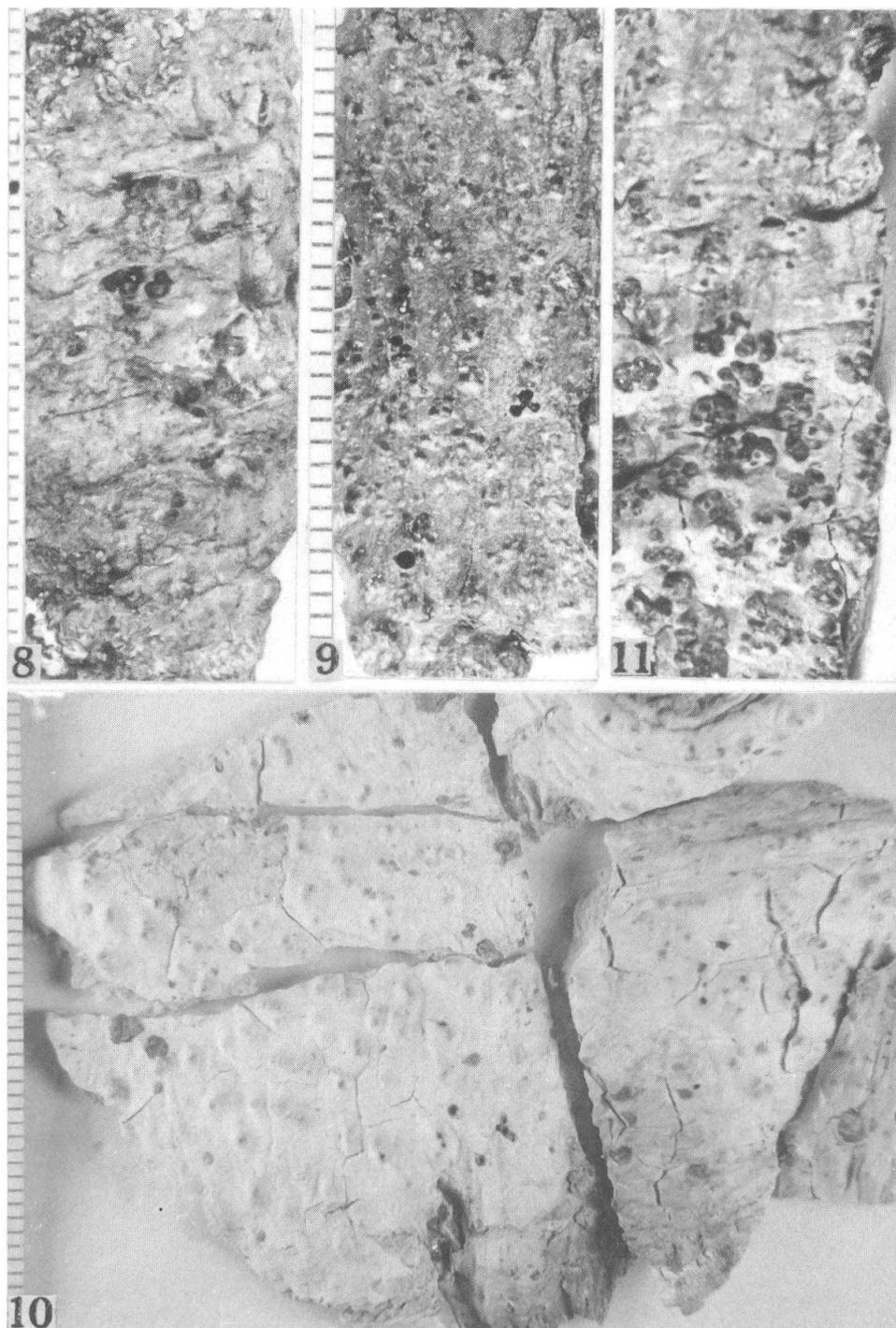
#### Additional specimen examined

India: Andaman Islands, Long Island, *Singh 52954* (LWG); South Andaman Island, Port Blair, *Singh 68983* (LWG).

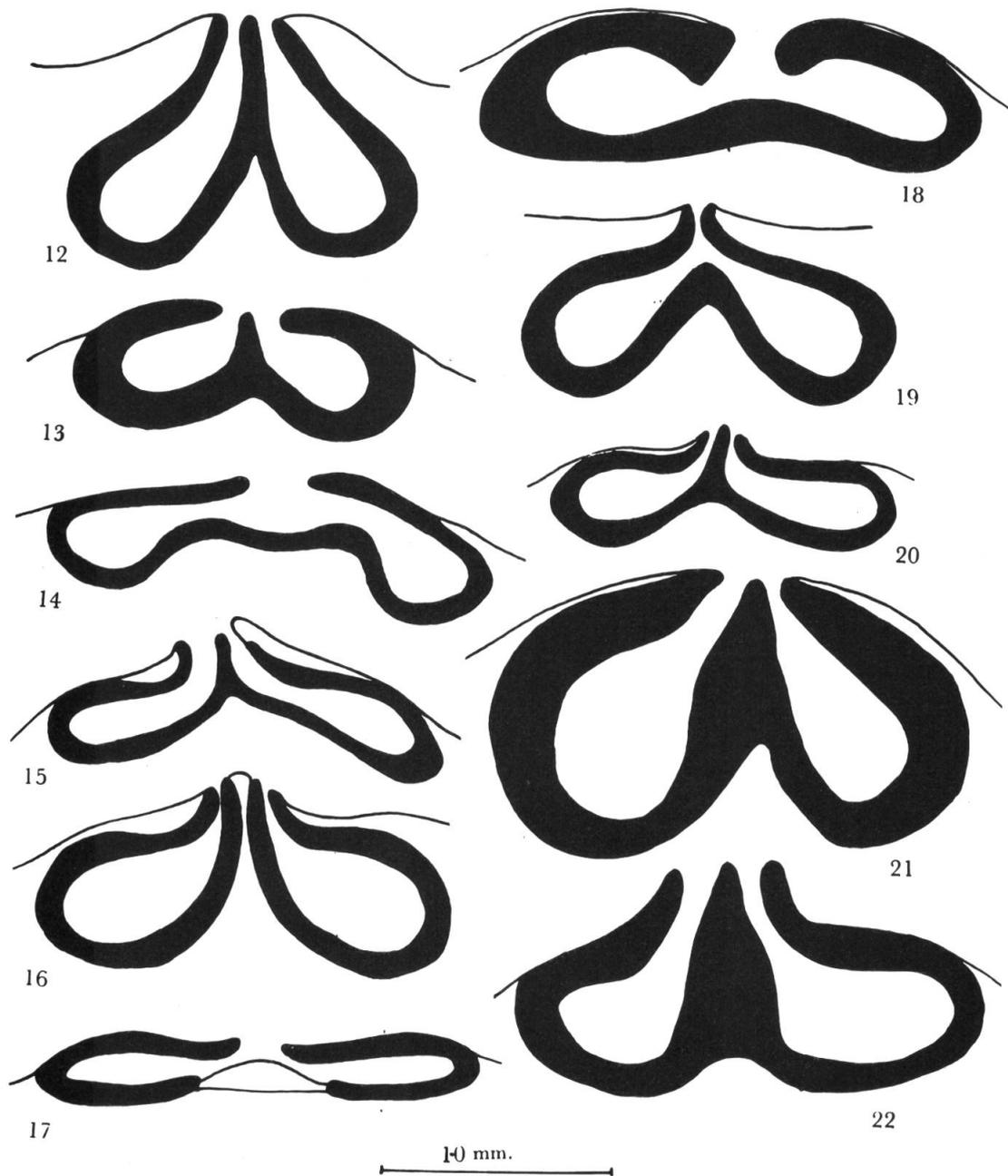


Figs. 1-7. — Habit (scale 1 division = 1 mm).

1, *Parmentaria anamalaiense*; 2, *P. andamanica*; 3, *P. astroidea*; 4, *P. ceylonense*; 5, *P. immersa*; 6, *P. indica*; 7, *P. interlatens*.

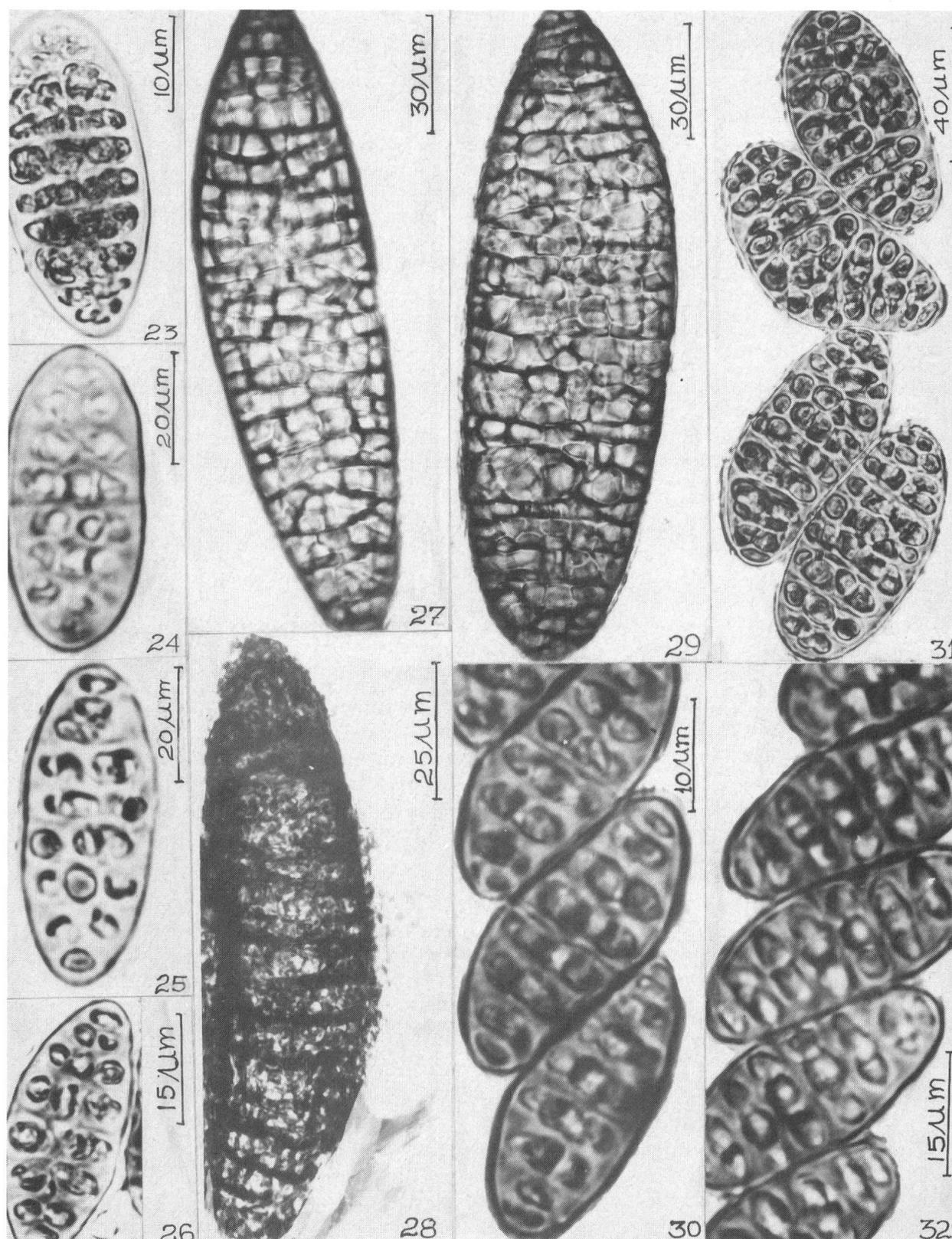


Figs. 8-11. — Habit (scale 1 division = 1 mm).  
8, *P. keralensis*; 9, *P. mamillata*; 10, *P. oligocarpa*; 11, *P. pluricarpa*.



Figs. 12-22. — Vertical section of ascocarps.

12, *Parmentaria anamalaiense*; 13, *P. andamanica*; 14, *P. astroidea*; 15, *P. ceylonense*; 16, *P. immersa*; 17, *P. indica*; 18, *P. interlatens*; 19, *P. keralensis*; 20, *P. mamillata*; 21, *P. oligocarpa*; 22, *P. pluricarpa*.



Figs. 23-32. — Spores.

23 *Parmentaria anomalaiense*; 24, *P. andamanica*; 25, *P. astroidea*; 26, *P. ceylonense*; 27, *P. indica*; 28, *P. interlatens*; 29, *P. keralensis*; 30, *P. mamillata*; 31, *P. oligocarpa*; 32, *P. pluricarpa*.

### 3. *Parmentaria astroidea* Fée, Essai sur les Cryptogames des écorces officinales: xci et 70. 1824.

**Type:** not seen (Figs. 3, 14 & 25).

Thallus corticolous, endophloedal, buff, smooth, 97-150  $\mu\text{m}$ , thick, K-, C-, KC-, P-, hypothallus indistinct.

Stromata up to 2 mm in diameter (2-)4-6-carpous; ascocarps radially arranged, 0.5-0.7 mm in diameter, 700-800  $\mu\text{m}$  from bottom to ostiole, naked and black occasionally partly to  $\pm$  completely covered with thallus, obliquely placed and an obliquely running ostiolar canal leading to a common cavity (where other ostiolar canals of the stroma also open) communicating with the exterior by an apical pore; perithecium black and carbonaceous, 50-100  $\mu\text{m}$  thick all-round; nucleus I + vinose red, without oil globules; asci clavate, 8-spored, 195-210  $\times$  36-40  $\mu\text{m}$ ; spores biserial in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8(-12) transverse tiers, 37-45  $\times$  15-20  $\mu\text{m}$ .

#### Remarks

*P. astroidea* seems to be close to *P. baileyi* Müll. Arg. but the latter is reported to have the maximum of 4 ascocarps in a stroma as compared to up to ten (TUCKERMAN, 1958) in the former. *P. astroidea* has slightly larger spores than *P. baileyi*. Another species that shows superficial resemblance to *P. astroidea* is *P. subastroidea* Müll. Arg., but the latter is characterised by 2-spored asci.

#### Specimen examined

Sri Lanka (Ceylon); Central Province, *Thwaites CL 93C* (BM).

### 4. *Parmentaria ceylonense* Upreti & A. Singh, spec. nov.

**Type:** Sri Lanka (Ceylon), no precise locality, *Thwaites* s.n. (*Leighton 187*) (BM: holotype) annotated as *Verrucaria aspistea* Fée (non Ach.) var. *astroidea* and *Anthracothecium libricolum* Müll. Arg. (Figs. 4, 15 & 26).

Thallus corticolous, endophloedus, bubalinus, ochraceus vel brunneolus, laevigatus. Stromata 1.5-1.8 mm diam., 2-6-carpa, convexa. Ascocarpia 1-1.2 mm diam.,  $\pm$  pyriformis, convexa, denudata, nigra, ostiolis a unusquisque ascocarpum e stroma convergens sed remanens discretis; perithecium fuliginosum, asci clavati, 8-sporei; sporae fuscae, ellipsoidae, muraliter divisae, cellulis 8-seriatis transversaliter dispositis, 27-36  $\mu\text{m}$  longae, 9-14  $\mu\text{m}$  crassae.

Thallus corticolous, endophloedal, straw-coloured, ochre to brownish, smooth, 110-130  $\mu\text{m}$  thick, K-, C-, KC-, P-, hypothallus indistinct.

Stromata 1.5-1.8 mm in diameter, 2-6-carpous, convex; ascocarps 1-1.2 mm in diameter,  $\pm$  pyriform, narrow towards ostiole and broad outward, up to 1100  $\mu\text{m}$  from bottom to ostiole,  $\pm$  immersed when young, emerging later, convex, naked and black, each with its separate ostiole, ostioles converging and situated on central, slightly raised, concolorous to thallus or of darker shaded platform; perithecium black and carbonaceous, with deposition of colourless crystals at non-carbonized ostiolar region, 35-50  $\mu\text{m}$  thick at sides, 100-120  $\mu\text{m}$  thick at bottom (opposite ostiole); nucleus I + vinose red, without oil globules; paraphysoid threads simple; asci clavate, 8-spored, 110-135  $\times$  27-30  $\mu\text{m}$ ; spores uni- or biserial in ascus, brown, ellipsoid, multi-celled muriform, with 8-transverse tiers of cells, with 2-3 cells in each, 27-36  $\times$  9-14  $\mu\text{m}$ .

#### Remarks

*P. ceylonense* differs from *P. astroidea* Fée to which it was earlier annotated by means of its ostioles which like the latter species converge to the centre of the stroma but unlike it open separately to the exterior. In this respect *P. ceylonense* resembles *P. ravenellii* (Tuck.) Müll. Arg., *P. andamanica* and *P. mamillata*, but differs from them in its larger ascocarps which in *P. andamanica* and *P. mamillata* are up to 0.7 mm in diameter and in *P. ravenellii*, is up to 0.9 mm in diameter.

Known from the type collection only.

**5. *Parmentaria immersa*** (Patw. & Makhija) A. Singh, *Nova Hedwigia* 44(3-4): 373-375. 1987  
= *Anthracothecium immersum* Patw. & Makhija, *Kavaka* 8: 22. 1980.

**Type:** India: Karnataka, Shimoga-dist., Sagar-Shimoga Road, Kalkoppa Forest, *Patwardhan & Kulkarni* 78-2872 (AMH! Holotype) annotated as *Anthracothecium immersum* by Patwardhan & Makhija (Figs. 5 & 16).

Thallus endophloedal, yellow-brown to brownish, smooth to verrucose, 60-150  $\mu\text{m}$  thick, verruca present in association with stroma, K-, C-, KC-, P-, hypothallus indistinct.

Thalline verruca always fertile, each enclosing a single stroma; stromata 1.5-1.75 mm in diameter, 3-4-carpous; ascocarps 0.5-0.75 mm in diameter, ca. 750  $\mu\text{m}$  long from bottom to ostiole, completely embedded in thalline verruca and concolorous to thallus or covered with thick corticiform layer and blackish, ostioles rather indistinct, converging but opening separately on a prominent protuberance of thalline colour; perithecium black and carbonaceous, 80-160  $\mu\text{m}$  thick at sides and 40-70  $\mu\text{m}$  thick at top; nucleus I —, without oil globules; paraphysoid threads simple; asci cylindrical, 8-spored, 205-210  $\times$  20-25  $\mu\text{m}$ , spores uniseriate in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8(-4) transverse tiers, 1-3 cells in each, with 7 primary septa, 25-40  $\times$  10-18  $\mu\text{m}$ .

*Remarks*

*P. immersa* closely resembles *P. mamillata* in many characters including the ostiolar plate, which is raised as a protuberance or as a mamillate structure. The stromata in *P. immersa*, however, are completely immersed in the thalline wart and are concolorous to thallus or are sometimes covered with thick corticiform layer of thallus and are dull black, which in *P. mamillata* are naked and black.

Known from the type collection only.

**6. *Parmentaria indica*** Upreti & A. Singh, *spec. nov.*

**Type:** India: Arunachal Pradesh, Dibang Valley dist., Shantipur, alt. ca. 500 m, 6.6.1984, *Upreti* L81777 (LWG! Holotype) (Figs. 6, 17 & 27).

Thallus corticolous, endophloedus, laevigatus, flavide-fuscescentus. Stromata 1-3-carpa, 1.8-2 mm diam., convexa, orbiculata vel 2-3 labata, omnia strata thallina velata et thallina concolorata, interdum thallina non algifera obducta et nigra; ascocarpia 0.8-1 mm diam., pyriformia, ostiolum commune fuscum; perithecium fuliginosum, asci 2-spore; sporae fuscae, oblong-ellipsoidae, muraliter divisae, cellulia parenchymaticodispositis, 135-175  $\mu\text{m}$  longae, 40-50  $\mu\text{m}$  crassae.

Thallus corticolous, endophloedal, yellow-brown, smooth, 60-130  $\mu\text{m}$ , K-, C-, KC-, P-, hypothallus indistinct.

Stromata embedded in thalline warts, 1.8-2 mm in diam., 1-3-carpous, circular in outline or 2-3 lobate, ostioles one for each stroma, centrally located, laterally located in 1-carpous stroma, prominent, generally brown, ascocarps radially arranged, 0.8-1 mm in diam.,  $\pm$  pyriform, with their narrow end towards the ostiole, completely embedded in and concolours with thallus, sometimes covered with corticiform layer only and then  $\pm$  dull black, each ascocarp opening laterally through a canal to the common ostiole; perithecium black and carbonaceous, 40-70  $\mu\text{m}$  thick at top and 60-120  $\mu\text{m}$  thick at sides, indistinct at bottom; nucleus I —, without oil globules; asci clavate, 2-spored, 170-220  $\times$  45-50  $\mu\text{m}$ ; spores brown, oblong-ellipsoid, multi-celled muriform, cells parenchymatously arranged, 135-175  $\times$  40-50  $\mu\text{m}$ .

*Remarks*

*P. indica* is characterized by lobed, completely covered stromata with a single ostiole, 2-spored asci and spores measuring 135-175  $\times$  40-50  $\mu\text{m}$ , with cells parenchymatously arranged. In genus *Parmentaria*, six species possess  $\pm$  similar characters but they differ from *P. indica* in the following manners. The spores of *P. gregalis* Müll. Arg., *P. grossa* Müll. Arg. and *P. subalpina* Müll. Arg. are smaller and their length ranges between 75 and 120  $\mu\text{m}$ . *P. subastroidea* and *P. toowoombensis*

Müll. Arg. with 2-spored asci and spores with parenchymatously arranged cells, have 4-6-carpous stromata and the ascocarps are naked and black. In *P. lyoni* Zahlbr. the stroma, though 2-3-carpous, are larger (2.5 mm in diam.) and the ascocarps are naked, black and nitidus, *P. interlatens*, the only other species with 2-spored asci reported from the Indian subcontinent (Sri Lanka) possesses 1-3-carpous stromata like *P. indica* but the spores of *P. interlatens*, though of the comparable size with those of *P. indica* have the cells arranged in numerous transverse tiers of cells and are with distinct 12-18 primary septa.

Known from the type collection only.

**7. *Parmentaria interlatens* (Nyl.) Müll. Arg., Flora 66: 244. 1883.**

= *Astrothelium interlatens* Nyl., Bull. Soc. Linn. Normandie, Ser. 2: 95: 1968.

**Type:** not seen (Figs. 7, 18 & 28).

Thallus, corticolous, endophloedal, ochre, smooth, up to 136 µm thick, nitidous, K-, C-, KC-, P-, hypothallus indistinct.

Stromata 1.5-2.5 mm in diameter, 1-3-carpous, ± round and unlobed or slightly bi- to tri-lobed (depending on the number of ascocarps present), completely covered with and concolorous to thallus or at places blackish due to corticiform covering only, with a common ostiole at centre in the form of a brown to blackish depression; ascocarps 1-1.5 mm in diameter, 700-800 µm from bottom to ostiole, each communicating by a lateral ostiolar canal with the central cavity opening to the exterior by an apical pore; perithecium black and carbonaceous, 125-250 µm thick, nucleus I —, without oil globules; asci clavate, 2-spored, 230-260 × 55-65 µm; spores brown, ellipsoid to oblong-ellipsoid, multi-celled muriform, cells arranged in numerous transverse tiers, with 12-18 prominent transverse primary septa, 90-160 × 32-50 µm.

*Remarks*

An annotation on the specimen sheet reads "Sp. 2, interdum 4 nae, fusif. ellip. fusae vel fusco nigrae, murali 160-200 × 38-42 µ". The spore size as per observations is smaller. *P. interlatens* is similar to *P. gregalis* Müll. Arg. in the character of stroma, being concolorous to thallus, but spores in the latter are characterized by 21-24 primary septa. *P. interlatens* is close to *P. pyrioidica* Müll. Arg. in outward resemblance, but the latter has 1-spored asci.

*Specimen examined*

Sri Lanka (Ceylon); Point de Galle, leg. illegible s.n. (BM).

**8. *Parmentaria keralensis* (Patw. & Makhija) A. Singh, Nova Hedwigia 44(3-4): 374. 1987.**

= *Anthracothecium keralense* Patw. & Makhija, Kavaka 8: 23. 1980.

**Type:** India: Kerala, Udabanchola, Cardamom hills, in evergreen rain forest, *Nagarkar & Gole* 76827 (AMH! Holotype) annotated as *Anthracothecium keralense* by Patwardhan & Makhija (Figs. 8, 19 & 29).

Thallus epiphloedal, ochre, smooth, 50-110 µm thick, undulate to irregularly verrucose (the last character to be attributed to the nature of the substratum and verrucae thus not associated with stroma), K-, C-, KC-, P-, hypothallus indistinct.

Stromata 1.5-2 mm in diameter, 2-4-carpous, completely embedded in thallus and not discernible externally, their position in the thallus being located by means of their ostioles, which are like minute brown to brownish-black circular, slightly depressed spots on the thalline surface; ascocarps 0.5-0.8 mm broad, 1200 µm from bottom to the lateral opening, deeply embedded in thallus; perithecium black and carbonaceous, 40-80 µm thick at top and 160-240 µm thick at sides; nucleus I —, with abundant oil globules; paraphysoid threads simple; asci clavate, 2-spored, 265-320 × 55-65 µm, spores brown, oblong-ellipsoid, multicelled muriform, cells ± parenchymatously arranged, 135-200 × 42-50 µm.

*Remarks*

*P. keralensis* shows affinity to *P. subastroidea* Müll. Arg. and *P. lyoni* in ascus and spore characters but the ascocarps in both the latter species are naked, black and nitidus.

Known from the type collection only.

**9. *Parmentaria mamillata*** A. Singh, Feddes Repert. 96: 266. 1985.

**Type:** Andaman Islands, South Andaman Island, Port Blair, on bark of *Mangifera indica*, Singh 78815 (LWG! Holotype) (Figs. 9, 20 & 30).

Thallus corticolous endophloedal, yellow-brown, smooth, 70-90  $\mu\text{m}$  thick,  $\pm$  nitidus, K-, C-, KC-, P-, hypothallus indistinct.

Stromata up to 1.5 mm in diameter, 2-4-carpous, ascocarps radially arranged, up to 0.7 mm in diameter, ca. 700  $\mu\text{m}$  long from bottom to ostiole, immersed, later emerging, convex, naked and black, each with separate ostiole, ostioles converging and situated on a central brown mamillate platform; perithecium black and carbonaceous, ca. 50  $\mu\text{m}$  thick at top and sides, ca. 150  $\mu\text{m}$  thick opposite the ostiole; nucleus I —, without oil globules; paraphysoid threads simple; asci clavate, 8-spored, 153-177  $\times$  28-40  $\mu\text{m}$ ; spores uniseriate in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8-10 transverse tiers, with 1-3 cells in each, with 7 primary septa, 20-40  $\times$  10-20  $\mu\text{m}$ .

*Remarks*

*P. mamillata* is easily identified by the presence of the mamillate structure at the centre of the stroma where all the converging ostioles open.

*Additional specimen examined*

India: Andaman Islands, South Andaman Islands, Port Blair, on bark of *Mangifera indica*, Singh 68988b (LWG).

**10. *Parmentaria oligocarpa*** A. Singh, Candollea 38: 460. 1983.

**Type:** India: Tamil Nadu, Madurai district, Shola near 9th mile on Kodaikanal-Berijam Road, alt. 2290 m, Foreau & Awasthi 4192 (AWAS! Holotype) (Figs. 10, 21 & 31).

Thallus corticolous, endophloedal, buff to straw-coloured, smooth, 125-160  $\mu\text{m}$  thick, K-, C-, KC-, P-, hypothallus indistinct.

Stromata (1-)2(-3)-carpous, up to 2 mm long, 1-1.5 mm broad, convex,  $\pm$  completely covered with and concolorous to thallus, only top part of individual ascocarps with a corticiform covering, blackish; ascocarps up to 1 mm in diameter, flask-shaped, each opening to the exterior independently through obliquely upward running ostiolar canal, all of which from a stroma, converging and each ending in an independent ostiole, ostioles situated on a thallus coloured or slightly darker-coloured,  $\pm$  circular, flat plate in form of (1-)2(-3) fine dots (depending on the number of ascocarps in the stroma); perithecium black and carbonaceous, with heavy deposition of colourless crystals, 200-225  $\mu\text{m}$  thick at top and sides, 100-150  $\mu\text{m}$  thick at bottom; nucleus I + vinose red, without oil globules; paraphysoid threads simple; asci clavate, 8-spored, 310-345  $\times$  55-70  $\mu\text{m}$ ; spores uni- or biseriate in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8-10 transverse tiers, 1-6 cells in each, with 7-9 primary septa, 70-92  $\times$  30-46  $\mu\text{m}$ .

*Remarks*

*P. oligocarpa* resembles *P. chilensis* Swinscow in thallus colour as well as in stromata and ostiolar characters, the two species differ in other details nonetheless. In *P. chilensis* the number of ascocarps in a stroma is 1-5. The asci are 4-8-spored, a character by virtue of which, as stated by IMSHAUG & HARRIS (1969), *P. chilensis* is well isolated in the genus.

Known from the type collection only.

### 11. *Parmentaria pluricarpa* A. Singh, Candollea 38: 462. 1983.

**Type:** India: Kerala, Mallapuram district, Calicut University campus, 23rd Jan. 1975, *Singh & Ranjan 102233b* (LWG! Holotype) (Figs. 11, 22 & 32).

Thallus corticolous, endophloedal, buff, smooth, 60-70  $\mu\text{m}$  thick, K-, C-, KC-, P-, hypothallus in the form of black line, partly surrounding the thallus.

Stromata (2-)4-7-carpous, up to 2 mm in diameter, immersed to emergent; ascocarps stellately arranged in the stroma, ca. 1 mm in diameter, immersed to emergent and convex to hemispherical, covered by thallus or completely naked, dull to shining black, opening through obliquely upward running ostiolar canals, all converging to the centre of stroma and each ending in an independent ostiole, ostioles situated on a pale or black,  $\pm$  circular plate, in form of (2-)4-7 dots (depending on the number of ascocarps in the stroma); perithecium black and carbonaceous, with moderate deposition of colourless crystals, 40-130  $\mu\text{m}$  thick; nucleus I + vinose red, without oil globules; paraphysoid threads unbranched; asci cylindrical to clavate, 8-spored, 155-180  $\times$  26-32  $\mu\text{m}$ ; spores uniseriate in ascus, brown, ellipsoid, multi-celled muriform, cells arranged in 8-transverse tiers, with 1-4 cells in each and with 7-primary septa, 28-38  $\times$  12-18  $\mu\text{m}$ .

#### Remarks

*P. pluricarpa*, somewhat resembles the new world species *P. ravenelii*. The two, however, differ in the following characters. The stroma in *P. pluricarpa* is a compact structure because of larger number of bigger ascocarps in it. That of *P. ravenelii* the stroma is (1-)2-3(-5)-carpous and presents rather a lax appearance. The ascocarps in the latter always remain covered with corticiform layer, which imparts a dull black coloration to them. The ostiolar plate in *P. pluricarpa* is brown in young stroma but turns black later on, but in *P. ravenelii* it always remains brown. The spores in the latter are larger, measuring 43-60  $\times$  15-22  $\mu\text{m}$ .

Known from the type collection only.

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