

A new species of *Lasiobolidium* from Californian soil

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Lasiobolidium gracile isolated from a soil sample collected from California, USA is described as a new species. This species is characterized by yellowish brown to reddish brown, nonostiolate ascomata with numerous, long straight appendages and a translucent peridium, subglobose to broadly clavate asci, hyaline to pale yellowish brown, ellipsoidal ascospores. It differs from the other species of *Lasiobolidium* in the straight and narrow appendages and the large ascospores. A key is presented separating the seven known species.

Key Words—cleistothecial ascomycete; *Lasiobolidium gracile*; soil fungus; taxonomy; USA.

The genus *Lasiobolidium* was erected by Malloch and Cain (1971) to accommodate *L. spirale* Malloch et Cain, which is a cleistothecial ascomycete with one-celled, hyaline, smooth ascospores. It is also characterized by coiled ascomatal initials, globose to subglobose, yellowish brown, appendiculate (helically coiled) ascomata, clavate, nonamyloid asci and ellipsoidal ascospores without a germ pore. Malloch and Cain (1971), recognizing the similarity between *Lasiobolidium* and *Cleistothelebolus* Malloch et Cain, considered them as the respective cleistothecial counterparts of the discomycetes *Lasiobolus* Sacc. and *Thelebolus* Tode: Fr. Both *Lasiobolidium* and *Cleistothelebolus* were placed along with *Eoterfezia* Atkinson, *Orbicula* Cooke, *Warcupia* Paden et Cameron in the Eoterfeziaceae (Malloch and Cain, 1971; Benny and Kimbrough, 1980; van Brummelen, 1994). *Lasiobolidium* has also been placed along with *Coprotiella* Jeng et Krug and *Warcupia* in the Pyronemataceae by some writers (Jeng and Krug, 1976; Malloch, 1994).

To date six species of *Lasiobolidium* have been described. *Lasiobolidium spirale*, the type species, was isolated from cow and horse dung in USA. Malloch and Benny (1973) added a second species, *L. orbiculooides*, from deer dung in California, which has subsequently been found in jackrabbit dung, USA, soil in Southern California, cultivated soil at a date palm plantation in Iraq and desert soil at Dunhuang in China (Horie et al., 1992; Anonymous, 1994; Ueda, personal communication). It differs from the type species in producing ascomata with wavy or irregularly coiled appendages, cylindrical asci and uniseriately arranged, oblate ascospores. Further taxa were added by Locquin-Linard (1983) and Moustafa and Ezz-Eldin (1989): e.g., *L. fallax* Locquin-Linard, isolated from camel dung in central Sahara, Africa; *L. helicoideum* Locquin-Linard, from goat dung in Arizona, USA; *L. recurvatum* Locquin-Linard, from gazelle dung in central Sahara, Africa; and *L. aegyptiacum* Moustafa et Ezz-Eldin, from coastal saline soil in North-Sinai, Egypt.

The first three are distinct species, while there is little to distinguish *L. aegyptiacum* from *L. orbiculooides*. The appendages in *L. fallax* were wavy as in *L. orbiculooides*, whereas the tightly coiled appendages of *L. helicoideum* are somewhat similar to those of *L. spirale*. On the other hand, *L. recurvatum* is easily distinguished on account of its almost straight appendages, which are contorted only near the base and circinated at the apex. Besides the morphology of their ascomatal appendages, the general features of the first three species are in producing clavate or ellipsoidal to subglobose asci and smaller ascospores. In the present paper, we describe a species which has a very diagnostic ascomatal appendage and ascospore morphology.

Taxonomy

Lasiobolidium gracile Yaguchi, Someya et Udagawa, sp. nov. Figs. 1, 2

Coloniae in agar cum decocto tuberorum et carotarum (PCA) effusae, floccosae, appressae vel arachnoideae, ex mycelio submerso tenui constantes, cum hyphis aeriis laxe obtectae; ascomata dispersa, rubro-brunnea vel latericia; reversum brunneo-aurantiacum vel cinnamomeum.

Ascomata superficialia vel immersa, dispersa, non ostiolata, flavo-brunnea vel rubro-brunnea, globosa vel subglobosa vel aliquantum irregularia, 145–500 μm diam praeter appendices exclusa, mollia, appendiculata; peridium translucidum, ex “textura intricata” et “textura angularis” compositum, multistratosum; stratum exterius ex cellulis subglobosis vel angulatis hyalinis 5–16 μm diam compositum; stratum interius hyalinum, prosenchymaticum; appendices hyalinae vel flavo-brunneae vel aurantio-brunneae, crassitunicatae, remote septatae, non ramosae, primum leves sed deinde saepe nodosae, rectae vel plus minusve sinuosae, 100–600(–1000) \times 2.5–3 μm , primum hyalinae, deinde flavo-brun-

neae. Asci vulgo 8-spori, subglobosi vel late clavati, $45-65 \times 35-45 \mu\text{m}$, brevi-stipitati, evanescentes, structura apicali destituti, cum iodo non reagentes. Ascosporae hyalinae vel dilute flavo-brunneae, unicellulares, late ellipsoideae, $(16-18-24 \times 12-18 \mu\text{m})$, incras-

satae, primum leves, maturitate subtiliter verrucosae, sine poro germinationis, sine vagina gelatinosa.

Mycelio vegetativo ex hyphis hyalinis, ramosis, saepe anastomosantibus, septatis, levibus, $3-10 \mu\text{m}$ diam composito. Anamorphosis abest.

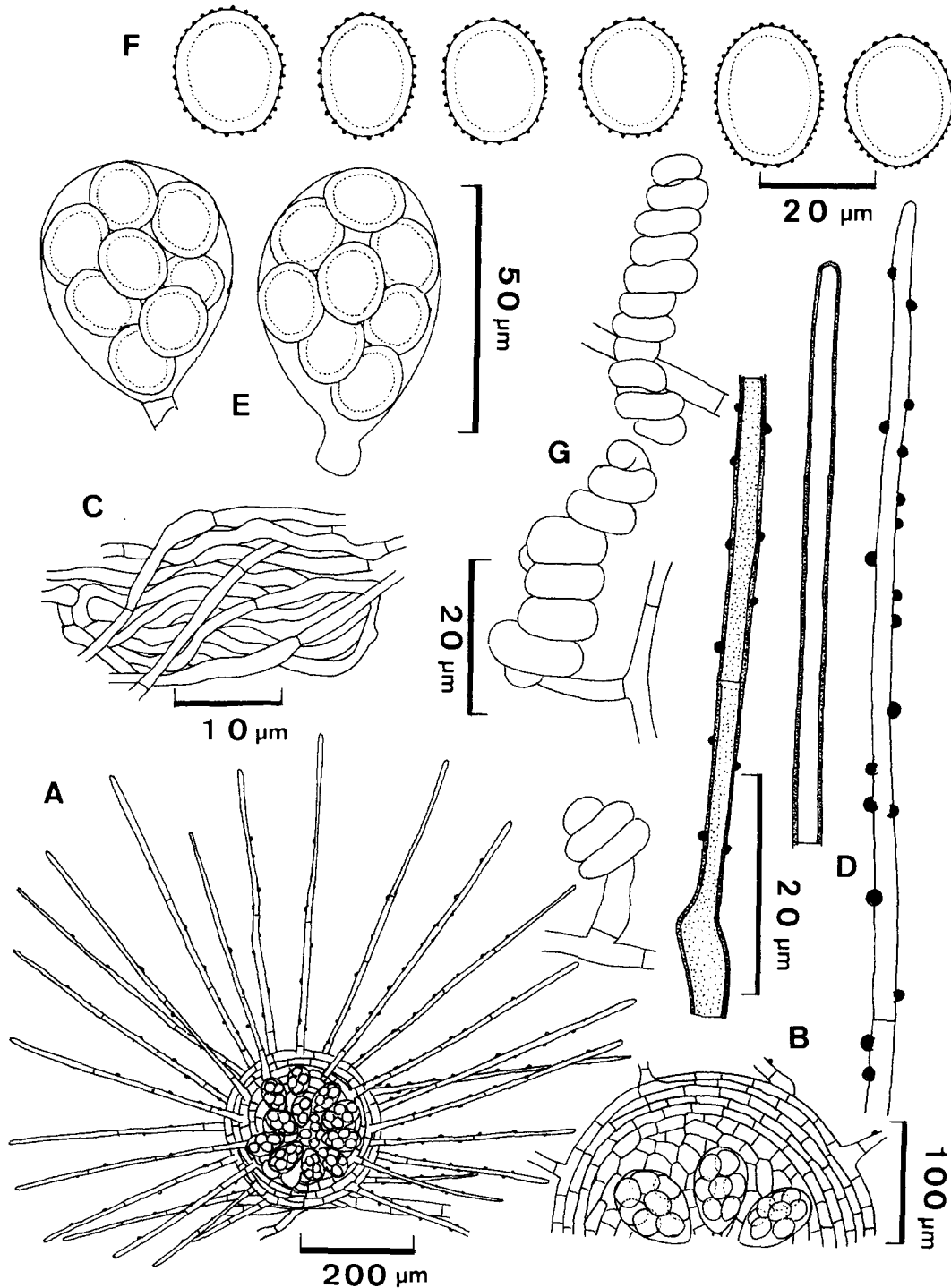


Fig. 1. *Lasiobolidium gracile*, PF 1173.

A. Ascomata. B. Part of lateral ascomatal wall. C. Part of inner layer of ascomatal wall. D. Ascomatal appendages. E. Asci. F. Ascospores. G. Ascomatal initials.

Holotypus: PF 1173, colonia exsiccata in cultura ex solo horti, San Francisco, California, USA, 22. v. 1995, a T. Yaguchi et A. Someya isolata et ea collectione fungorum Musei et Instituti Historiae Naturalis Chiba (CBM)

conservata.

Etymology: Latin, *gracilis*=slender, referring to the narrow appendages of the ascomata.

Colonies on PCA spreading broadly, attaining a di-

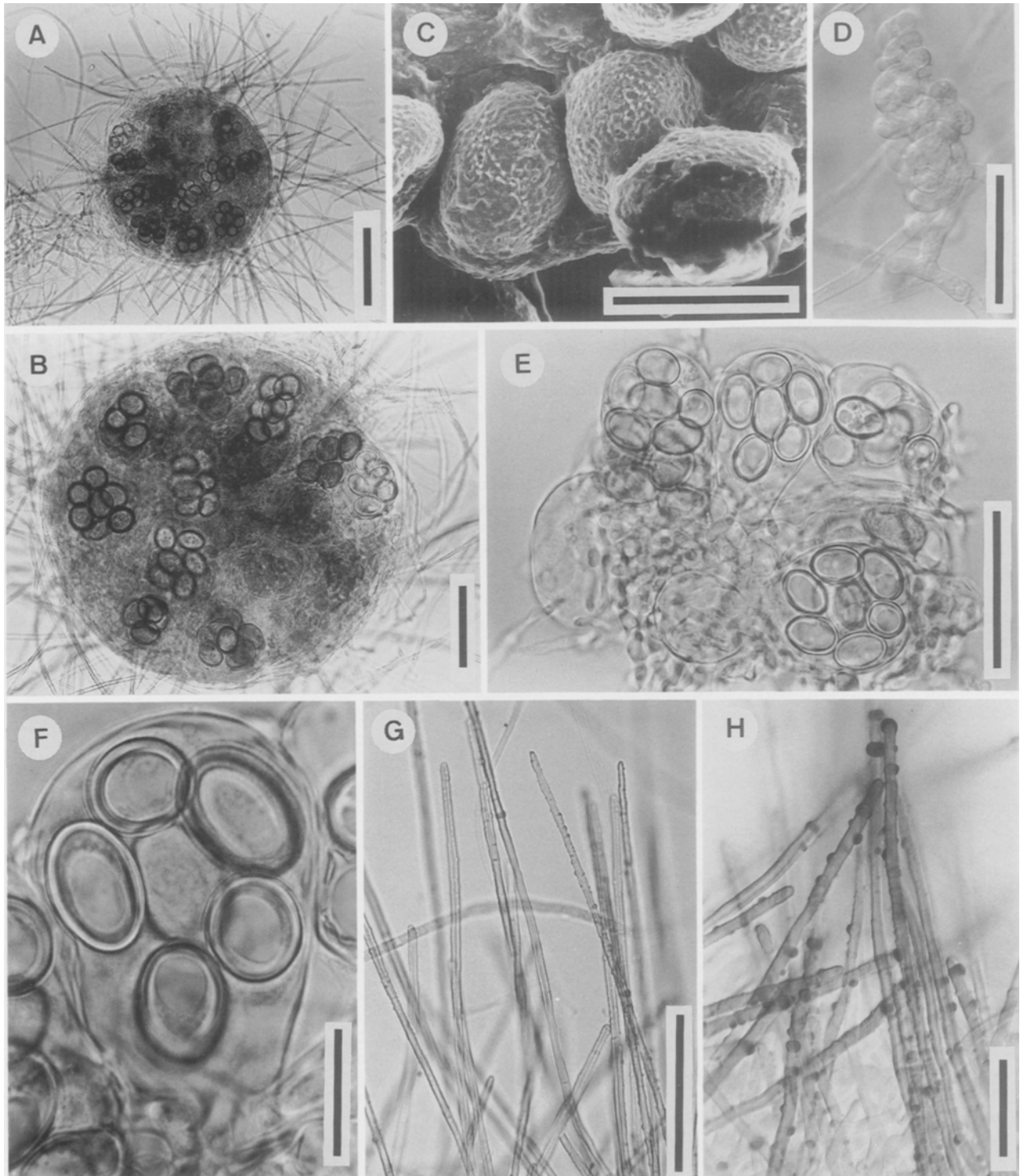


Fig. 2. *Lasiobolidium gracile*, PF 1173.

A, B. Ascomata. C. Ascospores (SEM). D. Ascomatal initial. E, F. Asci. G, H. Ascomatal appendages. Scale bars: A = 100 μm ; B, E, G = 50 μm ; C, D, F, H = 20 μm .

iameter of 85 mm or more in 7 d at 25°C, floccose, appressed to arachnoid, consisting of thin submerged mycelium, with loose aerial hyphae; ascomata scattered on the substratum, Reddish Brown (M. 8E4, after Korerup and Wanscher, 1978) or Dark Brick (Rayner, 1970); reverse centrally Brownish Orange (M. 6C4) or Cinnamon (R), uncolored at margin.

Colonies on cornmeal agar spreading broadly, attaining a diameter of 85 mm or more in 7 d at 25°C, largely submerged, with limited aerial hyphae, producing ascomata on the substratum or sometimes immersed into the agar, scattered as a Reddish Brown (M. 8D5) or Rust (R) mass; reverse uncolored.

Ascomata superficial or immersed, scattered, nonostiolate, yellowish brown to reddish brown, globose to subglobose, or somewhat irregular, 145–500 µm in diam excl. appendages, soft, hairy by numerous appendages; peridium translucent, indefinite in thickness, of texture intricata to textura angularis, multilayered; outer layer consisting of hyaline, subglobose to angular, 5–16 µm diam cells; and inner layer of hyaline, thin-walled, prosenchymatous cells; appendages arising from the outer peridial layer, evenly covered over the surface of the ascoma, hyaline to yellowish brown or orange brown, thick-walled, remotely septate, unbranched, at first smooth but later often nodulose by pigmented knots, straight or slightly sinuous, 100–600(–1000) × 2.5–3 µm, with a rounded end. Ascromatal initials appearing

in swollen branches from hypha, soon becoming spirally coiled. Asci at first hyaline, then yellowish brown, 8-spored (sometimes 4–6-spored), subglobose to broadly clavate, 45–65 × 35–45 µm, without apical structure, nonamyloid, borne on croziers, radially arranged from the centrum. Ascospores hyaline to pale yellowish brown, one-celled, broadly ellipsoidal, (16–)18–24 × 12–18 µm, thick-walled (2–3 µm thick), smooth when young, at maturity slightly warty owing to the epispore ornamentation, without germ pores; gelatinous material lacking.

Vegetative mycelium consisting of hyaline, branched, often anastomosed, septate, smooth-walled, 3–10 µm diam hyphae. Anamorph lacking.

At 37°C, growth rate is similar to the above, but ascromatal formation is reduced.

Specimen examined: PF 1173 (holotype), a dried culture derived from an isolate of garden soil, San Francisco, California, USA, 22 May 1995, isolated by T. Yaguchi and A. Someya. The holotype has been deposited with the Natural History Museum and Institute, Chiba, Japan (CBM).

The new species differs from the other members of *Lasiobolidium* in having straight and narrower ascromatal appendages and large, broadly ellipsoidal, slightly warty ascospores. It is most similar to *L. recurvatum* (Locquin-Linard, 1983), but that species has broader (4–8 µm in diam), uncinuate, aseptate ascromatal appendages and smaller ascospores (8–10(–11) × (5–)5.5–7(–7.5) µm).

Key to the species of *Lasiobolidium*

1. Asci cylindrical; ascospores uniseriately arranged2
1. Asci clavate to ellipsoidal or subglobose; ascospores biseriately arranged3
2. Ascromatal appendages wavy to irregularly coiled; ascospores oblate, 9.8–14 × 9–12 µm*L. orbiculoides*
2. Ascromatal appendages wavy to loosely coiled; ascospores ellipsoidal, 11–12 × 8–9 µm*L. aegyptiacum*
3. Ascromata with helically coiled appendages4
3. Ascromata with straight, wavy, irregularly coiled, or uncinuate appendages5
4. Asci clavate, 35–62 × 12–21 µm; ascospores broadly ellipsoidal, 12–17 × 9–12 µm*L. spirale*
4. Asci subglobose to ellipsoidal or broadly clavate, 18–20 × 14–16 µm; ascospores ellipsoidal, 8–9 × 5–6(–7) µm*L. helicoideum*
5. Ascromatal appendages straight, 2.5–3 µm broad, septate; asci subglobose to broadly clavate, 45–65 × 25–45 µm; ascospores large, (16–)18–24 × 12–18 µm*L. gracile*
5. Ascromatal appendages wavy or irregularly coiled or uncinuate; ascospores small, mostly 9–10 × 5.5–7 µm6
6. Ascromatal appendages wavy or irregularly coiled, up to 2 mm long and 5.5–9 µm broad, septate*L. fallax*
6. Ascromatal appendages uncinuate, 400–500 × 4–8 µm, aseptate*L. recurvatum*

Literature cited

- Anonymous. 1994. List of cultures—Fungi and yeasts. 33rd ed. Centraalbureau voor Schimmelcultures, Baarn-Delft, The Netherlands.
- Benny, G. L. and Kimbrough, J. W. 1980. A synopsis of the orders and families of Plectomycetes with keys to genera. *Mycotaxon* 12: 1–91.
- Brummelen, J. van. 1994. Problems in the systematics of Pezizales. In: *Ascomycete systematics. Problems and perspectives in the Nineties*, (ed. by Hawksworth, D. L.), pp. 303–314. Plenum Press, New York.
- Horie, Y., Udagawa, S. and Abdullah, S. K. 1992. Taxonomic study on soil-borne Ascomycetes from Iraq. *J. Nat. Hist. Mus. Inst., Chiba* 2: 31–36.

- Jeng, R. S. and Krug, J. C. 1976. *Coprotiella*, a new cleistocarpous genus of the Pyrenomataceae with ascospores possessing de Bary bubbles. *Mycotaxon* 4: 545–550.
- Korerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd ed., Eyre Methuen, London.
- Locquin-Linard, M. 1983. Trois nouvelles especes coprophiles de *Lasiobolidium* Malloch et Cain (Ascomycetes, Eotereziaceae). *Cryptog. Mycol.* 4: 283–290.
- Malloch, D. 1994. Outline of the Ascomycetes. Discussion 7. Pezizales. In: *Ascomycete systematics. Problems and perspectives in the Nineties*, (ed. by Hawksworth, D. L.), pp. 397–401. Plenum Press, New York.
- Malloch, D. and Cain, R. F. 1971. Four new genera of cleistothecial Ascomycetes with hyaline ascospores. *Can. J. Bot.* 49: 847–854.
- Malloch, D. and Benny, G. L. 1973. California Ascomycetes:

four new species and a new record. *Mycologia* **65**: 648–660.

Moustafa, A. F. and Ezz-Eldin, E. K. 1989. *Lasiobolidium aegyptiacum*, a new ascomycete from Egyptian soils. *Mycol.*

Res. **92**: 376–378.

Rayner, R. W. 1970. A mycological colour chart, Commonwealth Mycological Institute, Kew and British Mycological Society.