

# MYCOTAXON

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## Lepiotaceous fungi in California, U.S.A. – 2.

### *Lepiota rhodophylla* sp. nov.

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**Abstract** — A new *Lepiota* species with spurred spores and a pileus covering made up of repent hyphae is described from a *Cupressus macrocarpa* stand in central coastal California. Thick pinkish lamellae and sturdy pink-lilac brown basidiocarps are striking macroscopical characters of this species.

**Key words** — biodiversity, native forest, *Agaricaceae*, steno-spored species

### Introduction

Stands of *Cupressus macrocarpa* and of *Sequoia sempervirens* in coastal California are rich in lepiotaceous species (white-spored members of the family *Agaricaceae*) (e.g. Vellinga 2004; Sundberg 1971, 1989; Largent 2000), though many have not been recognized as separate species in the past (e.g. the species of *Leucoagaricus* sect. *Rubrotincti*). A high number of these species may grow together in a small area, such as a single Monterey cypress stand in the San Francisco Watershed (Vellinga 2004), where 25 species were encountered in the 2002/2003 mushroom season. Reasons for this phenomenon may be found in the absence of competition from ectomycorrhizal fungi, temporal differences in growth optimum for the species involved, and specialization to different micro-habitats by individual species (see also Vellinga 2004).

During fieldwork in this area in the mushroom seasons of 2000 and 2002/2003 a striking *Lepiota* species with pink lamellae was found. It is here described as new.

### Materials and methods

Standard methods for describing the basidiocarps were applied, using the terminology of Vellinga (2001). Colour annotations in the macroscopical descriptions are from Munsell soil color charts (1975). The notation [80, 5, 5]

indicates that measurements were made on 80 spores in five samples in five collections. Spores were measured in Congo Red in ammonia. The length of the spores is measured from bottom of spur to top of spores; the width of the spores is measured in the middle of the spore, excluding the spur. In other words, the spur is included in the length of the spores, but excluded from the measurements of the width. The following abbreviations are used: avl for average length, avw for average width, Q for quotient of length and width and avQ for average quotient.

### Taxonomic description

*Lepiota rhodophylla* Vellinga sp. nov.

Figures 1-2

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*Lepiota* boudieri Bres. *affinis*; *basidiocarpa valida*; *pileus pallide roseobrunneus*, *vel purpuraceobrunneus*; *lamellae crassae, roseolae*.

**Holotypus:** 'U.S.A., California, San Mateo County, San Francisco Watershed, Monterey cypress grove, 28 January 2003, E.C. Vellinga 3026 (UC)'.  
 (Note: The original text contains a typo '3026' which has been corrected to '3026' based on the image content.)

**Etymology:** The epithet 'rhodophylla' is derived from the Greek 'ῥοδοφυλλος', pink leaf, because of the striking pink lamellae.

**Pileus** 27-68 mm, irregularly convex with deflexed to involute margin when young, wavy appanate plano-convex later, with low umbo to plano-concave in older specimens, completely felted-tomentose, either completely closed or in small patches, not distinctly discretely squamose, sometimes radially fibrillose at margin, variable in colour, pale pinkish brownish (like 5 YR 7/4-8/4) all over, or rather dark brown (7.5 YR 4-3/4, 5 YR 5/4 to 6/4 around centre), and paler at margin to pinkish-greyish or beige (like 5YR8-7/2-3), in some places showing white context, but orange where damaged; margin when young thick, pale pinkish, and cottony, exceeding lamellae. **Lamellae**, L = 55-70, l = 0-3, moderately crowded, free, often almost emarginate, rather thick, segmentiform to ventricose up to 6 mm wide, pink, pale brownish, pinkish beige or pale pinkish (10 YR 8/4, 7.5 YR 7/4, 5 YR 6/4, 5 YR 7/4, 5 YR 8/3-4, sometimes with touches of 5 YR 6/4), with white irregular cystidioid edge or with concolourous even edge. **Stipe** 38-65 x 7-15 mm, sturdy, cylindrical or, rarely, compressed, sometimes slightly narrower at base, pale pink and distinctly lilac pink or pale lilac pink at apex, with colour as on pileus lower down, longitudinally innately striate-fibrillose in upper 1/3, in lower 2/3 when young with distinct bands or girdles and tufts of material as on pileus, later less clearly so, and more woolly, when young with annulus-like structure, with white rhizomorphs at base, hollow. **Context** whitish in pileus and pinkish just above the lamellae, orange around maggot holes; pinkish or lilac in stipe apex to cream at bottom, with white pith, brown discoloured at utmost base. **Smell**

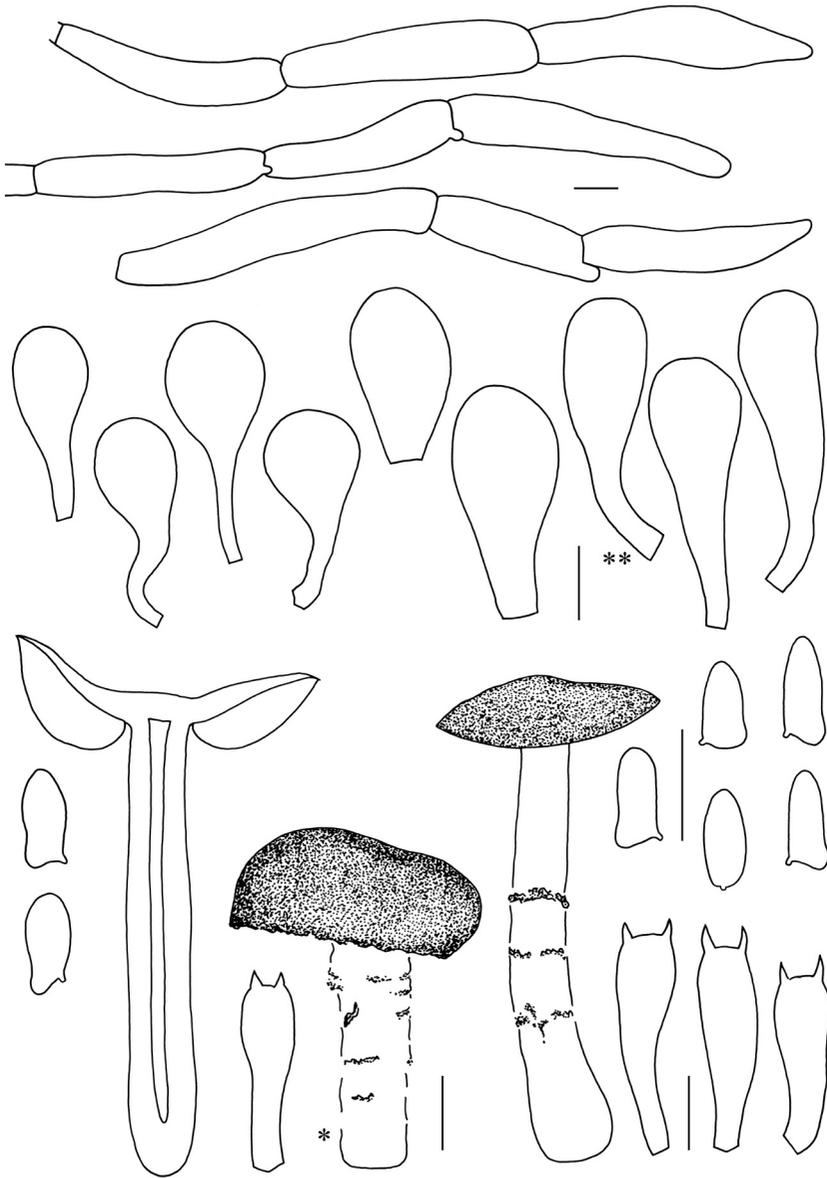


Fig. 1: *Lepiota rhodophylla*. Basidiocarps, spores, basidia, cheilocystidia and pileus covering elements. All from ecv3026, except \* from ecv2972 and \*\* from ecv2610.

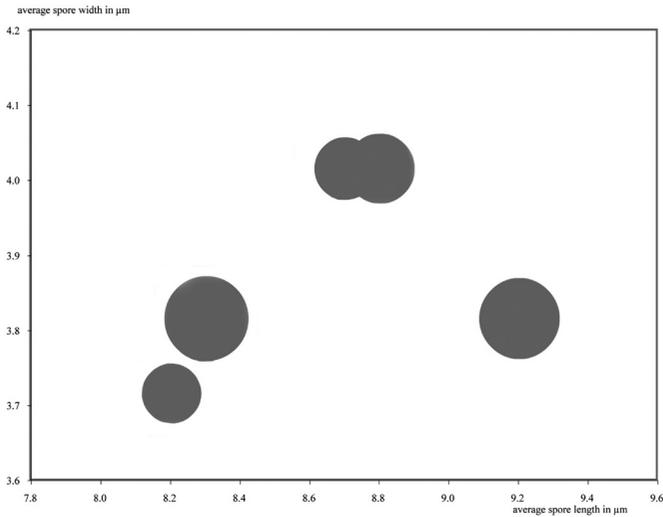


Fig. 2: *Lepiota rhodophylla*: average spore sizes per collection; the size of the bubble is an indication of the maximum size of the cheilocystidia, varying from 23 to 41  $\mu\text{m}$ .

variable, from vaguely rubber-like, i.e. like the smell of *L. cristata* (Bolton :Fr.) P. Kumm. to very strongly so, but without the sweet component. **Taste** and **spore print** colour unknown. KOH on pileus surface yellow.

**Basidiospores** [80, 5, 5] 7.6-10.0 x 3.3-4.2  $\mu\text{m}$ , avl x avw = 8.2-9.2 x 3.7-4.0  $\mu\text{m}$ , Q = 2.0-2.7, avQ = 2.2-2.45, in side-view subcylindrical, with (but not always) broad straight or outgrown spur, in frontal view subcylindrical, slightly thick-walled, with one guttule, dextrinoid, congophilous, not metachromatic in Cresyl blue. **Basidia** 23-35 x 6.5-8.5  $\mu\text{m}$ , 4-spored, with basal clamp connection. **Lamella edge** sterile. **Cheilocystidia** 16-41 x 7.0-16  $\mu\text{m}$ , clavate, broadly clavate or narrowly clavate, varying in size between collections, e.g. 20-30  $\mu\text{m}$  long in collection ecv2992, and 23-40  $\mu\text{m}$  long in collection ecv2610. **Pleurocystidia** absent. **Pileus covering** a cutis with adnate hyphae, made up of up to 5-6 pigmented elements, with terminal cells, 56-120 x 8-16  $\mu\text{m}$ , tapering towards apex; clamp connections present at all septa; pigment intracellular light purple brown, sometimes granular, soluble in ammonia. **Stipe covering** a cutis of cylindrical, straight hyphae, 3-7  $\mu\text{m}$  in diameter; in lower 2/3 of stipe patches made up of repent hyphae, as on pileus. **Clamp connections** present at all septa.

**Habitat and distribution** – Gregarious in small groups, only known from one locality in central coastal California, terrestrial in an almost 100 yr old *Cupressus*

*macrocarpa* plantation on an east-facing slope, close to a small seasonal creek. December-end of February.

**Collections examined** — U.S.A., CALIFORNIA: San Mateo Co., SAN FRANCISCO WATERSHED, 8.XII.2000, E.C. Vellinga 2610 (Genbank nrITS AY176480); *ibidem*, 23.XII.2002, E.C. Vellinga 2972; *ibidem*, 7.I.2003, E.C. Vellinga 2992; *ibidem*, 28.I.2003, E.C. Vellinga 3026 (**Holotype**; Genbank nrITS EF080864); *ibidem*, 25.II.2003, E.C. Vellinga 3049 (all in UC).

**Comments** — At first sight, *Lepiota rhodophylla* can be taken for an *Agaricus* species, because of the strikingly pink lamellae. However, the absence of brown spores, and the presence of white spurred spores and clamp connections make identification as a *Lepiota* species easy. The present author knows no *Lepiota* species with which it can be confused. The combination of its robustness and the pink lamellae is unique. *Lepiota andegavensis* also has sturdy basidiocarps, but the pileus is dark brown, and the stipe and lamellae are strikingly white (Mornand 1983, Chalange 1995).

There is intraspecific variation in the colour of the basidiocarps, and in the length of the spores and cheilocystidia. There does not seem to be any correlation between spore length and cystidium length (fig. 2). The two collections represented by the nrITS sequences in Fig. 3 exhibit differences in colour, ecv2610 being dark, and ecv3026 pale pink.

*Lepiota rhodophylla* groups together with *L. boudieri* Bres. in a maximum likelihood analysis of nrITS data in a wide sampling of *Lepiota* species (Clade I in fig. 3). *Lepiota rhodophylla*, *L. boudieri* and the others in this clade are characterized by spurred spores, and repent, clamped hyphae on the pileus covering (see also Vellinga 2003). The sister group to this clade has also spurred spores, but the pileus covering is made up of erect elements, with septa lacking clamp connections (Clade II in fig. 3).

One species, *Lepiota andegavensis* Mornand (1983), is an enigma in morphological and molecular-phylogenetic aspects. Bon (1993) described its pileus covering as a cutis, resembling that of *L. rhodophylla* and *L. boudieri*, but Vellinga (2001) who studied his collection concluded it was closer to that of *L. castanea* Qué., i.e. with septate but clampless elements. Parsimony analyses of the nrITS sequences group *L. andegavensis* with *L. boudieri* and *L. rhodophylla*, but in the Maximum Likelihood analyses it is basal to all spurred spored (stenospored) species.

The sister group to all stenospored species is morphologically characterized by ellipsoid spores and long cells in the pileus covering (Vellinga 2003). This group, comprising *L. subincarnata* J.E. Lange and *L. brunneoincarnata* Chodat & C. Martin, is infamous due to the occurrence of  $\alpha$ - and  $\beta$ -amanitines in the basidiocarps, though these substances have also been reported in the stenospored *L. castanea* (Gérault & Girre 1975).

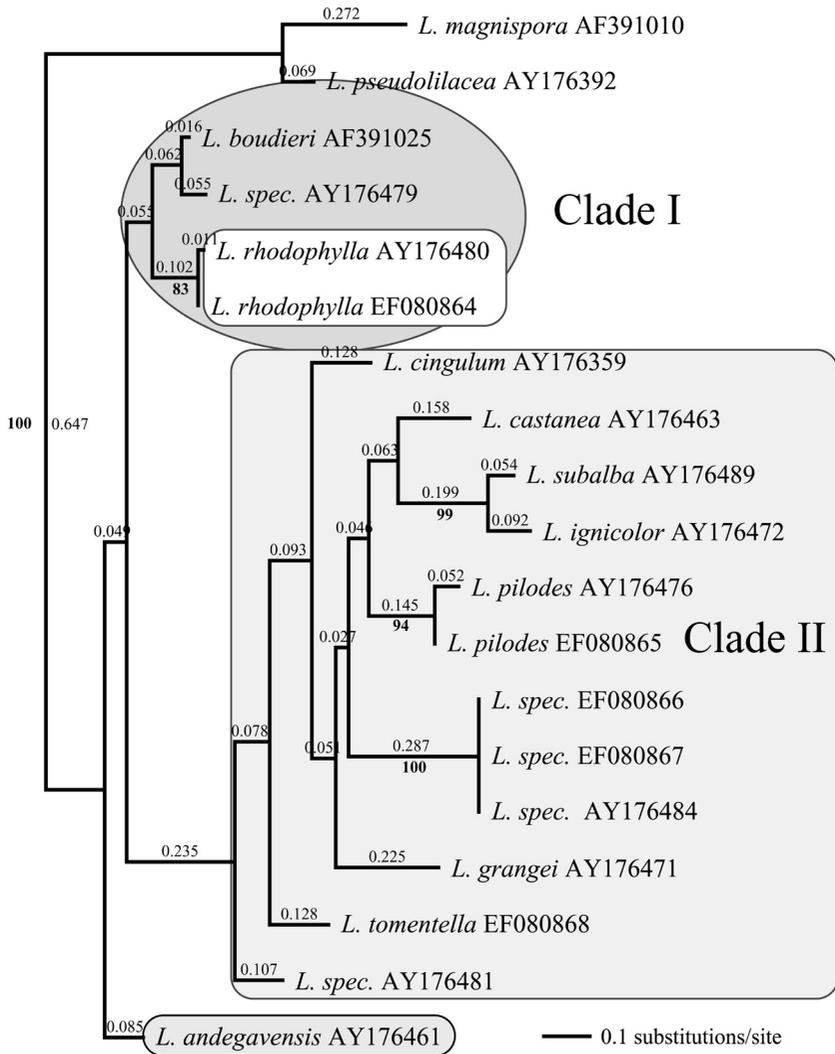


Fig. 3: Phylogenetic relationships of *Lepiota* species with spurred spores and a pileus covering made up of long elements, based on a Maximum Likelihood analysis of nrITS sequences under the HKY85 model. Bootstrap values in bold are based on 100 replicates. Genbank accession numbers are given for each collection. The topology of a tree based on Maximum Parsimony analysis is identical, except for the position of *L. andegavensis* which belongs to Clade I in the MP analysis. *Lepiota magnispora* Murrill and *L. pseudolilacea* Huijsman, with a trichodermal pileus covering with both long elements, and short, clavate elements at the base of these long elements, are used as outgroup.

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### References

- Bon M. 1993. Flore mycologique d'Europe 3. Les Lépiotes. Docum. mycol. Mémoire hors Série 3: 1-153. *Lepiotaceae* Roze.
- Chalange R. 1995. *Lepiota andegavensis*. Bull. trimest. Soc. mycol. Fr. 111: Atlas pl. 303.
- Gérault A, Girre L. 1975. Recherches toxicologiques sur le genre *Lepiota* Fries (1822). C. r. hebd. Séances Acad. Sci., Paris, série D, 280: 2841-2843.
- Largent DL. 2000. Appendix 3.2. Fungi associated with Redwood. In RF Noss (ed.). The redwood forest: history, ecology, and conservation of the coast redwoods: 64-68. Washington D.C., Island Press.
- Mornand J. ('1982') 1983. Une nouvelle Lépiote, *Lepiota andegavensis* sp. nov. Docum. mycol. 12 (48): 41-43.
- Munsell soil color charts. 1975. Baltimore.
- Sundberg WJ. 1971. A new species of *Lepiota*. Mycologia 63: 79-82.
- Sundberg WJ. 1989. *Lepiota* sensu lato in California III. Species with a hymeniform pileipellis. Mycotaxon 34: 239-248.
- Vellinga EC. 2001. *Lepiota*. In ME Noordeloos, ThW Kuyper, EC Vellinga (eds). Flora agaricina neerlandica 5: 109-151. Lisse/Abingdon/Exton (PA)/Tokyo, A.A. Balkema Publishers.
- Vellinga EC. 2003. Phylogeny of *Lepiota* (*Agaricaceae*) – Evidence from nrITS and nrLSU sequences. Mycol. Progr. 2: 305-322.
- Vellinga EC. 2004. Ecology and distribution of lepiotaceous fungi – a review. Nova Hedwigia 78: 273-299.

