



Diversity of *Lactarius* subgenus *Russularia* in California

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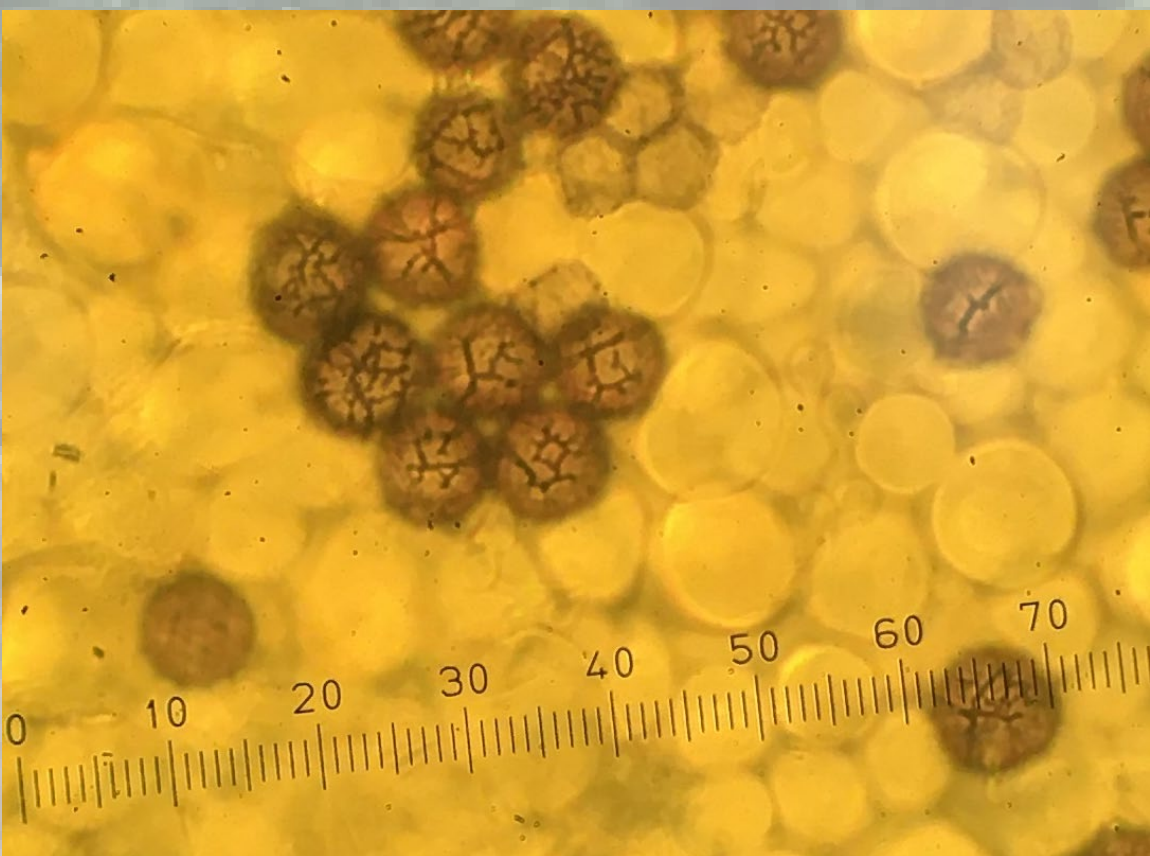
Abstract

Lactarius subgenus *Russularia* is an important group of ectomycorrhizal fungi worldwide, with high diversity in California. Many species in this group are difficult to identify and are therefore poorly understood. I used microscopy and DNA analysis to find characteristics to accurately identify taxa in this group. I analyzed enough specimens of *Lactarius* “acrid orange,” which Methven (1998) called “*desjardinii*,” to support the hypothesis that it represents a distinct species, and to propose features that amateur mycologists can use to consistently identify it in the field. Limited DNA evidence and microscopic analysis of unidentified specimens also suggests the existence of previously unknown diversity in this group in California.

Materials and methods

I used ITS1f and ITS4b primers to amplify the ITS1, 5.8s, and ITS2 regions. I used Geneious to trim and align sequence and generate a tree. I used an iPhone 6 camera take photographs of mushrooms in the field and their microscopic structures through the eyepiece of a microscope. I used Meltzer’s reagent to stain the ornamentation of the spores and Congo Red to stain cell walls

The ornamentation of *L. rufulus* spores is clearly visible when stained with Meltzer’s reagent

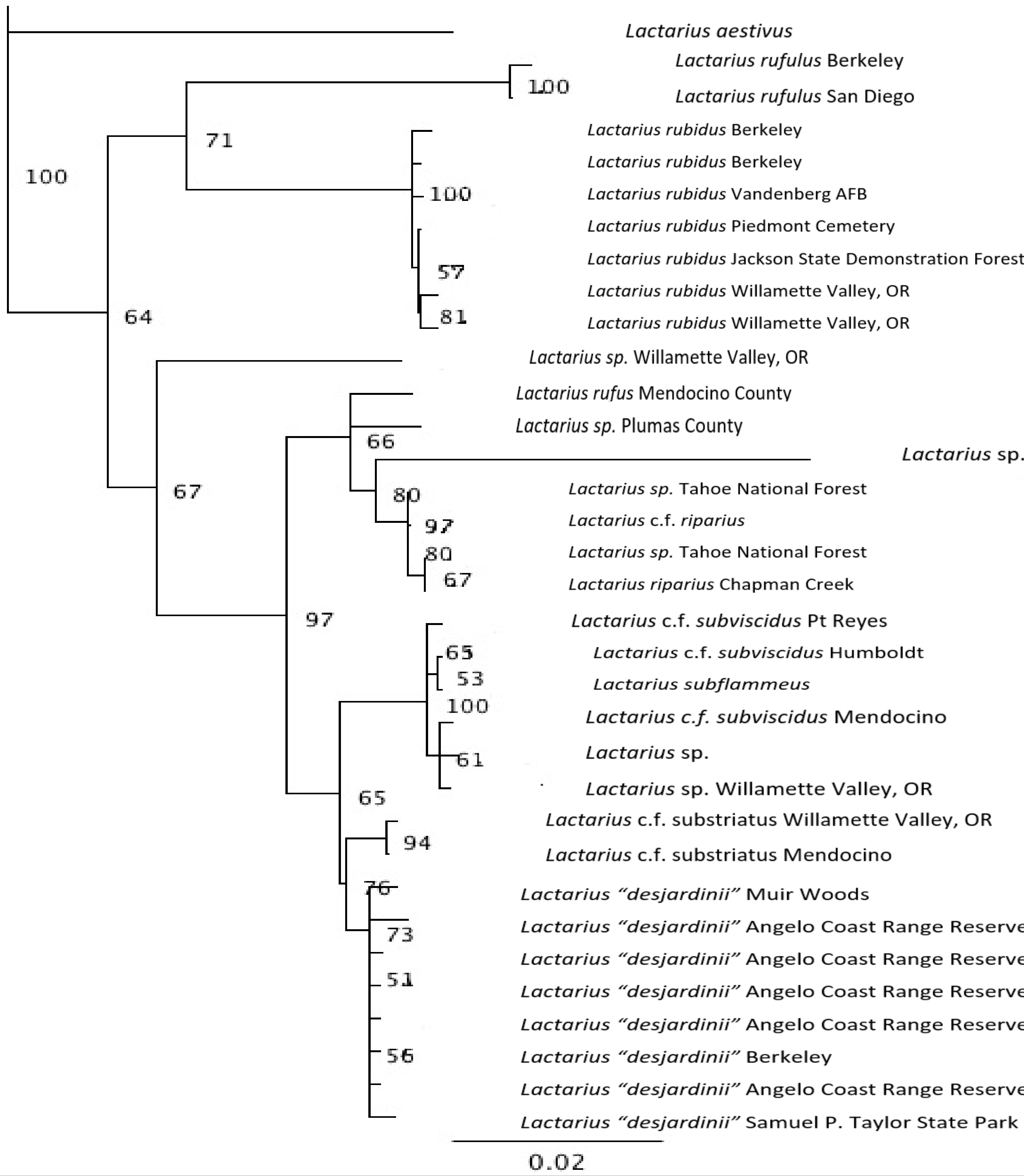


The pileipellis of *L. “desjardinii”* stained with Congo Red. This pileipellis is an ixotrichoderm

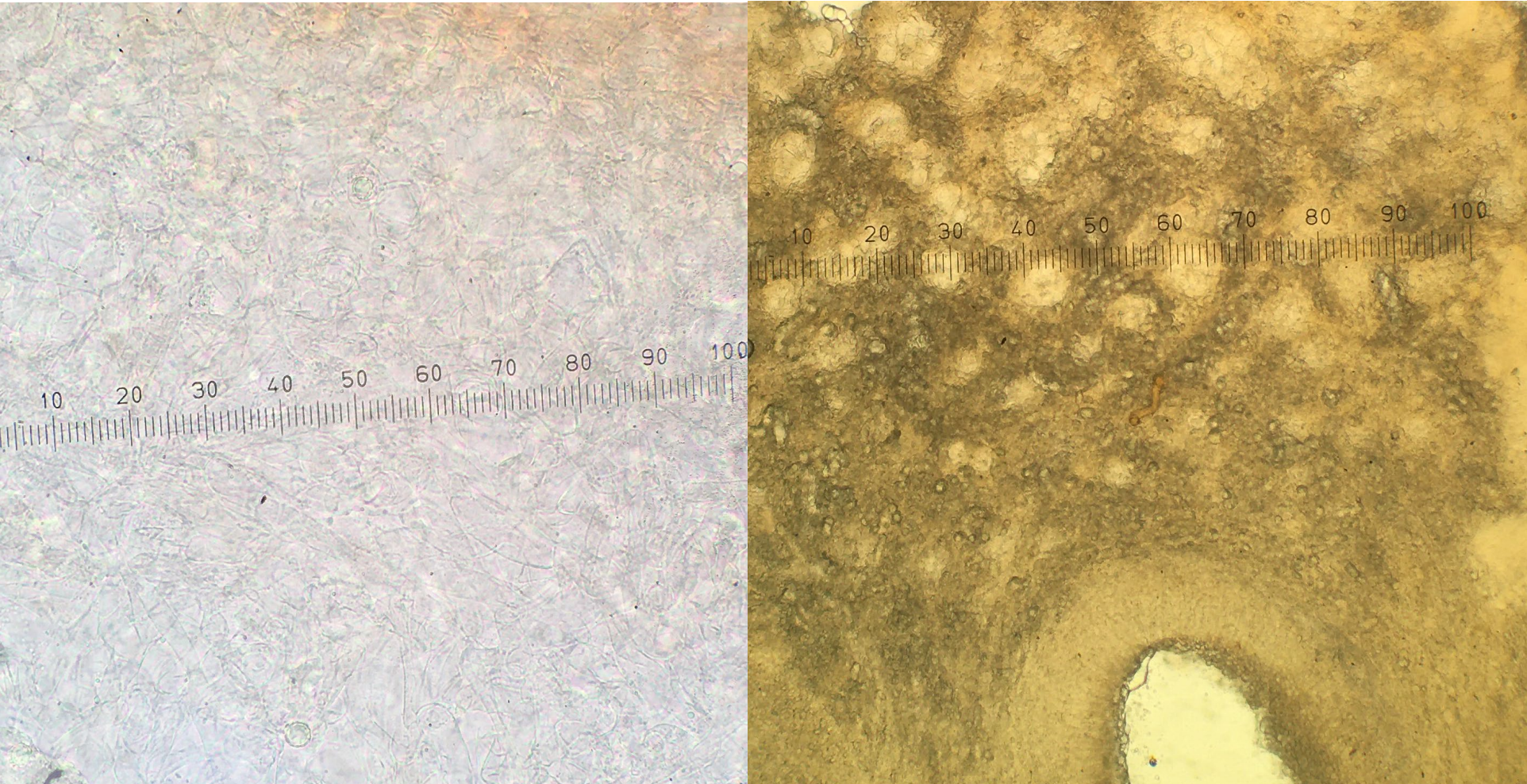


Results

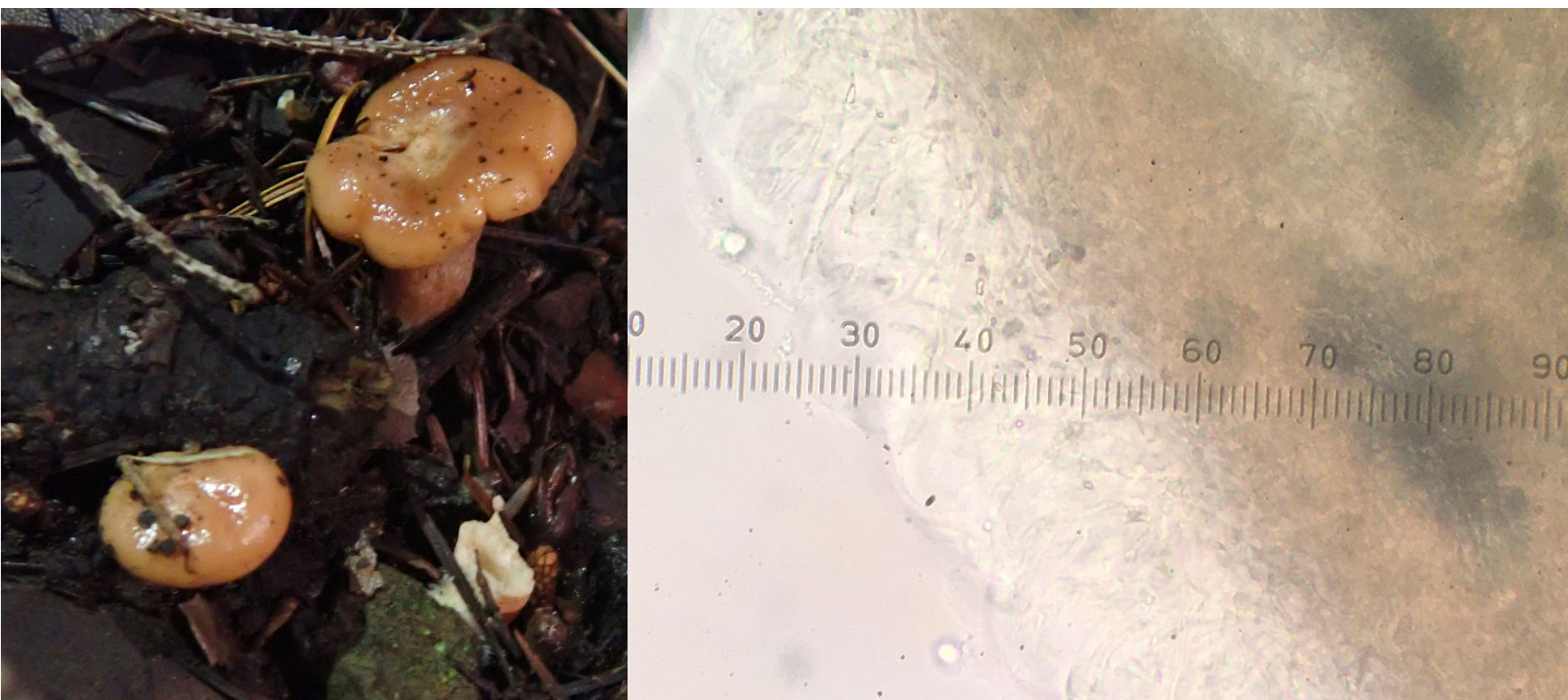
ITS tree



The flesh of *L. rufulus* (left) lacks distinct clusters of round cells called sphaerocysts, while that of *L. rubidus* (right) clearly contains these clusters of sphaerocysts. Both photos were taken at 100x



L. rubidus usually has a stark white spore deposit, as depicted in this photo, but can have a cream-colored to buff-beige spore deposit, which can lead to confusion with *L. rufulus*. For this reason, spore deposit color should not be considered an identifying feature of this species



L. “desjardinii” has a slimy orange cap, sometimes with a small nipple-like protrusion, called an umbo, in the center. The layer of cells at the cap surface, called the pileipellis, is a lattice of hyphae in a layer of slime. This type of pileipellis is called an ixolattice, with the prefix ixo- referring to the slime.

Conclusions

- Lactarius rubidus* can be distinguished from *L. rufulus* microscopically by the presence of conspicuous rosettes of sphaerocysts (round cells) in the flesh (trama) of the mushroom
- I was unable to identify easily observable macro-morphological characteristics to distinguish *L. rubidus* from *L. rufulus* because atypical specimens of each fall within the range of variability of the other
- Lactarius “desjardinii”* is not consistently acrid-tasting, but does consistently have a slightly sticky to very slimy cap, a dry stem, and a pale apricot to orange color. Its pileipellis can be variable, ranging from a thick ixocutis as Methven (1997) described to an ixotrichoderm
- There are many *Lactarius* in California that are infrequently collected and therefore poorly understood

L. riparius, an uncommonly collected montane species. Photo by Thea Chesney



An unidentified montane *Lactarius*. Photo by Thea Chesney



Literature cited

Hesler, L. R., & Smith, A. H. (1979). *North American species of Lactarius*. University of Michigan Press.
Methven, A. (1998). *Agaricales of California 10: Lactarius*. Mad River Press.
Siegel, N., & Schwarz, C. (2016). *Mushrooms of the Redwood Coast: A Comprehensive Guide to the Fungi of Coastal Northern California*. Ten Speed Press.

Acknowledgments

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Further information

Mushrooms of the Redwood Coast is the best available field guide for identifying members of *Lactarius* subg. *Russularia* in California because of its clear descriptions and excellent photographs. However, many species in this group still lack good descriptions, and the scarcity of in-situ photographs, genetic data, and preserved specimens makes it difficult to clearly define species concepts. Citizen science initiatives such as iNaturalist will hopefully improve our understanding of this diverse and ecologically important group.