

# ***Russula lithocarpi* sp. nov. and *Lactarius sulphosmus*, two gasteroid species of Russulaceae (Basidiomycota) found in Taiwan**

Wen-Neng Chou<sup>1\*</sup>, Bi-Hua Yang<sup>2</sup>

<sup>1</sup> National Museum of Natural Science, 1 Kuan-chien Road, Taichung City 404, Taiwan

<sup>2</sup> Grape King Bio. Ltd, Longtan, Taoyuan City 325, Taiwan

(Accepted: December 27, 2022)

## ABSTRACT

Two hypogeous gasteroid species of Russulaceae were collected in Taiwan. *Russula lithocarpi* is newly described, whereas *Lactarius sulphosmus* is newly recorded in Taiwan.

**Key words:** false truffles, Gasteromycetes, hypogeous fungi

## Introduction

Russulaceae (Russulales) comprises seven genera (Calonge and Martín 2000) and roughly 1,900 known species, and has a worldwide distribution. Species of Russulaceae have typically agaricoid basidiomata, but certain species have laterally striped (pleurotoid), closed (secotioid or gasteroid), or crust-like (corticioid) basidiomata. Russulaceous fungi are characterized by having a brittle basidiomatal flesh and spherical to elliptic basidiospores with faint to conspicuous, warty, spiny, or crested ornamentations that stain bluish-black in Melzer's reagent. Basidia are usually club-shaped, two- or four-spored, and clampless (Zhang, at al. 2018). Gasteroid russulaceous fungi used to be included in the genera *Elasmo-*

*ces*, but they are now placed in *Lactarius*, with which *Zelleromyces* is in synonymy, and *Russula*, with which *Gymnomyces*, *Elasmomyces*, and *Martellia* are in synonymy (Beaton at al. 1984; Calonge and Martín 2000; Zhang and Yu 1990).

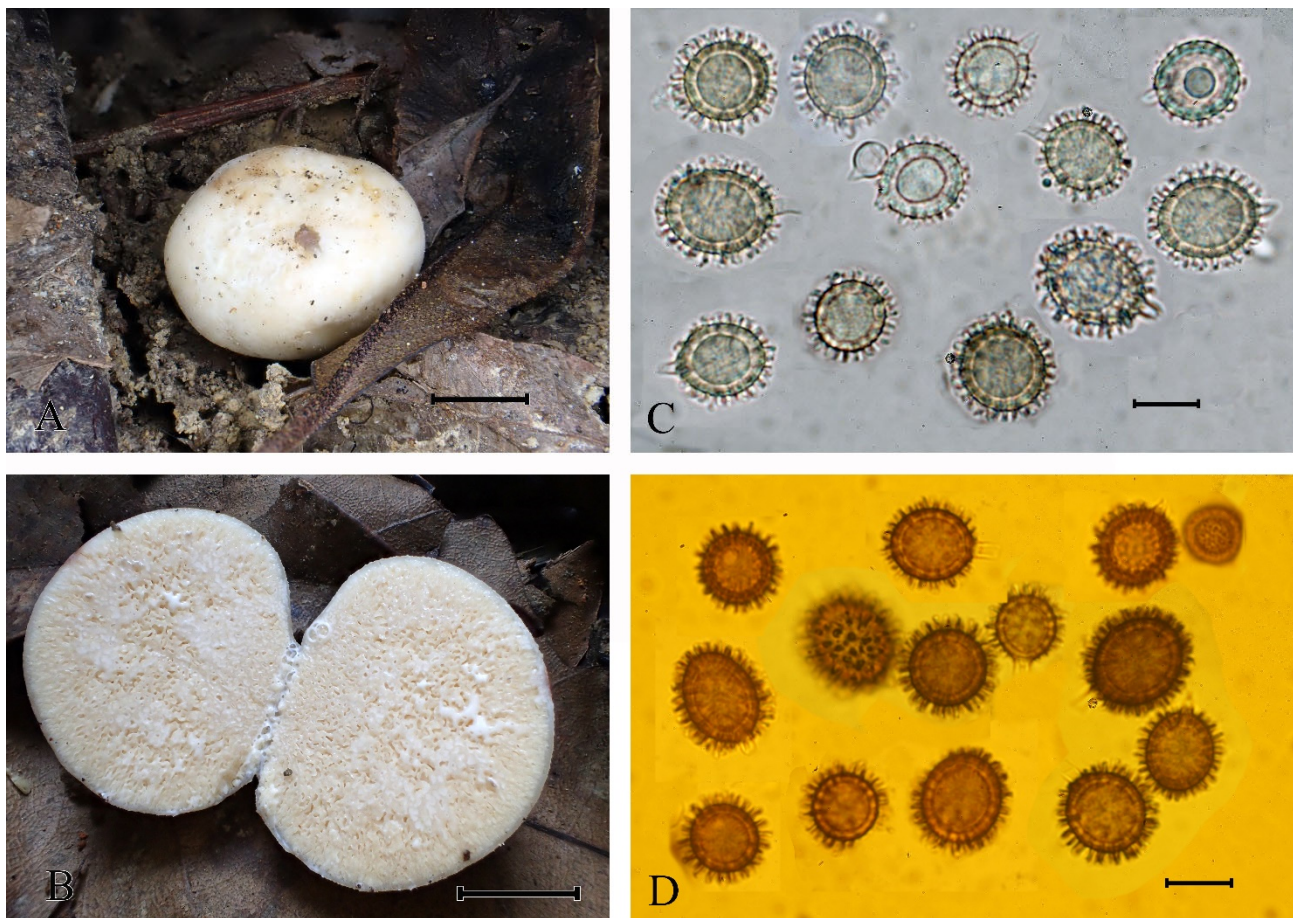
Gasteroid Russulaceae has been thoroughly investigated in Australia, New Zealand, and North America. There are fewer records from Southeast Asia and China (Zhang at al. 2018). Four gasteroid species have been reported in Taiwan (Chou 2011, 2016). Two gasteroid russulaceous species are included in this study: *Russula lithocarpi* is described as new, whereas *Lactarius sulphosmus* is newly recorded in Taiwan.

## Materials and Methods

Microscopic structures were examined by bright

---

\*Corresponding author, e-mail: [cwn@mail.nmns.edu.tw](mailto:cwn@mail.nmns.edu.tw)



**Fig. 1.** *Lactarius sulphosmus*. A, B. Basidiomata. C, D. Echinulate basidiospores, with those in D showing amyloid prickles. Bars: A, B = 1 cm; C, D = 10 µm.

field microscopy (BF). Material was mounted in water for examination by BF. PCR amplification of ITS was described in Hsieh et al. (2009). The ITS sequence was subjected to NCBI BLAST queries. The studied specimens are deposited at National Museum of Natural Science in Taiwan (TNM).

### Taxonomy

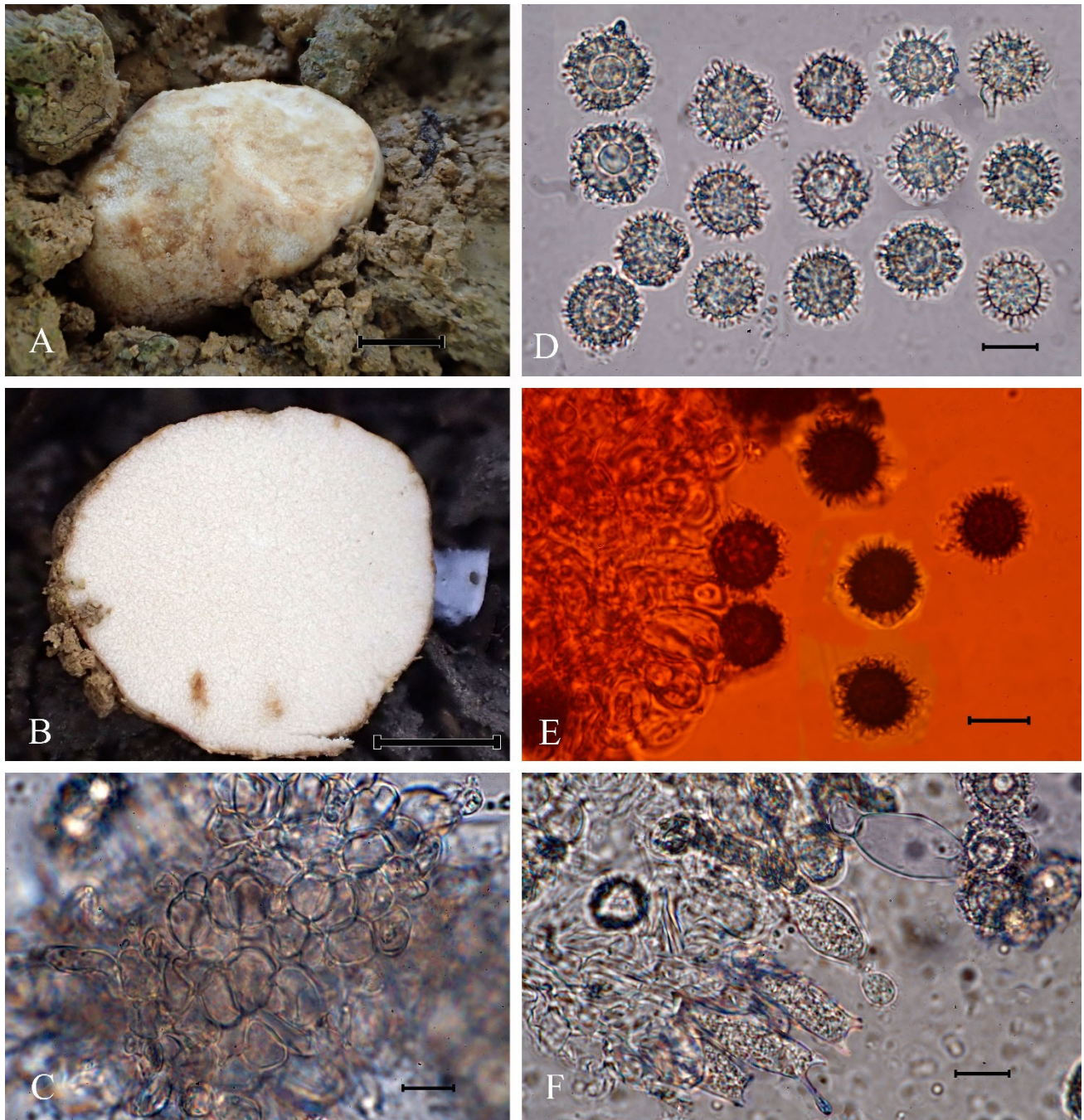
*Lactarius sulphosmus* G. J. Li & R. L. Zhao, Mycosphere 9: 847. 2018.

**Fig. 1**

Basidiomata angiocarpous, semihypogeous, 1.5–

2.5 cm high by 1.5–3 cm wide, irregularly subglobose; exoperidium smooth, whitish. Gleba cream, loculate; columella absent; latex abundant; smell strongly sulfide when overmature. Basidiospores globose to subglobose, rarely broadly ellipsoid,  $11\text{--}16 \times 10\text{--}13 \mu\text{m}$ , echinulately ornamented, amyloid at prickles, attached with a pedicel. Basidia not seen. Hyphae clampless.

**Specimens examined:** TAIWAN. Taipei, Nei-hu, Da-lun Lake (內湖大崙湖), 410 m elev., at rhizosphere of *Cyclobalanopsis glauca*, 5 Dec 2021, Chou, W. N. CWN11671 (TNM), GenBank: ITS = OQ102930; same locality and habitat, 1 May



**Fig. 2.** *Russula lithocarpi*. A–B. Basidiomata. C. Hymenophoral trama. D, E. Echinulate basidiospores, with those in E showing amyloid prickles. F. Basidia. Bars: A, B = 0.5 cm; C–F = 10  $\mu$ m.

2022, Chou, W. N. CWN11731 (TNM); Taipei: Nei-hu, Tian-suei-yuan-yang Lake (內湖甜水鴛鴦湖), 476 m elev., at the rhizosphere of *C. glauca*, 9 Oct 2021, Chou, W. N. CWN11617

(TNM).

**Distribution:** China, Taiwan (this study).

**Notes:** *Lactarius sulphosmus* produces abundant

white latex and smells strongly sulfidic. Its basidiospores are ornamented with prickles that are strongly amyloid. A GenBank BLAST search by using the ITS sequence OQ102930 from CWN 11671 showed that it shared a 99.81% similarity with MG719937 of *L. sulphosmus*.

***Russula lithocarpi*** W. N. Chou, sp. nov. **Fig. 2**

MycoBank: MB847048

Typification: TAIWAN. Nan-tou, Lien-hwa-chih, at rhizosphere of *Lithocarpus konishii*, 7 Jul 2022, Chou, W. N. CWN 11770 (holotype TNM F0036301), GenBank: ITS = OQ108367.

**Etymology:** The epithet *lithocarpi* referring to its growth at the rhizosphere of *Lithocarpus konishii*.

Basidiomata angiocarpous, semihypogeous, 0.8–2 cm, irregularly subglobose; exoperidium smooth, whitish tinged pale red. Gleba cream, loculate; columella absent; latex lacking. Basidiospores globose to subglobose, 8–14 × 8–12 μm, echinulately ornamented, amyloid at prickles. Basidia capitate, 20–25 × 7–9 μm, with 2 sterigmata. Cystidia subcapitate to ventricose, 20–30 × 10–13 μm. Hymenophoral trama with clustered sphaerocysts. Hyphae clampless.

**Note:** *Russula lithocarpi* and *L. sulphosmus* have similar basidiospore morphologies. However, *R. lithocarpi* does not exude latex when cut. *Russula candidissima* is a similar species but differs by basidiomata being angiocarpous to partially hemiangiocarpous and stipitate (Vidal et al. 2019).

### Acknowledgements

W.-N. Chou would like to express his gratitude to National Museum of Natural Science of Taiwan for supporting the present study.

### References

- Calonge FD, Martín MP. 2000. Morphological and molecular data on the taxonomy of *Gymnomyces*, *Martellia* and *Zelleromyces* (Elasmomycetaceae, Russulales). Mycotaxon. 76: 9–15.
- Beaton G, Pegler DN, Young TWK. 1984. Gasteroid Basidiomycota of Victoria State, Australia 2. Russulales. Kew Bulletin 39:669–698.
- Chou W-N. 2011. *Hymenogaster arenarius* (Basidiomycotina) new to Taiwan. Taiwan Journal of Biodiversity 13:265–268.
- Chou W-N. 2016. Two Species of Hypogeous Gasteroid Fungi (Basidiomycota) New to Taiwan. Taiwan Journal of Biodiversity 18: 169–172.
- Li G-J, Zhang C-L, Lin F-C, Zhao R-L. 2018. Hypogeous gasteroid *Lactarius sulphosmus* sp. nov. and agaricoid *Russula vinosobruneola* sp. nov. (Russulaceae) from China. Mycosphere 9:838–858.
- Pegler DN, Young TW. 1979. “The gasteroid Russulales.” Transactions of the British Mycological Society 72:353–388.
- Vidal JM, Alvarado P, Loizides M, Konstantinidis G, Chachuła P, Mleczko P, Moreno G, Vizzini A, Krakhmalnyi M, Paz A, Cabero J, Kaounas V, Slavova M, Moreno-Arroyo B & Llistosella J. 2019. A phylogenetic and taxonomic revision of sequestrate Russulaceae in Mediterranean and temperate Europe. Persoonia 42:127–185.

Zhang B. C. and Y. N. Yu, 1990. Two new species of gasteroid Russulales from China, with notes on taxonomy of *Gymnomyces*,

*Martellia* and *Zelleromyces*. Mycological Research 94:457–462.

## 兩種腹菌型紅菇科(擔子菌)的新種及臺灣新紀錄種

周文能<sup>1\*</sup>，楊碧華<sup>2</sup>

1 國立自然科學博物館，臺中市館前路一號 404，臺灣

2 葡萄王生物科技研究所，桃園市龍潭區龍園一路 68 號，臺灣

### 摘 要

本文描述兩種腹菌型紅菇科的臺灣新紀錄種及新種。新紀錄種為硫味乳菇 *Lactarius sulphosmus*，新種為石櫟紅菇 *Russula lithocarpi*。

**關鍵詞：**假松露、腹菌目、地下真菌