

Ramonia vermispora, a new species from the Sonoran Desert Region of Southwestern North America

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ABSTRACT. – *Ramonia vermispora*, a new saxicolous species from southern California, U.S.A. is described as new to science. The new species is presumed to be endemic to montane regions of southern California, and related to *R. ablephora* and *R. gyalectiformis* both of which are also endemic to the region.

INTRODUCTION

Ramonia Stizenb. is a small genus of just over thirty species of minute, mostly corticolous, crustose lichens (Vězda 1966, 1967, 1973). Although the type of the genus *R. valenzueliana* (Mont.) Stizenb. is primarily tropical in distribution, the majority of species have been described from Europe (Canals & Gómez-Bolea 1992; Coppins 1987; Coppins et al. 1994; Vězda 1966, 1967, 1974). The small size of most species and their occurrence on substrates not usually inhabited by other lichens likely accounts for the scarcity of reports and collections of the genus.

Seven species of *Ramonia* are known to occur in North America (Esslinger 2008), two of which have also been reported from southern California (viz. *R. ablephora* (Nyl. ex Hasse) R.C. Harris and *R. gyalectiformis* (Zahlbr.) Vězda). The species reported from southern California are anomalous in the genus because of their saxicolous habit. The lack of available material of these taxa led Harris (1993) to consider *R. ablephora* and *R. gyalectiformis* to be synonyms. A view adopted by Ryan and Nimis (2004) for the treatment of species occurring in the Sonoran Desert Region. However Knudsen and Lendemer (2005) showed the species to be distinct based on ascospore characters and the size of the ascomata.

Recently while collecting in the San Jacinto Mountains of Southern California, the authors collected a specimen of *Ramonia* on decomposing granite in a montane oak-conifer forest, which they identified as *R. gyalectiformis* in the field despite the altitudinal and ecological disparity between the locality and the other known populations of *R. gyalectiformis* at lower elevations in arid or desert habitats. Subsequent microscopic examination of the material in the lab revealed it to have acicular rather than fusiform or ob-ovoid ascospores, and thus it represents an additional species of *Ramonia*, which is here described as *R. vermispora* Lendemer & K. Knudsen.

MATERIALS AND METHODS

Apothecia were measured dry with a Bausch & Lomb StereZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 microscope with an Olympus DP20 digital camera using Microsuite Special Edition. Photographs were taken with the same compound microscope, camera, and software outline above and prepared in Adobe Photoshop. Sections of the apothecia were prepared by hand cutting with a razor blade and mounted in water. Measurements are based on water mounts prior to the application of (10% KOH, or I). Chromatography was not performed because of the scant nature of the material.

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SUMMARY OF THE STATUS OF *RAMONIA ABLEPHORA* AND *RAMONIA GYALECTIFORMIS*

At present, *Ramonia gyalectiformis* is a rare species. It was described from a single Hasse collection (Zahlbruckner 1902) on sandy earth between rocks at the eastern base of the San Jacinto Mountains at 170 meters in the desert near Palm Springs. It is currently known only from two locations on the west side of the San Jacinto Mountains on decomposing granite at 748-827 meters in the chaparral belt of the San Jacinto Mountains of Southern California.

Ramonia ablephora is known only on the basis of historical collections on soil from the Santa Monica Mountains of Southern California in coastal habitats. There are no modern collections known, and the species may be extinct (Knudsen & Lendemer 2007). Both species should be surveyed for where they may possibly occur and deserve special protection by public land management agencies when located.

THE NEW SPECIES

Ramonia vermispора Lendemer & K. Knudsen, *sp. nov.*

MYCOBANK #511605.

Similis *R. ablephora*, sed sporis acicularibus differt.

TYPE: U.S.A. CALIFORNIA. RIVERSIDE CO.: Peninsular Range, San Bernardino National Forest, San Jacinto Mountains, Thomas Mountain, along Thomas Mountain Road, Anza Quad., 33° 35' 36" N, 116° 38' 16" W, elev. 1655 m., shaded granitic outcrop in oak-conifer woodland, on granite, 11.i.2008, *J.C. Lendemer 11377 & K. Knudsen* (NY, holotype).

DESCRIPTION. – Thallus saxicolous, crustose, within substrate. Photobiont *Trentepohlia*. Apothecia 0.5-0.7 mm in diameter, irregular (scattered to +/- confluent in the material examined), at first immersed, becoming erumpent, black, often appearing greyish to +/- pruinose because of adhering thalline tissue, disc pale black-brown to grey, margin radially fissured. Exciple black, carbonized, 30-40-(50)µm wide, thinner at base of hymenium, only inner-moist layer of cells distinct (i.e. not carbonized, dark brown, ~3-5µm wide), inner surface lined with a thick pad of periphyses (~50µm wide). Hymenium 80-110µm tall, hyaline, I-. Asci cylindrical, 80-100 x 15-20µm, [apical structures not fully examined because of lack of material], 8-spored. Ascospores acicular, transversely septate (3 septate, 4-celled), hyaline, +/- spirally arranged in the ascus, 45-60 x 3-4µm. Periphyses ~2-2.5µm wide, with the uppermost cell slightly expanded. Hypothecium hyaline, thin, 30-40µm thick.

ETYMOLOGY. – The epithet “vermispора” is derived from the worm-like appearance of the ascospores.

SUBSTRATE AND ECOLOGY. – *Ramonia vermispора* is presently known only from the type locality, a decomposing granite outcrop in a montane oak-conifer forest in the San Jacinto Mountains of Southern California, USA.

DISCUSSION. – Despite the scarce material we have chosen to describe this species because of its potentially endemic nature and rarity, and the possibility that it may be taxonomically and phylogenetically informative with respect to the other two rare and endemic species of *Ramonia* known from southern California. *Ramonia vermispора* occurs in an ecologically different habitat than *R. gyalectiformis* (desert-arid) and *R. ablephora* (coastal) in the montane belt of the San Jacinto Mountains.

The new species is most similar to *R. ablephora* and *R. gyalectiformis* in the morphology of the apothecia (especially the exciple) and the saxicolous habit. It differs from those species however, primarily in having vermiform ascospores, a character shared by two corticolous European species of *Ramonia* namely *R. chrysophaea* (Pers.) Vězda, *R. subsphaeroides* (Tav.) Vězda. *Ramonia vermispора* is however, readily distinguished from all other species of *Ramonia* with fusiform or acicular ascospores by its saxicolous habit, the size of the ascomata, and the spirally arranged acicular ascospores which are consistently 3-septate.

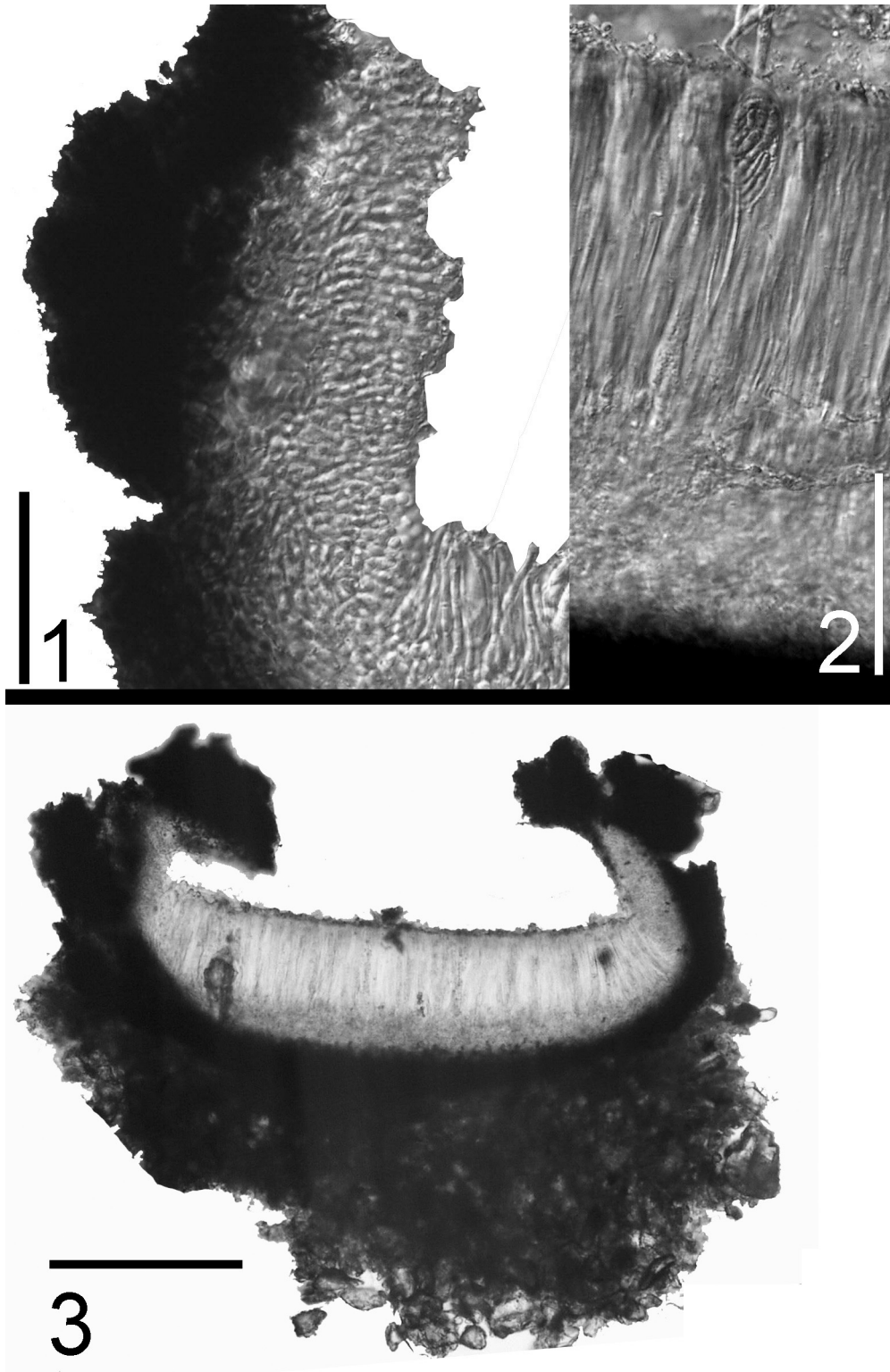


Plate 1. **Figure 1**, detail of carbonized exciple and periphysoid pad (scale bar = 50 μ m). **Figure 2**, section of apothecium showing detail of hymenium and hypothecium (scale bar = 50 μ m). **Figure 3**, section of apothecium (scale bar = 200 μ m).

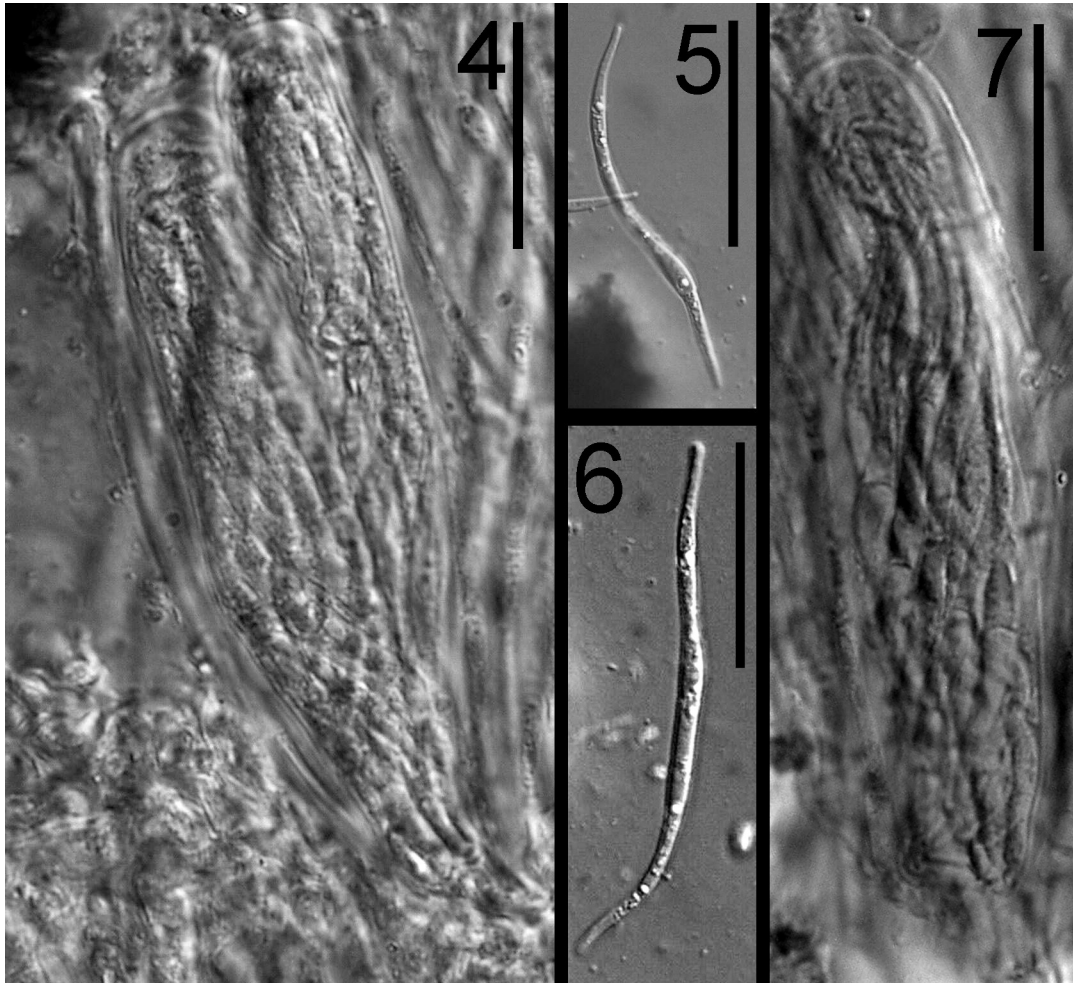


Plate 2. Figure 4, two asci with +/- spirally arranged ascospores (scale bar = 50µm). **Figures 5-6**, ascospores (scale bars = 20µm). **Figure 7**, ascus with well defined apical structure and spirally arranged ascospores (scale bar = 50µm).

The brown radially fissured exciple places *Ramonia vermispora* in *Ramonia* sect. *Ramonia* following Vězda (1966). Both *R. ablephora* and *R. gyalectiformis* also belong to *Ramonia* sect. *Ramonia*. It should be noted Vězda (1966) defined *Ramonia* sect. *Ramonia* as having ellipsoid or ovoid ascospores, a character found in *R. ablephora* and *R. gyalectiformis* but not in *R. vermispora*. In fact, elongate ascospores similar to those of *R. vermispora* are characteristic of *Ramonia* sect. *Ramonidium* Vězda. We believe the excipular and ecological characters shared by *R. vermispora*, *R. ablephora*, and *R. gyalectiformis* outweigh the differences in ascospore shape/septation when considering the position of the new species in the current infrageneric framework of *Ramonia*.

KEY TO THE GENUS RAMONIA

A key to the known species of *Ramonia* is presented below. Although largely based on data taken from the literature we feel it is helpful to present this information here, as there is presently no published summary of the genus. Note that *R. azorica* Purvis & P. James is not included here because it does not represent a species of *Ramonia* (T. Lumbsch pers. comm.).

1. Asci polysporous (>8 spores per ascus); all corticolous.....	2
2. Ascospores simple.....	3
3. Ascospores globose, 2.2-3.5µm in diameter; Africa.....	<i>R. micrococca</i> Vězda
3. Ascospores ellipsoid.....	4
4. Ascospores <3µm wide, narrowly ellipsoid; Tropical Americas.....	<i>R. microspora</i> Vězda
4. Ascospores ≥3µm wide; obtuse-ellipsoid; Brazil.....	5
5. Ascospores 4-6 x 3µm; apothecia 0.2-0.4mm in diameter, Brazil....	<i>R. intermedia</i> Kalb
5. Ascospores 8-9 x 4-4.5µm; apothecia 0.2-0.6mm in diameter; Brazil..	<i>R. kandlerii</i> Kalb
2. Ascospores septate to submuriform, not simple.....	6
6. Ascospores 16-24-per ascus, 1-3-septate to submuriform, 9-14 x 4-5µm; Nepal...	<i>R. nepalensis</i> Thor & Vězda
6. Ascospores >16-24-per ascus, 1-3 septate, not from Nepal.....	7
7. Ascospores 1-septate, 10-14 x 5-6µm; Tropical Americas... <i>R. valenzueliana</i> (Mont.) Stiz.	
7. Ascospores more than 1-septate.....	8
8. Apothecia 0.4mm in diameter; ascospores 3-septate, 13-20 x 4-6µm; Sub-tropical North America.....	<i>R. absconsa</i> (Tuck.) Vězda
8. Apothecia 0.3-0.6mm in diameter; ascospores 1-3 septate, 8-11-(12) x 4-6µm or 12-14-(16) x 5-6µm; Africa.....	<i>R. elixii</i> Kalb
1. Asci with 8 (or fewer) spores per ascus.....	9
9. Ascospores 1-per ascus, densely muriform; Papua New Guinea.....	<i>R. monospora</i> Aptroot
9. Ascospores more than 1-per ascus.....	10
10. Ascospores vermiform to acicular (length:width ratio >10:1).....	11
11. Thallus corticolous; ascospores >8 septate.....	12
12. Apothecia 0.2-0.4mm in diameter; ascospores 8-10 septate, 50-60 x 3-5µm; Portugal....	<i>R. subsphaeroides</i> (Tav.) Vězda
12. Apothecia 0.4-0.7mm in diameter; ascospores 8-14 septate; 45-75 x 3.5-4µm; Europe....	<i>R. chrysophaea</i> (Pers.) Vězda
11. Thallus saxicolous; ascospores 3-septate, 45-60 x 3-4µm; Southern California...	<i>R. vermisporea</i> Lendemer & K. Knudsen
10. Ascospores ellipsoid to ob-ovoid or fusiform (length:width ratio <10:1).....	13
13. Ascospores muriform; Europe.....	14
14. Exciple black; ascospores 28-45-(50) x 8-13µm.....	<i>R. nigra</i> Coppins
14. Exciple pale; ascospores 21-38-(45) x 9-14µm.....	<i>R. dictyospora</i> Coppins
13. Ascospores transversely septate; distribution various.....	15
15. Thallus saxicolous or terricolous; ascospores 3-septate.....	16
16. Exciple pale; on calcareous rocks; ascospores fusiform, 18-23 x 4-6µm; Europe.....	<i>R. calcicola</i> Canals & Gómez-Bolea
16. Exciple black; on non-calcareous rocks or soil; Southern California.....	17
17. Ascospores ob-ovate, 23-27 x 7-8µm.....	<i>R. ablephora</i> (Nyl.) R.C. Harris
17. Ascospores fusiform, (17.5)-20-(25) x 5-6µm.....	<i>R. gyalectiformis</i> (Zahlbr.) Vězda
15. Thallus corticolous; septation various.....	18
18. Ascospores >3-septate, >20µm long.....	19

19. Ascospores with perispore, 20-30 x 4-6µm; apothecia 0.25-0.4mm in diameter; Europe.....*R. luteola* Vězda
19. Ascospores without perispore, 24-43 x 4.5-7µm; apothecia 0.3-0.4mm in diameter; Europe.....*R. interjecta* Coppins
18. Ascospores 1-3-septate, <20µm long.....20
20. Ascospores 1-septate, 9-12 x 4-5µm, Tropical Americas....*R. malmei* Vězda
20. Ascospores 3-septate.....21
21. Apothecia small, 0.1-0.2mm in diameter; ascospores narrowly ellipsoid; Australia.....*R. leptospora* (Müll. Arg.) Vězda
21. Apothecia larger, >0.2mm in diameter; ascospores ovoid-ellipsoid....22
22. Ascospores >15µm long; Australia.....*R. eungellae* Kalb
22. Ascospores <15µm long; non-Australian.....23
23. Apothecia 0.5-0.7mm in diameter; Indonesia + Brazil.....
.....*R. cupellina* Vězda
23. Apothecia 0.3-0.4mm in diameter; Florida, USA.....
.....*R. rappii* Vězda

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