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Re-instatement of *Russula levyana* Murrill as a good and distinct American species of *Russula* section *Xerampelinae*

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Abstract – *R. levyana*, *R. floridana* and *R. praerubriceps* are three species described by W.A. Murrill that are traditionally interpreted as synonyms of *R. xerampelina* var. *semirubra* Singer. As such, these species have never been reported again since their original description. In this paper the authors re-examine and illustrate the type-specimens of these species in detail and come to the conclusion that they represent 3 different species that are not synonymous with Singer's variety. Of these 3 species, only *R. levyana* belongs in sect. *Xerampelinae* and a new, modern description is provided based on recent collections from Texas. These specimens represent the first records of Murrill's species since its original description from Florida.

Résumé – *R. levyana*, *R. floridana* et *R. praerubriceps* sont trois russules décrites par W.A. Murrill et traditionnellement considérées comme des synoniemes de *R. xerampelina* var. *semirubra* Singer. Il n'est donc pas surprenant que les types de ces espèces n'ont jamais été signalés depuis leur description. Ce papier fournit des descriptions modernes et illustrées pour les spécimens types de ces 3 espèces de Murrill. Les auteurs concluent qu'il s'agit de 3 espèces distinctes non seulement entre elles, mais aussi distinctes de la variété de Singer. A part cette dernière, seul *R. levyana* appartient à la sect. *Xerampelinae*. *R. levyana* a été retrouvé pour la première fois depuis sa description originale, notamment au Texas.

taxonomy / type studies / *Russula floridana* / *Russula praerubriceps* / morphology

INTRODUCTION

Members of *Russula* sect. *Xerampelinae* (Singer) Jull. Schaeff. are typically recognized by the flesh staining rusty-brown upon handling or bruising, the development of an unpleasant, fishy smell at maturity and in particular by the bluish to dark grayish green color reaction of the flesh to iron sulfate. All species have a mild taste and produce ochre to pale cream spore-prints.

In a recent paper describing a new and also first species of *Xerampelinae* for Texas, Buyck *et al.* (2008) point out the extreme rarity of this subsection in warmer climates and in particular in the State of Texas. In this contribution, we

report the discovery of a second species in *Xerampelinae* from Texas. This second species corresponds to *Russula levyana* Murrill, originally described from Florida (Murrill, 1945) and later attributed to *Xerampelinae* but as a synonym of *R. xerampelina* var. *semirubra* Singer (Singer, 1958).

Indeed, Singer (1958) was of the opinion that not only *R. levyana*, but also *R. floridana* Murrill (Murrill, 1940) and *R. praerubriceps* Murrill (Murrill, 1943) are conspecific with his own *R. xerampelina* var. *semirubra.* The synonymy proposed by Singer was adopted in nearly all later publications dealing with American russulas – involving sometimes the use of the illegitimate name "*R. semirubra*" (e.g. Roberts, 2007 ; Thiers, 1997). This synonymy was also maintained in the widely used and influential synoptic key by Kibby & Fatto (1990). A likely consequence of the general acceptance of Singer's synonymy is that the corresponding types of Murrill's species never seem to have been examined again by other mycologists over the years. Nevertheless, as we demonstrate below, there exist surprising macro- and microscopical differences between Singer's variety and the types of the three above-mentioned species described by Murrill. Whether or not Singer's variety should be synonymized with *R. fucosa* Burl. – another red-capped species in *Xerampelinae* with isolated spines on the spores (Adamčík unpubl.) – remains for the moment unanswered and awaits support from molecular data.

MATERIALS AND METHODS

Micromorphological characters were observed in Olympus CX-41 and Nikon Eclipse E400 microscopes using an oil-immersion lens at a magnification of 1000x. All drawings of microscopical structures - except for spores - were made with a 'camera lucida' using a Nikon Y-IDT drawing attachment at a projection scale of x2400. Contents of hymenial cystidia and pileocystidia in the illustrations are indicated schematically, except for a single element where contents are indicated as observed in Congo Red preparations from dried material. Spores on the lamellae were observed in Melzer's reagent. All other microscopic observations were made in ammoniacal Congo red, after a short aqueous KOH pre-treatment to improve tissue dissociation through gelatinous matrix dissolution. All tissues were also examined for the presence of ortho- or metachromatic contents or incrustations in cresyl blue as explained in Buyck (1989).

Spores were scanned with an Olympus Artcam camera and measured using Quick Micro Photo (version 2.1) software. Enlarged scanned pictures of spores were used for measuring with an accuracy of 0.1 µm and for drawing. Q gives length/width ratio of the spores. Measurements exclude ornamentation. Statistics for measurements of microscopical characters are given as mean value (underlined) plus/minus standard deviation and are based on 30 measurements. Values in parentheses give measured minimum or maximum values. An estimate for spore ornamentation density is given following Adamčík & Marhold (2000).

Names for infrageneric taxa follow the classification system proposed by Romagnesi (1985, 1987).

1. Type studies

Russula floridana Murrill, Bull. Torrey bot. Club 67: 57. 1940. Fig. 1-7

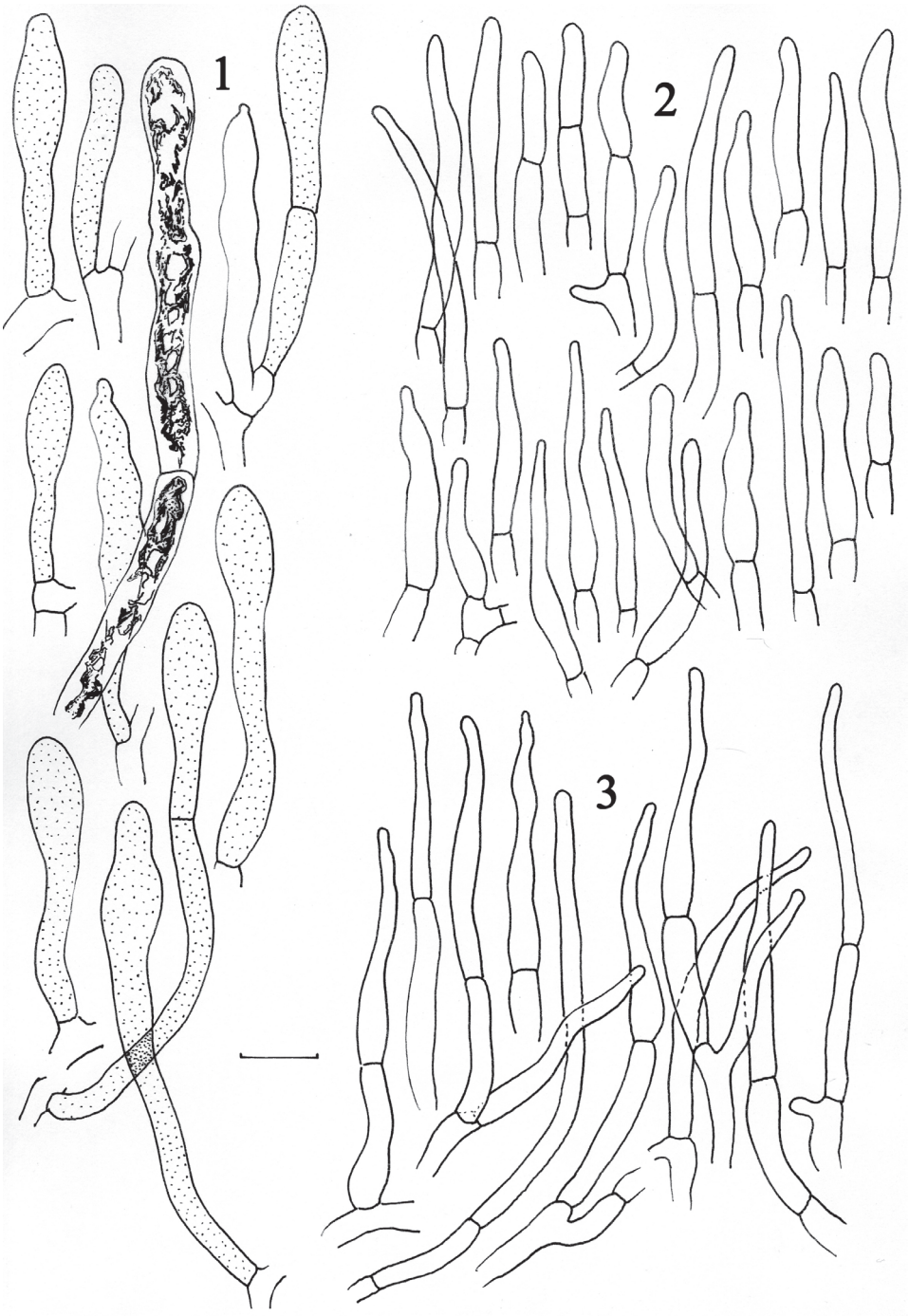
Original description : Pileo convexo-depresso, 8 cm. lato, viscido, glabro, purpureorubro ; sporis albis, ellipsoideis, 6-8 × 4-6 µ, stipite albo, 8 × 2 cm.

Pileus convex to somewhat depressed, solitary, 8 cm. broad; surface viscid, smooth, glabrous, uniformly purple-red, cuticle not readily separable, margin entire, tuberculate-striate; context white, mild, odorless, yellowish when dry; lamellae adnate, mostly equal, medium distant, broad, entire, white, gray in dried specimens; spores white in mass, broadly ellipsoid, distinctly echinulate, 1-guttulate, 6-8 × 4-6 µm; stipe equal, smooth, glabrous, white, slightly grayish or yellowish when dry, 8 × 2 cm.

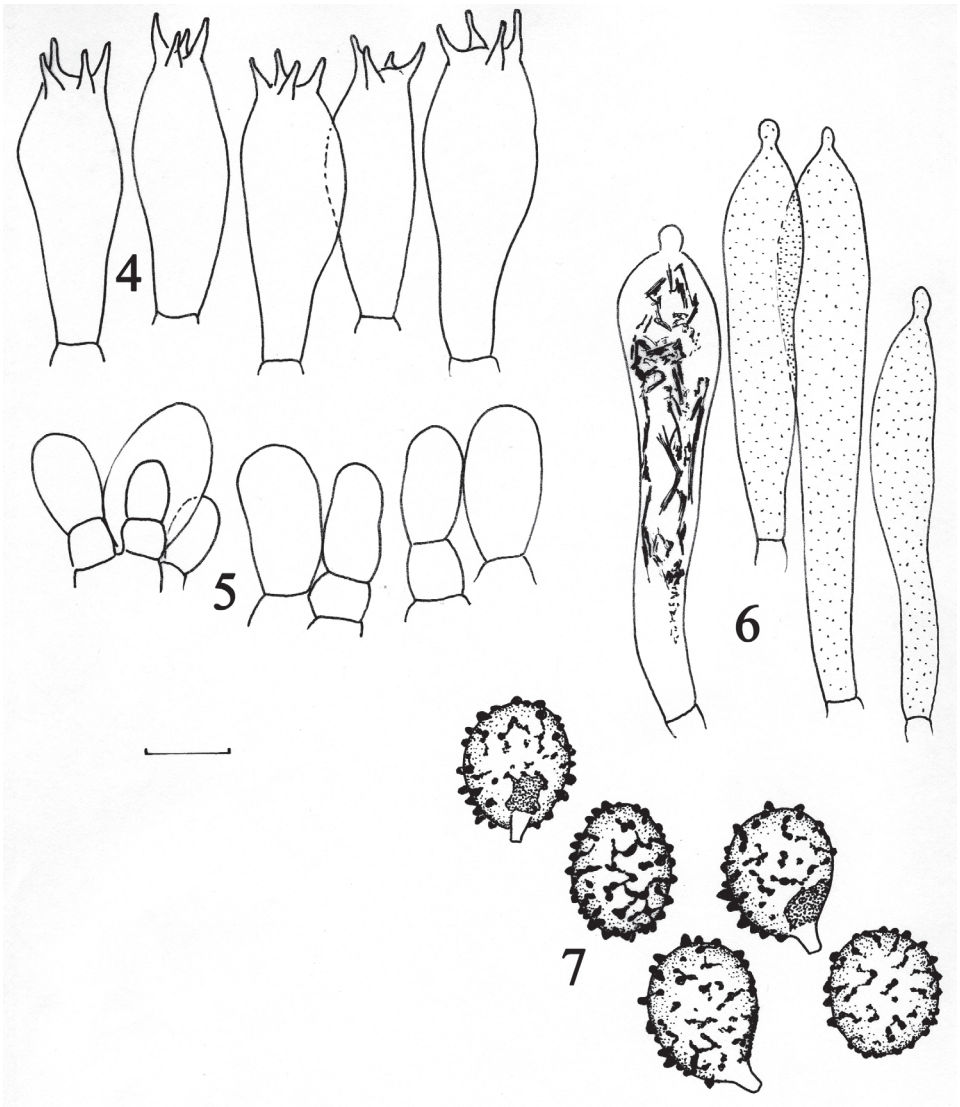
Type collected by W. A. Murrill on the ground in woods at Gainesville, Fla., June 30, 1938 (F 18084). A handsome species of rare occurence. *(Holotype at FLAS).*

Microscopic features : **Spores** (7.4-)7.7-8.2-8.7(-9.5) × (6-)6.2-6.4-6.7(-7.1) µm, Q = (1.15-)1.21-1.28-1.34(-1.41); ornamentation rather dense (5-8 elements in a 3 µm diam. circle), composed of conical to hemisphaerical, amyloid warts up to (0.8-)0.9-1(-1.1) µm high, with frequent line connections (2-5(-7) connections in a circle) or warts occasionally fused in short ridges (0-3 fusions in a circle), rarely isolated; suprahillar plage amyloid. **Basidia** short and rather voluminous, 29-32.8-36(-42.5) × (10-)12-13.5-15(-16) µm, 4-spored, clavate; basidiola voluminous. **Subhymenium** pseudoparenchymatic. **Lamellar trama** mainly composed of large sphaerocytes. **Hymenial cystidia** 500-700/mm^2, measuring ca. (38-)48-55.8-63(-70) × (7-)8-9.6-11(-11.5) µm on gill sides, clavate to fusiform-pedicellate, mostly capitulate-mucronate, with slightly thickened walls, with heteromorphous to coarsely crystalline, usually abundant, SV-negative contents. **Marginal cells** on edge of gills small and narrow ca. 3.5-7 µm diam., often nodulose. **Pileipellis** orthochromatic in cresyl blue, not sharply delimited from the underlying spherocytes of the context, thin, vaguely divided in a rather poorly gelatinized subpellis changing imperceptibly in a suprapellis of ascending hyphae, comprising both distinct pileocystidia and endings of generative hyphae. Hyphal endings without incrustations, thin-walled, sparsely branched, near the cap margin with terminal cells measuring (25-)28-38.3-48.5(-60) × (2-)2.5-3-4(-4.5) µm, mostly attenuated upwards and ca 1.5-2.5 µm diam.; subapical cells only very slightly larger or equal in diam. but shorter, often branched ; hyphal endings in the cap centre similar but shorter and more frequently subcilindrical, measuring (13.5-)18-25.8-34(-42) × (2.5-)3-3.4-4 µm. Pileocystidia dispersed but with distinct contents, 1(-2)-celled, apical cell 26.5-40.6-54.5(-66) × (4.5-)5.5-6.3-7 µm, narrowly clavate, some irregularly constricted, rounded-obtuse at apex, rarely mucronate, contents refringent, rather coarsely crystalline, SV-negative. **Clamp connections** absent in all parts.

Commentary : Using the European *Russula*-key of Romagnesi (1985), this red-capped species keys out to subg. *Russula*, close to the *R. atropurpurea*-group because of the mild taste and white spore print. Using Bon's key (1988), one is guided to *R.* sect. *Rhodellinae* Romagn. in subg. *Tenellula* Romagn. because of the mild taste and the small size of hymenial elements, esp. basidia. The synoptic key of Kibby & Fatto (1990) results in the character combination AHKNPT which corresponds to nothing since there is no mild species known from the US that combines these particular features (it is more specifically the mention of a hardly peeling pileipellis which is difficult to combine with the other features). Yet, the key by Kibby & Fatto does include *R. floridana,* but the feature combination used by Kibby & Fatto is not the same as the one used here since they accepted the synonymy proposed by Singer (see introduction) and coded the



Figs. **1-3**. *Russula floridana* (holotype). **1.** Pileocystidia, with contents indicated in one element as seen in Congo red. **2.** Hyphal terminations in cap center. **3.** Hyphal terminations near cap margin. Scale bar = 10 μm.



Figs. **4-7**. *Russula floridana* (holotype). **4.** Basidia. **5.** Basidiola. **6.** Hymenial cystidia with contents indicated in one element as seen in Congo red. **7.** Spores in Melzer's reagent. Scale bar = 5 µm for spores, 10 µm for the other elements.

features of Singer's *R. xerampelina* var. *semirubra* instead of those mentioned in the original description of Murrill's species !

Yet, when reading the original description (see above), Murrill mentions some features that can be considered as very unusual or at least suspect for species in sect. *Xerampelinae* : e.g. a tuberculate-striate margin, white spore print, odorless flesh that is not browning but greying and becoming slightly yellowish when dry. Singer's interpretation to consider this species a synonym of a variety

of *R. xerampelina* is therefore quite surprising and in the absence of any mention of a fishy smell or a green $FeSO_4$ reaction – both characters being typical features of all fishy russulas described so far – there is absolutely no reason to assume that this white (or pale-)spored species should indeed belong to sect. *Xerampelinae*.

Our own examination of the type specimen did not provide any good argument that would suggest such a relationship. Instead, the type of subreticulate spore ornamentation and the very narrow elements of the suprapellis together with the mention "tuberculate-striate" cap margin, suggest a fragile species in subg. *Tenellula* as is also suggested when following Bon's key mentioned above. We therefore reinstate *R. floridana* in its original concept as a good, red-capped, fragile species with mild flesh and very pale spore print that belongs in subg. *Tenellula*, perhaps close to European species in *R.* sect. *Rhodellinae* Romagn. or *R.* sect. *Puellarinae* Singer.

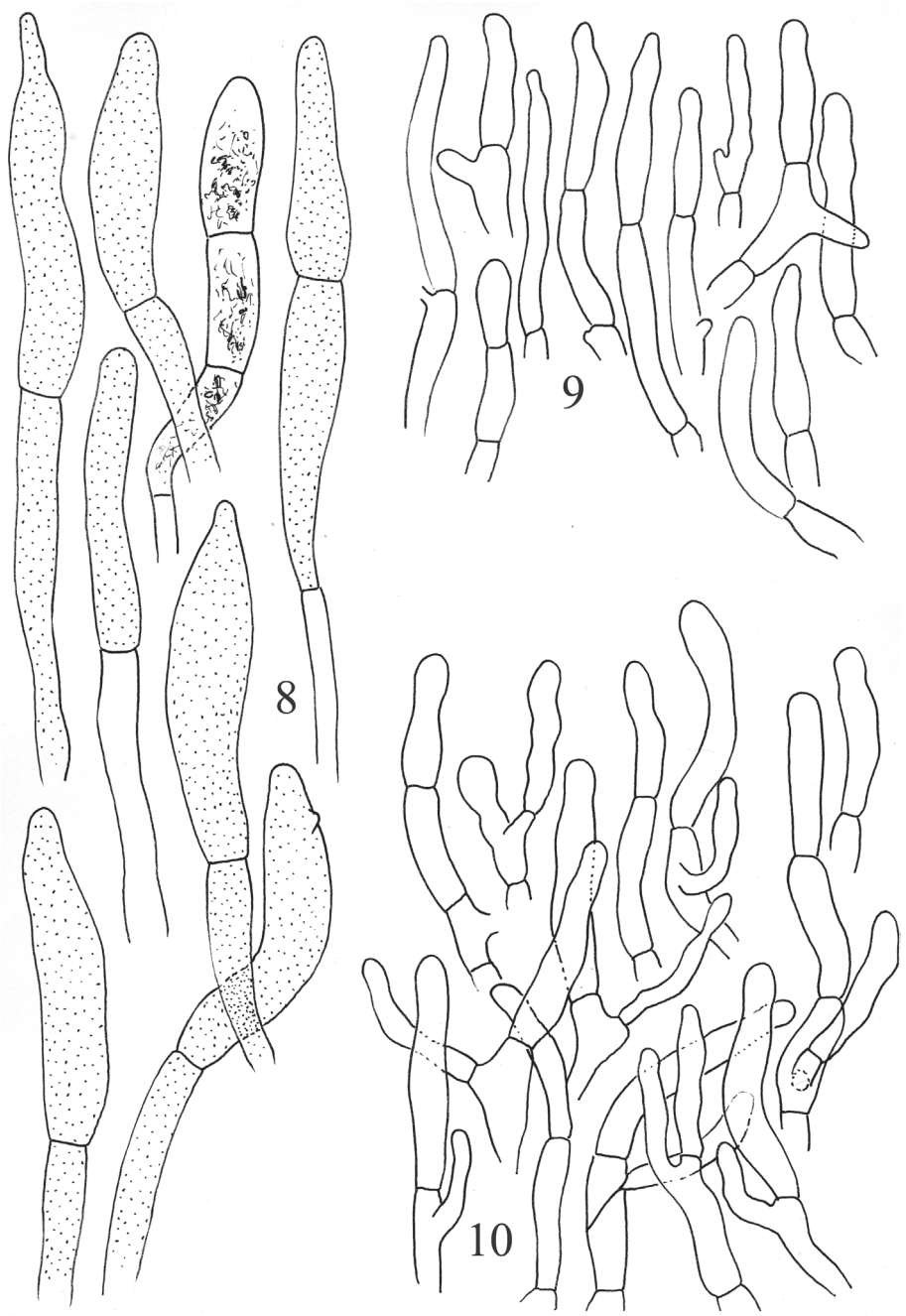
***Russula levyana* Murrill,** Lloydia 7 (4): 311. 1945. Fig. 8-15

Original description : Pileo convexo-depresso, 4-5 cm. lato, subviscido, glabro, purpureorubro, grato; lamellis adnatis, latis, albis; sporis globosis, echinulatis, stramineis, 10 µ; stipite glabro, albo, 3 × 1 cm.

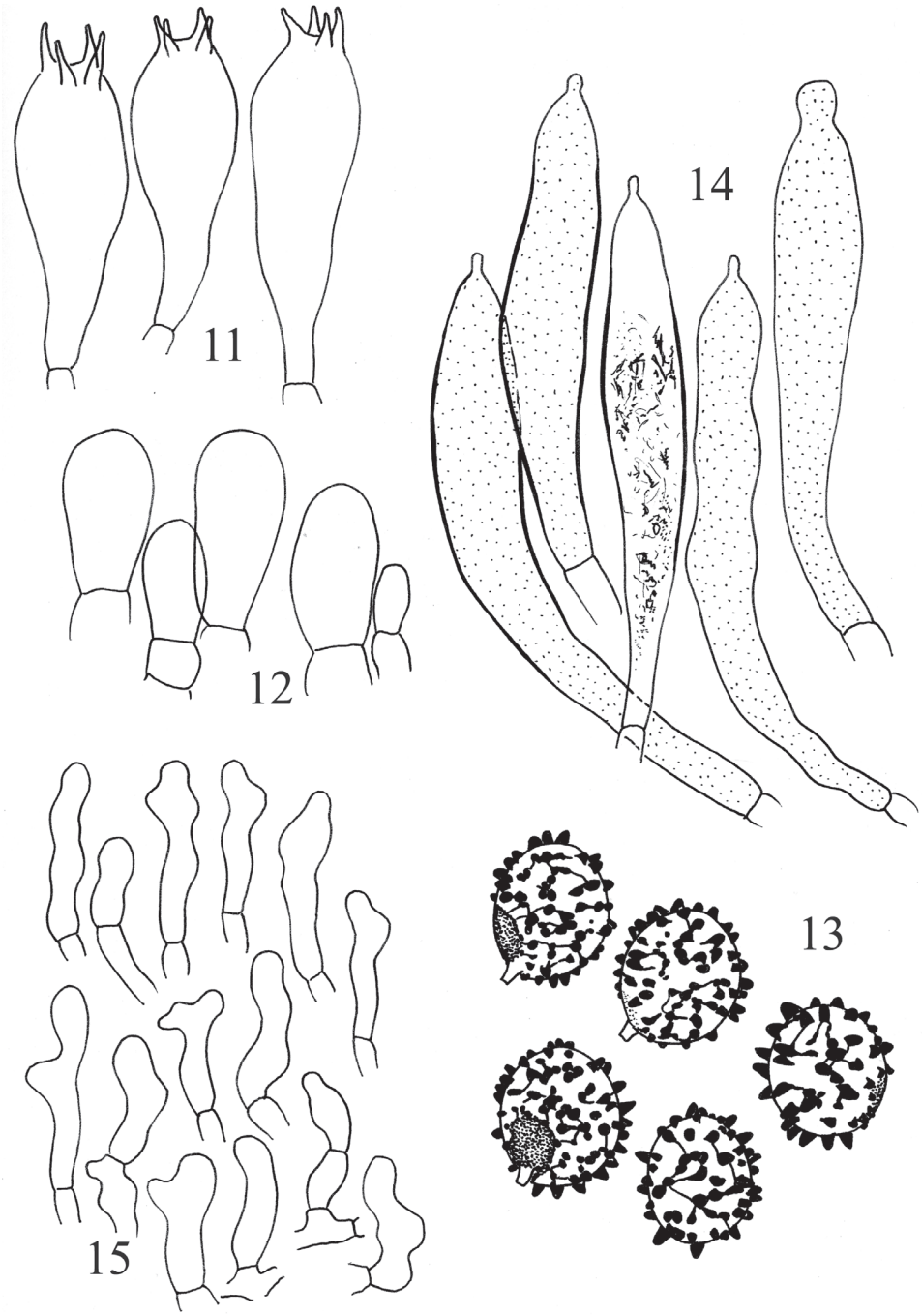
Pileus convex to depressed, gregarious, 4-5 cm. broad; surface slightly viscid, smooth, glabrous, bright purplish-red, margin even, entire; context white, unchanging, odorless, sweet and nutty; lamellae adnate, many forked at the base, broad, ventricose, rather close, entire, white to slightly yellowish; spores globose, roughly echinulate, pale-stramineous in mass, about 10µ; cystidia none; stipe equal or tapering downward, smooth, glabrous, white, about 3 × 1 cm.

Type collected by W. A. Murrill under longleaf pine near OtterCreek, Levy Co., Fla., Jan. 14, 1940 (F 15859). In the dried specimens the gills are grayish and the stems slightly discolored. Related to *R. xerampelina* Fr. but without the disagreeable odor of that species. *(Holotype at FLAS).*

Microscopic features : **Spores** ellipsoid, measuring (7.7-)8.2-8.7-9.1(-9.5) × (6.3-)6.8-7.2-7.5(-7.7) µm, Q=(1.12-)1.16-1.21-1.25(-1.3), ornamented with conical, amyloid and relatively distant spines, usually (3-)4-6(-7) spines in a circle of 3 µm diam. on the spore surface, measuring (0.7-)0.9-1.1 µm high, with some occasional line connections (0-2 line connections in the same circle) or locally fused in very short ridges (0-3 fusions in the circle) ; suprahilar plage amyloid. **Basidia** (36-)39.5-42.4-45.5(-49) × (12-)13.5-15-16.5 µm, 4-spored, clavate-pedicellate; basidiola first cylindrical or ellipsoid, then indistinctly clavate. **Subhymenium** pseudoparenchymatic. **Lamellar trama** mainly composed of large sphaerocytes. **Hymenial cystidia** widely dispersed, less than 300/mm^2, measuring (62-)68-73.2-79.5(-84) × (8-)9-10.3-11.5(-13.5) µm on sides of the gills, more numerous near the gill edge, clavate to fusiform-pedicellate, mucronate to capitulate, thin-walled or with slightly thickened (up to 0.5 µm) wall in the central part ; contents distinctly greying in sulfovanillin. **Marginal cells** 10-17.7-26 × 3-4.9-6.5 µm**,** short celled and irregularly inflated, often sinuate and repeatedly constricted. **Pileipellis** orthochromatic in cresyl blue, sharply delimited from the underlying sphaerocytes of the context, well divided in a dens, rather poorly gelatinized, 60-80 µm deep subpellis of paralell hyphae and a thicker 150-180 µm deep suprapellis of intricated and distinctly gelatinized hyphae lacking incrustations. Hyphal endings thin-walled, near the cap margin with terminal cells measuring (15-)19.5-27-34.5(-46) × (3.5-)4-4.4-5 µm, subcylindrical or slightly narrowing towards the apex, occasionally clavulate or more or less sinuate and mostly subapically, sometimes repeatedly constricted ; subapical cells of similar diam., often branched but usually more irregular; towards the centre of the cap becoming less irregular and less



Figs. 8-10. *Russula levyana* (holotype). **8.** Pileocystidia, with contents indicated in one element as seen in Congo red. **9.** Hyphal terminations in cap center. **10.** Hyphal terminations near cap margin. Scale bar = 10 µm.



Figs. 11-15. *Russula levyana* (holotype). **11.** Basidia. **12.** Basidiola. **13.** Spores in Melzer's reagent. **14.** Hymenial cystidia with contents indicated in one element as seen in Congo red. **15.** Marginal cells on gill edge. Scale bar = 5 µm for spores, 10 µm for the other elements.

voluminous, measuring (11-)15.5-21.5-27.5(-35) × (3-)3.5-3.7-4 µm. Pileocystidia distinct and abundant near the cap surface, frequently with 1(-2) septa, the terminal cell measuring 32-39.5-52 × 5.5-8.1-11 µm, fusiform or subcylindrical, sometimes mucronate, subterminal cells usually narrowing upwards, filled with heteromorphous contents that hardly react to sulphovanillin. **Clamp connections** absent in all parts.

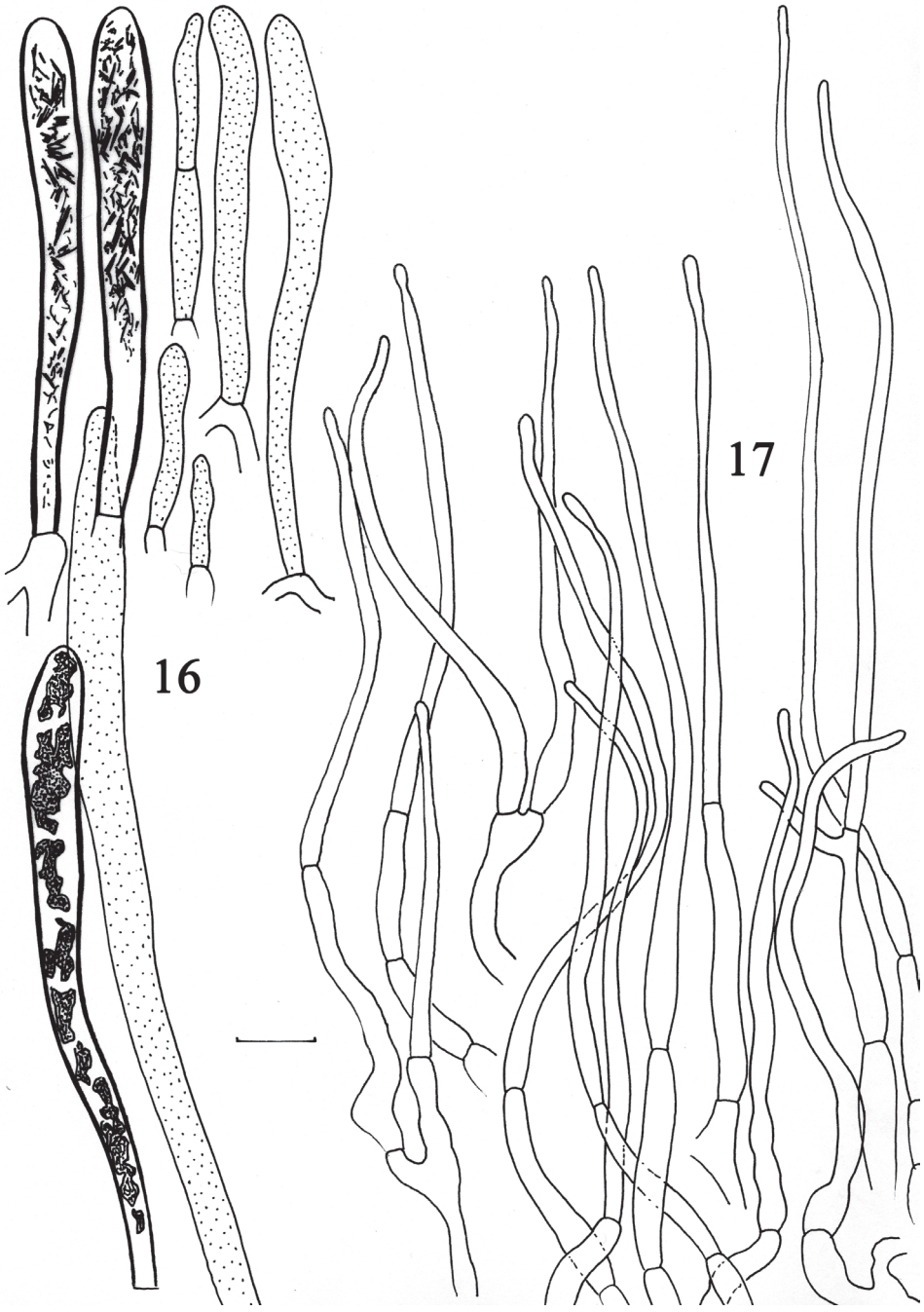
Commentary: Murril's original description is absolutely not convincing to place this species in section *Xerampelinae*: mild flesh, red cap surface and "pale-stramineous" spore print are characters typical for the section but absence of smell and unchanging flesh do not fit at all for *Xerampelinae*. However, Murrill mentions "grayish" gills and a "slightly discolored" stipe for the type, once dried, as well as its resemblance to *R. xerampelina*. The absence of the typical smell can perhaps be explained by the fact that Murrill described young specimens (white gills) and collected them under very wet conditions (subviscous cap). It is also possible that the type collection had a particularly weak smell as happens sometimes (e.g. in the American *R. texensis* Buyck & Adamčík (Buyck *et al*., 2008) or European *R. subrubens* (J.E. Lange) Bon (Adamčík & Knudsen, 2004). Unfortunately, Murrill never used iron sulfate to identify unambiguously members of sect. *Xerampelinae*.

Under the microscope, members of *Xerampelinae* resemble other groups in *Russula* that combine an amyloid suprahilar spot, voluminous hyphal terminations in pileipellis, and have rather large, mostly clavate pileocystidia with 0-1(2) septa that lack incrustations and react only weakly or not at all to sulfovaniline (e.g. some species of *R.* subg. *Tenellula* Romagn. or *R.* subg. *Polychromidia* Romagn.). A confirmation of its placement in this section is therefore only possible with molecular tools or identical new collections.

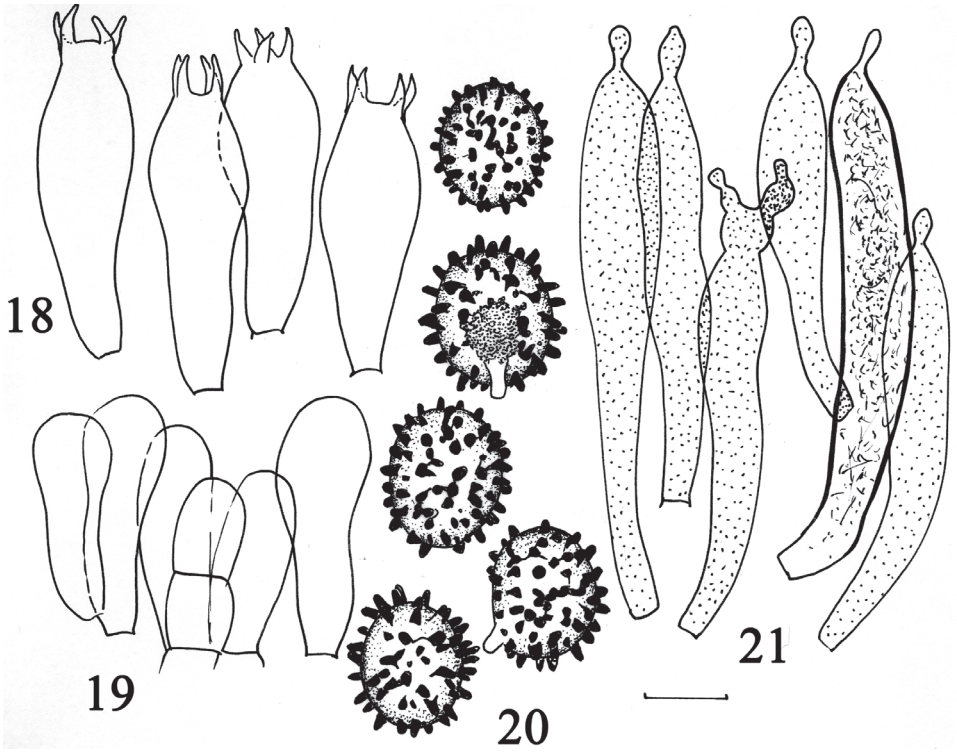
Russula praerubriceps Murrill, Lloydia 6 (3): 215. 1943. Fig. 16-21

Original description : Pileo convexo-depresso, 8 cm. lato, rubro, sapore grato ; lamellis furcatis, sporis albis, globosis, 7-9 µ ; stipite albo, 5 ×1.5-2 cm. Pileus convex to slightly depressed, solitary, 8 cm. broad; surface slightly viscid, smooth, glabrous, ruber, margin mostly even and entire, peeling readily; context white, unchanging, odorless, mild; lamellae adnate, without decurrent ridges, rather crowded, rather broad, equal, mostly forked at the base, entire, white; spores whitish in mass, globose or subglobose, strongly echinulate, 7-9 u; stipe tapering downward, smooth, glabrous, milk-white, unchanging, 5 × 1.5-2 cm. Type collected by West and Murrill in low ground under hardwood trees at Planera Hammock, eleven miles northwest of Gainesville, Fla., August 2, 1938 (F 17977). A truly red species with whitish spores and mild flesh. *(Holotype at FLAS).*

Microscopic features : **Spores** (7.3-)7.6-8-8.3(-8.9) × (6.2-)6.5-6.9-7.3(-7.8) µm, Q = (1.08-)1.12-1.16-1.19(-1.23); ornamentation relatively distant with (4-)5-6 ornaments in a circle of 3 µm diam., composed of acute and narrow, amyloid spines measuring 0.9-1.1(-1.4) µm high, isolated or with occasional line connections (0-3 line connection in 3 µm diam circle) or locally fused in short or long ridges (0-3(-4) fusions per circle) ; suprahillar plage amyloid. **Basidia** relatively short and rather voluminous, (30-)35-39.6-44.5(-51) × (10.5-)13-14.2-15.5(-17) µm, 4-spored, clavate. **Subhymenium** pseudoparenchymatic. **Lamellar trama** mainly composed of large sphaerocytes. **Hymenial cystidia** dispersed, ca 600-700/mm^2, measuring (52-)64.5-74.8-85(-94) × 8-9.6-11(-12.5) µm on sides, subfusiformous to clavate-pedicellate, generally with a 2-14 µm long, apical appendage, with distinct refringent but hardly crystalline, SV-negative to weakly positive contents. **Marginal cells** hardly differentiated, slender, ca. 4-6 µm diam., often irregular in shape or locally constricted. **Pileipellis** orthochromatic in cresyl

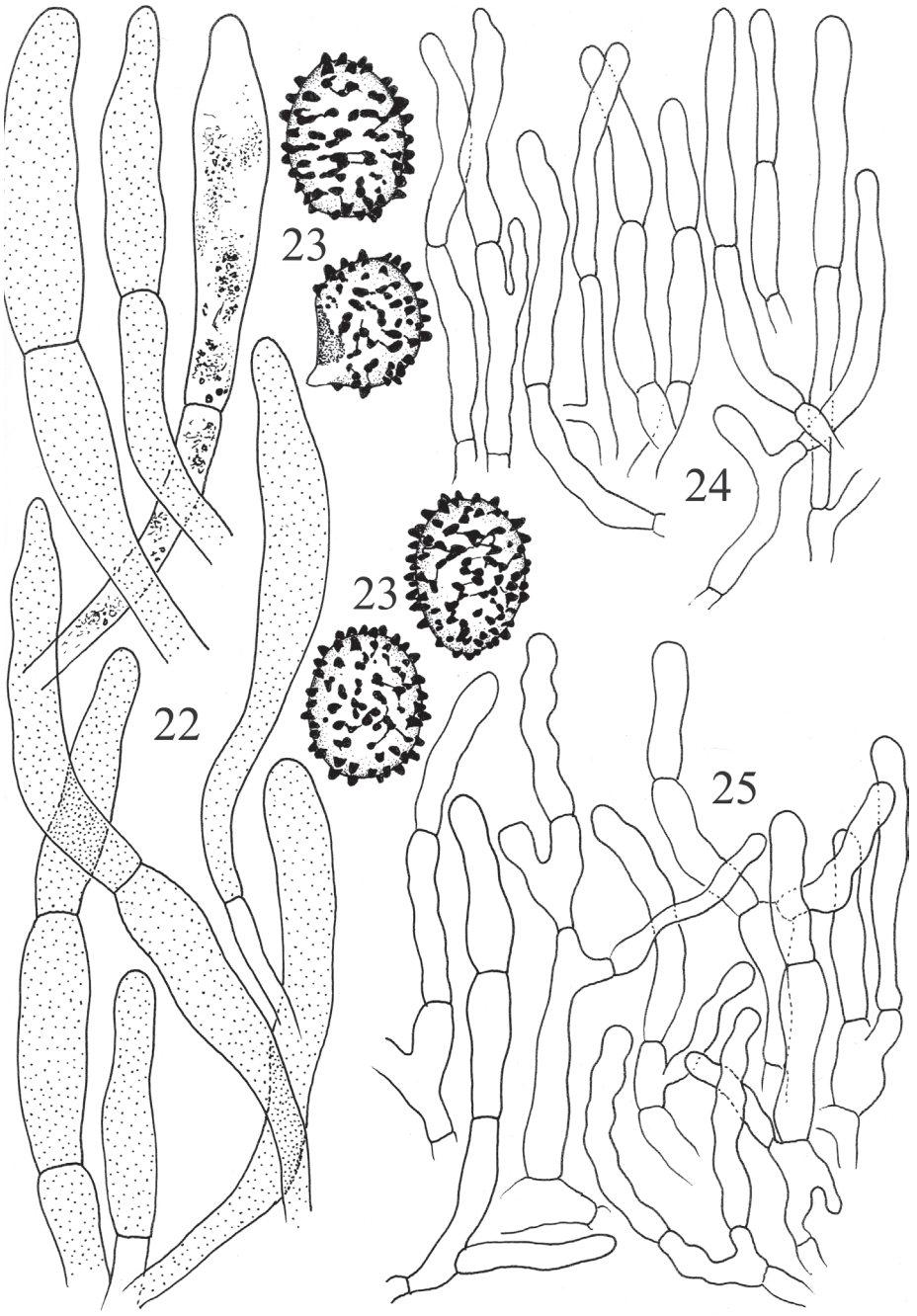


Figs. **16-17.** *Russula praerubriceps* (holotype). **16.** Pileocystidia, with contents indicated in one element as seen in Congo red. **17.** Hyphal terminations in cap. Scale bar = 10 μm.



Figs. 18-21. *Russula praerubriceps* (holotype). **18.** Basidia. **19.** Basidiola. **20.** Spores in Melzer's reagent. **21.** Hymenial cystidia with contents indicated in one element as seen in Congo red. Scale bar = 5 µm for spores, 10 µm for the other elements.

blue, not sharply delimited from the underlying spherocytes of the context, thin, vaguely divided in a gelatinized subpellis and a suprapellis of slightly more ascending elements, composed of pileocystidia and endings of sparsely septate, narrow, generative hyphae showing little differentiation between cap margin and cap center. Hyphal endings without incrustations, thin-walled, very long, mostly gradually tapering and subulate to subcylindrical, near the cap margin with terminal cells measuring (47-)66-85.5-105(-114) long and (2-)2.5-3.1-4(-5) µm wide at the base, then quickly narrowing upward to 1.5-2 µm wide; the tips not clitting together in tufts ; subapical cells usually ca. 3.5-5.5 µm wide, often laterally branched; with some scattered hyphae with refringent grayish contents measuring ca. 17-40 × 3-5 µm. Pileocystidia numerous and very distinct, both at the surface and in the subpellis, also continuing in the trama underneath, non-septate, rarely with one septum, 47-62.2-82(200) × 4.5-6.1-8 µm, narrowly clavate to subcylindrical, generally rounded obtuse, containing distinct, more or less coarsely crystalline to amorphous, strongly refringent, SV-negative contents ; walls clearly thickened (0.5-1 µm thick). Oleiferous hyphae with refringent, homogeneous contents are quite frequent in subpellis and in the underlying trama, nodulose-undulate, narrow (3-5 µm diam.). **Clamp connections** absent in all parts.



Figs. **22-25.** *Russula levyana. (Buyck 09.956)* **22.** Pileocystidia, with contents indicated in one element as seen in Congo red. **23.** Spores. **24**. Hyphal terminations in cap centre. **25.** Hyphal terminations between mid-radius and margin. Scale bar = 5 μm for spores, 10 μm for the other elements.

Commentary : The type specimen certainly resembles the *R. floridana* type very much in general color and habit. It equally concerns a mild, red-capped species of exactly the same size, but it differs from the *R. floridana*-type in the smooth cap margin with readily peeling pileipellis and also in the unchanging color of the stipe (and perhaps flesh?).

Once again, it is very surprising that a taxon with a white spore print, odourless flesh and unchanging context was synonymised by Singer with a member of sect. *Xerampelinae*. There is absolutely nothing in the description that suggests such an affinity.

Using the European *Russula*-keys, this species keys out to exactly the same groups as for *R. floridana* (see above), whereas the synoptic key of Kibby & Fatto (1990) leads us with the combination AJKNPT to *R. sericeonitens* Kauffman (1909), which is quite a different taxon. In our opinion, *R. praerubriceps* is close, but nevertheless distinct from *R. floridana* : main differences for *R. praerubriceps* reside in (1) the much longer terminal cells in the pileipellis especially in the cap center, (2) the thicker walls of the pileocystidia – which are also more abundant – and (3) the higher spore ornamentation of the more subglobose spores.

2. Macroscopic description of the new collections from Texas (Figs. 26-29) :

Fruit bodies dispersed in groups of few to many (> 10) individuals. **Cap** becoming gently depressed in the center, (42)60-70(-95) mm diam., very shortly to tardily striate at the margin, glabrous, dull, hardly getting viscous when wet, smooth and continuous, most often orange to pinkish orange to wine red with large cream to pale yellow patches, sometimes also for the larger part pinkish red to blood red, but in an uneven manner, mostly paler or discoloring in the center with age, locally graying in age by transparency from underlying context change, peeling 1/3 to1/4 and then sometimes exposing a lilac tinge just underneath the pellis. **Gills** narrowly attached to subfree, very brittle, normally to somewhat widely spaced, certainly never crowded (more or less 8/mm at the cap margin), 6-10(-15) mm high, not anastomosing or only a little bit so near the stipe, not forking, white when young, later more cream, with concolorous, even edges. **Stipe** central, not radicant, shorter than the cap diam., (30-)40-60 x (11-)15-20(-25) mm, subcilindrical and usually slightly narrowing upward, neither remarquably fragile nor hard, smooth and not pruinose, white but rapidely and strongly turning brownish-grey when handled, without cavities but becoming soft-spongy inside. **Context** 5-10 mm thick in the cap above stipe, strongly graying – browning with age, particularly in the stipe, showing the typical green reaction to iron sulfate. **Taste** mild. **Odour** typical for the group, of gray fish. **Spore print** pale ochre (Romagnesi IIIa-b).

Specimens examined : Texas. Galveston Co., Runge Park, Santa Fe, N 29*21.203', W 95* 07.315', in lawn under loblolly pine (*Pinus taeda*), 3 Dec. 2009, Buyck 09.954 to Buyck 09.959 (all PC).

Fig. 26. *Russula levyana* in Runge Park, Santa Fe – Texas (BB 09.958, photo B. Buyck).

Fig. 27. *Russula levyana* in Runge Park, Santa Fe – Texas (BB 09.957, photo B. Buyck).

Fig. 28. *Russula levyana* in Runge Park, Santa Fe – Texas (BB 09.955, photo B. Buyck).

Fig. 29. *Russula levyana* in Runge Park, Santa Fe – Texas (BB 09.959, photo B. Buyck).

DISCUSSION

Microscopically, the Texas' collections (Figs. 22-25) are identical with the type of *R. levyana*. All these collections possess the same spores (in average among collections 8.7-9.2 × 7.2-7.5 µm, with a distinct suprahilar amyloid spot and relatively prominent spines that are connected by occasional line connections or locally fused; they all have subcylindrical, terminal cells of similar size at the pileus surface (in average 26-38 × 4.1-4.6 µm) with obtuse, rarely constricted tips, becoming less voluminous and narrower (in average × 3.4-3.7 µm) near the cap centre, and they all possess distinct, rather wide pileocystidia (in average 5.5 – 8.8 µm diam.) that are mostly septate (Tab. 1). However, there may exist quite some variation among specimens produced by what seems to be the same mycelium (as in the case of BB 09.955 for ex.- not illustrated).

As in many *Xerampelinae*, the cap colour seems quite variable and the purplish red cap described for the type of *R.levyana* fits well in the range of the colours observed for the Texas' collections.

Since both the original description as well as our own collections from Texas have been made under three needle pines - longleaf pine (*Pinus palustris*) and loblolly pine (*P. taeda*) respectively - it is quite possible that *R. levyana* is strictly associated with the typically southern 3-needle pines in the US.

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Table 1. Comparison of characters meassured on individual specimens of *R. levyana*. The values given are an average based of 30 measurements. Number of spines and line connections on spores are observed in a circle of 3 µm diameter on the spore surface. TC margin/centre = terminal cells of generative hyphae near margin/centre of pileus, PC = terminal cells of pileocystidia.

	spores					*TC margin*					*TC centre*		*PC*	
	length	width	Q	number of spines	number of line connections	length	width	proportion of constricted	proportion of clavate	proportion of cylindrixcal	length	width	length	width
type	**8,66**	**7,17**	**1,21**	**5**	**1,1**	**27**	**4,35**	**0,067**	**0,2**	**0,8**	**21,5**	**3,683**	**39,5**	**8,06**
B09.956	9,22	7,41	1,25	6,5	2	27	4,46	0,267	0,2	0,667	29,7	3,722	65,88	8,79
B09.955	9,16	7,47	1,23	6	1,8	38,7	4,08	0,733	0,167	0,567	38,9	3,414	57,48	5,41
B09.955B	9,11	7,15	1,27	5,7	1,7	26,1	4,5	0,233	0,1	0,767	20,7	3,417	51,05	7,19
B09.958	8,74	7,21	1,21	5,9	2	26,1	4,55	0,167	0,333	0,567	23,4	3,467	65,9	8,38
average all	**8,8**	**7,08**	**1,24**	**6,2**	**1,6**	**27,1**	**4,41**	**0,313**	**0,254**	**0,717**	**24,7**	**3,527**	**51,27**	**7,12**

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