

clamped, thick-walled (wall uncommonly up to 1.5 μm thick), not agglutinated or adherent, tightly packed; ampulliform inflations not observed; gloeoplerous hyphae occasional, 3-8 μm diam, thin-walled, yellow-refringent, with common abrupt inflations. Tramal hyphae of upper branches 3-12 μm diam, hyaline, usually clamped, thin- to thick-walled (wall rarely up to 1.5 μm thick), not agglutinated or adherent, densely packed, parallel. Subhymenium extensive; hyphae 1.5-2.0 μm diam, densely interwoven, clamped. Hymenium thickening; basidia 65-72 X 9-11 μm , clavate, clamped; contents densely multiguttulate at maturity, yellow; sterigmata 4, lyriform, delicate.

Spores 9.7-14.4 X 4.0-4.7 μm ($E = 2.25-3.30$; $E_m = 2.68$; $L_m = 11.44 \mu\text{m}$), ellipsoid to subcylindrical, obscurely roughened in profile; contents yellowish, homogeneous to obscurely 1-several-guttulate, the guttules dark ochre, refringent; wall up to 0.2 μm thick; hilar appendix not prominent, with moderate throat; ornamentation of small, low warts and scattered meandering ridges.

Commentary: When the key by Marr and Stuntz (1973) is used, one is led to *R. rubricarnata* [var. *rubricarnata*]. Fruitbodies of the typical variety exhibit more vivid colors, smaller stipes and generally shorter, stockier branches than those of var. *pallida*. Variety *verna* does not differ significantly in stature or color from the typical variety, but var. *pallida*, however, produces longer major and secondary branches, and muted colors of branches and branch flesh. All three varieties share weakly amyloid flesh, macrochemical reactivity, salmon outer branch flesh underlying a yellow hymenium, slow syringaldazine reactions, roughened spores of comparable dimensions, and presence of clamp connections.

Quite similar in fruitbody stature and color is *R. thiersii*, fruitbody flesh of which is macrochemically active and produces a rapid reaction with SYR, but unlike *R. rubricarnata* var. *pallida*, fruitbody flesh is inamyloid. In *R. thiersii* branch colors usually do not include any salmon tint, branch flesh is pure white, and all parts show conspicuous brunnescence where handled or rubbed. The stipe appears large, but usually is cleft deeply by the major branches.

The characters which diagnose var. *pallida* are subtle, and require a sharp eye. All cited specimens were first

listed as *R. rubricarnata* var. *verna*, and when it became obvious that they were not contaxic, they were placed under *R. thiersii*. Positive reaction with IKI and rapid, strong reaction with SYR separate the two.

Specimens examined: California, Sierra Co., Tahoe Nat. Forest, 8.vi.86, coll. R. Halling, no. 47082 (Holotype, TENN); same data, nos. 47091, 47092 (TENN); same location, 9.vi.86, nos. 47090, 47083 (TENN); same location, 10.vi.86, coll. Tom Pugh, nos. 47078, 47080 (TENN). Idaho, Bonner Co., vic. Coolin, 4.vi.71, Scates no. 1461, no. 47096 (TENN); Kootenai Co., vic. Spirit Lake, 7.vi.71, Scates no. 1477, no. 47087 (TENN); Canfield Mt., 8.vi.71, Scates no. 1488, no. 47088 (TENN); Kootenai Co., Spirit Lake, 1.vi.71, Scates no. 1423, no. 47084 (TENN); Kootenai Co., Spirit Lake, 29.v.72, Scates no. 1884, no. 47085 (TENN); E. Hayden Lake, 1.vi.75, Scates no. 3346, no. 47093 (TENN); Sisson's Flats, 6.vi.71, Scates no. 1466, no. 47094 (TENN); E. Hayden Creek Rd., 8.vi.74, Scates no. 3093, no. 47095 (TENN); Huckleberry Hill, Panhandle Natl. Forest, 23.vi.74, Scates no. 3121, no. 47098 (TENN); Kootenai Co., Spirit Lake, 27.v.80, Scates no. 5812, no. 47089 (TENN).

7b. *Ramaria rubricarnata* var. *verna* Petersen and Scates, var. nov.

Ut varietate typica, vel: 1) fructifer vernalis; 2) rami flavi; 3) sporae 10.4-12.2 X 4-5 μm ; et 4) caro stipito sicco albo.

Fruitbodies (Fig. 16) up to 9 X 7 cm, obpyriform to subcircular in outline. **Stipe** up to 4 X 3 cm, single, large, with common clusters of abortive branchlets, white, minutely pruinose in some areas, the pruina easily rubbed off, and there very weakly watery brunnescent; abortive branchlets cauliflower-like, white where protected; flesh white, solid, homogeneous, drying white, firm. **Major branches** 2-4, hardly terete, short; upper stipe and lower branches light yellow ("baryta yellow," "maize yellow"). **Branches** in 3-5 ranks, terete, salmon-orange to light salmon ("light ochraceous salmon," "light ochraceous buff," "ochraceous salmon," "salmon color," "capucine orange"), vinescent ("light vinaceous fawn") around soil particles; flesh usually brighter salmon or salmon-orange ("light salmon orange," "orange pink," "salmon buff," "mikado orange,"), internodes all short, diminishing upward gradually in adolescent specimens; axils acute to narrowly rounded. **Apices** yellow to rich yellow ("buff yellow," "light orange yellow," "apricot yellow," "light cadmium"), quickly fading to concolorous with branches. **Odor** negligible to weakly fabaceous; **taste** negligible.

Macrochemical reactions: FSW, FCL, GUA, ANW, PHN, IKI = positive; PYR, ANO = probably positive (only one test performed); PDAB = negative; SYR, TYR = not performed.

Stipe tramal hyphae 5-15 μm diam, hyaline, clamped, thick-walled (wall up to 0.5 μm thick), not agglutinated or adherent, undulate to serpentine; ampulliform inflations occasional, as clamp connections, aliiform, up to 17 μm broad, thick-walled (wall locally up to 1 μm thick), with extensive stalactitiform ornamentation; gloeoplerous hyphae not observed. Tramal hyphae of upper branches 5-17 μm diam, hyaline, often with somewhat sludgy contents, clamped, thick-walled (wall up to 1 μm thick), more or less parallel, not agglutinated or adherent, ampulliform inflations and gloeoplerous hyphae not observed. Subhymenium extensive; hyphae 1.5-2.5 μm diam, tightly interwoven. Hymenium thickening; basidia 70-80 X 8-9 μm , clavate, clamped; contents multiguttulate at maturity, strongly cyanophilous; sterigmata 4, spindly, sublyriform.

Spores (Fig. 17) 10.4-12.2 X 4.0-5.0 μm ($E = 2.21-2.82$; $E_m = 2.55$; $L_m = 11.09 \mu\text{m}$), ellipsoid, delicately but distinctly roughened in profile; contents with 1-3 well-defined, subrefringent guttules; wall up to 0.2 μm thick; hilar appendix gradual, not prominent; ornamentation of very delicate, small, low warts and/or short meandering ridges.

Commentary: The several characters which separate the varieties of *R. rubricarnata* are shown in Table I.

With these character differences, one might question why the varieties are not proposed as separate species. Several characters link them, namely: 1) General color of branches and apices; 2) general color of branch flesh; 3) amyloidity and general macrochemical reactivity of the flesh; and 4) presence of clamp connections.

Fruitbody macromorphology combines characters similar to those of other taxa. For example, *R. formosa* combines the salmon branches and yellow apices, while abortive branchlets occur in several taxa, including *R. coralcolor* Coker apud Pet. and *R. piedmontiana* Coker apud Pet.. Much less common is the strong macrochemical reactivity of branch flesh. All told, I judge that the overlapping characters convey conspecificity, but that the specimens can be separated at the varietal rank.

Specimens examined: California: Sierra Co., Tahoe Nat. Forest, ii.vi.86, no. 47009 (TENN). Idaho: Benewah Co., vic. Enida, Little John Creek Rd., 29.v.74, Scates no. 3064, no. 47077 (TENN); Kootenai Co.,

TABLE I
Varieties of *Ramaria rubricarnata*

var. <i>rubricarnata</i>	var. <i>verna</i>	var. <i>pallida</i>
1. Autumnal fruiter	Vernal fruiter	Vernal fruiter
2. Lower branches stocky, concolorous with branches	Lower branches stocky, yellow	Lower branches elongate, cream-colored
3. Spore $L_m = <10 \mu\text{m}$.	Spore $L_m = >11 \mu\text{m}$.	Spore $L_m = >11 \mu\text{m}$
4. Dried stipe flesh yellow	Dried stipe flesh white	Dried stipe flesh white
5. Upper branches salmon-colored; stocky	Upper branches salmon-colored; stocky	Upper branches cream-colored; elongate
6. Branch flesh bright salmon	Branch flesh bright salmon	Branch flesh pallid pinkish

7.vi.84, coll. E. Coulter, no. 45775 (TENN); vic. Coeur d'Alene, 5.vi.84, no. 45752 (TENN); E. Hayden Creek Rd., 26.vi.76, coll. M. Bueg, no. 45755 (TENN); vic. Spirit Lake, 9.vi.70, coll. KS, Scates no. 595, no. 46651 (TENN); Variety Corner, 7.vi.70, Scates no. 577 (TENN); E. Hayden Creek Rd., 15.vi.70, Scates no. 616, no. 46655 (TENN); Fourth of July Canyon, 7.vi.70, coll. C. & L. Chariton, Scates no. 589, no. 46653 (TENN); Shoshone Co., Lost Mine Rd., 23.vi.74, Scates no. 3122, no. 47602 (TENN).

8. *Ramaria thiersii* Petersen and Scates, sp. nov.

Basidiocarp ad 15 X 8 cm, obpyramidi ad subcylindrici, in terra firma sub humus. Basi ad 7 X 6 cm, subattenuati, albi, laevi, sine ramuli abortivi, contusi brunnescenti; caro albo. Ramuli albi vel pallide flavi; caro albo ad salmonicolor. Apices digitati, pallide viridoflavi; sectiones ramorum in soluto macrochemico affirmo. Hyphae contextualae tenui- ad crassitunicatae, fibulatae; basidia 45-50 X 7-8 μ m, clavata, fibulata. Sporae 12.2-15.1 X 4-4.7 μ m, cylindricae ad tenui-ellipsoidae, subcorrugatae.

Fruitbodies up to 15 X 8 cm, obpyramidal to subcylindrical in outline; usually under litter layer in gritty soil. Stipe up to 7 X 6 cm, obpyramidal, tapering downward to narrowly rounded base, often sub-geniculate, white, smooth, without abortive branchlets or stumps, weakly to strongly brunnescent where rubbed or bruised; flesh white, not mottled, soft to spongy, often grub-ridden. Major branches 3-5, ascending to flaring, often split and splintered, hardly terete, white to pale yellow ("pale buff"). Branches in 4-6 ranks, terete, erect to flaring, often grooved, white to pallid yellow ("pale ochraceous salmon," "light ochraceous buff," "cream buff," "cartridge buff," 5A2); flesh soft, stringy, white in hypogeous forms, salmon-colored in exposed fruitbodies; internodes diminishing upward gradually at maturity; axils rounded, often split below. Apices digitate to molar-like when young, coarsely digitate by maturity, white where protected, pallid greenish yellow where exposed ("cream color," "straw yellow," "colonial buff," "Naples yellow," 4A2, 5A2-4). Odor and taste negligible.

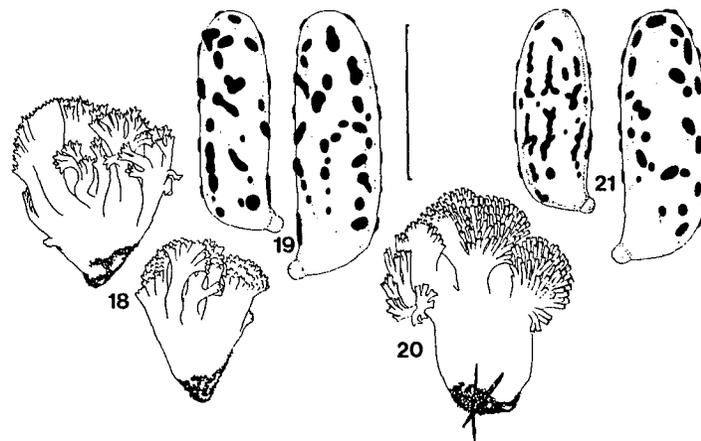
Macrochemical reactions: ANO, ANW, PYR, PHN, FCL, SYR = positive to strongly positive; KOH = darkening on hymenium; NOH, TYR, IKI = negative.

Stipe tramal hyphae 3-12 μ m diam, hyaline, clamped, locally adherent, tightly interwoven, thin- to thick-walled (wall up to 1 μ m thick); ampulliform inflations as clamps, up to 13 μ m broad, ellipsoid, thick-walled (wall up to 2 μ m thick), with extensive and coarse stalactitiform ornamentation; gloeoplerous hyphal system represented by

short lengths of yellow-refringent hyphae 3-5 μ m diam. Tramal hyphae of upper branches 4-12 μ m diam, hyaline, thin- to thick-walled (wall up to 1 μ m thick), clamped, more or less parallel, extensively but not exclusively adherent; ampulliform inflations rare, thin-walled, with extensive but delicate stalactitiform ornamentation; gloeoplerous hyphal system as above, and of bulbous, refringent hyphal tips. Subhymenium rudimentary. Hymenium thickening; basidia 45-50 X 7-8 μ m, clavate, clamped; contents granular to minutely multiguttulate; sterigmata 4, stout, straight, subcoronate.

Spores (Fig. 19) 11.6-15.8 X 4.0-5.0 μ m ($E = 2.46-3.55$; $Em = 3.13$; $Lm = 13.28 \mu$ m), cylindrical to narrowly ellipsoid, occasionally subsigmoid, obscurely roughened in profile; contents uni- to bi-guttulate, the guttules yellow-refringent; wall up to 0.2 μ m thick; hilar appendix small, gradual; ornamentation of small, discrete low warts; struma low, refringent, cyanophilous.

Commentary: Of the several fruitbodies we have seen, most were beneath the soil level and covered with gritty soil when collected. In this condition, colors are virtually absent. When exposed to sunlight during development, the yellow pigmentation is expressed, and in



Figs. 18-21. Fruitbodies and basidiospores of *Ramaria* taxa. 18, 19. *R. thiersii*. 18. Fruitbodies. TENN 46672. 19. Spores. TENN 46677. 20, 21. *R. vinosimaculans*. 20. Fruitbody. TENN 45748. 21. Spores. TENN 45933. Standard line = 10 μ m for spores. Fruitbodies not to scale.