

Figs 25, 26, 27. *Clavulinopsis cineroides*.

(1950), this is why old fruit-bodies with much-thickened hymenia become dilated, hollow and rugulose. Variation in both height and thickness was observed within collection 12897.

The spores and occasional basidia showed a dextrinoid reaction in Melzer's reagent.

Petersen (1968) reduced this species to a form of *C. aurantio-cinnabarina* on the basis of similarity in microscopic detail. Corner (1970) supports the retention of this species though, relating *C. amoena* more closely with *C. fusiformis* than *C. aurantio-cinnabarina*. Collection 12897 did not have the reddish pigmentation characteristic of *C. aurantio-cinnabarina*, nor was it identical in microscopic characteristics.

*Clavulinopsis amoena* was considered to be a tropical species (Corner 1950) but Petersen (1968) has reported collections from the eastern U.S.A. This is the first report of *C. amoena* from Nova Scotia.

### **Clavulinopsis aurantio-cinnabarina (Schw.) Corner**

Ann. Bot. Mem. 1: 358, 1950.

*Clavaria aurantio-cinnabarina* Schw., Trans. Am. Philos. Soc. 2,4: 183, 1832.

*Clavaria shimadai* Imai, Trans. Sapporo Nat. Hist. Soc. 11: 41, 1929.

*Clavaria miyabeana* Imai, Trans. Sapporo Nat. Hist. Soc. 11: 72, 1930.

aurantio-cinnabarina = aurantiacus (L)—orange, between yellow and scarlet  
cinnabarinus (L)—vermilion

Figs 23, 24

**Fructifications:** Simple, cespitose with scattered solitary individuals, 1.5-9.0 cm high, cylindrical, smooth, sometimes developing a central furrow, apices blunt or acute, often curving, dark orange—5A8 (vivid orange yellow—66), carrot red—6B7 (moderate orange—53), with drying, hollow, moderately brittle, stem indistinct. Spore deposit cream—4A3 (pale orange yellow—73). Taste indistinguishable. Odor foetid. Terrestrial, in mixed woods, often under *Fagus grandifolia*.

**Macrochemical Tests:** Positive color reactions occurring with  $\text{FeSO}_4$ . No significant color reactions occurring in pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, aniline.

**Microscopic Structures:** Spores smooth, pale green, subglobose, 3.5-5.0 x 4.0-6.5  $\mu\text{m}$ , apiculate, 1-guttate. Basidia 40-50 x 5-9  $\mu\text{m}$ , with 2 or 4 sterigmata 5-8  $\mu\text{m}$  long, filled with large oil droplets. Hymenium 40-60  $\mu\text{m}$ , containing numerous small granular crystals; subhymenium 10-20  $\mu\text{m}$ . Contextual hyphae 3.5-9.0  $\mu\text{m}$  broad; subhymenial hyphae 2-3  $\mu\text{m}$ . Clamp connections present.

**Collections Examined:** ACAD 12898, 12/9/77, Harrington woods, Kings Co.; ACAD 12899, 17/9/77, Gospel Wood Road, Kings Co.

**Discussion:** In the field, this species is easily distinguished from others of the same shape and habit by its deep orange-red color. It most closely resembles *C. fusiformis* but the spores of *C. aurantio-cinnabarina* are subglobose rather than globose.

Wehmeyer (1935), from his Nova Scotian collections, reported yellow tips on the young clubs, triangular spores 6-7 x 4-5.2  $\mu\text{m}$ , and dark reddish brown conducting hyphae 3.5-7.0  $\mu\text{m}$  wide in the hymenium. None of the above features was observed in collections ACAD 12898 or 12899.

**Clavulinopsis cineroides (Atk.) Corner**

Ann. Bot. Mem. 1: 360, 1950.

*Clavaria cineroides* Atk., Ann. Mycol. 7: 367, 1909.

cineroides (L)—ash grey

Figs 25, 26, 27

**Fructifications:** Solitary, up to 10 cm tall x 5-7 cm wide, very loosely and openly branched from a scurfy, white, mycelioid base; branches dichotomous, cylindrical, smooth, solid; axils rounded, apices bidentate, blunt; yellowish white—4A2 (yellowish white—92), drying cream—4A3 (pale yellow—89), tips becoming hair brown—5E4 (moderate yellowish brown—77). Context tough. Spore deposit white. Odor strong and unpleasant. Taste rank. Terrestrial, in mixed woods.

**Macrochemical Tests:** No significant color reactions in  $\text{FeSO}_4$ ,  $\alpha$ -naphthol, guaiac tincture, guaiacol, aniline. Positive reactions with pyrogallol, 2% phenol.

**Microscopic Structures:** Spores hyaline, smooth, globose to subglobose, 1-guttate, 3.5-6 x 4-6.5  $\mu\text{m}$ . Basidia 50-60 x 5-7  $\mu\text{m}$ , with 4 sterigmata 5-11  $\mu\text{m}$  long. Hymenium thickening to 120  $\mu\text{m}$ ; subhymenium 20  $\mu\text{m}$ . Contextual hyphae 3-4  $\mu\text{m}$  wide, long, slender cells; subhymenial hyphae 2-3  $\mu\text{m}$ . Clamp connections present.

**Collections Examined:** ACAD 12900, 12/9/77, Harrington woods, Kings Co.; ACAD 609, 21/8/32, Stillwater Lake, Guysborough Co.; ACAD 610, 4/9/32, Scots Bay, Kings Co.

**Discussion:** This species closely resembles *C. corniculata* but is separated by the paler color and the larger size. The rank taste and unpleasant odor were not reported by Corner (1950) or Coker (1923). The unmistakable, strong, unpleasant odor lingered in the laboratory during the time the fungus was drying. Coker (1923) did report a rank odor for *C. corniculata* while Corner (1950) described this as mealy. Collection 12901 (*C. corniculata*) had an odor of green corn.

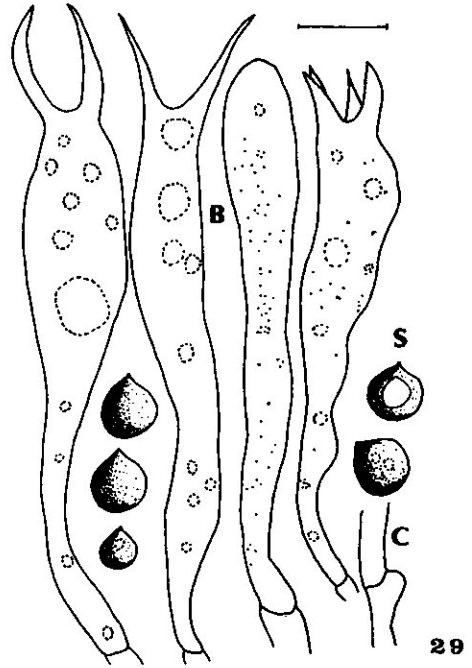
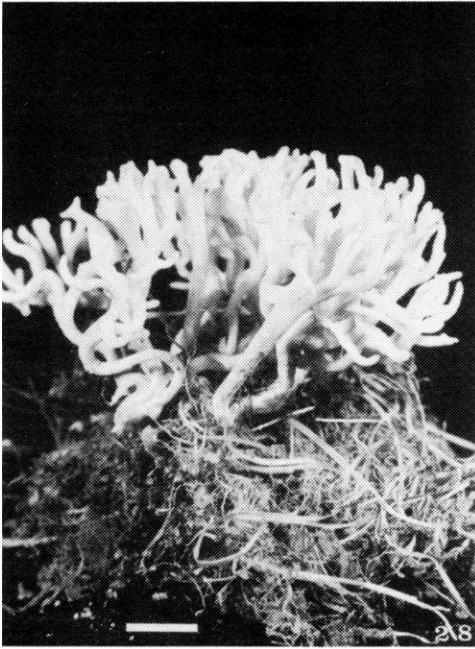
**Clavulinopsis corniculata (Fr.) Corner**

Ann. Bot. Mem. 1: 363, 1950.

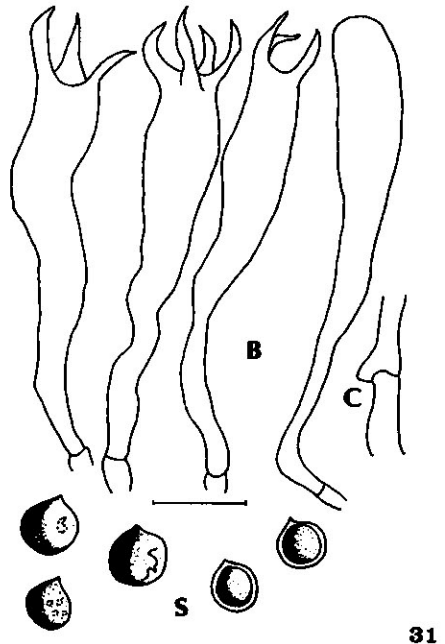
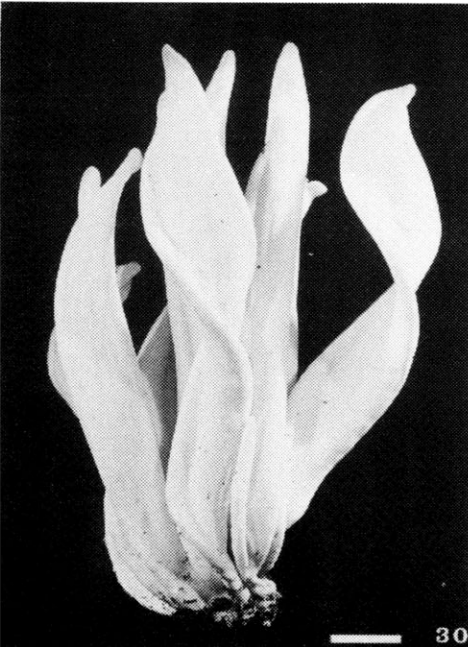
*Clavaria corniculata* Fr., Syst. Mycol. 1: 471, 1821.*Clavaria pratensis* Fr., Syst. Mycol. 1: 471, 1821.*Ramaria corniculata* S.F. Gray, Nat. Arr. Br. Pl. 1: 655, 1821.*Ramaria pratensis* S.F. Gray, Nat. Arr. Br. Pl. 1: 655, 1821.*Clavaria vitellina* Pers., Mycol. Eur. 1: 170, 1822.*Clavaria helvola* Fr., var *dispar* Pers., Mycol. Eur. 1: 181, 1822.*Clavaria fastigiata* Fr., Epicr. Syst. Mycol. 571, 1838.*Clavaria muscoides* Fr., Epicr., Syst. Mycol. 571, 1838.*Ramaria corniculata* (Fr.) Quél., Flore Mycol. 466, 1888.*Ramaria fastigiata* (Fr.) Quél., Flore Mycol. 466, 1888.*Clavaria similis* Pk., Rep. N.Y. State Mus. 43: 24, 1890.*Clavaria peckii* Sacc., Syll. Fung. 9: 249, 1891.*Clavaria fellea* Pk., Rep. N.Y. State Mus. 51: 292, 1898.*Clavaria caloceriformis* Oud., Beih. Bot. Centralbl. 11: 525, 1902.

corniculata (L)—having small horns

Figs 28, 29

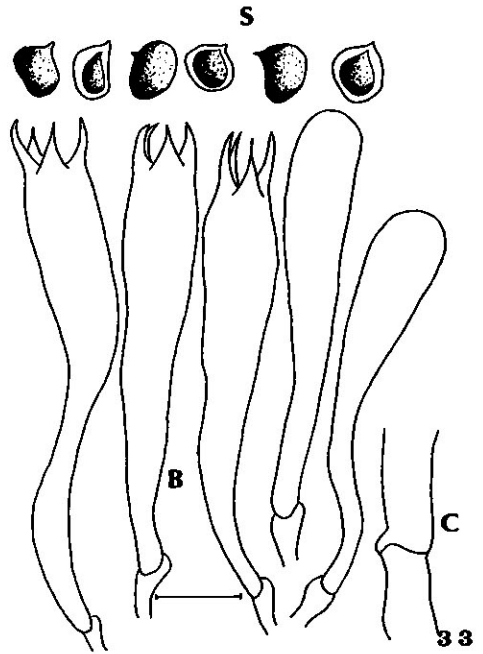
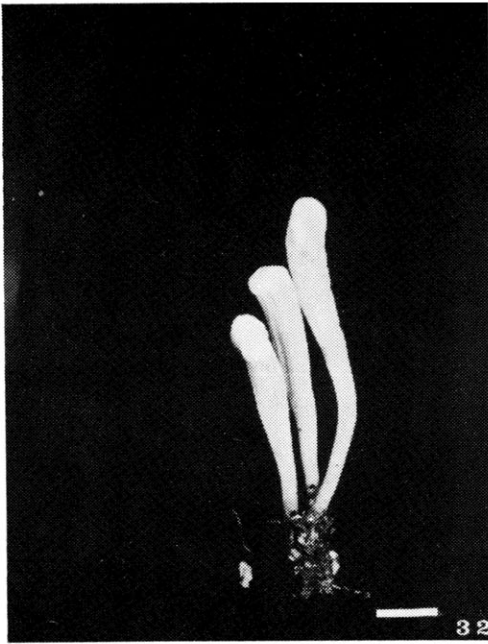


Figs 28, 29. *Clavulinopsis corniculata*.

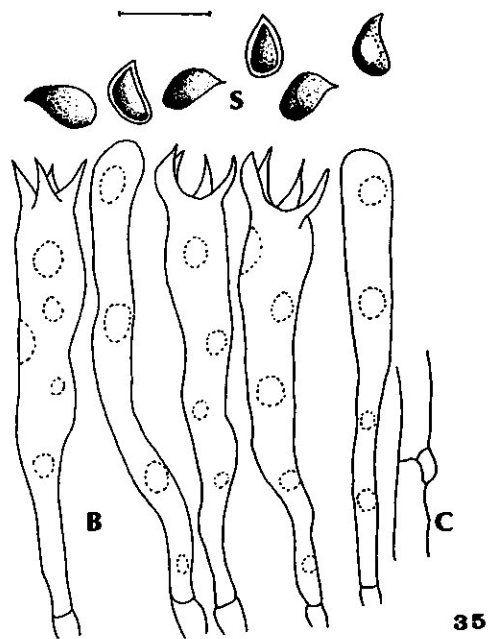
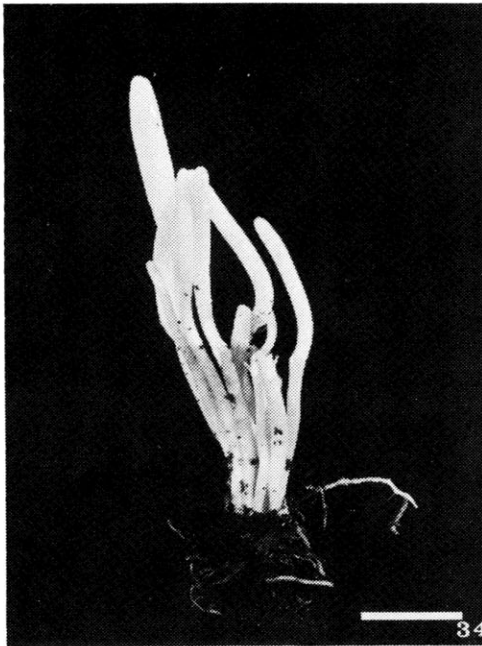


Figs 30, 31. *Clavulinopsis fusiformis*.





Figs 32, 33. *Clavulinopsis laeticolor*.



Figs 34, 35. *Clavulinopsis luteo-alba*.

*Fructifications:* Gregarious or cespitose, branched dichotomously into cylindrical branches, divaricate with lunate axils, smooth, 2-5 cm, sometimes becoming furrowed, hollow, lower branches sometimes polychotomous and intertwined; color butter yellow—4A5 (pale yellow—89) drying light yellow—4A4 (pale orange yellow—73). Context concolorous, moderately brittle. Stem 0.75-2.50 cm long, white, subtomentose at base. Spore deposit white. Taste bitter. Odor of green corn.

*Macrochemical Tests:* Positive color reactions with  $\text{FeSO}_4$ , pyrogallol, 2% phenol. No color changes occurring in  $\alpha$ -naphthol, guaiac tincture, guaiacol, aniline.

*Microscopic Structures:* Spores smooth, subglobose, pale green, 4-6 x 4.5-6.5  $\mu\text{m}$ , apiculus 1.0  $\mu\text{m}$ . Basidia 40-55  $\mu\text{m}$ , with 2 or 4 sterigmata 5-10  $\mu\text{m}$  long. Hymenium 50-60  $\mu\text{m}$ ; subhymenium 10-15  $\mu\text{m}$ . Contextual hyphae 3-7  $\mu\text{m}$  broad, thin-walled, interwoven; subhymenial hyphae 1-3  $\mu\text{m}$ . Clamp connections present. Terrestrial, among grass in fields or lawns and in mixed woods.

*Collections Examined:* ACAD 12901, 12/10/77, Comeau lawn, Kentville, Kings Co.; ACAD 4491, 22/9/62, Lake Kejimikujik area, Annapolis Co.

*Discussion:* In shape and habit, this species is similar to *C. cineroides* but *C. corniculata* may be distinguished by its smaller size, darker yellow color and the odor of green corn. Corner (1950) and Henry (1967) have reported the context as "firm rather tough" while Coker (1923) reported a brittle context. The flesh of ACAD 12901 was moderately brittle.

### **Clavulinopsis fusiformis (Fr.) Corner**

Ann. Bot Mem. 1: 367, 1950.

*Clavaria fusiformis* Fr., Syst. Mycol. 1: 420, 1821.

*Clavaria platyclada* Pk., Bull. Torrey Bot. Club 23: 419, 1896.

fusiformis— *fusus* (L)—a spindle  
forma (L)—shape

Figs 30, 31

*Fructifications:* 3-10 cm tall, simple but densely fasciculate, hollow, fusiform, flattening often becoming spirally twisted, smooth, vivid yellow—4A8 (vivid yellow—82), drying concolorous, tips becoming rust brown—6E8 (deep brown—56); context white, relatively brittle; stem indistinct, base white, finely mycelioid. Spore deposit cream—4A3 (pale orange yellow—73). Taste mild. Odor absent. Terrestrial. Common in mixed woods and in mossy or grassy areas in open fields.

*Macrochemical Tests:* Positive color reactions occurring with  $\text{FeSO}_4$ . No color changes occurred in  $\alpha$ -naphthol, guaiac tincture, guaiacol, aniline. Occasional faint reactions occurred with pyrogallol and 2% phenol.

*Microscopic Structures:* Spores pale yellow-green, smooth, 4-6 x 4.5-6.5  $\mu\text{m}$ , globose with central apiculus, multiguttulate, or with 1 large gutta. Basidia 40-60  $\mu\text{m}$  x 6-7  $\mu\text{m}$ , with 2 or 4 sterigmata 4-10  $\mu\text{m}$  long. Hymenium 40-70  $\mu\text{m}$  thick; subhymenium 10-20  $\mu\text{m}$ . Contextual hyphae 3.5-7.0  $\mu\text{m}$  broad, thin-walled; subhymenial hyphae 2-3  $\mu\text{m}$  broad. Clamp connections present.

*Collections Examined:* ACAD 12902, 29/7/77, Aylesford Lake, Kings Co.; ACAD 12903, 24/8/77, West Gaspereau, Kings Co.; ACAD 12904, 31/8/77, Moses Mountain, Hants Co.; ACAD 12905, 24/8/77, Trout Lake, Annapolis Co.; ACAD 12906, 12/9/77, Harrington woods, Kings Co.; ACAD 12907, 17/9/77, Gospel Woods Road, Kings Co.; ACAD 12908, 2/9/77, Harrington slope, Kings Co.

*Discussion:* *Clavulinopsis fusiformis* is the most common species of this genus. It is distinguished by the globose spores with central apiculus and by the densely fasciculate groups of clubs which are usually hollow and fusiform and remain yellow upon drying. Owing to its common occurrence, similar taxa are frequently misidentified as *C. fusiformis*.

### ***Clavulinopsis laeticolor* (B. and C.) Petersen**

*Mycologia* 57: 522, 1965.

*Clavaria laeticolor* B. and C., *J. Linn. Soc. Lond.* 10: 338, 1868.

*Clavaria pulchra* Peck, *Rep. N.Y. State Mus.* 28: 53, 1876.

*Clavulinopsis pulchra* (Pk.) Corner, *Ann. Bot. Mem.* 1: 384, 1950.

laeticolor (L)—cheerfully, pleasantly, brightly colored

Figs 32, 33

*Fructifications:* Simple, gregarious or solitary in small tufts, cylindrical and acute becoming blunt, compressed, spatulate or rugulose, 1.5-8 cm x 1.2-6.0 mm; genet—3A7 (brilliant yellow—83) to dark yellow—4A8 (vivid yellow—82), unchanging upon drying. Context concolorous, firm, not brittle. Stem distinct, 0.5-2.0 cm, white, finely mycelioid, arising from a white, crusty, basal tomentum. Spore deposit white. Taste sweet. Odor absent. Terrestrial, among grass in fields or in coniferous woods.

*Macrochemical Tests:* No significant color changes occurring in  $\text{FeSO}_4$ , pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, aniline.

*Microscopic Structures:* Spores smooth, hyaline, ovoid, broadly ellipsoid or subglobose, with distinct oil drop, 2-6.5 x 4-5  $\mu\text{m}$ , slightly thick-walled, sublateral apiculus 1-2  $\mu\text{m}$  long; basidia 50 x 5-8  $\mu\text{m}$ , with 4 sterigmata 6-7  $\mu\text{m}$  long. Hymenium 50-75  $\mu\text{m}$  thick; subhymenium 10-20  $\mu\text{m}$  thick. Contextual hyphae 3-8  $\mu\text{m}$  broad, long-celled; subhymenial hyphae 2.4  $\mu\text{m}$  broad. Clamps present.

*Collections Examined:* ACAD 12909, 12/10/77, Comeau lawn, Kentville, Kings Co.; ACAD 12910, 20/10/77, Agriculture Canada Experimental Station, Kentville, Kings Co.; ACAD 5027, 14/9/63, Lake Kejimikujik Area, Annapolis Co.; ACAD 5030, 10/9/63, Melrose, Guysborough Co.

*Discussion:* This species is distinguished from *C. fusiformis* and *C. luteo-alba*, which it most closely resembles, by its deeper color, nonfasciculate habit and ovoid, apiculate spores. Coker (1923) reports the bitter or farinaceous taste as characteristic but this was not evident in collection 12909 or 12910.

Petersen (1965) examined the type specimen of *Clavaria pulchra* at New York State Museum Herbarium in Northville and Chittenango Falls, N.Y. (NYS) and the type specimens of *C. laeticolor* at University of North Carolina Herbarium (UNCC), Royal Botanic Gardens Herbarium, Kew (K), and Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University (FH). He considered Peck's species to be a later synonym and designated the material at K as lectotype and the specimens at UNCC and FH as syntypes, proposing the name *Clavulinopsis laeticolor* (B. & C.) Petersen.

**Clavulinopsis luteo-alba (Rea) Corner**

Ann. Bot. Mem. 1: 374, 1950.

*Clavaria luteo-alba* Rea, Trans. Br. Mycol. Soc. 2: 66, 1903.*Clavaria helveola* Pers. sensu Coker, Clav. U.S. Can., 37, 1923.luteo-alba— luteus (L)—golden yellow  
alba (L)—white

Figs 34, 35

**Fructifications:** Simple, occasionally with 2 or 3 short branches, gregarious, scattered or cespitose, cylindrical, acute, often curved, becoming finely longitudinally rugulose, hollow, 1.5-5.0 cm x 1.0-3.5 mm, melon yellow—5A6 (moderate orange—53), light yellow—4A4 (pale orange yellow—73) upon drying. Context concolorous, floccose, friable. Stem short and distinct, arising from a white, finely woolly basal tomentum. Spore deposit white. Taste musty. Odor absent. Among grass in fields or lawns or growing on rotting wood in the humus layer in mixed woods.

**Macrochemical Tests:** No significant color reactions in  $\text{FeSO}_4$ , pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, or aniline.

**Microscopic Structures:** Spores smooth, hyaline, ellipsoid, flattened adaxially, 5-8 x 3.5-4.5  $\mu\text{m}$ , apiculus 0.5  $\mu\text{m}$  long. Basidia 40-60 x 4-7  $\mu\text{m}$ , containing large yellow oil droplets; 4 sterigmata, 5-7  $\mu\text{m}$  long. Hymenium 50-70  $\mu\text{m}$  thick; subhymenium 10-20  $\mu\text{m}$ . Contextual hyphae 3-5  $\mu\text{m}$  broad, long-celled, occasionally inflating up to 13  $\mu\text{m}$ ; yellow conducting hyphae, 5  $\mu\text{m}$  in diameter, interwoven throughout the context; subhymenial hyphae 1.5-3  $\mu\text{m}$ . Clamp connections present.

**Collections Examined:** ACAD 12911, 20/9/77, Agriculture Canada Experimental Station, Kentville, Kings Co.

**Discussion:** The distinguishing features of *C. luteo-alba* are the melon yellow color of fresh material, drying light yellow, the finely longitudinally rugulose club, and the adaxially flattened, apiculate spores.

**Circumscription of the Genus *Lentaria***

*Lentaria* Corner, Ann. Bot. Mem. 1: 437, 1950.

Type species: *Lentaria surculus* (Berk.) Corner, Ann Bot. Mem. 1: 444, 1950.

Corner (1950) proposed *Lentaria* for 2 groups of *Clavaria* which did not fit into the microscopic characterization of other genera. The 2 groups were named subgenus *Eu-Lentaria* and subgenus *Lentariopsis*. He related *Eu-Lentaria*, with thick-walled hyphae, tough, radially branched yellowish-ochraceous fruit-bodies, lignicolous habit and abundant development of the secondary mycelium to the *stricta*-group of *Ramaria*. *Lentaria* has smooth, thin-walled spores, white in most cases, and narrowly ellipsoid or elongate. Spores in the *stricta*-group are rough, short ellipsoid with yellow, ochraceous or nearly ferruginous, thickened walls. *Lentaria byssisseda* and *L. micheneri* spores have been reported white, cream, pale ochraceous by different authors, thus appearing to bridge the gap between *Lentaria* and *Ramaria*.

Petersen (1967) distinguished 2 groups existing within the genus which did not correspond with the 2 subgenera. The first group had rather large, usually well-branched fruiting bodies, arising from an extensive mycelial mass with thick-

walled, dichotomously branched contextual hyphae, generally parallel but loosely arranged. The second group, which included the common *L. mucida*, was distinguished by small, usually simple or sparsely branched fruiting bodies almost exclusively associated with mosses or algae, naked insertion in the substratum or very small mycelial mat, and slightly thickened, tightly packed hyphae, strictly parallel and rarely branched. To accommodate the species in this second group, Petersen (1967) created the genus *Multiclavula* Petersen.

Corner (1970) rejected the genus as the species *L. albovinacea*, *L. micheneri*, and *L. soluta* supply every gradation in structure and form between *L. surculus* and *L. mucida* representing Petersen's first and second groups respectively. Corner also pointed out that *L. afflata* and *L. delicata*, both placed in the genus *Multiclavula*, are neither phycophilous or bryicolous.

Corner (1950) described the genus *Lentaria* as follows: Fruiting bodies radially branched, white, cream, alutaceous, tan, flesh-color, ochraceous or brownish, often arising from a spreading villous or subtomentose, white or yellowish, sterile mycelial felt; flesh tough, pliant. Spores white, smooth, narrowly ellipsoid, aguttate. Hymenium usually thickening. Hyphae clamped, inflating, becoming thick-walled.

### ***Lentaria mucida* (Fr.) Corner**

Ann. Bot. Mem. 1: 442, 1950.

*Clavaria mucida* Fr., Syst. Mycol. 1:476, 1821.

*Clavaria mucida* var. *curtisii* Berk., Grevillea 2: 17, 1873.

*mucida* (L)—slimy, mucous, mucilaginous

Figs 36, 37

*Fructifications*: Gregarious, 3-15 mm tall, mostly simple, clavate, sometimes forked into 2 to 6 curved ascending branches, apices acute. White becoming yellowish white—2A2 (yellowish white—92), apex sometimes becoming black—2C7. Stem indistinct. Context delicate, but tough, solid, not breaking with handling. Spore deposit white. Odor fishy. Taste absent. Lignicolous, on decaying wood in mixed woods, associated with alga *Chlorococcus*, which forms a surface coat on logs beneath the fruiting bodies.

*Macrochemical Tests*: No significant color reactions in  $\text{FeSO}_4$ , pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, aniline.

*Microscopic Structures*: Spores smooth, pale green, subglobose to ellipsoid, 4-8 x 2-4  $\mu\text{m}$ . Basidia 25-35 x 3-6  $\mu\text{m}$ , with 4 sterigmata 4-5  $\mu\text{m}$  long. Hymenium 35-45  $\mu\text{m}$  thick; subhymenium 6-10  $\mu\text{m}$ . Contextual hyphae 2-5  $\mu\text{m}$  broad, of 2 kinds: (a) with oil globules, (b) without oil globules, thickened walls 0.1-0.5  $\mu\text{m}$ ; subhymenial hyphae 2-3  $\mu\text{m}$ . Clamp connections present.

*Collections Examined:* ACAD 12912, 2/11/77, Harrington woods, Kings Co.; ACAD 627, 8/10/32, Agriculture Canada Experimental Station, Kentville, Kings Co.

*Discussion:* *Lentaria mucida* is the most cosmopolitan species in the genus and its form is variable in color, size and shape (Petersen 1967). It has been suggested (Coker 1923) that *L. mucida* is a lichen rather than a true basidiomycete as it is found only in conjunction with the alga *Chlorococcus*. Corner (1950) has pointed out that since there is no alga in the fruiting body, this is a case of semiparasitism rather than symbiosis. Coker (1923) has reported that in North America this fungus grows only on species of *Nyssa*. Petersen (1967) reported the species to be most common on *Populus tremuloides*. Collections 627 and 12912 were growing on deciduous wood.

### Circumscription of the Genus *Ramaria*

*Ramaria* (Fr.) Bonorden, Handb. Mykol., 166, 1851.

*Cladaria* Ritgen, Schr. Marb. Ges. 2: 94, 1831.

*Clavaria* sect. *Ramaria* Fr., Epicr. Syst. Mycol. 571, 1838.

*Clavariella* Karst., Rev. Mycol. 3: 21, 1881.

*Lachnocladium* sect. *Coniocladium* Pat. & sect. *Dendrocladium* Pat., Bot. 3: 23, 33, 1889.

*Phaeoclavulina* Brinkm., Jahrb. Westfal. Prov. Ver. Wiss. Kunst., Bot. Sect., 197, 1896-7.

*Dendrocladium* Lloyd, Mycol. Writ. 5: 870, 1919.

Lectotype: *R. botrytis* (Fr.) Ricken, Vademecum, 253, 1918.

Holmskjöld (1790) proposed the name *Ramaria* for those clavarioid fungi possessing branching habit. *R. coralloides* var. *alba apicibus purpurascens* was included in this group. Persoon (1797), although he did not continue with *Ramaria*, in his comments on Holmskjöld's reprinted edition, used the synonymous name of *R. coralloides* var. *alba apicibus purpurascens*, *Clavaria botrytis*. Gray (1821) validated Holmskjöld's genus *Ramaria*, citing Holmskjöld as author. Fries (1821), however, validly published the name *C. botrytis*, adopting the name *Ramaria* as a "Tribe" under the genus *Clavaria*. The 3 tribes proposed by Fries were based exclusively on fruiting body shape but later (Fries 1838), spore color was used as the basis of subdivision.

Bonorden (1851), Quélet (1888), and Ricken (1918) all used the name *Ramaria* as a genus for clavarioid fungi with branching habit.

Donk (1933) emended the genus to include branched species with colored spores. Gray's (1821) book, *Natural Arrangement of British Plants*, had dropped out of circulation and so was unknown to Donk. His emendment was *Ramaria* (Holmskj. ex Fr.) Bon. emend. Donk.

Rogers (1941) rediscovered Gray's work, established as a valid publication, post-Friesian by only a few months. It included Holmskjöld's 3 species of *Ramaria* but all were white-spored.

Petersen (1968) proposed the acceptance of *Ramaria* Holmskjöld per S.F. Gray typified with *R. coralloides* var. *alba apicibus purpurascens*. The proposal by Donk (1949; 1964) to conserve the name *Ramaria* (Fr.) Bonorden was ratified by the Eleventh International Botanical Congress (Stafleu 1972), thus stabilizing the name *Ramaria*.

Doty (1948), using the positive macrochemical reaction with ferric sulphate, introduced a new key characteristic to distinguish *Clavariella* Karst. (*Ramaria*). The

strongly cyanophilous spore walls of certain species of *Ramaria*, *Ramaricium*, and *Kavinia* was suggested by Ericksson (1954) as another distinguishing characteristic. This feature was later emphasized by Kotlaba and Pouzar (1964) and Petersen (1967).

Marr and Stuntz (1973) considered the genus to be distinguished by (1) branched habit, (2) colored spores, (3) positive ferric sulfate reaction, (4) cyanophilous spore ornamentation.

The genus is cosmopolitan, including 97 species. Corner (1950; 1970) has described the genus as follows: Fruiting bodies radially branched, generally colored, context often vinescent or rufescent. Spores pale yellow, ochraceous, cinnamon or ferruginous, the spore-wall colored, ellipsoid, smooth, striate, rough, rugulose, verruculose or echinulate. Basidia 4-spored. Cystidia and gloecystidia absent. Hymenium thickening or not, often dorsiventral and sterile on the uppersides of the branches. The genus is divided into 3 subgenera: (1) *Lentoramaria*—dimitic or monomitic, generative hyphae frequently thick-walled, spores not echinulate; (2) *Echinoramaria*—monomitic, with thin-walled hyphae, spores echinulate or echinulate verrucose; and (3) *Ramaria*—monomitic, thin-walled hyphae, spores not echinulate.

### Key to the Species of *Ramaria*

1. Hyphae in most of the fruiting body becoming thick-walled, clamped ..... 2
1. Hyphae thin-walled, occasionally a few thick-walled in older parts of the fruiting body, clamped or not ..... 4
2. Dimitic with skeletal hyphae in the basal mycelium ..... 3
2. Monomitic throughout; dark brown, upper branches yellow-green; context tough, dense; spores dull ochraceous, 7-9 x 3.5-5.0  $\mu\text{m}$ ; coniferous habitat . . .  
..... *R. stricta* p. 62
3. Fruiting bodies greyish orange, branch apices white; context tough, bruising dark brown; spores punctate-roughened, 5-10 x 3-4  $\mu\text{m}$ ; lignicolous, deciduous habitat ..... *R. concolor* p. 39
3. Fruiting bodies pale buff or clay-colored, often tinged pale pink or flesh; context tough, unchanging; spores ovoid, minutely warted with warts in sub-spiral arrangement, 5-8 x 3-4  $\mu\text{m}$ ; terrestrial habit ..... *R. gracilis* p. 51
4. Clamps at most septa ..... 9
4. Clamps absent or only occasional ..... 5
5. Context not firmly gelatinous ..... 6
5. Context firmly gelatinous; fruiting bodies pale orange; spores 7-10 x 3.5-4.5  $\mu\text{m}$ , ornamented with irregular warts ..... *R. flavigelatinosa* p. 44
6. Fruiting bodies pinkish or reddish ..... 7
6. Fruiting bodies otherwise ..... 9
7. Fruiting bodies scarlet to bright red or melon, tips concolorous ..... 8
7. Fruiting bodies pink, red, or pinkish yellow, branch tips light yellow; fasciculate with many slender trunks; context concolorous; spores 6.5-9.5 x 3-4  $\mu\text{m}$ , minutely roughened to smooth ..... *R. conjunctipes* p. 43
8. Fruiting bodies scarlet to bright red or light orange, context darker than the hymenium; spores 7-11 x 3-4  $\mu\text{m}$ , finely verrucose ..... *R. subbotrytis* p. 62
8. Fruiting bodies melon, context subconcolorous; spores 6.5-9 x 3-4.5  $\mu\text{m}$ , asperulate ..... *R. sandaracina* p. 56



9. Fruiting bodies 5-9 x 4-7 cm, yellowish white, branch tips pastel yellow, bruising dull vinaceous; context fleshy-fibrous to slightly gelatinous; spores 9-15 x 3.5-5.0  $\mu\text{m}$ , with sinuous, faint spiral lines or grooves to nearly smooth ..... *R. xanthosperma* p. 66
9. Fruiting bodies 2-6 x 1-4 cm, apricot yellow to light orange, sometimes bruising rufescent; context tough; spores 6-10 x 3.5-5.0  $\mu\text{m}$ , minutely verrucose ..... *R. suecica* p. 65
10. Spores striate ..... 11
10. Spores rugulose, verrucose, varying to smooth ..... 12
11. Spores 10-16 x 3-5.5  $\mu\text{m}$ ; fruiting bodies cream, terminal branches reddish or purplish, bruising vinaceous ..... *R. botrytis* p. 36
11. Spores 9-14 x 3-4  $\mu\text{m}$ ; fruiting bodies cream, terminal branches dull red with an overall vinaceous tinge, no bruising reaction . . . . *R. rubripermanens* p. 56
12. Fruiting bodies pinkish to reddish orange ..... 13
12. Fruiting bodies not as above ..... 16
13. With bruising reactions ..... 14
13. Without bruising reactions ..... 15
14. Fruiting bodies salmon, tips concolorous, turning reddish brown with age or bruising; context spongy, fibrous; spores 8-12 x 3.5-5.0  $\mu\text{m}$ , minutely roughened to faintly verruculose ..... *R. secunda* p. 61
14. Fruiting bodies pinkish buff to orange-rose, tips yellow, bruising orange; context fleshy-fibrous drying chalky-friable; spores 8-15 x 4-6  $\mu\text{m}$ , coarsely rugulose, verrucose ..... *R. formosa* p. 48
15. Lower branches cream, terminal branches pinkish, quickly turning brown; spores 8-11.5 x 3-4.5  $\mu\text{m}$ , ellipsoid with longitudinal rows of obscure warts ..... *R. botrytoides* p. 39
15. Lower branches light orange, terminal branches bright pastel red; spores 11-24 x 3-4.5  $\mu\text{m}$ , oblong-ellipsoid to subfusiform, finely ornamented to smooth ..... *R. longissimispora* p. 52
16. Fruiting bodies yellow, ochraceous, orange ..... 17
16. Fruiting bodies white, pale yellowish, cream, tan, brown ..... 20
17. Fruiting bodies with short, compact, bright yellow branches, stipe white, massive, bruising orange; spores 7-15 x 3-4.5  $\mu\text{m}$ , distinctly warted ..... *R. magnipes* p. 53
17. Fruiting bodies with branches and stipe yellow, ochraceous or orange . . . 18
18. Fruiting bodies light orange, 5-10 x 3.5-9 cm; context pinkish white, bruising brown; spores 8.5-12 x 3.5-5.0  $\mu\text{m}$ , cinnamon ochraceous, finely verruculose ..... *R. formosa* var. *concolor* p. 48
18. Fruit-bodies deeply colored yellow to ochre or tinged orange, sometimes bruising brownish; branches usually elongate; spores finely rugulose to asperate ..... *R. flavobrunnescens* p. 45
- a) spores 9-15 x 4-6  $\mu\text{m}$  ..... var. *formosoides* p. 47
- a) spores 7-11 x 3-5  $\mu\text{m}$  ..... (b)
- b) light yellow to ochre with deeper yellow tips . var. *flavobrunnescens* p. 45
- b) more or less orange ..... var. *aurea* p. 47
19. Fruiting bodies up to 20 cm tall, cream with light yellow tips; context fleshy-fibrous, bruising vinaceous; spores 10-15 x 3.5  $\mu\text{m}$ , smooth ..... *R. obtusissima* p. 55
19. Fruiting bodies up to 6 cm tall, golden brown with pale yellow tips, browning and withering with age; context cartilaginous, bruising umber brown; spores 8-12 x 3.5-5.0  $\mu\text{m}$ , verruculose ..... *R. fennica* p. 43

**Ramaria botrytis (Pers. ex Fr.) Ricken**

Vademecum, 253, 1918.

*Clavaria botrytis* Pers., Comm. Fung. Clavif., 174, 1797.*Clavaria botrytis* Pers. ex Fr., Syst. Mycol. 1: 466, 1821.*Clavaria platyceras* Viv., Fung. Ital., t. 54, 1834.*Clavaria purpurascens* Paulet, Icon, Champ., 113: t. 194, 1855.*Ramaria acroporphyrea* Quél., Flore. Mycol., 466, 1888.*Clavariella botrytis* (Fr.) Schroet., Cohn, Krypt. Fl. Schles., Pilze 3: 477, 1888.*Clavaria sculpta* Beck, Verh. K. Zool.-Bot. Ges. Wien, 39: 603, 1889.*Clavaria rielii* Boud., Bull. Soc. Mycol. Fr. 13: 14, 1897.

botrytis (Gk)—a bunch of grapes

Figs 38, 39, 40

**Fructifications:** Gregarious, 7-15 x 4-11 cm, cream—4A3 (pale orange yellow—70), drying greyish orange—5B5 (light brown—57), tips greyish red—8B6 (greyish reddish—39) to oxblood red—9E6 (moderate reddish brown—43). Branches polychotomous, crowded, thick, much branched, mostly parallel becoming divergent towards the often cauliflower-like tips, many abortive branches, apices pluridigitate, subacute to rounded, axils rounded. Context white, bruising vinaceous, fleshy-fibrous drying hard. Stem simple, white then yellowish, thick and massive, 3-6 x 3-5 cm. Spore deposit greyish orange—6B5 (light brown—71). Taste mild. Odor not distinct. Terrestrial, in mixed woods, often under *Tsuga canadensis*.

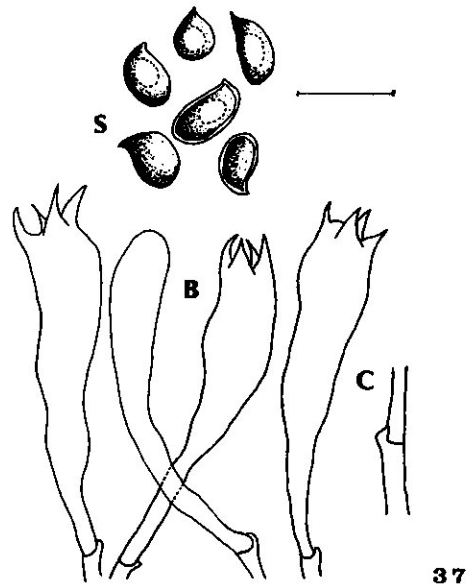
**Macrochemical Tests:** Positive color reactions with  $\text{FeSO}_4$  and sometimes pyrogallol. No significant color change in  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol or aniline.

**Microscopic Structures:** Spores 10-16 x 3-5.5  $\mu\text{m}$ , ochre, oblong-elliptic, finely striate. Basidia 40-70 x 4-7  $\mu\text{m}$ , with 4 sterigmata 3-7  $\mu\text{m}$  long. Hymenium 50-90  $\mu\text{m}$  thick; subhymenium 15-20  $\mu\text{m}$ . Clamp connections frequent.

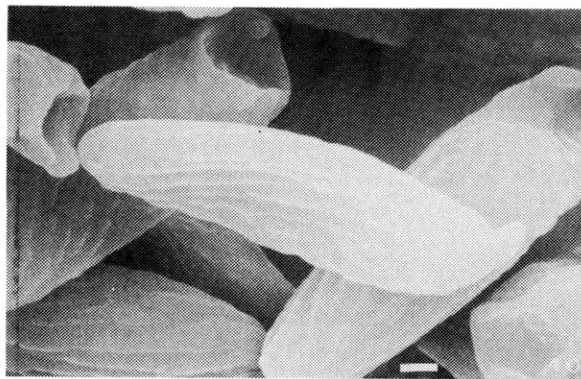
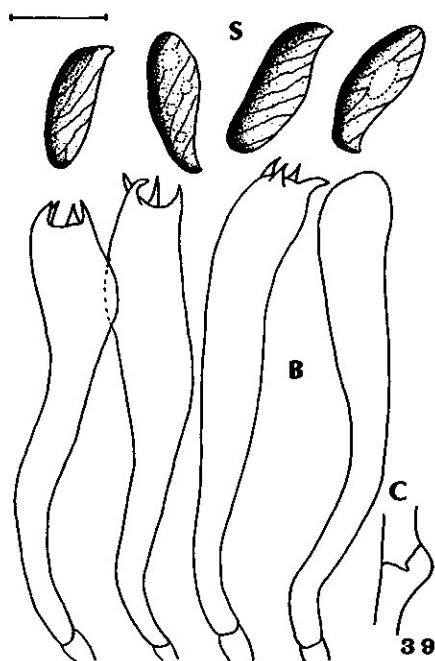
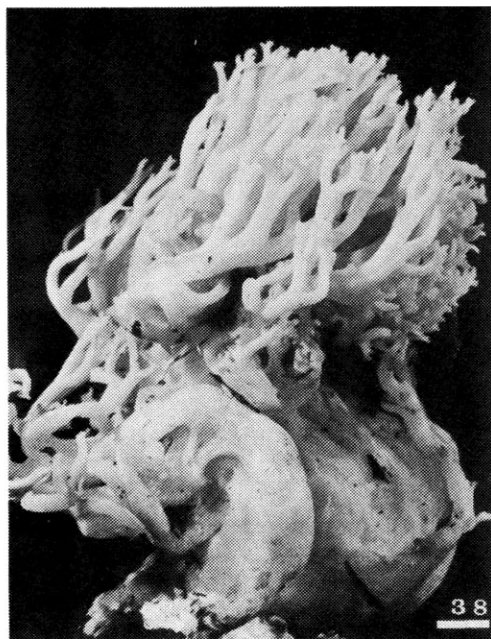
**Collections Examined:** ACAD 12919, 25/8/77, Nicholville, Kings Co.; ACAD 12920, 22/8/77, Moores Falls, Kings Co.; ACAD 12921, 12/9/77, Harrington woods, Kings Co.; ACAD 12922, 12/9/77, Harrington woods, Kings Co.; ACAD 12923, 23/9/77, Melanson ravine, Kings Co.

**Discussion:** This is the type species of the genus and one of the most easily recognized, but there has been much confusion as to its identity. The collections examined were closest to the description presented by Marr and Stuntz (1973) in which the species is distinguished by striate ornamented spores (12-18 x 4-6  $\mu\text{m}$ ), deep reddish or purplish terminal branches and a vinaceous bruising reaction. Corner's *R. holorubella*, which he separates from *R. botrytis* on the basis of spore morphology also fits this description. Marr and Stuntz (1973), after having examined the type of *R. holorubella* Atk., decided that the spore morphology of the 2 species was similar, thus making *R. holorubella* synonymous with *R. botrytis*.

Collection 12923, although similar in other characters, did not exhibit the vinaceous bruising reaction distinctive of the species, but this could have been a reflection of the age of the specimen.



Figs 36, 37. *Lentaria mucida*.



Figs 38, 39, 40. *Ramaria botrytis*.

**Ramaria botrytoides (Pk.) Corner**

Ann. Bot. Mem. 1: 562, 1950.

*Clavaria botrytoides* Pk., Bull. N.Y. State Mus. 94: 21, 49, 1905.

botrytoides (Gk)—descended from or related to botrytis, a bunch of grapes.

Figs 41, 42, 43

**Fructifications:** Massive, 9-17 x 4-16 cm, cream 4A3 (pale orange yellow—73) to light orange—5A4 (light orange yellow—70), drying concolorous, tips and upper branches pinkish in youth but soon turning brown—6E8 (strong brown—55) with age. Branches polychotomous, branching at ground level, curving upright, the marginal branches acutely divaricate, rugose, much branched distally, axils rounded, apices pluridigitate, blunt, convoluted, slightly inflated. Context white, pinkish in upper branches, unchanging, firm, turgid, brittle, drying somewhat elastic. Stem short, white 1-6 x 1-4 cm, somewhat pointed, rooting just below ground level, with numerous primordial branches arising from the base. Spore deposit greyish orange—6B5 (light brown—57). Odor sweet. Taste like raw new potatoes. Terrestrial, in mixed woods, sometimes under *Tsuga canadensis*.

**Macrochemical Tests:** Positive color reactions occurring with FeSO<sub>4</sub>, pyrogallol,  $\alpha$ -naphthol. No color reactions occurring in guaiac tincture, guaiacol, 2% phenol or aniline.

**Microscopic Structures:** Spores 8.0-11.5 x 3.0-4.5  $\mu$ m, pale yellow, ellipsoid, rough, longitudinal rows of low obscure warts, indistinct lateral apiculus. Basidia 40-60 x 7-9  $\mu$ m, with 4 sterigmata 4-6  $\mu$ m. Hymenium 50-75  $\mu$ m thick; subhymenium 10-20  $\mu$ m. Contextual hyphae 5-10  $\mu$ m broad. Clamp connections present.

**Collections Examined:** ACAD 12917, Harrington slope, Kings Co.; ACAD 12918, 23/9/77, Melanson ravine, Kings Co.

**Discussion:** *Ramaria botrytoides* is a common North American species (Corner 1950). Coker (1923) describes the taste and smell as that of green-pea hulls and has rated the fungus as "one of the most esteemed as an esculent." It is easily distinguished from *R. botrytis* and *R. rubripermanens*, which are macroscopically similar, by its smaller spores ornamented with longitudinal rows of low obscure warts and by the paler color of the branch tips.

**Ramaria concolor (Corner) Petersen**

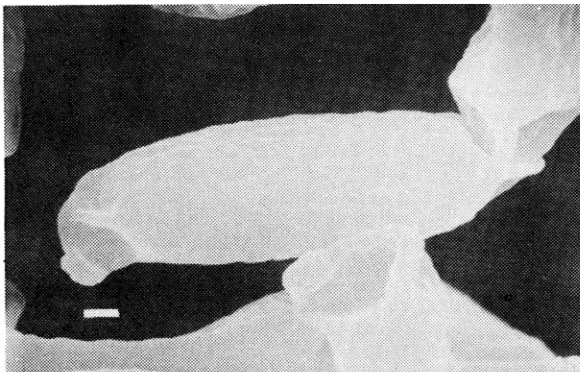
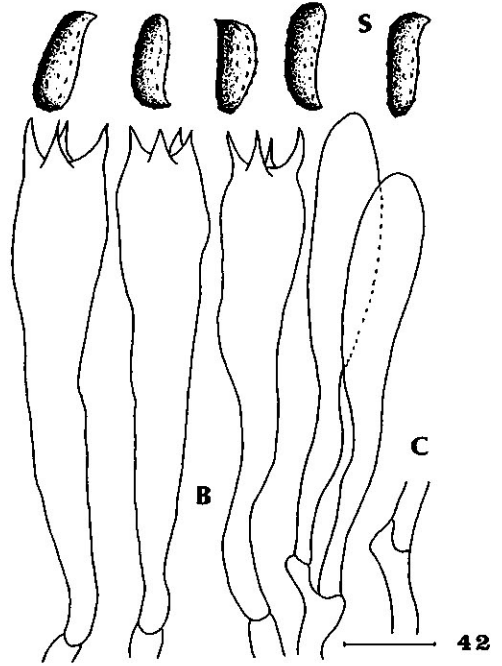
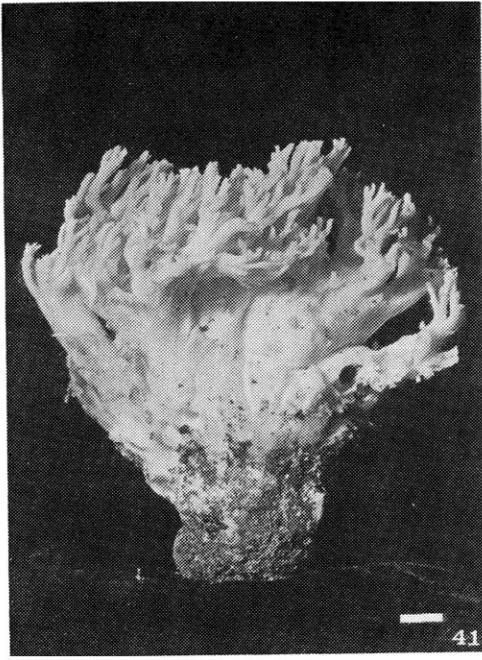
Bibl. Mycol. 43: 54, 1975.

*Ramaria stricta* var. *concolor* Corner, Ann. Bot. Mem. 1: 623, 700, 1950.

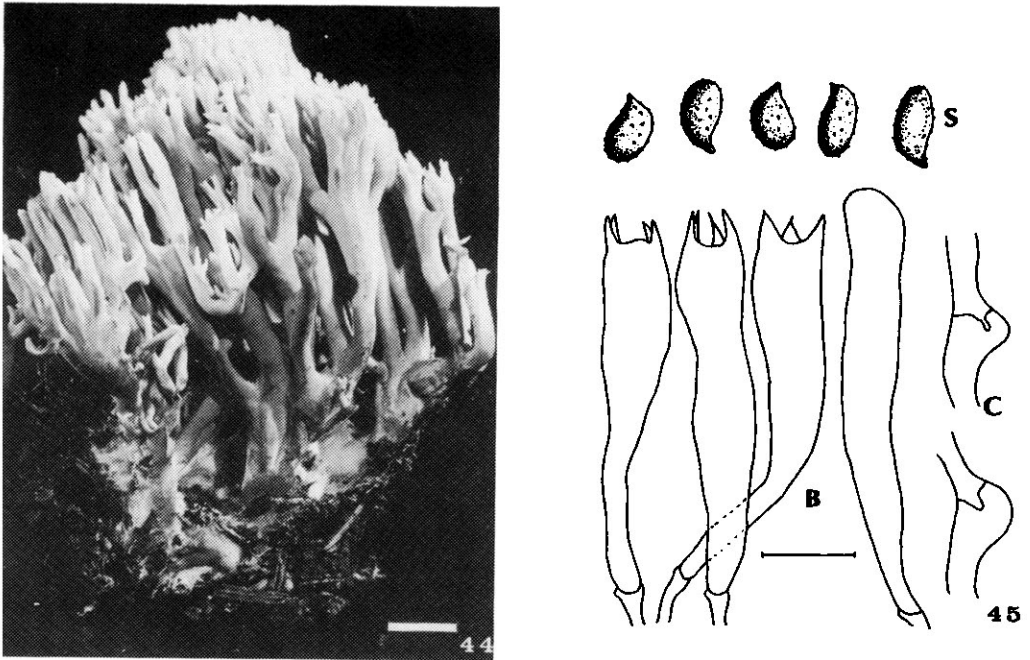
concolor (L)—of the same color

Figs 44, 45

**Fructifications:** Gregarious, 3-11 x 2-8 cm, greyish orange—5B4 (light brown—57), unchanging upon drying. Branches dichotomous, erect, parallel, numerous, axils obtuse, apices acute, single or bifid, white. Context white, bruising dark brown—6F8 (deep brown—56) when cut, tough. Stem distinct, 0.5-4 cm long, pale mycelioid, arising from a white woolly basal tomentum, long white thread-like rhizomorphs extending into the wood. Spore deposit greyish orange—5B4 (light brown—57). Taste absent. Odor sweet or faintly of anise. Lignicolous, common mixed or deciduous woods, usually growing on hardwood.



Figs 41, 42, 43. *Ramaria botrytoides*.



Figs 44, 45. *Ramaria concolor*.

**Macrochemical Tests:** Positive color reactions with  $\text{FeSO}_4$ . Other chemicals did not give consistent, reliable results.

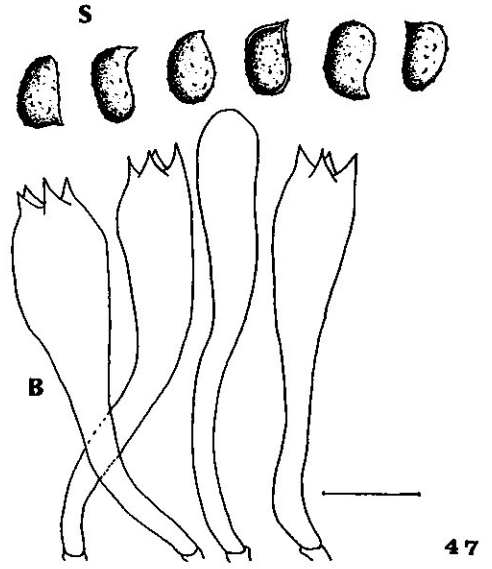
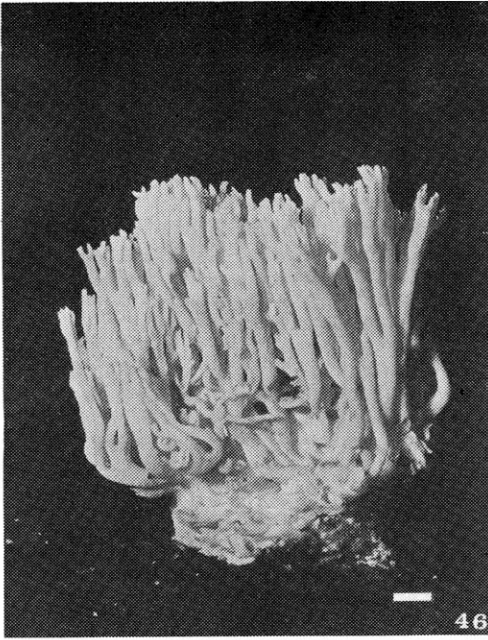
**Microscopic Structures:** Spores  $5-10 \times 3-4.5 \mu\text{m}$ , ochre, oblong or pip-shaped, punctate-roughened. Basidia  $35-50 \times 6.5-8 \mu\text{m}$ , with 4 sterigmata  $5-6 \mu\text{m}$ . Hymenium  $45-50 \mu\text{m}$ , thickening; subhymenium  $10-25 \mu\text{m}$ . Contextual hyphae of 2 types, thin-and thick-walled generative hyphae  $3-10 \mu\text{m}$  wide, walls of thick-walled hyphae  $1-3 \mu\text{m}$ ; subhymenial hyphae  $2-4 \mu\text{m}$ , thin-walled; rhizomorphs containing skeletal hyphae, walls  $1-2 \mu\text{m}$  thick. Clamp connections abundant.

**Collections Examined:** ACAD 12959, 15/8/77, Scots Bay, Kings Co.; ACAD 12960, 22/8/77, Moores Falls, Kings Co.; ACAD 12961, 26/8/77, Scots Bay, Kings Co.; ACAD 12962, 26/8/77, Scots Bay, Kings Co.; ACAD 12963, 4/9/77, Agriculture Canada Experimental Station, Kentville, Kings Co.; ACAD 12964, 19/9/77, Caseys Corner, Kings Co.; ACAD 12965, 12/9/77, Harrington woods, Kings Co.; ACAD 12966, 1/8/77, Harrington woods, Kings Co.

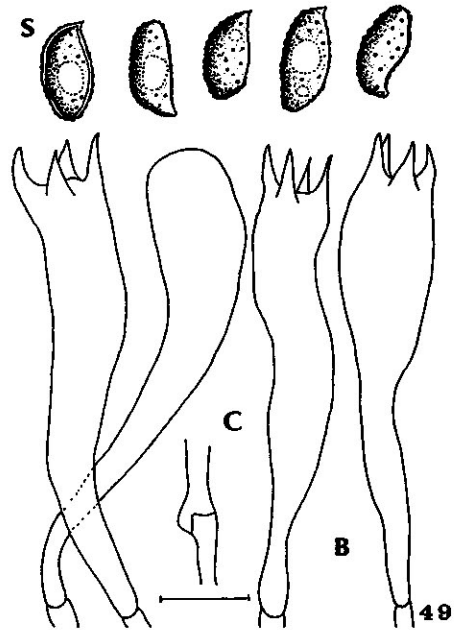
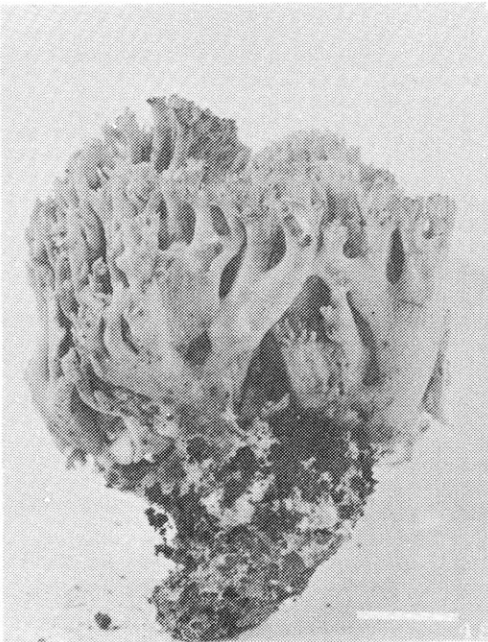
**Discussion:** *Ramaria concolor* is a common species frequently found growing along the length of fallen logs. Its distinctive features include a lignicolous habit, punctate-roughened spores and white ropy rhizomorphs penetrating the substratum.

Until Petersen (1975) raised *R. concolor* to specific status, it was considered as a variety of *R. stricta*. The 2 species are found in overlapping ranges and are often confused. *R. concolor* may be distinguished from *R. stricta* by its generally larger size, tighter closer branching habit, pallid or whitish branch tips and its typical association with deciduous wood.





Figs 46, 47. *Ramaria conjunctipes*.



Figs 48, 49. *Ramaria fennica*.

**Ramaria conjunctipes (Coker) Corner**

Ann. Bot. Mem. 1: 567, 1950.

*Clavaria conjunctipes* Coker, Clav. U.S. Can., 131, t. 43, 91, 1923.conjunctipes—conjunctus (L)—connected  
pes (L)—foot

Figs 46, 47

**Fructifications:** Gregarious, light orange 5A2 (pale orange yellow—73), drying apricot—5B6 (moderate orange yellow—71), branch tips light yellow—5A3 (pale orange yellow—73), 4-15 x 3-7 cm. Branches dichotomous, subparallel, elongated, axils narrowly rounded, apices bifid, subacute. Context concolorous, unchanging when bruised, fleshy fibrous, drying slightly brittle. Stem multiple, white, slender, mycelioid, 1-3 x 0.5-1.5 cm. Spore deposit golden yellow. Taste and odor absent. Terrestrial, in moss or humus in coniferous woods.

**Macrochemical Tests:** No color changes occurring in pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol or aniline. Positive reaction with  $\text{FeSO}_4$ .

**Microscopic Structures:** Spores 6.5-9.5 x 3.4  $\mu\text{m}$ , ochre, ovate or short ellipsoid, minutely roughened to smooth. Basidia 30-45  $\mu\text{m}$  x 5-9  $\mu\text{m}$ ; 4 sterigmata, 3-5  $\mu\text{m}$  long. Hymenium 40-55  $\mu\text{m}$  thick; subhymenium 15-20  $\mu\text{m}$ , cells short and inflated, walls slightly thickened, hyphae 3-4  $\mu\text{m}$  broad. Contextual hyphae 6-7  $\mu\text{m}$  broad. Clamp connections absent.

**Collections Examined:** ACAD 12925, 29/9/77, Melanson ravine, Kings Co.; ACAD 12926, 25/9/77, Melanson ravine, Kings Co.; M-102, 18/10/64, Big River, Wash.

**Discussion:** The pink color of the fruiting body with the yellow branch tips gives this species a close resemblance to *R. formosa*. It is easily separated, however, by its shorter, smoother spores, the numerous slender stems and the tougher texture of the context, which does not dry chalky-friable.

*Ramaria conjunctipes* may also be confused in the field with *R. sandaracina*, but microscopically it is distinguished by the absence of clamp connections.

**Ramaria fennica (Karst.) Ricken**

Vademecum, 264, 1920.

*Clavaria fennica* Karst., Nat. Sällsk. Fauna Flora Fenn. 9: 372, 1868.*C. testaceoflava* Bres. var. *testaceoviridis* Atk., Ann. Mycol. 6: 58, 1908.*C. testaceoviridis* Doty, Clav. Pac. N.W., 47, 1944.

fennica—Fennia (L)—Finland

Figs 48, 49

**Fructifications:** Up to 6 cm tall, champagne—4B4 (greyish yellow—90), drying concolorous, tips light yellow—4A4 (pale orange yellow—73), browning with age and withering. Branches polychotomous, smooth, mostly parallel, stout and compact, becoming hollow, axils of lower branches rounded, upper branches acute, apices pluridentate. Context white, bruising brown—6E8 (strong brown—55), fleshy-cartilaginous, drying hard and brittle. Stem up to 2 cm high, stout, violaceous white at the base, mycelioid. Spore deposit greyish orange—6B5 (light brown—57). Taste bitter. Odor absent. Terrestrial, in coniferous or deciduous woods.

**Macrochemical Tests:** No significant color reactions in  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, aniline. Positive reactions with  $\text{FeSO}_4$ , pyrogallol and KOH.

**Microscopic Structures:** Spores 8-12 x 3.5-5  $\mu\text{m}$ , mostly 10 x 4  $\mu\text{m}$ , buff, elliptical, sometimes curved, verruculose, multiguttate, apiculus conspicuous. Basidia 40-60  $\mu\text{m}$ ; 4 sterigmata, 3-5  $\mu\text{m}$  long. Hymenium 50-75  $\mu\text{m}$  thick with embedded spores; subhymenium 10-20  $\mu\text{m}$  thick. Contextual hyphae 4-6  $\mu\text{m}$  broad, slightly thickened walls; subhymenial hyphae 2-3  $\mu\text{m}$ . Clamp connections frequent.

**Collections Examined:** ACAD 12971, 25/8/77, Nicholasville, Kings Co.; ACAD 645, 4/9/32, Scots Bay, Kings Co.; M-526, 7/11/66, Mason Lake, near Shelton, Wash.

**Discussion:** The distinctive characters of this species are its small size, the golden brown branches with fine, pale yellow-green tips drying concolorous, the umber brown bruising reaction, and the bitter taste. *Ramaria fennica* along with other members of this group of closely related taxa, i.e. *R. fumigata*, *R. bataillei*, respond to application of 10% KOH to the lower branches with a red color change in fresh specimens and a rust brown reaction in dried specimens. This diagnostic reaction seems to be associated with a violet pigment which serves as a natural indicator, changing color in response to pH changes (Marr & Stuntz, 1973).

### ***Ramaria flavigelatinosa* Marr & Stuntz**

Bibl. Mycol. 38: 81, 1973.

flavigelatinosa — flavus (L)—yellow  
gelatinosus (L)—jelly-like

Figs 50, 51

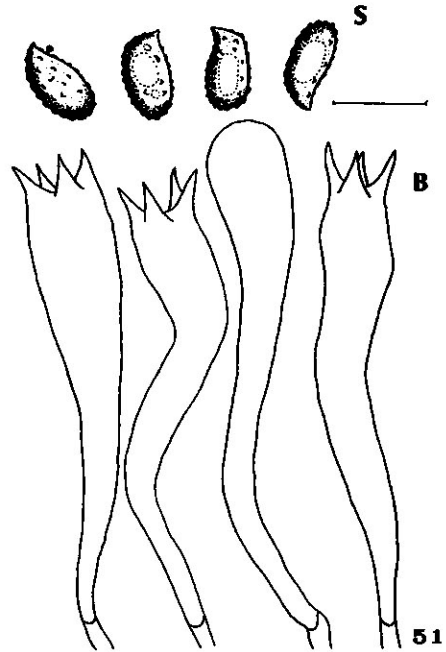
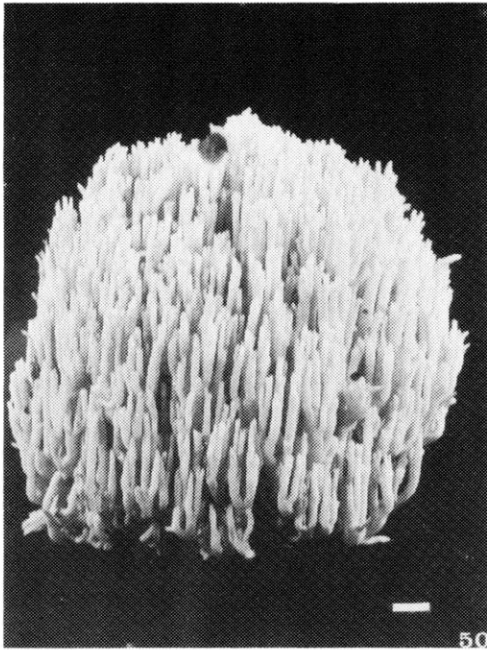
**Fructifications:** 6-12 x 8-15 cm, pale orange—5A3 (pale orange yellow—73), cream—4A3 (pale orange yellow—70) upon drying. Branches parallel, smooth, lower branches polychotomous and connate, upper branches usually dichotomous and free, axils rounded, apices subacute to rounded, forked or pluridigitate. Context translucent, white at the base, context of the branches concolorous, firmly gelatinous when fresh, drying rather pliable. Stem white, multiple, 1-2 x 2-3 cm. Spore deposit apricot yellow—5B6 (moderate orange—53). Taste absent. Odor fabaceous. Terrestrial, in mixed woods under *Tsuga canadensis*.

**Macrochemical Tests:** No positive color changes in  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol, analine. Positive reaction observed for  $\text{FeSO}_4$ .

**Microscopic Structures:** Spores 7-10 x 3.5-4.5  $\mu\text{m}$ , buff, subcylindrical, ornamented with irregular warts, 1-3-guttate. Basidia 45-60 x 7-9  $\mu\text{m}$ ; 4 sterigmata, 4-6  $\mu\text{m}$  long. Hymenium 80-100  $\mu\text{m}$  thick, subhymenium 20-30  $\mu\text{m}$ . Contextual hyphae 4-12  $\mu\text{m}$  broad, interwoven in stipe, closely packed and parallel in branches, gelatinous matrix present; subhymenial hyphae 2.5-4.0  $\mu\text{m}$ . Clamp connections absent. Gloeoplerous hyphae present.

**Collections Examined:** ACAD 12927, 31/8/77, West Gaspereau, Kings Co.

**Discussion:** *Ramaria flavigelatinosa* is easily recognized by the translucent, gelatinous quality of the flesh. *R. gelatinosa* (Coker) Corner differs in the red pigmentation, the hard brittle consistency of the dried flesh and in the presence of clamps.



Figs 50, 51. *Ramaria flavigelatinosa*.

***Ramaria flavobrunnescens* (Atk.) Corner var. *flavobrunnescens***

Ann. Bot. Mem. 1: 581, 1950.

*Clavaria flavobrunnescens* Atk., Ann. Mycol. 7: 367, 1909.

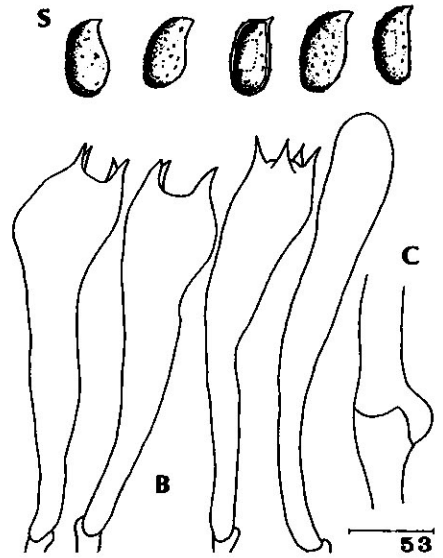
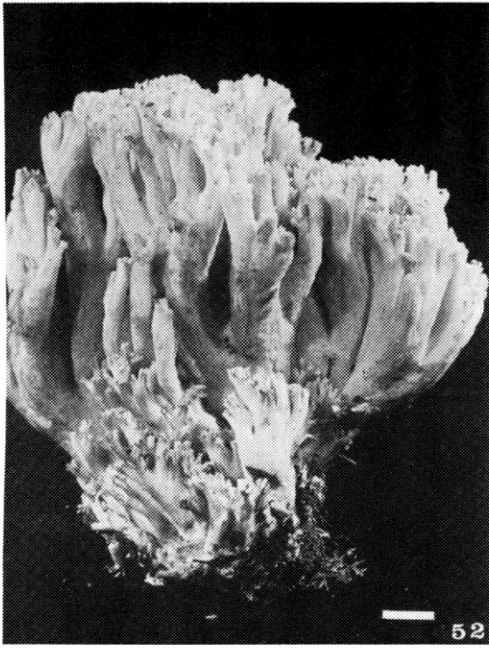
*flavobrunnescens*— flavus (L)—yellow  
 brunneus (L)—brownish

Figs 52, 53

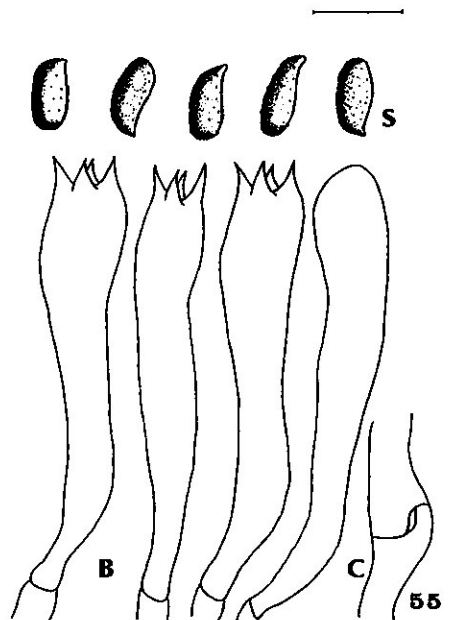
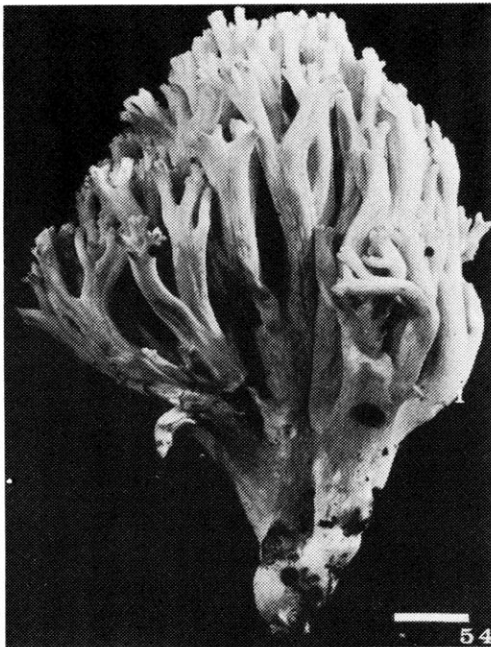
**Fructifications:** Gregarious, 4-13 x 3-6 cm, light yellow—4A4 (pale orange yellow—73) to yellowish orange—4A7 (vivid yellow—82), tips dark yellow—4A8 (vivid yellow—82), turning brown on withering or bruising. Branching at ground level, mostly parallel or diverging slightly, internodes lengthening up to 3.5 cm in lower branches, upper branches short and much thickened, brush-like in appearance, polychotomous, axils acute, apices pluridigitate, blunt or cuspid. Context pale concolorous, watery with age, sometimes bruising brownish, firm to brittle, drying somewhat elastic. Stem 1-4 x 0.5-2.0 cm, usually single, white, cylindrical, tapering, felt-like mycelioid, with short abortive or primordial branches at the base. Spore deposit greyish orange—6B5 (light brown—57). Taste mild. Odor fungal. Terrestrial, in coniferous or deciduous woods.

**Macrochemical Tests:** No significant color reactions occurring in pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol, 2% phenol or aniline. Positive color reaction occurring with  $\text{FeSO}_4$ .

**Microscopic Structures:** Spores 7-11 x 3-5  $\mu\text{m}$ , pale yellow, ellipsoid, faintly roughened, asperate to nearly smooth. Basidia 40-55  $\mu\text{m}$ , basally clamped; 2-4 sterigmata, 3-6  $\mu\text{m}$  long. Hymenium 40-70  $\mu\text{m}$  thick, subhymenium 10-15  $\mu\text{m}$ . Con-



Figs 52, 53. *Ramaria flavobrunnescens* var. *flavobrunnescens*.



Figs 54, 55. *Ramaria flavobrunnescens* var. *aurea*.

textual hyphae 4-10  $\mu\text{m}$  broad, occasionally inflating; subhymenial hyphae 2-3  $\mu\text{m}$ . Clamps frequent. Gloeoplerous hyphae present.

*Collections Examined:* ACAD 12928, 29/8/77, Melanson ravine, Kings Co.; ACAD 12929, 25/8/77, Nicholasville, Kings Co.; ACAD 12930, 25/8/77, Nicholasville, Kings Co.; ACAD 12931, 8/9/77, Black Hole, Kings Co.; ACAD 12932, 26/8/77, Scots Bay, Kings Co.; ACAD 12933, 23/8/77, Black Hole, Kings Co.; ACAD 12934, 7/9/77, Harrington slope, Kings Co.; ACAD 12935, 25/8/77, Nicholson, Kings Co.; ACAD 5045, 11/9/59, Harrington Road, Kings Co.; ACAD 607, 15/7/30, Agricultural Canada Experimental Station, Kentville, Kings Co.; ACAD 12936, 25/8/77, Nicholasville, Kings Co.; ACAD 12937, 25/8/77, Nicholasville, Kings Co.; ACAD 5040, 4/9/59, Odell Park, Fredericton, N.B.

***Ramaria flavobrunnescens* (Atk.) Corner**

Ann. Bot. Mem. 1: 581, 1950.

**var. *aurea* Coker**

Clav. U.S. Can., 124, 1923.

Figs 54, 55

*Fructifications:* 9 x 6 cm, light orange—5A2 (pale orange yellow—73), branch tips pastel yellow—2A4 (pale greenish yellow—104).

*Macrochemical Tests:* Similar to var. *flavobrunnescens*. A faint reaction with pyrogallol and  $\alpha$ -naphthol was observed.

*Microscopic Structures:* Spores 7-10 x 3-4  $\mu\text{m}$ , ellipsoid-oblong, faintly roughened or nearly smooth, pale yellow.

*Collections Examined:* ACAD 12940, 2/9/77, Harrington slope, Kings Co.

*Discussion:* *Ramaria flavobrunnescens* is a common, widely distributed and variable species. The clear, rich yellow pigmentation and the brush-like stiff appearance of the branches serve to identify the species in the field. Var. *formosoides* is distinguished by its larger spores (9-15 x 4-6  $\mu\text{m}$ ). Var. *aurea* has smaller spores (7-10 x 3-4  $\mu\text{m}$ ) and smaller orange fruit bodies with pale yellow branch tips. Wehmeyer (1935) has described this variety from Nova Scotia under *C. flava* var. *aurea*. The rancid unpleasant smell and the reddish vinaceous tips that he described were not evident in ACAD 12940.

***Ramaria flavobrunnescens* (Atk.) Corner**

Ann. Bot. Mem. 1: 581, 1950.

**var. *formosoides* Corner**

Nova Hedwigia 33: 274, 1970.

Figs 56, 57, 58

*Fructifications:* Similar to var. *flavobrunnescens* except that the branch tips are concolorous.

*Macrochemical Tests:* Identical to var. *flavobrunnescens*.

*Microscopic Structures:* Spores 9-15 x 4-6  $\mu\text{m}$ , pale yellow, ellipsoid, finely rugulose. Clamp connections present but inconspicuous.

*Collections Examined:* ACAD 12938, 29/8/77, West Gaspereau, Kings Co.; ACAD 12939, 18/8/77, Lequille, Annapolis Co.; ACAD 5038, 19/9/59, Glenmont, Kings Co.



**Ramaria formosa (Pers. ex Fr.) Qué.**

Flore Mycol., 466, 1888.

*Clavaria formosa* Pers., Icon. Descr. 1: 3, 1798.*Clavaria formosa* Pers. ex Fr., Syst. Mycol. 1: 466, 1821.*Clavariella formosa* (Fr.) Karst., Hattsv. Ryssl. 2: 185, 1882.*Clavaria formosula* Britz., Hym., Südb. 8: 287, 1885.

formosa (L)—handsome

Figs 59, 60

*Fructifications:* Gregarious, 6-20 x 1.5-8.0 cm, melon—5A7 (moderate orange yellow—71), drying light orange—5A4 (light orange yellow—70), tips light yellow—3A5 (light yellow—86). Branches parallel, polychotomous below, ultimately bifid, smooth or longitudinally rugulose, axils rounded, apices blunt to rounded. Context white or subconcolorous, sometimes bruising light orange—5A5 (light orange yellow—70), fleshy-fibrous drying chalky friable. Stem multiple, 1.5-4.0 x 0.5-2.0 cm, whitish at base, finely mycelioid. Spore deposit greyish orange—6B5 (light brown—57). Taste bitter. Odor not distinct. Terrestrial, frequent in mixed woods, often under *Tsuga canadensis*.

*Macrochemical Tests:* Positive color reactions with FeSO<sub>4</sub>, pyrogallol,  $\alpha$ -naphthol, guaiac tincture, guaiacol 2% phenol. Aniline resulted in a positive test in 50% of the applications.

*Microscopic Structures:* Spores 8-12 x 3-6  $\mu$ m, buff, distinctly roughened with coarse, scattered warts, oblong-ellipsoid, 1-3-guttate. Basidia 40-55 x 5-8  $\mu$ m; 4 sterigmata, 3-5  $\mu$ m long. Hymenium 45-60  $\mu$ m, not thickening; subhymenium 15-20  $\mu$ m. Contextual hyphae 4-10  $\mu$ m wide, cells long, with slightly thickened walls, compact; few thick-walled gloeoplerous hyphae 3  $\mu$ m wide; subhymenial hyphae 2-3.5  $\mu$ m. Clamp connections present but sometimes obscure.

*Collections Examined:* ACAD 12941, 18/8/77, Lequille, Annapolis Co.; ACAD 12942, 22/8/77, Moores Falls, Kings Co.; ACAD 12943, 24/8/77, West Gaspereau, Kings Co.; ACAD 12944, 12/9/77, Harrington woods, Kings Co.; ACAD 12945, 25/8/77, Nicholville, Kings Co.; M-513B, 7/11/66, Mason Lake, near Shelton, Wash.

**Ramaria formosa (Pers. ex Fr.) Qué.**

Flore Mycol., 466, 1888.

**var. concolor var. nov.**

concolor (L)—of the same color.

Figs 61, 62

Ad 5-10 x 3.5-9 cm, basi multiramosa, armeniae, apicibus concoloribus; ramis polychotomis; carnea. Sporae 9-14 x 4-5.5  $\mu$ m, ochraceae, ellipsoideae, subverruculosae.

Typus ACAD 12968 in sylvis prope Nicholville, comitato Kings, Nova Scotia lectus, holotypus in herbario Universitatis Acadiae (ACAD) conservatus.

A typo differt praecipue apicibus concoloribus.

*Fructifications:* 5-10 x 3.5-9 cm, light orange—5A4 (light orange—52), drying golden wheat—4B5 (moderate yellow—87), tips concolorous, browning with age. Branches polychotomous, numerous, moderately rugulose, branching just above