

North American Fungi



Volume 9, Number 3, Pages 1-22
Published June 9, 2014

New North American species of *Gymnopus*

Ronald H. Petersen and Karen W. Hughes

Ecology and Evolutionary Biology
University of Tennessee
Knoxville, TN 37996-1100

Petersen, R. H., and K. W. Hughes. 2014. New North American species of *Gymnopus*.
North American Fungi 9(3): 1-22. doi: <http://dx.doi:10.2509/naf2014.009.003>

Corresponding author: R.H. Petersen: repete@utk.edu Accepted for publication
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Abstract: Collections of four *Gymnopus* taxa are proposed as new species: *G. barbipes*, *G. disjunctus*, *G. micromphaleoides* and *G. pseudoluxurians*. All are placed in subg. *Vestipedes* and all are compared with taxa producing similar basidiomata.

Key words: Taxonomy, Euagarics, /omphalotaceae

Introduction: In the course of fieldwork in 2013, two locations not often previously targeted for inventorying were visited. One, in southern Mississippi in mid-July (vic. Wiggins) during the Gulf States Mycological Society summer foray, is considered at the northern border of the Gulf (of Mexico) floristic area. Although Murrill (1938, 1939a, b, 1941, 1942, 1945a, b, 1951) described several *Gymnopus* (also known as *Collybia* at that time) species from the vicinity of Gainesville, Florida, that area seems hardly sympatric to the southern Mississippi site. In an otherwise comprehensive, annotated list of Alabama fungi, Underwood and Earle (1897) included only seven "*Collybia*" species, almost all of which have been transferred to other genera, but also furnished a bibliography to a preceding publication on fungi of the southeastern United States (Underwood, 1897). Atkinson (1897) nearly overlooked agarics, his major interest being in plant pathogenic fungi. The second under-explored site was on the Ozark Plateau of Arkansas (Baxter Co. and vicinity) during the annual foray of the North American Mycological Association in late October. Although late in the season for fleshy fungi, numerous new and/or interesting collections were made.

A third site, conversely, has seen concerted inventorying for much of the 20th century. Although Atkinson (1892) summarized some fungi from the Appalachian Mountains of North Carolina, and Hesler (1937, 1942, 1943, 1945, 1949, 1951, 1957, 1959) and Smith & Hesler (1938, 1943) described the *Gymnopus* (as *Collybia*) taxa from the southern Appalachian Mountains of Tennessee and North Carolina, they apparently missed a small fungus from the Great Smoky Mountains National Park. The introduction below of four putatively new species of *Gymnopus* underscores the probability that additional taxa will be discovered.

Almost all the new taxa described below are represented only by their type specimens, a practice normally disparaged, but considering the low likelihood of recollecting these taxa again in the near future, to relegate them to herbarium names would seem inappropriate.

Materials and methods: DNA extraction, PCR of the ribosomal ITS region, Sanger sequencing and cloning procedures were described in Hughes et al., (Hughes et al. 2013). ITS sequences were aligned with other *Gymnopus* sequences in our database (Mata et al. 2007) and from GenBank using GCG (GCG 2000). The sequence database was trimmed to retain only closely related clades and imported into Geneious (Geneious 2005). PHYML (Guindon & Gascuel 2008) with 100 bootstrap replicates was performed in Geneious. The resulting tree was exported to FigTree (Rambaut 2006). GenBank numbers for this data set are KJ416235 to KJ416269.

Abbreviations: RHP = senior author; KWH = Karen W. Hughes; BF = bright field microscopic illumination; PhC = phase contrast microscopic illumination; GSMNP = Great Smoky Mountains National Park; TFB = Tennessee field book = temporary tracking number of fungal collections assigned prior to herbarium number (TENN). L = length; L^m = mean length of n spores; W = width; W^m = mean width of n spores; Q = length divided by width; Q^m = mean of length divided by width of n spores. Colors enclosed in quotation marks are from Ridgway (1912); color cited alphanumerically are from Kornerup & Wanscher (1967).

Gymnopus barbipes R.H. Petersen & K.W. Hughes, sp. nov. Figs. 1, 4-6
Mycobank no.: 808041

Holotype: United States, Tennessee, Blount Co., GSMNP, Metcalf's Bottoms, 35° 40' 15.22"

N, 83° 41' 28.20" W, 10.VIII.2012, coll. KWH, TFB 14110 (TENN 67858).

Diagnosis: 1. fruiting on deciduous leaf litter, not bark or wood; 2. basal mycelium binding substratum; 3. small basidiospores; 4. absence of well-differentiated pleuro- or cheilocystidia.

Basidiomata (Fig. 1) small, collybioid or marasmielloid. **Pileus** 5-15 mm broad, appanate at least when mature, striatulate, not discernibly fibrillose; disc dark brown (6E5, "Verona brown"); limb tan (6C5, "sayal brown"); margin grayish buff (7B2, "tilleul buff"), hardly sulcate. **Lamellae** adnexed to free, sinuate, usually significantly seceding during drying, shallow, thin, subdistant, "Mikado brown" (7C6) around stipe, outward "tilleul buff" (7B2), drying pale cream or off-white (not pearl gray). **Stipe** terete, profoundly hollow, upward "wood brown" (7C4), downward "buffy brown" (6D4) near stipe base, minutely vestured apically, less so downward; stipe base sheathed in a thin, felty, off-white mycelium which spreads locally over the leafy substrate (not tuberculate, not hispid); basal mycelium off-white with very slender repent rhizomorphs. **Odor** negligible; **taste** negligible.

Habitat and phenology: Fruiting on deciduous leaf litter; mid-summer.

Pileipellis a repent, radial layer of hyphae 2-4 cells thick, with occasional upraised hyphal termini variable in diameter but sometimes slightly enlarged; hyphae 4-12 µm diam, firm-walled (wall – 0.5 µm thick), hardly pigmented, delicately encrusted with scattered (never spiraled or annulate), small deposits (PhC). Subhymenium composed of tightly interwoven, knobby or strangulate hyphae 2-2.5 µm diam, conspicuously clamped, surrounded by a matrix of amorphous, perhaps gelatinous material (?collapsed dead spores and dead, crumpled subhymenium?). Basidioles typically fusiform or torpedo-shaped. **Basidia** (Fig. 4a) 24-31 × 6-7(-

7.5) µm, clavate to shallowly urniform or hour glass-shaped, 4-sterigmate (sterigmata not unusually long); contents homogeneous, with 1-2 paler vacuoles (?nuclei under PhC). **Pleuro-** and **cheilocystidia** (Fig. 4a) doubtful, somewhat strangulate to hour glass-shaped, clamped; contents more or less homogeneous, not refringent. **Basidiospores** (Fig. 5) 6-6.5 × 2.5-3 (-3.5) µm, ellipsoid, slightly flattened adaxially, smooth, thin-walled, aguttulate, inamyloid, hyaline. **Caulocystidia** (Fig. 4b) from stipe apex abundant, 7-12 µm diam, knobby to irregularly shaped, apparently without clamp connections, unencrusted, very slightly pigmented (BF). Lower stipe surface less vestured than upper stipe surface; caulocystidia 3.5-10 µm diam, side branches of stipe surface hyphae, gnarled to irregularly knobby, usually tapering distally or with narrower terminus than base, thick-walled (wall from firm to 1.0 µm thick, never obscuring cell lumen), hardly pigmented, clamped.

Commentary: Original collection TFB 14106 was found to be a mixture of two taxa; *G. dichrous* (retaining TFB 14106) and a taxon, now identified as a second collection of *G. barbipes* (TFB 14483).

For Murrill (see Kimbrough, 1972), the Florida *Gymnopus* species were sorted according to substrate. Those on cones are now placed in *Strobilurus*, the rest were divided as those "on the ground" versus those "on dead wood, above ground or buried." According to this, *G. barbipes* would be placed in the former category. Among "*Gymnopus*" taxa fruiting "on the ground," *G. atriceps* Murrill (1942) seems most similar to *G. barbipes*, but Singer (1946, 1982), after examining type material, transferred Murrill's species to *Hydropus*, diagnosed (in part) by amyloid spores. Hesler (1959) drew the same conclusion.

Pleurocystidia are very doubtful. Structures observed were probably advanced basidioles,

given the shape and size of sterigmate basidia. Concerted search on several gill edges did not reveal any other differentiated structures which could be identified as cheilocystidia. Without differentiated pleuro- or cheilocystidia, with prominent stipe vestiture (especially on upper stipe), essentially narrow spores and pileipellis hyphae ornamented only with scattered “crystals” (not diverticulate branchlets), *G. barbipes* would have been placed in sect. *Subfumosae* under the taxonomic scheme by Halling (1983), but his later revision (<http://www.nybg.org/bsci/res/col/index.html>) merged sects. *Subfumosae* and *Vestipedes* and *G. barbipes* must be placed in the latter section. Spores are at the limits of Halling’s key but too short for *G. fasciatus*, and basidiomata much smaller than *G. striatipes*.

Fortuitously, a spore print was produced by TFB 14110, the spores germinated and a self-cross of single-basidiospore isolates was accomplished. When 12 SBIs were paired in all combinations, a tetrapolar mating system was revealed. $A_1B_1 = 1^*, 2, 5, 7$; $A_2B_2 = 4, 6^*, 8, 11$; $A_2B_1 = 3^*$; $A_1B_2 = 9, 10, 12^*$. Subordinate mating types were assigned based on $1/2/5/7 \times 9/10/12 = \text{flat} = \text{common-A}$. The self-cross was very difficult to read, with clamp connections scattered, exclusively on slender, often crimped hyphae and obscured by crystals.

As seen on the limited phylogeny (Fig. 6), *G. barbipes* is found in a clade which is dominated by taxa whose basidiomata emit a foul or disagreeable odor (Antonin & Noordeloos, 2010, *Gymnopus* subg. *Vestipedes*, sect. *Impudicae*). The clade also includes *G. foetidus*, the type species of the formerly recognized genus *Micromphale*. Following Mata et al. (2007), *Micromphale* taxa were transferred to *Gymnopus*. Recently, Cooper & Leonard (2013) described three *Gymnopus* taxa with foetid basidiomata from New Zealand, thus following Mata et al. (2007) and Antonin & Noordeloos (2010).

Micromphale was diagnosed by two leading characters: 1. foetid odor of basidiomata; and 2. gelatinized material in pileus, lamella and stipe tramae. Testifying to discrepancies between diagnostic characters gleaned from morphological features and phylogenies based on DNA, *G. barbipes* seems to lack both diagnostic characters. Instead it seems rather typical of other taxa in subg. *Vestipedes* (*G. subnudus*, *G. biformis*, etc.).

In phylogenies below, a clade labeled as *G. luxurians* and “aff. *dichrous*” contains collections from eastern Russia, Primorsky Territory, Hasansky Dist. Examination of these collections may show them to also represent a new taxon, the subject of a future investigation.

Specimens examined: United States, Tennessee, Blount Co., GSMNP, Metcalf’s Bottoms, 35° 40’ 15.22” N, 83° 41’ 28.20” W, 10.VIII.2012, coll. KWH, TFB 14110 (TENN 67858; holotype); same location, same date, TFB 14106 (pro parte) (TENN 69173).

Gymnopus disjunctus R.H. Petersen & K.W. Hughes, sp. nov. Figs. 7-9
Mycobank no.: 808042

Holotype: United States, Connecticut, Tolland Co., vic. Amston, Camp Hemlocks, 41° 37’ 23.15” N, 72° 23’ 34.81” W, 1.IX.2013, coll Paula De Santo (COMA), TFB 14339 (TENN 69172).

Etymology: “disjunctus” = referring to the wide geographic separation of the two known collections.

Diagnosis: 1) capillary stipe; 2) barbed stipe vestiture; 3) small, dark pileus; 4) off-white basal pad; 5) occurrence on deciduous leaves and aments of *Quercus*; 5) spores with Q^m circum 2.0; 6) locally abundant, coralloid cheilocystidia; and 7) heavily encrusted pileipellis hyphae.

Basidiomata (Fig. 7a) 17-45 mm high, collybioid or marasmioid, erect. **Pileus** 7-12 mm broad, shallowly convex to appanate, minutely roughened in contour, matt, radially fibrillose, often with slightly darker central depression, closely sulcate-striate $\frac{1}{4}$ - $\frac{1}{3}$ toward center; disc “snuff brown” (5E8), outward “sayal brown” (6C5), drying darker, with an olivaceous tint (near “dark grayish olive” 30E4) and disc sometimes becomes paler, creating a pallid “eye.” **Lamellae** adnexed, thickish, subdistant to distant, seceding in drying, perhaps so in nature when aging to give a pseudocollariate impression, shallow, not ventricose, not anastomosed, “pale pinkish buff” (6A2) to near “tilleul buff” (7B2). **Stipe** 3-6 times as long as pileus breadth, erect, terete, equal, very slender (0.5-1 mm thick), lightly vested throughout, apically concolorous with lamellae, downward “sayal brown” (6C5) to “buffy brown” (6D4), usually becoming strigose; vesture minute and delicate upward on stipe, downward becoming a solid turf, often with caulocystidia gathered into spikes or synnemata; stipe base hardly expanded, inserted as a small mycelial pad occasionally well-developed, off-white; in one case, accompanied by a couple off-white, hair-like rhizomorphs with bases as pads on the mid-vein of a leaf. **Odor** and **taste** negligible.

Habitat and phenology: Some basidiomata on dead, sclerophyllous leaves, others on cast-off but not rotted catkins (probably of *Quercus*); mid-summer in open, secondary forest of “mixed woods,” including *Quercus*, *Carya* and *Pinus*.

Superficial pileipellis hyphae (Fig. 7b, c) radial, 3.5-8 μ m diam, significantly pigmented, strongly encrusted in bands with small calluses in profile, conspicuously clamped; subpellis hyphae 3-4.5 μ m diam, firm-walled, frequently branched, smooth to lightly encrusted; encrustation appearing as flakes, scattered, without profile calluses, “free-form,” appearing as though in a mucoid matrix.

Subhymenium and hymenium immersed in hyaline mucoid material, with evidence that effete basidia gelatinize. Subhymenial hyphae 1-1.5 μ m diam, tightly interwoven, clamped. Basidioles 23-32 \times 4-7 μ m, digitate when young, becoming torpedo-shaped and finally broadening into basidia. **Basidia** 22-34 \times 5-7(-11) μ m, clavate, 4-sterigmate, clamped; contents multigranular, the granules scattered throughout. Pleurocystidia not observed.

Basidiospores (Fig 8c, d) (5.5-)6-7.5 \times 3-3.5 μ m ($Q = 1.71$ - 2.33 ; $Q^m = 1.98$; $L^m = 6.58$ μ m), ellipsoid-lacrymiform, smooth, thin-walled, inamyloid, hyaline; contents more or less homogeneous. Lamellar edge sporadically fertile. **Cheilocystidia** (Fig. 7d, e) locally abundant, 24-50 \times 8-20 μ m, subarbuscular with stout stalk and lobed-branched apex, thin-walled, often internally septate, hyaline. Hyphae of stipe trama 5-12 μ m diam, strictly parallel, adherent, firm- to thick-walled (wall -0.7 μ m thick), weakly pigmented, with evidence of a mucoid or gelatinized matrix partially soluble in KOH. Stipe cortical hyphae 2.5-4.5 μ m diam, strictly longitudinal, apparently adherent, thick-walled (wall -1.0 μ m thick), seldom but prominently clamped, gradually tapering to slender, acutely rounded apex. Stipitipellis a thatch of interwoven, thick-walled (wall -1 μ m thick), copiously branched, gnarled or coralloid hyphae producing caulocystidia as hyphal tips. **Caulocystidia** (Fig. 8a, b) more or less straight, internally clamped, thick-walled (wall -0.7 μ m thick), hyaline, gathered together into conical sheaves so as to appear thorny or barbed at 50 \times ; individual caulocystidial hyphal cells 28-85 \times 3-6 μ m, smooth, thick-walled (wall -0.7 μ m thick), hyaline.

Commentary: The presence of a mucoid or subgelatinous exudate in pileus trama, lamellar and stipe tissues is reminiscent of *Micromphale*, but Mata et al (2007) showed that *Micromphale* was subsumed within *Gymnopus*, so presence or absence of mucoid matrix no longer defines

Micromphale at genus rank. ITS sequence also shows that *G. disjunctus* is not closely related to either *M. foetens* or *M. perforans* complexes. (Fig.9).

It was serendipitous to find two collections of this fungus widely separated geographically. The eventual type specimen (Connecticut) was thought to represent *G. subnudus*, but its ITS match to the Mississippi specimen obliged a more careful morphological examination in which the two specimens were hardly separable. The Connecticut specimen was contributed to the sorting table at the annual foray of the Connecticut-Westchester Mycological Association (COMA).

Additional specimen examined:

Mississippi, Forrest Co., Desoto National Forest, vic. Wiggins, Black Creek Trail at CCC Camp car park, N 31° 01' 34.64", W 89° 11' 35.24" (229 ft elev), 11.VII.2013, coll RHP, TFB 14281 (TENN 68136).

***Gymnopus micromphaleoides* R.H.**

Petersen & K.W. Hughes, sp. nov.

Figs. 2, 10, 11

Mycobank no.: 808043

Holotype: United States, Mississippi, Forrest Co., vic Wiggins, DeSoto National Forest, Black Creek Trail at CCC Camp car park, 31° 01' 34.64" N, 89° 11' 35.24" W, 11.VII.2013, coll RHP, TFB 14282 (TENN 68165).

Etymology: micromphale = referring to the genus *Micromphale*; -oides = resembling; thus, resembling *Micromphale*.

Diagnosis: 1) common pileocystidia; 2) small spores; 3) small basidiomata; 4) clavate cheilocystidia; 5) habit on dead, deciduous woody twigs; 6) close, ventricose lamellae. Location in Gulf-influenced geography may also be significant.

Basidiomata (Fig. 2) small, marasmielloid or micromphaleoid. **Pileus** -12 mm broad, appanate, slightly centrally depressed, deeply pebbled-striate, "wood brown" (7C4), outward "vinaceous buff" (9B2) remaining so in drying. **Lamellae** adnexed, more or less thick, ventricose, close, "tilleul buff" (7B2), drying pale pearl gray. **Stipe** scurfy-vestured, "olive brown" (5E5) over all, inserted squarely (not expanded at base, not insititious), perhaps arising from a lenticel, becoming somewhat cartilaginous upon drying, but vesture remaining intact; vesture scales "tilleul buff" (7B2). **Odor** none; **taste** not tested.

Habitat and phenology: Fruiting on dead deciduous twigs: mid-summer.

Pileipellis (Fig. 10a) a layer of radially oriented hyphae; hyphae (3-)5-12 µm diam, strongly pigmented, firm- to thick-walled (wall -0.7 µm thick), strongly encrusted; encrustation in irregular rings or stripes, commonly with slender, refringent (PhC) calluses in profile.

Pileocystidia (Fig. 10c) erect, common, composed of 1-2 cells (with clamp connection between), of which the terminal cell is 27-55 × 10-14 µm, clavate, thick-walled (wall -0.7 µm thick), weakly pigmented, virtually smooth to lightly speckled or flecked. Lamellar trama irregularly longitudinal; hyphae (2.5-)3-7 µm diam, thin-walled, free (not gelatinized or in a mucoid matrix), conspicuously clamped; contents homogeneous. Basidioles clavate (not torpedo-shaped); **Basidia** (Fig. 10b) 20-22 × 5-6 µm, clavate, 4-sterigmate, obscurely clamped; contents scattered-multiguttulate.

Cheilocystidia (Fig. 10b) locally abundant, 30-52 × 8-12 µm, clavate, clamped, thin-walled, often semicollapsed; contents homogeneous, "empty." **Basidiospores** (Fig. 10d) 4.5-6(-6.5) × 2.5-3 µm (Q = 1.67-2.20(-2.60); Q^m = 1.96), lacrymiform to ellipsoid, smooth, thin-walled, inamyloid; contents 1-3-guttulate (guttules refringent, masking spore wall outline, PhC). Stipe medulla cartilaginous; **stipe**

medullary hyphae 3-7 μm diam, strictly parallel, thick-walled (wall -0.5 μm thick), unornamented, hardly pigmented. Stipe surface cartilaginous; hyphae 3-7 μm diam, thick-walled (wall -0.7 μm thick), encrusted in flakes, moderately pigmented (olive-brown, PhC), producing caulocystidia as side branches. Stipe ornamentation a thatch of tightly interwoven, tortuous-gnarled, encrusted hyphae producing caulocystidial terminal cells; **caulocystidial terminal cells** (Fig. 10E) 11-50 \times 4-11 μm , digitate to clavate, often branched once or twice, thick-walled (wall -0.7 μm thick), unornamented (smooth), hardly pigmented.

Commentary: Based on habit on wood and appanate brown, striate pilei, the collection was mistaken for a *Micromphale*. Absence of gelatinized deposit on the pileipellis or in the trama of pileus or lamellae, however, pointed in the direction of *Gymnopus*. ITS sequence (Fig. 11) indicated its close relationship to *G. dichrous* (also on deciduous wood or bark), where it was considered a variant. *G. dichrous* differs in significantly larger basidiomata, usually campanulate pileus, flattened or compressed stipe, more saccate cheilocystidia and larger spores.

Stipe vesture appears somewhat squamose when dry. The squamose scale-like structures are actually plaques of gnarled, tightly interwoven superficial hyphae which produce the smooth caulocystidial terminal cells. Thus the smooth terminal cells can be seen arising from encrusted subcystidial cells.

Pileocystidia are obvious and common, somewhat rare in the *Vestipedes* complex.

Recently (Cooper & Leonard 2013), three species of *Gymnopus* belonging to the *Micromphale* complex were described from New Zealand. *Gymnopus micromphaleoides* basidiomata macroscopically resemble those of *G. hakaroa* in

size, shape and habit, but ITS sequences are clearly separate.

Gymnopus pseudoluxurians R.H. Petersen & K.W. Hughes, sp. nov. Figs. 3, 12-14. Mycobank no.: 808044

Holotype: United States, Mississippi, Stone Co., vic. Wiggins, Walker's Run, 30° 54' 42" N, 89° 05' 25" W, 12.VII.2013, coll C. Ovrebø, TFB 14290 (TENN 68144)

Diagnosis: 1. basidiomata of medium size; 2. resemblance to *Marasmius* sect. *Globulares*; 3. habit among grasses; 4. cheilocystidia hardly differentiated from basidia in size and clavate shape; 5. basidiospores 8-10 \times 4-5 μm ($Q^m = 1.90$); 6. caulocystidia short, a tangled thatch.

Basidiomata (Figs. 3, 12a) medium-sized, collybioid. **Pileus** -29 mm broad, weakly convex when young, appanate by maturity, occasionally centrally depressed, smooth, delicately radially fibrillose to subglabrous, not striate, sometimes cracked centrally, more or less uniform in color, "cinnamon buff" (6B4). **Lamellae** adnate, close, thin, shallow, weakly sinuate, "pale pinkish cinnamon" (6A2), seceding in drying to appear pseudocollariate. **Stipe** terete, more or less equal, sometimes slightly tapered downward, thinly vested, apically concolorous with lamellae, downward soon "pinkish buff" (6A3) to "cinnamon buff" (6B4), becoming twisted in drying, usually including a small ball of soil on stipe base. **Odor** none. **Taste** negligible.

Habitat and phenology: Fruiting on small, well-decayed woody debris buried in lawn; summer.

Pileipellis hyphae (Fig. 12b) 4-16 μm diam, firm-walled, very weakly encrusted in transverse banding (PhC) but with no visible calluses in profile and invisible in BF with no stain, with occasional erect side branches or termini (Fig.12b), consistently clamped.

Pleurocystidia not observed. Basidioles fusiform, tapering distally. **Basidia** (Fig. 12c) 27-29 × 7-9 μm, clavate, 4-sterigmate, arising from a clamp connection, thin-walled; contents multiguttulate, with guttules scattered throughout. **Basidiospores** (Fig. 13) (7.5-)8-10 × 4-5 μm (Q = 1.67-2.25; Q^m = 1.90; L^m = 8.75 μm), hyaline, thin-walled, inamyloid, smooth; contents 1-few guttulate, the guttules small but obscuring the spore wall (PhC). **Cheilocystidia** (Fig. 12c), if present, scattered on lamellar edge (lamellar edge fertile), 30-39 × 8-11 μm, clavate, somewhat larger than basidia, sometimes with irregularly lumpy apex, thin-walled, arising at a clamp connection; contents uni- to few-guttulate. Stipitipellis of longitudinal, clamped hyphae. Vesture a thatch of tangled caulocystidia. **Caulocystidia** (Fig. 12d) -90 × 3.5-6.5 μm diam, thick-walled (wall -0.5 μm thick), pallid straw-colored in mass (BF), occasionally internally clamped, gnarled to wavy, often branched.

Commentary: Basidiomata of *G. luxurians* are larger, darker brown, more or less polished with habit on second-year woody mulch (usually spread among ornamental plantings).

Basidiomata of *G. pseudoluxurians* are paler and resemble those of *Marasmius* of sect. *Globulares* [*M. cystidiosus* (A.H. Sm & Hesler) Gilliam, *M. oreades* (Bolton) Fr., *M. nigrodiscus* (Peck) Halling or *M. strictipes* (Peck) Singer], for which it was mistaken when fresh. The lack of unornamented broom cells in the pileipellis disqualifies *G. pseudoluxurians* from that complex. The stipe is hardly pruinose, but the pileipellis is surely not a “dryophila structure,” but more or less typical of the old *Collybia* section *Subfumosae*.

This stipe vesture in *G. pseudoluxurians* is unique. As vestures go, it is quite short and rather uniform in length, giving the appearance of a cropped beard rather than a long tangle. This may account for the ease with which the

vesture is suppressed on handling of the stipe.

Discussion: It is unfortunate that the new taxa described above are represented by only very sparse specimens. No data are available, for example, on the variability of caulocystidial characters, perhaps important in identification of collections of *Gymnopus* subg. *Vestipedes*. While “barcode” DNA sequences (now accepted as nrITS sequence) are becoming useful in identification as more and more diverse sequences are deposited in databases, such sequences for small, unimpressive, saprophytic agarics are few and so cannot yet provide a guide for identification and therefore for morphological comparison and assessment of character variability.

A case in point is *Gymnopus dichrous*, which now seems to occur in a plethora of macro- and micromorphological forms some of which would qualify as distinct taxa were it not for close matches of ITS sequences. Moreover, according to Hughes et al. (2013), these entities are undergoing hybridization in nature, which may account for the proliferation of taxonomic variation.

Acknowledgements: Sincere thanks are offered to David and Patricia Lewis for organizing the GSMS summer foray in 2013 and to Jay Justice for hosting the North American Mycological Association fall foray for 2013. Ms Paula De Santo contributed the Connecticut specimen of *G. disjunctus*. Thanks to Dr. Scott Redhead for pointing out the literature on *Hydropus atriceps*. Drs. Scott Redhead and Clark Ovrebo provided constructive reviews. This research was supported (in part) by National Science Foundation Grant DEB1144974 to the University of Tennessee.

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Table 1. List of collections sequenced for this study.

Herbarium designator	Field collections no.	Name	GenBank number	Location of collection
TENN65132	13755	<i>Gymnopus ramealis</i>	KJ416235; KJ189566	Belgium, Dinante
TENN60713	11828c1	<i>Gymnopus afn luxurians, clone 1</i>	KJ416236	Russia, Kedrovayae
TENN60722	11837h1	<i>Gymnopus afn luxurians, haplotype 1</i>	KJ416237	Russia, Kedrovayae
TENN60722	11837h2	<i>Gymnopus afn luxurians, haplotype 2</i>	KJ416238	Russia, Kedrovayae
TENN60725	11840	<i>Gymnopus afn luxurians</i>	KJ416239	Russia, Kedrovayae
TENN50619	4283ss10	<i>Gymnopus luxurians</i>	KJ416240	Switzerland
TENN67854	14107	<i>Gymnopus luxurians</i>	KJ416241	USA, Tennessee, Great Smoky Mountains
TENN68144 (holotype)	14290	<i>Gymnopus pseudoluxurians</i>	KJ416242	USA, Mississippi
TENN68165 (holotype)	14282	<i>Gymnopus micromphaleoides</i>	KJ416243	USA, Mississippi, DeSoto National Forest
TENN61061	13056	<i>Gymnopus readiae</i>	KJ416244	New Zealand, Buller Dist.
TENN68109	14251	<i>Gymnopus biformis</i>	KJ416245; KJ189567	USA, TN, Great Smoky Mountains
TENN68108	14250	<i>Gymnopus biformis</i>	KJ416246; KJ189568	USA, TN, Great Smoky Mountains
TENN53558	7230	<i>Gymnopus biformis</i>	KJ416247	USA, South Carolina
TENN65586	13890	<i>Gymnopus biformis</i>	KJ416248; KJ189570	USA, North Carolina
TENN65189	13814	<i>Gymnopus biformis</i>	KJ416249; KJ189569	USA, TN, Knox Co.
TENN55753	9127ss11	<i>Gymnopus biformis</i>	KJ416250	USA, Louisiana
TENN60737	11853	<i>Gymnopus sp.</i>	KJ416251	Russia, Kedrovayae
TENN69172 (holotype)	14339	<i>Gymnopus disjunctus</i>	KJ416252	USA, Connecticut
TENN68136	14281	<i>Gymnopus disjunctus</i>	KJ416253	USA, Mississippi, DeSoto National Forest
TENN56618	9657	<i>Gymnopus biformis v. lobatus</i>	KJ416254	Costa Rica, Prov Cartago
TENN60951	12836	<i>Gymnopus villosipes</i>	KJ416255; FJ750264	New Zealand, Fiordland
	07-11-07-AV06	<i>Gymnopus eneficola</i>	KJ416256	Canada, Newfoundland
	MS4-007	<i>Gymnopus eneficola</i>	KJ416257	Canada, Newfoundland
TENN61221	13135	<i>Micromphale foetidum</i>	KJ416258	USA, North Carolina, Great Smoky Mountains
TENN59259	11434	<i>Micromphale</i>	KJ416259	Austria

TENN61086	13082	<i>foetidum</i> <i>Gymnopus ceraceicola</i>	KJ416260	New Zealand, Buller Dist
TENN61068	13063	<i>Gymnopus ceraceicola</i>	KJ416261	New Zealand, Nelson Dist.
TENN61085	13081	<i>Gymnopus ceraceicola</i>	KJ416262	New Zealand, Buller Dist
TENN60094	12155	<i>Gymnopus impudicus</i>	KJ416263	Russia, Samara Reg.
Culture	LE147-2004	<i>Gymnopus impudicus</i>	KJ416264	Russia, Samara Reg.
TENN69173	14483ss2 Single spore isolate 2	<i>Gymnopus barbipes</i>	KJ416265	USA:TN, Great Smoky Mountains
TENN69173	14483ss4 Single spore isolate 4	<i>Gymnopus barbipes</i>	KJ416266	USA, TN, Great Smoky Mountains
TENN69173	14483ss6 Single spore isolate 6	<i>Gymnopus barbipes</i>	KJ416267	USA, TN, Great Smoky Mountains
TENN69173	14483ss8 Single spore isolate 8	<i>Gymnopus barbipes</i>	KJ416268	USA, TN, Great Smoky Mountains
TENN67858 (holotype)	14110	<i>Gymnopus barbipes</i>	KJ416269	USA, TN, Great Smoky Mountains



Figs. 1-3. Basidiomata of *Gymnopus* species. 1. *Gymnopus barbipes*. Holotype. 2. *Gymnopus micromphaleoides*. Holotype. 3. *Gymnopus pseudoluxurians*. Holotype.

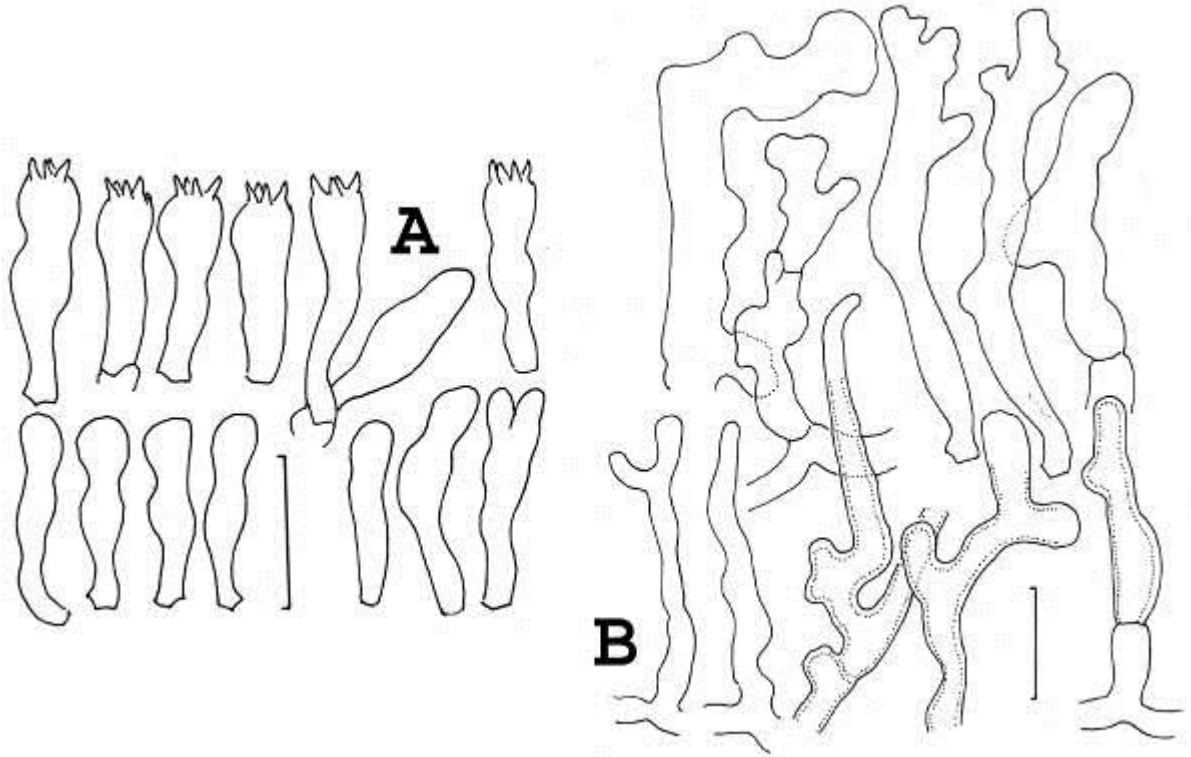


Fig. 4. *Gymnopus barbipes*, microstructures. A. Basidia and cheilocystidial structures. B. Caulocystidia; above = stipe apex; below = lower stipe. Holotype. Standard bar = 20 μm

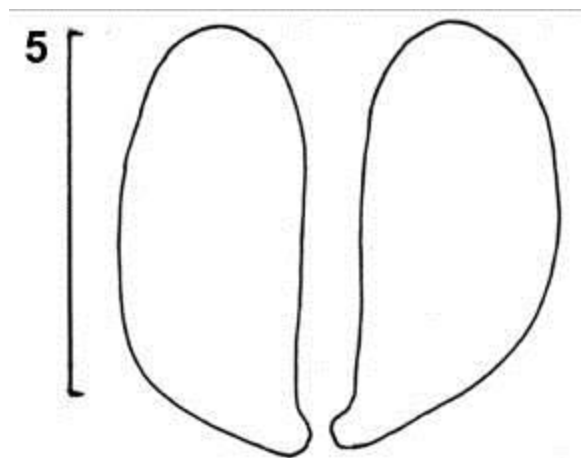


Fig. 5. *Gymnopus barbipes*, basidiospores. Holotype. Standard bar = 5 μm .

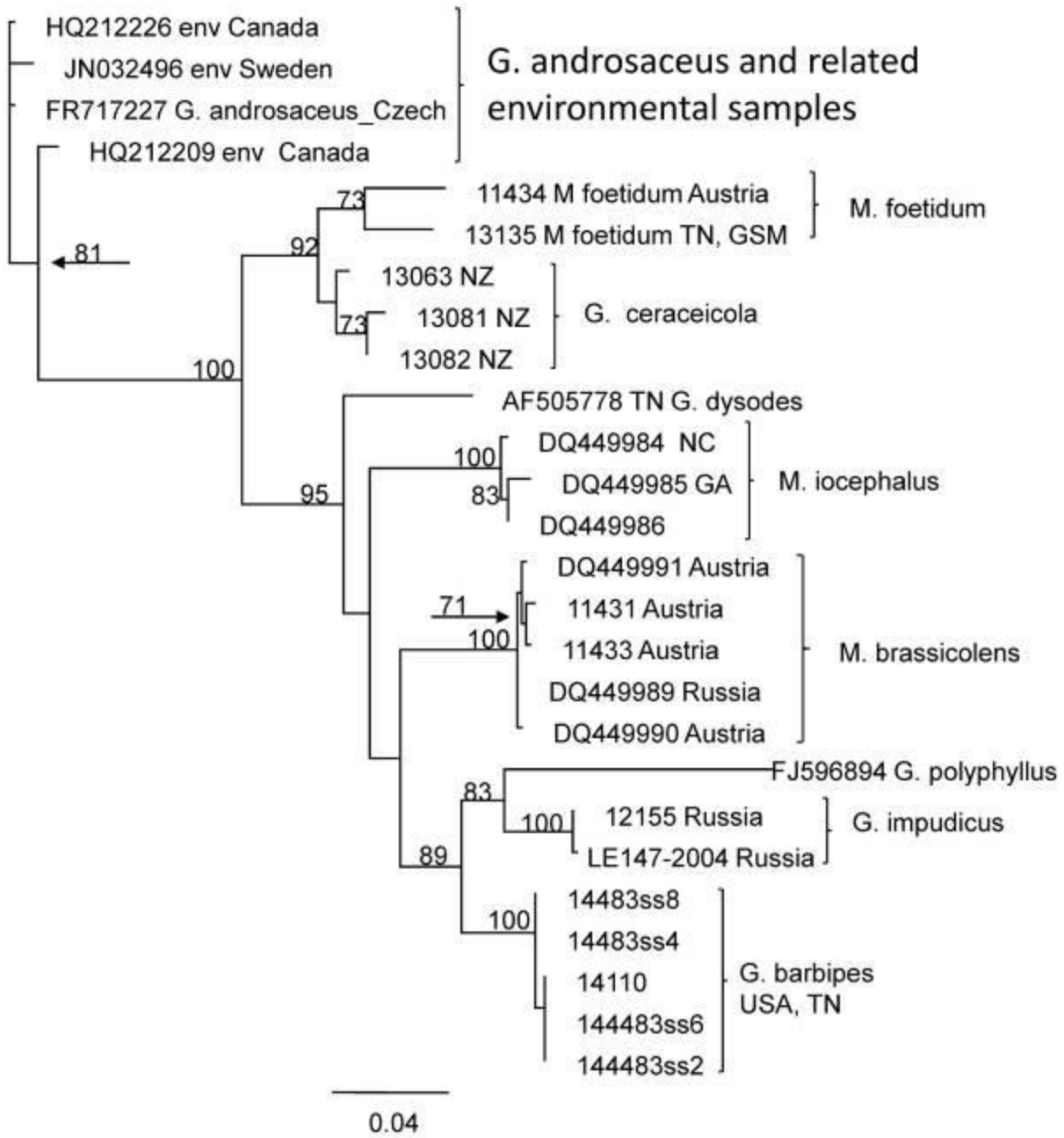


Fig. 6. Abbreviated nrITS phylogeny showing placement of *G. barbipes*. PYHML tree of ribosomal ITS sequences. Bootstrap support is given to the left of the supported node. GenBank numbers are given for sequences not generated in this study.

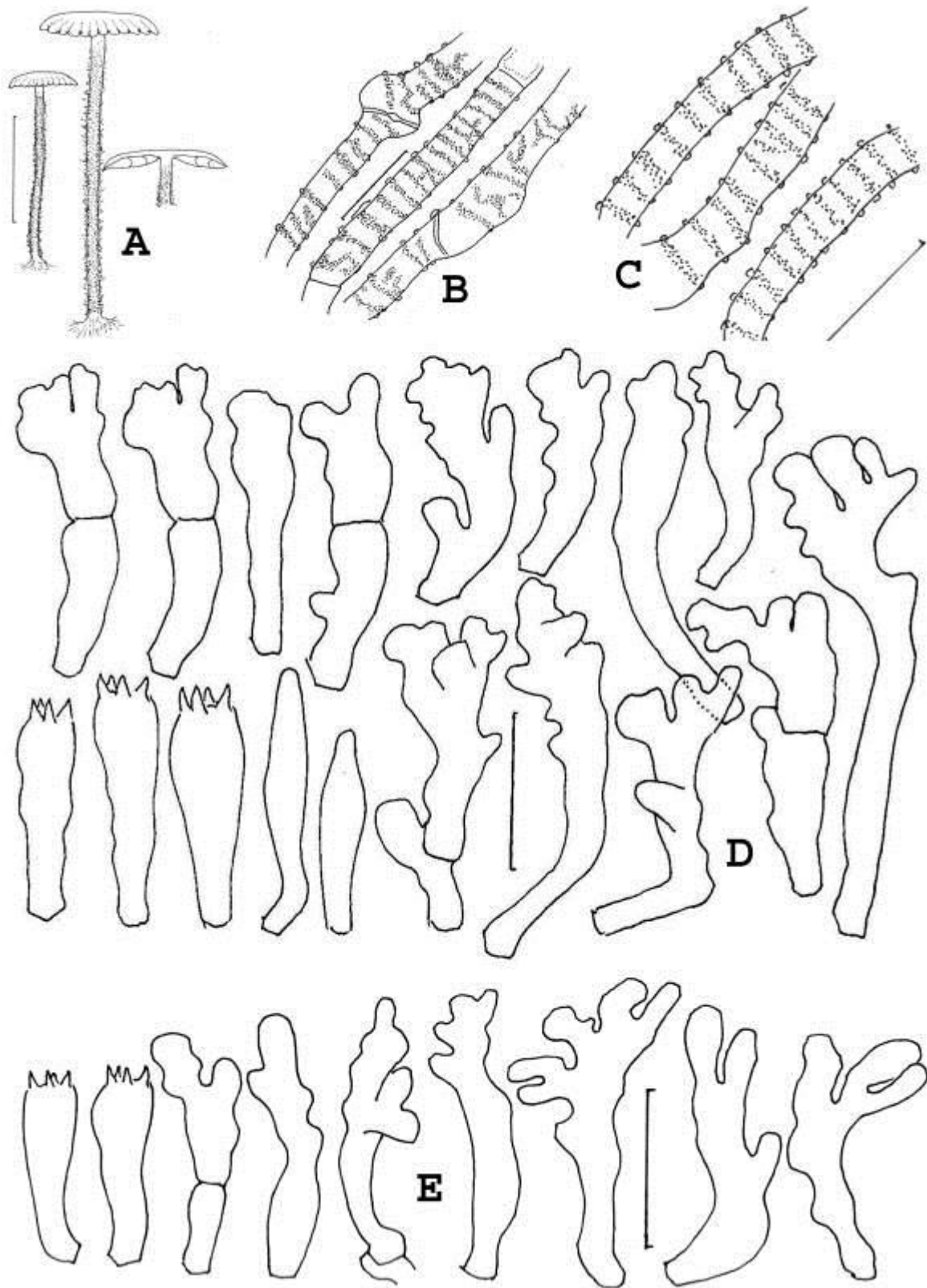


Fig. 7. *Gymnopus disjunctus*. A. Basidiomata. B, C. Pileipellis hyphae. D, E. Basidia and cheilocystidia. A, C, E = Holotype; B, D = TENN 68136. Standard bar: A = 20 mm; B-E = 20 μ m.

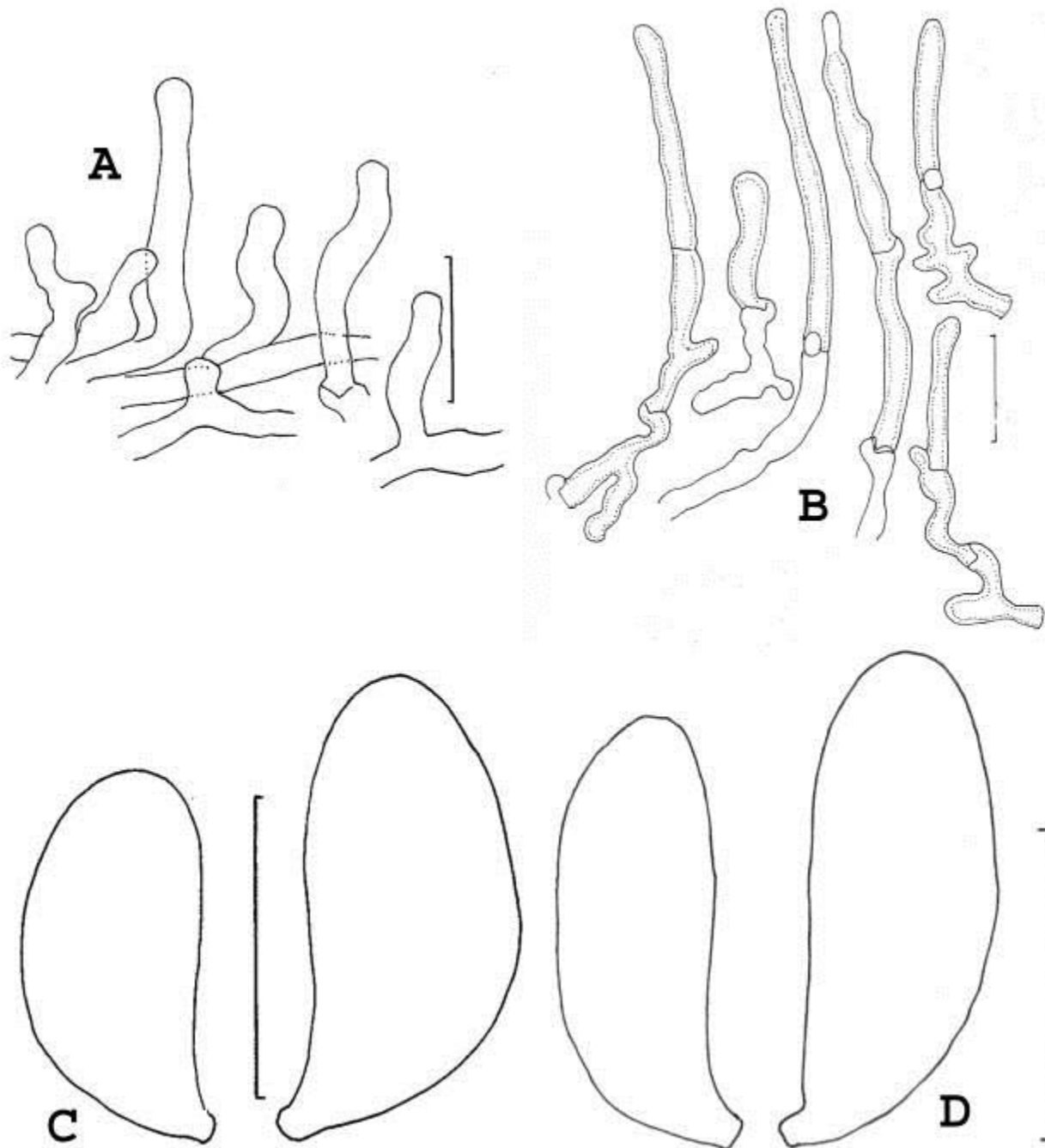


Fig. 8. *Gymnopus disjunctus*. A, B. Caulocystidia. C, D. Basidiospores. A, C = Holotype; B, D = TENN 68136. Standard bar A, B = 20 μ m. Standard bar C, D = 5 μ m.

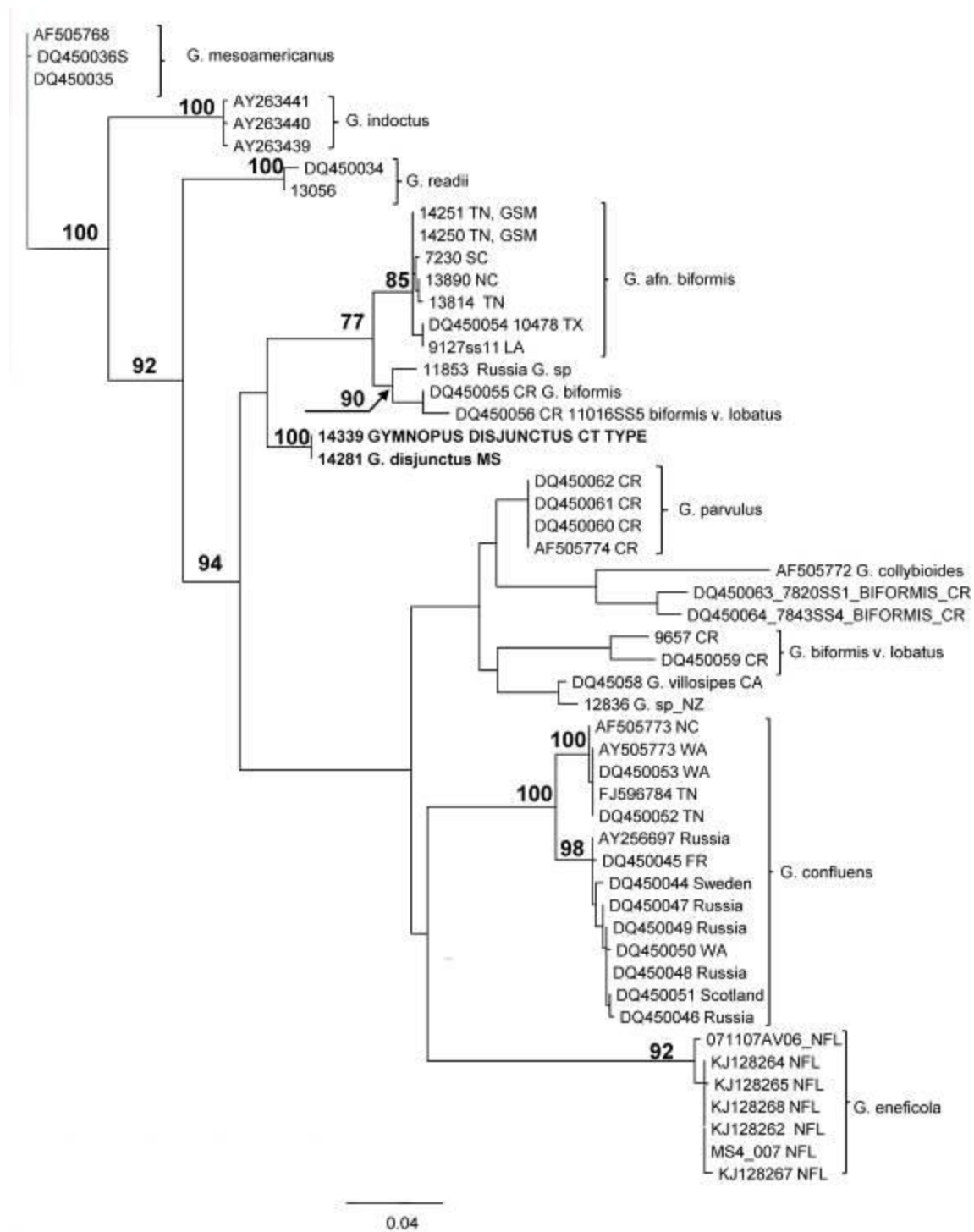


Fig. 9. Abbreviated nrITS phylogeny showing placement of *G. disjunctus*. PYHML tree of ribosomal ITS sequences. Bootstrap support is given to the left of the supported node. GenBank numbers are given for sequences not generated in this study

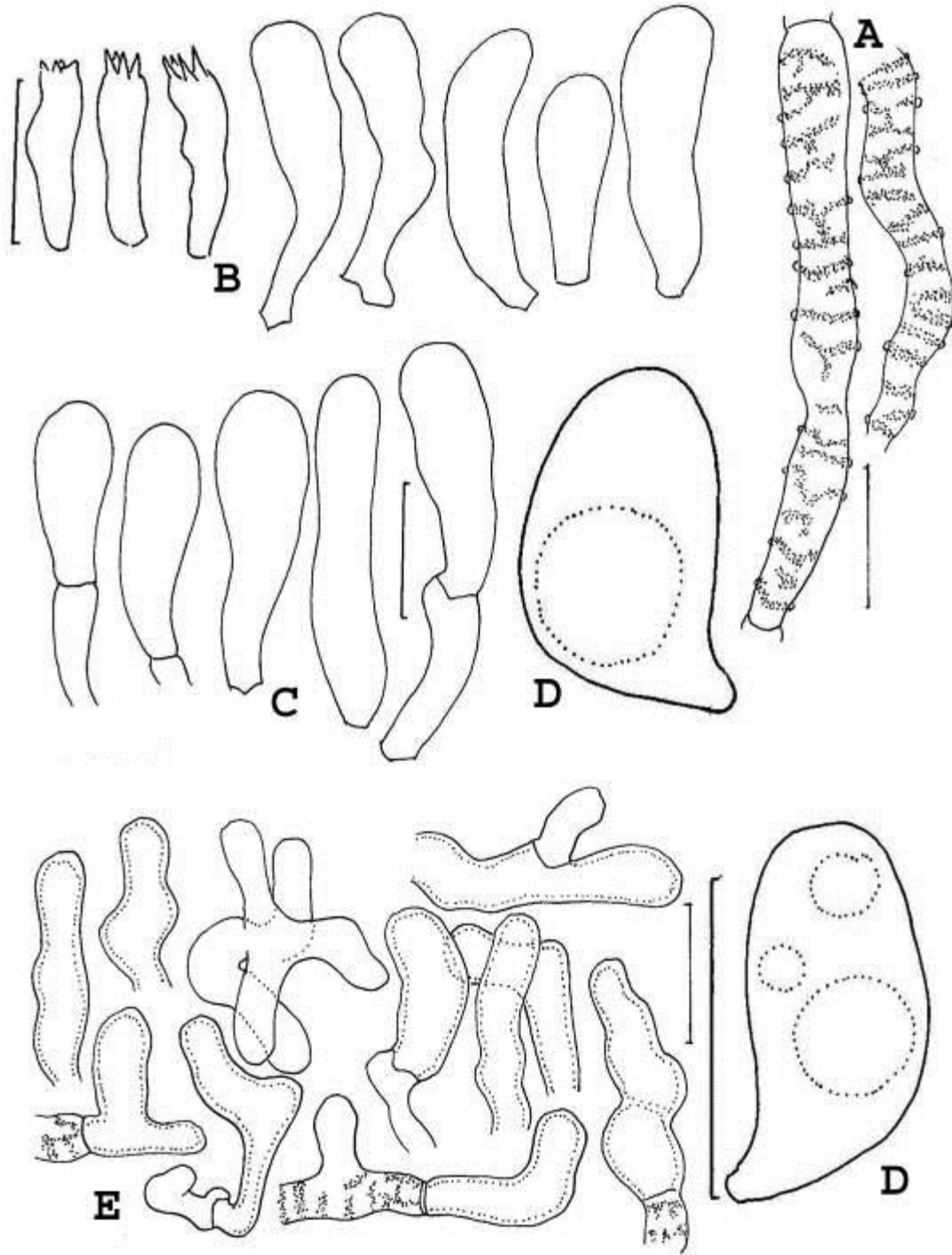


Fig. 10. *Gymnopus micromphaleoides*. A. Basidia and cheilocystidia. B. Pileipellis hyphae. C. Pileocystidia. D. Basidiospores. E. Caulocystidia. Holotype. Standard bar A-C, E = 20 μ m. Standard bar D = 5 μ m.

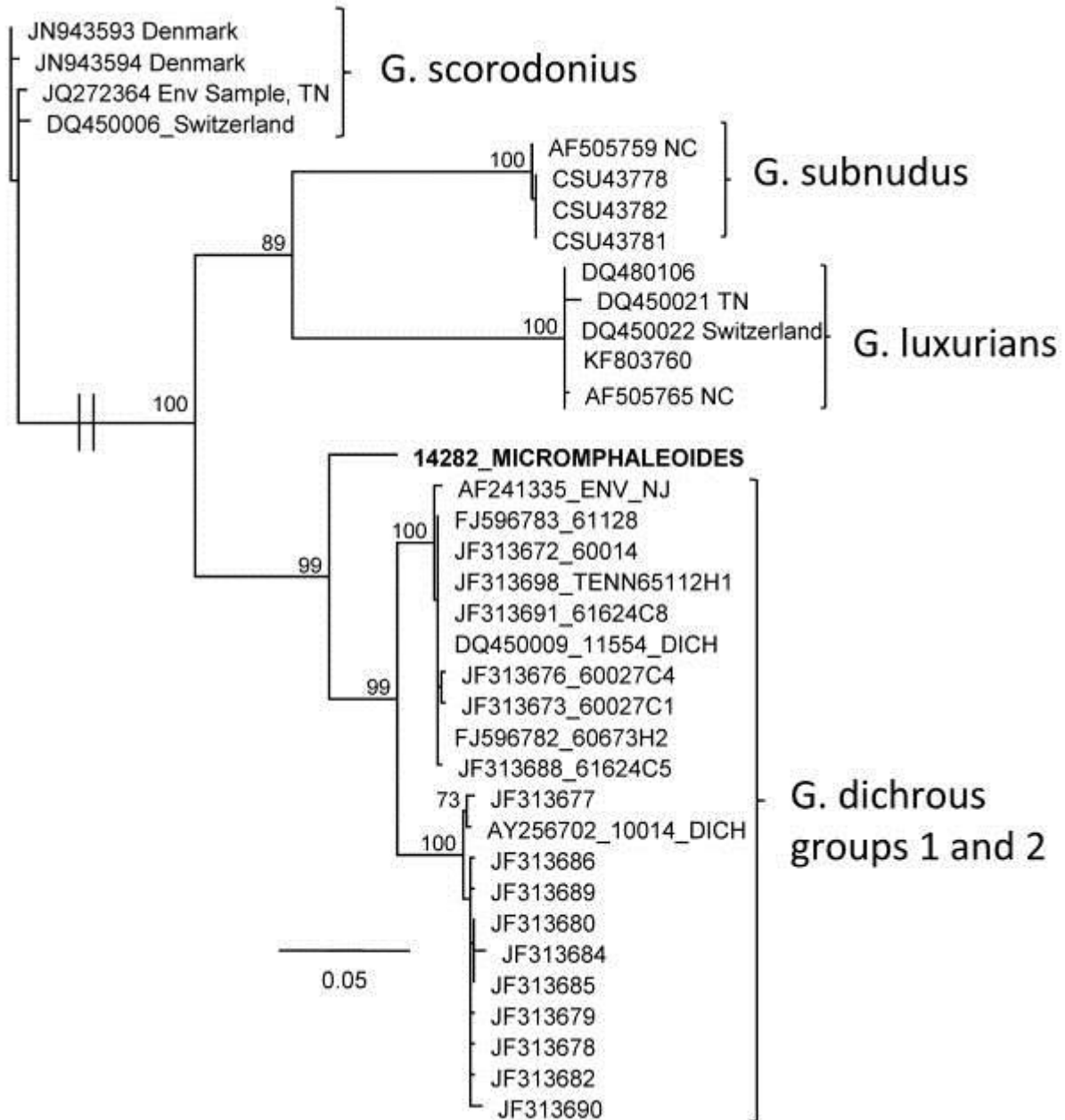


Fig. 11. Abbreviated phylogeny of nrITS showing placement of *G. micromphaleoides*. PYHML tree of ribosomal ITS sequences. Bootstrap support is given to the left of the supported node. GenBank numbers are given for sequences not generated in this study.

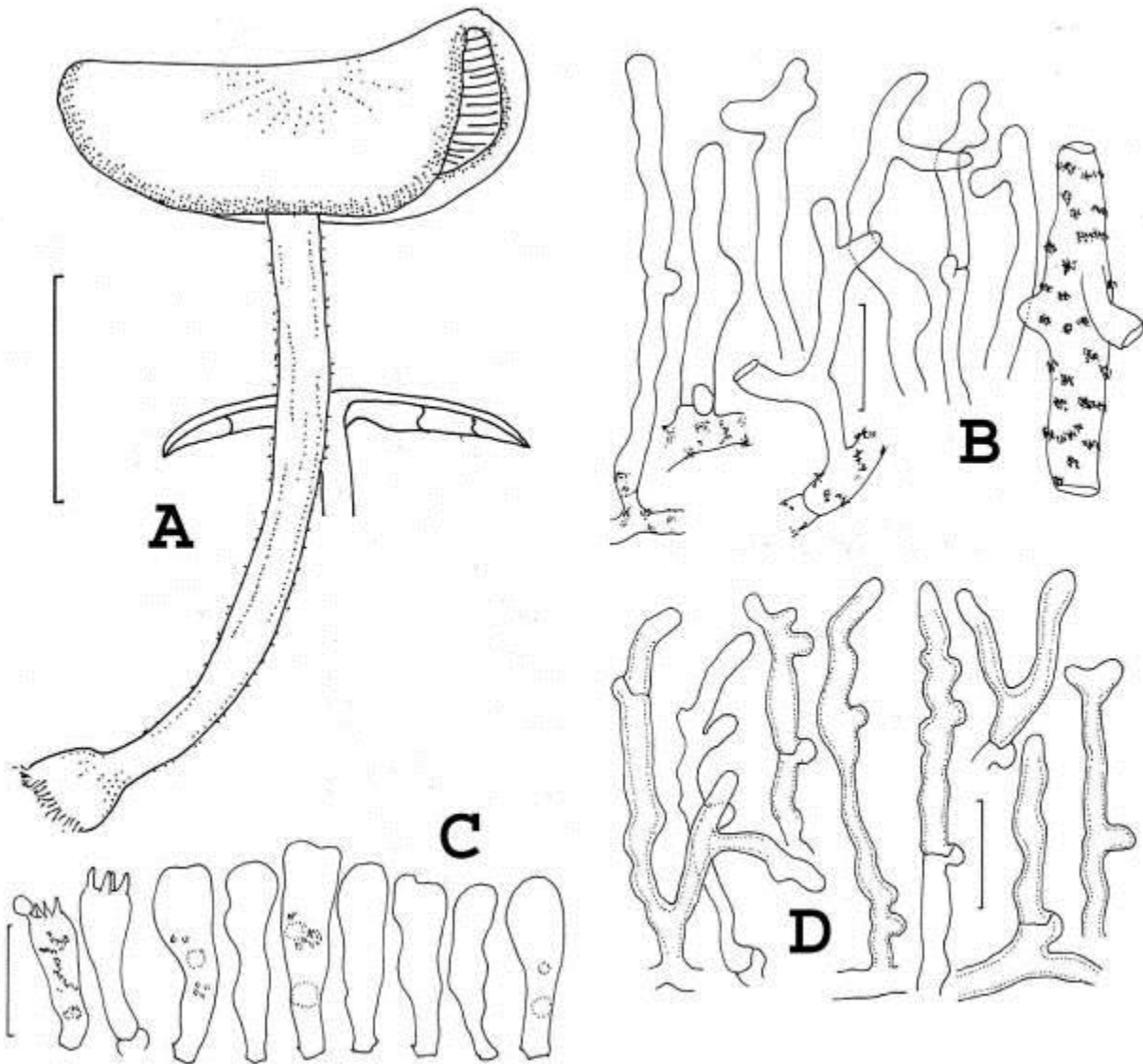


Fig. 12. *Gymnopus pseudoluxurians*. A. Basidiomata. B. Pileipellis hyphae. Note encrusted hyphae producing erect, unencrusted branches. C. Basidia and cheilocystidial structures. D. Caulocystidia. Holotype. . Standard bar A = 2 cm. Standard bar B-D = 20 μ m.

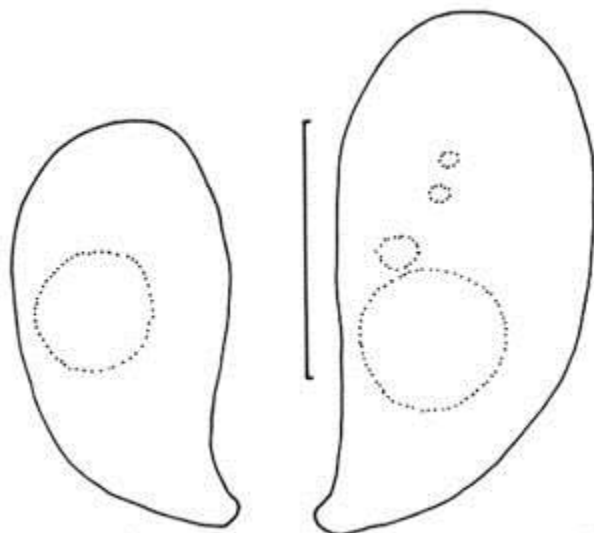


Fig. 13. *Gymnopus pseudoluxurians*, basidiospores. Holotype. Standard bar = 5 μ m.

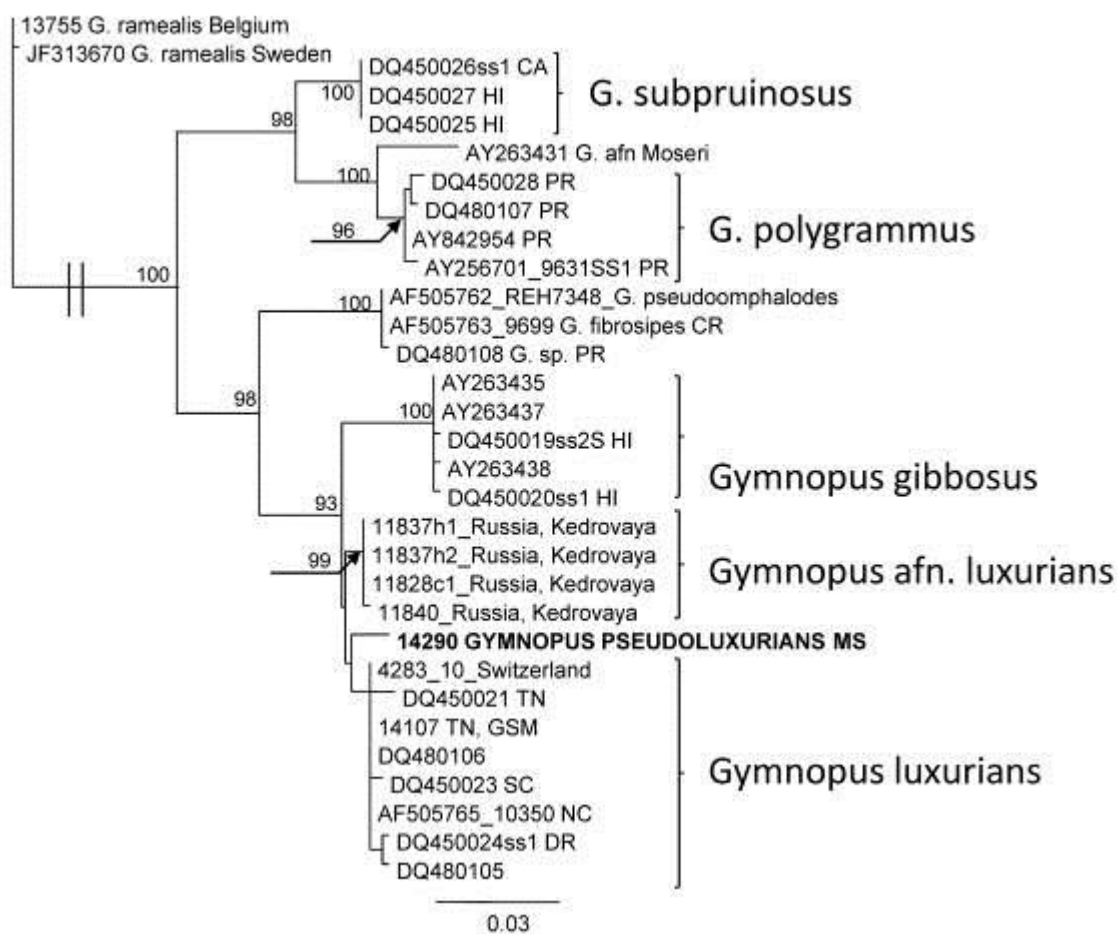


Fig. 14. Abbreviated phylogeny of nrITS showing placement of *G. pseudoluxurians*. PYHML tree of ribosomal ITS sequences. Bootstrap support is given to the left of the supported node. GenBank numbers are given for sequences not generated in this study.