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GLOMUS LAMELLOSUM sp. nov.: A NEW GLOMACEAE ASSOCIATED WITH BEACH GRASS

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Analysis of soil and roots sampled from the Great Lakes region revealed the presence of an undescribed *Glomus* species associated with American beach grass (*Ammophila breviligulata* Fern.). Spores were abundant in roots and sandy soils of the eastern shore of Nottawasaga Bay, Georgian Bay, Ontario and also were found in a soil sample from the western shore of Lake Michigan. Isolated spores were successfully propagated on *Allium porrum* L. plants.

The description reported here is based on fresh specimens mounted in a polyvinyl alcohol-lactic acid-glycerol (PVLG) medium (Omar et al., 1979) and observed with differential interference contrast (DIC) and ultra-violet autofluorescence optics. Roots were observed after Trypan Blue staining (Koske & Gemma, 1989). Spore wall description follows the murograph terminology of Walker (1983, 1987). Holotypes have been deposited at the National Mycological Herbarium, Agriculture Canada, Ottawa (DAOM), and isotypes were deposited at Oregon State University Herbarium (OSC) and Farlow Herbarium (FH).

GLOMUS LAMELLOSUM Dalpé, Koske & Tews sp. nov. Figs. 1-10

Sporocarpia ignota. Sporae singulares, hyalinae, citrinae ad flavidae, globosae ad irregulares (98-)106-142 x 122-162 μm. Tunica sporae in stratorum trium turma una, exteriore lamellosa pagina, hyalina ad citrina, laminata (2-) 6-12,5 (-16) μm crassa ; media citrina ad flavida, laminata, 6-12,5 μm crassa ; interiore hyalina, membranacea <1 μm crassa. Hyphae sustinentes hyalinae ad citrinae, rectae vel recurvae, cylindricae vel subinfundibuliformes, 8-13 μm crassae ; tunicae 1,5-2 μm crassae. Porus apertus 1-1,5μm latus. Mycorrhizae cum vesiculis et arbusculis formans.

Sporocarps unknown. Spores formed singly in soil or in roots, hyaline when young, lemon-yellow to light yellow at maturity (#86 ISCC-

NBS Color-Name Charts), globose to irregular, (98-)106-142 x 122-162 μm (Figs 1,2,8). Spore wall structure (Figs 2,4,8) of three walls (1-3) in one group (A). Wall 1 a flaking but persistent hyaline to lemon-yellow laminated wall, (2-) 6-12.5 (-16) μm thick, with a foliated, lamellate surface that sloughs away with age (Figs 3,6,8,9). Wall 2 lemon to light yellow, laminated, 6-12.5 μm thick, abruptly terminated at lumen level (Figs 1,6). Wall 3 hyaline, membranous, <1 μm thick, adherent to wall 2, sometimes difficult to distinguish. Subtending hyphae hyaline to lemon-yellow, straight to recurved, cylindrical to slightly funnel shaped, 8-13 μm in diameter at spore base (Figs 1,6). Wall of subtending hyphae hyaline to pale yellow, 1.5-2 μm thick, continuous with spore wall 1 and 2. Pore usually open, sometimes closed by a curved septum, 1-1.5 μm wide, inflated to 6-8 μm below the septum. Extramatrical hyphae hyaline, often septate, 8-10 μm wide with walls 2 μm thick.

ETYMOLOGY

Latin - lamellosus = lamellate, arranged in layers or thin plates, referring to the outer surface of spore wall 1.

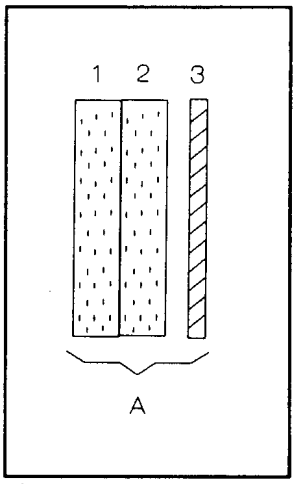


Fig. 10. Murograph.

DISTRIBUTION AND HABITAT

Known from sandy habitats from Great Lakes area: sandy shore of Nottawasaga Bay in Georgian Bay, Ontario, Canada; sand dunes of Bailey's Harbor, Wisconsin, U.S.A. as *Glomus* species A described in Koske & Tews, 1987.

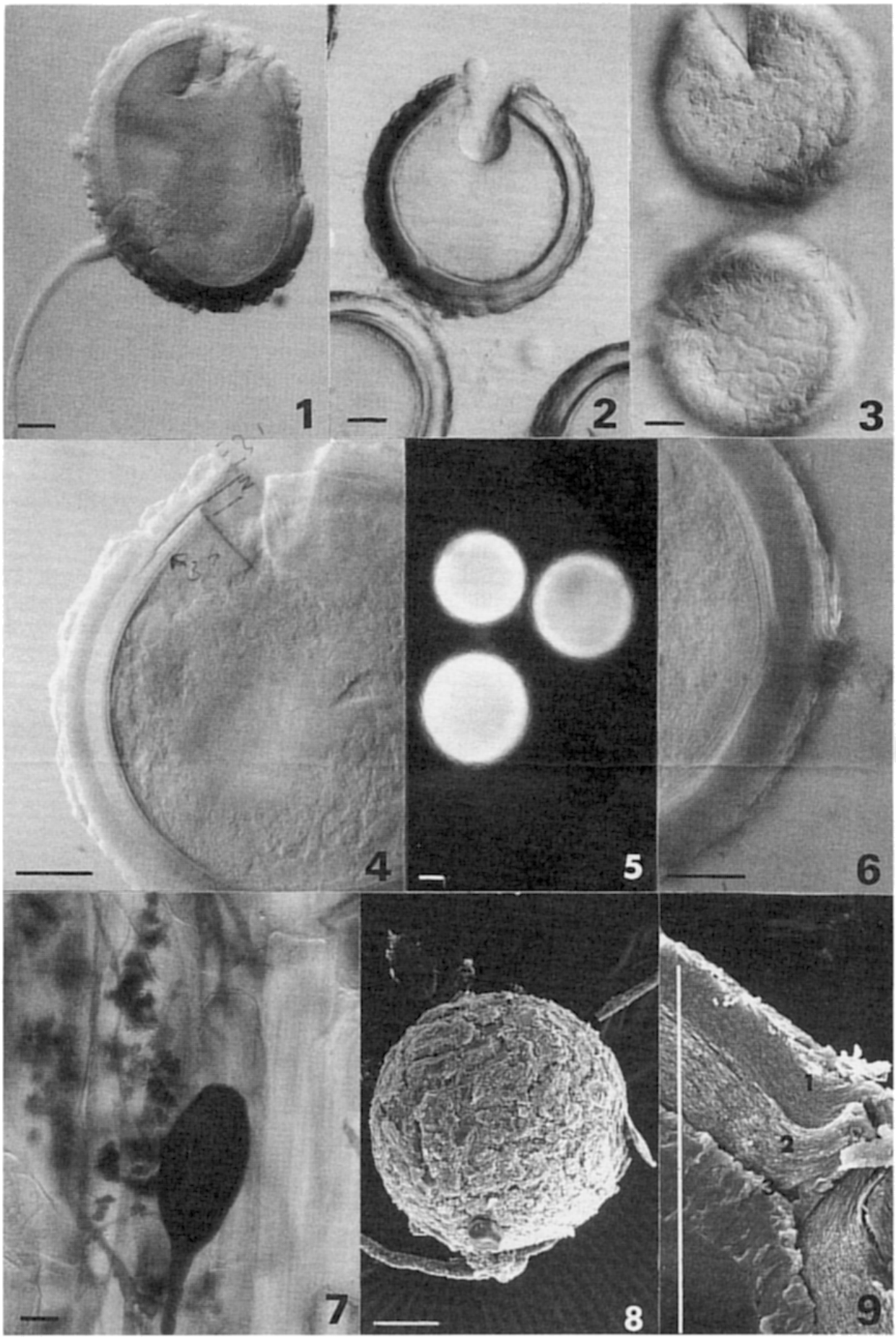
MYCORRHIZAL ASSOCIATIONS

In the field, the species was associated with *Ammophila breviligulata* Fern and *Avena* sp. It formed typical vesicular-arbuscular mycorrhizae when pot-cultivated with *Allium porrum* L. (Fig. 3).

COLLECTIONS EXAMINED:

TYPE: Canada, Beach # 1, Wasaga Beach Provincial Park, Simcoe Co., in the rhizosphere of *Ammophila breviligulata* Fern., 31/08/89 (Dalpé & Mitrow # 3938) DAOM 212349.

Figs. 1-9. *Glomus lamellosum*. Fig. 1. Spore with subtending hypha. 2,4. Crushed spore. Fig. 3. Surface of spore wall 1. Fig. 5. Spore with hyphae (Autofluorescence under U.V. light). Fig. 6. Spore wall at pore level. Fig. 7. Intraradical vesicle and arbuscules (Trypan Blue staining). Fig. 8. Spore with subtending hyphae. Fig. 9. Cross-section of spore wall at pore level. Figs 1-4,6,7. Differential Interference Contrast. Figs 8,9. Scanning Electron Microscope. Bar lines = 30 μm.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ISOTYPE: Canada, pot-culture on *Allium porrum*. Ottawa Ont., 10/10/90 DAOM 212349 (Isotypes, FH, OSC).
OTHER COLLECTION: U.S.A., Kohler-Andre State Park, Sheboygan Co., Wisconsin, in the rhizosphere of *Ammophila breviligulata*. 83/10 (Tews #KA-4-1).

DISCUSSION

Spores of *Glomus lamellosum* are easily detected in soil sievings under the dissecting microscope by their lemon-yellow to light yellow coloration and their rough surface in reflected light. With the compound microscope, spores are readily distinguished by the flaking outer surface of wall 1 and the relatively thick, lemon yellow laminate wall 2. When the spore surface is examined in U.V. light, it autofluoresces strongly, revealing the plate-like nature of the flaking surface (Fig. 5).

The outermost wall of spores of *G. lamellosum* is reminiscent of the thick, hyaline wall 2 of spores of *G. clarum* Nicol. & Schenck. Laminations are not readily apparent, and the wall has a glistening quality to it, suggesting that its composition is different from that of the more typical type of laminated wall (e.g., wall 2 of *G. lamellosum*). Reactions to Cotton blue and Congo Red are not distinctive. With lactic acid, wall 1 loses its foliated appearance and the surface becomes distorted and crusty. Melzer's reagent treatment increases contrast of wall 2 laminations and facilitates the distinction between walls 1 and 2.

In most specimens, the innermost wall does no readily separate from wall two and is not easily observed (Figs. 1,4). In some well-crushed specimens, however, wall 3 is displaced from wall 2 and is clearly defined (Figs 2,6).

The subtending hypha has two apparent walls, an outer, flaking one derived from wall 1 of the spore and an inner one that is continuous with wall 2. As wall 2 merges into the inner wall of the subtending hypha, the color is lost, and the entire subtending hypha is hyaline to very pale yellow.

Spores of *G.lamellosum* are most likely to be confused with those of *G. fasciculatum* (Thaxter) Gerd. & Trappe sensu Thaxter (Walker & Koske, 1987). Spores of both species are similar in size and color, have relatively thick laminated walls (in comparison to spore diameter) and innermost membranous walls, and the walls of the subtending hyphae taper markedly away from the spore. Spores of *G. fasciculatum*, however, have a thin outermost hyaline unit wall that does not flake or slough with age.

Spores of *G. halonatum* Rose & Trappe also possess a thick, hyaline outermost wall that roughens with age. Unlike spores of *G. lamellosum*, those of *G. halonatum* are light brown to brown in color, range in diameter from 200-280 μm, with a thick, laminated inner wall ornamented with short, crowded spines that project into the hyaline wall.

After 12 to 15 weeks of pot-cultivation, the species produces abundant extraradical spores, and the roots were typically colonized with arbuscules and vesicles (Fig. 7). No intraradical spores were observed in pot-cultivated leek plants (*Allium porrum* L.). In the field, however, intra- and extraradical spores were associated with roots of *Ammophila breviligulata*.

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