

The Genus *Gomphillus* (Ostropales: Gomphillaceae) in the Americas, with the New Species *Gomphillus pedersenii* from Argentina

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Abstract. A synopsis of the genus *Gomphillus* in the Americas is presented, with the description of the new species, *G. pedersenii* L. I. Ferraro & Lücking, from Argentina. The new species is characterized by pale, vertically elongate apothecia, rather broad ascospores, and umbrelliform hyphophores. With the exclusion of *G. caribaeus* W. R. Buck, which belongs in a new genus, *Bryogomphus*, in the *Pilocarpaceae*, and the recent discovery of another new species, *G. morchelloides* Lücking & Sérus., the genus *Gomphillus* now comprises five species. All taxa are keyed out and briefly discussed, and a distribution map for the Americas is given.

Keywords. *Gomphillus*, Brazil, Chile, Costa Rica, Cuba, Ecuador, Jamaica, Puerto Rico, United States, muscicolous.

The genus *Gomphillus* Nyl. was first described to accommodate an enigmatic lichen with vertically elongate apothecia, *G. calycioides* (Del. ex Duby) Nyl., rare but widespread in oceanic parts of western Europe. That species had originally been described in the genus *Baeomyces* and was also later frequently related to lichens with stipitate or podetiate apothecia (Duvigneaud 1944; Räsänen 1943; Zahlbruckner 1926), although differing clearly in apothecial anatomy (Santesson 1952). Watson (1929) was the first to accommodate *Gomphillus* in the separate family Gomphillaceae, which was later validated by Hafellner (1984). Vězda and Poelt (1987) established that the “postmature apothecia” described from a second species, *G. americanus* Essl. (Esslinger 1975), were in fact hyphophores, and emended the family Gomphillaceae to include all species with hyphophores previously assigned to Asterothyriaceae. This was supported by additional characters shared between *Gomphillus* and these other genera, such as excipulum and hamathecium structure, ascus type, and thallus structure.

Hafellner (1984, 1988) considered the ascus of *Gomphillus* to be fissitunicate and established the order Gomphillales [*nom. nud.*] for the family. Vězda and Poelt (1987) supported the view of the asci of Gomphillaceae as being fissitunicate, but Lücking (1997) assigned them to the annellaseous type typical of Ostropales and suggested that the seemingly fissitunicate asci of *Gomphillus* might merely be an observational artifact due to the fact that they

are extremely elongate. The position of *Gomphillus* and the Gomphillaceae within the Ostropales was recently confirmed using a molecular approach (Lücking et al. 2004), and phenotype-based phylogenetic analyses suggests *Gomphillus* to be derived from a *Gyalideopsis*-like ancestor (DenNETière & Péroni 1998; Lücking et al. 2005a).

Thus far, *Gomphillus* comprised four species (Esslinger 1975; Kalb & Vězda 1988; Buck 1998; Lücking et al. 2005a), characterized by dark brown, vertically elongate or stipitate apothecia with filiform, transversely multiseptate ascospores and umbrelliform hyphophores (only known from *G. americanus*). Upon restudy of the original material, one of these, *G. caribaeus*, had to be excluded from the genus and is now placed in a new genus, *Bryogomphus*, in the *Pilocarpaceae* (Lücking et al. 2005b). Also, a new species with *Morchella*-like, cerebriform apothecia was discovered in material from Papua New Guinea and Chile (Lücking & Sérusiaux 2005). During an ongoing survey of Gomphillaceae in northern Argentina and adjacent areas (Ferraro 2000, 2004; Ferraro & Lücking 2003; Ferraro et al. 2001; Ferraro & Vězda 1989), the first author discovered another species of *Gomphillus* that differs by its pale instead of dark apothecia; it is the second species of the genus that produces hyphophores. This new species, *G. pedersenii*, is described in this paper, and a synopsis of the genus in the Americas is given.

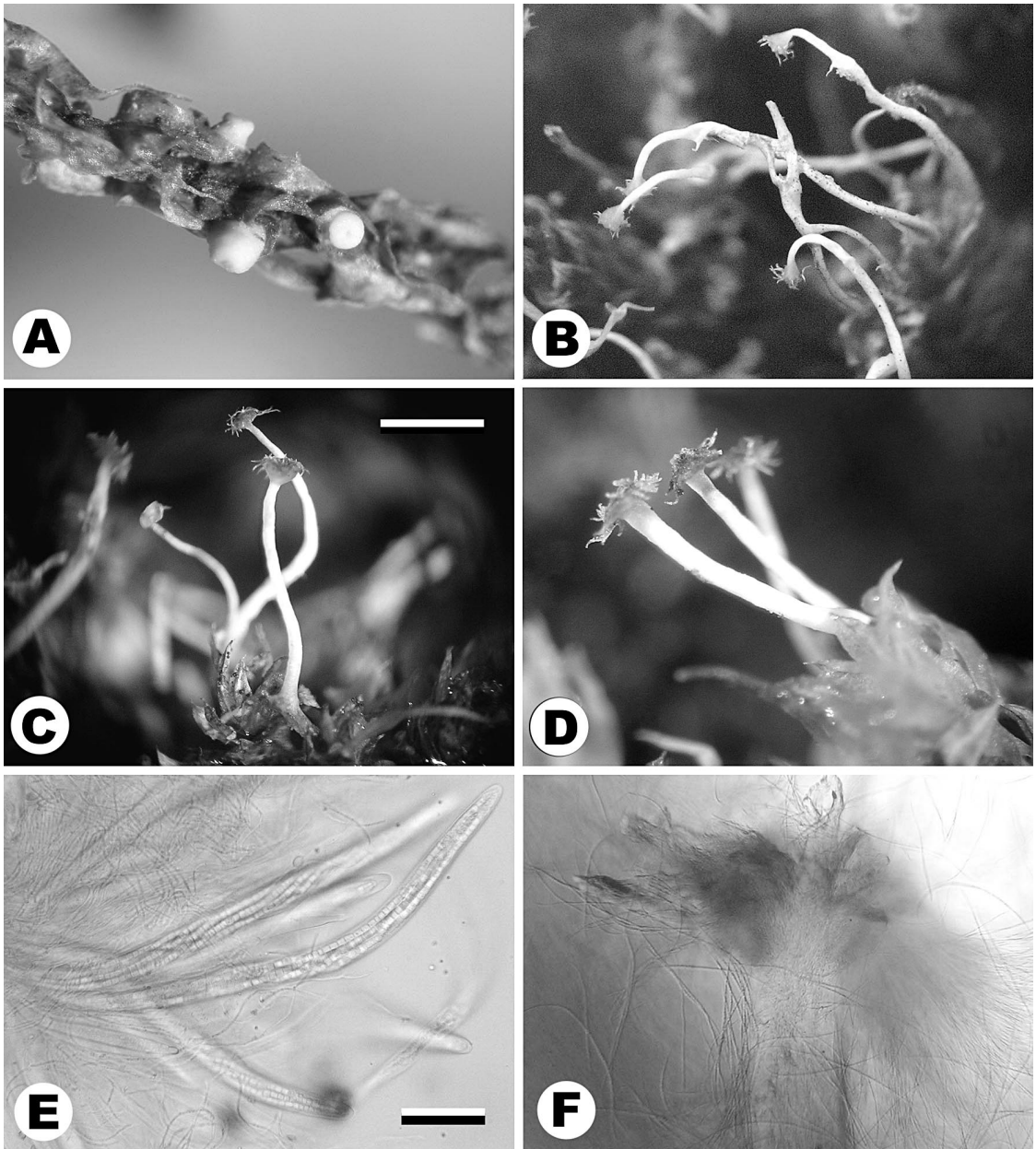


FIGURE 1. Morphology and anatomy of *Gomphillus pedersenii* (holotype). —A. Apothecia. —B–D. Hyphophores. —E. Asci with ascospores and paraphyses. —F. Apical portion of hyphophore with conidia. —Macroscopic scale for A and B = 1 mm, for C = 0.75 mm, for D = 0.5 mm; microscopic scale for E and F = 50 μm .

THE NEW SPECIES

GOMPHILLUS PEDERSENII Ferraro & Lücking, *sp. nov.* FIG. 1

Apothecia flavo-alba; ascospori 2.0–2.5 μm lati; hyphophori umbelliformes, parte apicali peltati lobulis triangularibus instructi.

TYPE: ARGENTINA. SALTA. El Rey National Park, cloud forest, in forest aisle, trail to Pozo

Verde, over mosses on canopy branches of fallen tree, 11 March 2005, *Ferraro & Popoff 7901* (CTES, holotype; F, isotype).

Thallus muscicolous over bark (fallen canopy branches), very thin, pale greenish, smooth to weakly verrucose. *Apothecia* sessile and vertically elongate, stout-cylindrical to barrel-shaped, 0.3–0.5 mm diam. and 0.4–0.8 mm high, yellowish white. *Excipulum* hyphal, 20–30 μm broad, colorless. *Hymenium* 300–600 μm high. *Paraphyses* thin,

branched and anastomosing. *Asci* cylindrical, 250–400 × 14–18 μm. *Ascospores* 8 per ascus, in a straight bundle or slightly and irregularly twisted, filiform, transversally multiseptate, 250–300 × 2.5–4.0 μm, colorless. *Hyphophores* narrowly umbelliform, very rarely branched at the base, 5–10 mm high, with pale stipe and dark brown, to 0.3 mm broad, peltate-denticulate apex formed by acute, triangular lobes. *Diahyphae* filiform, transversally multiseptate, 150–200 × 1.0–1.5 μm.

Additional specimen examined.—ARGENTINA. SALTA: El Rey National Park, at the entrance of Los Lobitos trail towards the waterfall, over mosses in forest understorey, 12 March 2005, Ferraro & Popoff 7972 (CTES).

Etymology.—This new species is dedicated to Dr. Myndel Pedersen and the Myndel Botanical Foundation, for supporting collection trips of Latin American taxonomists, on one of which the new species was discovered.

Gomphillus pedersenii exhibits the typical apothecial morphology and anatomy of the genus, with vertically elongate apothecia and filiform, transversally multiseptate ascospores. It is the second species in the genus found with hyphophores, and the hyphophores conform perfectly to the *Gomphillus* type (see Buck 1998; Vězda & Poelt 1987).

The new species differs from the other species known so far by its yellowish white instead of dark brown apothecia. Indeed, at first glance the apothecia of *Gomphillus pedersenii* closely resemble the perithecia of certain *Aspidothelium* species, such as *A. macrosporum* and *A. papilliferum*. The ascospores are most similar to those of the type species, *Gomphillus calycioides*, although slightly larger. Hyphophores have so far only been described from *G. americanus*, which differs from *G. pedersenii* by its dark brown, stipitate rather than vertically elongate apothecia, and its shorter, thinner ascospores which are spirally twisted within the asci (Buck 1998; Esslinger 1975). The hyphophores of *G. americanus* are very similar in shape but larger (Buck 1998).

Because of its stipitate rather than vertically elongate apothecia, and because being the only species to produce hyphophores, Buck (1998) considered *Gomphillus americanus* as somewhat isolated within the genus and even possibly deserving separate generic status. The discovery of *G. pedersenii* supports the unity of the species known so far, since it combines vertically elongate apothecia similar to those of *G. calycioides* and *G. ophiosporus* with the hyphophores typical of *G. americanus*. This is also confirmed by a phenotype-based phylogenetic analysis, which strongly supports *G. americanus*, *G. calycioides*, and *G. ophiosporus*, as monophyletic clade (Lücking et al. 2005a).

Gomphillus pedersenii was first found over mosses on canopy branches of a fallen tree in a montane cloud forest in El Rey National Park, with trees being to 30 m high, with abundant lianas and epiphytes, and an annual precipitation of 700–1,000 mm. This suggests that species of *Gomphillus* might be commonly found on epiphytic bryophytes in the canopy of tropical montane rainforests, a habitat that is rarely collected for lichens.

KEY TO THE SPECIES OF *GOMPHILLUS*

1. Apothecia pale yellowish white; hyphophores present, to 10 mm high; southern South America (Argentina) *Gomphillus pedersenii*
1. Apothecia dark brown; hyphophores absent or present and then to 20 mm high 2
 2. Apothecia cerebriform, with irregularly foveolate surface resembling a tiny *Morchella*; southern South America (Chile) and Papua New Guinea *Gomphillus morchelloides*
 2. Apothecia with smooth surface 3
3. Apothecia stipitate, thinly pruinose; hyphophores present; southeastern North America (U.S.A.) and southern South America (Argentina) *Gomphillus americanus*
3. Apothecia vertically elongate, non-pruinose; hyphophores absent 4
 4. Ascospores 350–500 × 1.5–2.0 μm, 200–250 times as long as broad, strongly spirally twisted within the asci; Neotropics (Central and South America, West Indies) *Gomphillus ophiosporus*
 4. Ascospores 200–350 × 2–4 μm, 100–150 times as long as broad, straight or slightly and irregularly twisted within the asci; southeastern North America (U.S.A.), southern South America (Chile) and western Europe *Gomphillus calycioides*

NOTES ON THE OTHER SPECIES OF *GOMPHILLUS*

A restudy of the type material and the other collections cited in the protologue of *Gomphillus caribaeus* W. R. Buck revealed that this taxon does not belong in Gomphillaceae but is a member of the Pilocarpaceae. Its apothecia are very similar to those of *Bapalmuia marginalis* (Kalb et al. 2000), its asci are lecanoroid and of the *Sporopodium*-type *sensu* Hafellner (1984), and its paraphyses are very similar to those of *Tapellaria* (Santesson 1952). The new genus *Bryogomphus* is described for this taxon (Lücking et al. 2005b).

The genus *Gomphillus* thus contains five species, all of which have been reported from the Americas (FIG. 2). Only the type species, *G. calycioides*, and the other new species, *G. morchelloides*, are known outside the Americas. The five species have very distinctive distribution ranges: while *G. ophiosporus* is only known from the Neotropics and so far the only species known from that area, the other four occur in the temperate zones in either both (*G.*



FIGURE 2. Distribution of species of *Gomphillus* in the Americas. Black dots = *G. ophiosporus*, black circles with white center = *G. calycioides*, black crosses = *G. americanus*, black triangle = *G. pedersenii*, circle with black dot = *G. morchelloides*.

calycioides and *G. americanus*) or in the Southern Hemisphere only (*G. morchelloides*, *G. pedersenii*).

GOMPHILLUS AMERICANUS Essl., Mycotaxon 1: 189 (1975). Type. U.S.A., *Esslinger 3184A* (holotype: US; isotype: DUKE).

Diagnostic characters.—Apothecia stipitate, dark brown; ascospores irregularly twisted, 2.0–2.5 μm broad; hyphophores present, umbelliform with pale stipe and dark brown, peltate and denticulate apex.

Remarks.—The nature of the hyphophores was not recognized in the original description, since Esslinger (1975) considered them to be postmature apothecia. Vězda and Poelt (1987) eventually established the connection between the hyphophores of *Gomphillus americanus* and those found in many taxa of Asterothyriaceae, and emended the family Gomphillaceae to include all genera with hyphophores.

Distribution.—Reported from North America (SE United States; Buck 1998; Esslinger 1975;

Ladd et al. 1994) and newly found in northern Argentina. The hyphophores of the Argentinian collections are slightly more robust than those in the specimen from the U.S.A. examined by us.

Specimens examined.—U.S.A. OKLAHOMA: Cherokee County, J. T. Nickel Family Nature and Wildlife Preserve (J5 Ranch), 7 mi. NE of Tahlequah, Tully Hollow, 35°59'30" N, 94°51'45" W, low sandstone bluffs along stream, in upland *Quercus*-dominated woods, 30 Oct 2000, *Buck 38443* (CTES). MISIONES: Guaraní, Predio Guaraní, 26°54'–59' S, 54°12'–18' W, 9 Sep 1994, over *Papillaria nigrescens*, 9 Sep 1994, *Schinini et al. 28811* (CTES); SALTA: Orán, Finca San Andrés, in Yungas, secondary forest, 28°04'23" S, 64°45'07" W, over *Schlotheimia* aff. *rugifolia*, 28 Oct 1997, *Schinini 34157A* (CTES).

GOMPHILLUS CALYCOIDES (Del. ex Duby) Nyl., Bot. Notiser 1853: 165. 1853, Mém. Soc. Sci. Nat. Cherbourg 2: 15. 1854; *Baeomyces calycioides* Del. ex Duby, Bot. Gall. 2: 636. 1830; *Mycetodium calycioides* (Del. ex Duby) A. Massal., Flora 39: 285. 1856, Sched. Crit. 3: 63. 1856; *Gomphillus calycioides* var. *polycephalus* Nyl., Syn. Meth. Lich. 1(2): 175. 1860, *nom. illeg.* Type. France, *Despréaux s.n.* (holotype: G!; isotype: H-NYL!).

Baeomyces microcephalus Taylor in Mackay, Fl. Hibern 2: 78. 1836; *Gomphillus calycioides* var. *microcephalus* (Taylor) Nyl., Syn. Meth. Lich. 1(2): 175. 1860; *Gomphillus calycioides* f. *microcephalus* (Taylor) Crombie, Monogr. Lich. 1: 108. 1894. Type. Ireland, *Taylor s.n.* (holotype: FH; isotype: H-NYL!).

Diagnostic characters.—Apothecia vertically elongate, dark brown; ascospores straight or irregularly twisted, 2.0–4.0 μm broad; hyphophores absent.

Remarks.—We studied material collected by Imshaug in the West Indies and South America. All specimens from the West Indies belong to *Gomphillus ophiosporus*, whereas the material from Chile is typical *G. calycioides*, except one specimen whose apothecia have a strongly irregular surface that resembles the apothecium of a *Morchella* species (see Sérusiaux & Lücking 2005).

Distribution.—Possibly widespread in temperate regions but not yet known from tropical areas. Reported from North America (SE United States), South America (Chile), oceanic parts of western Europe (Purvis et al. 1992; Tavares 1946; Tønberg & Øvstedal 1982), Macaronesia, and Hawaii.

Specimens examined.—FRANCE. Pyrénées Atlantiques, crevasses d'Holcarté (S de Tardets-Sorholus), 400 m, Aug 1985, *Sérusiaux 7607, 7609* (LG). PORTUGAL. Lisboa: Estremadura, Serra de Sintra, Parque da Pena, vicinity of Cruz Alta, May 1964, *Imshaug 36256* (MSC). CHILE. X Región (Los Lagos): Osorno, along road at Refugio Antillanca, Sep 1969, *Imshaug & Ohlsson 42888* (MSC); Juan Fernández Islands: Más a Tierra [= Robinson Crusoe Is.], El Yunque, Dec 1965, *Imshaug 37779* (MSC).

GOMPHILLUS MORCHELLOIDES Lücking & Sérus., THE

BRYOLOGIST 108: 487 (2005). Type. Papua New Guinea, *Lambley 40/86* (holotype: BM!).

Diagnostic characters.—Apothecia vertically elongate and shortly stipitate at base, dark brown to brownish black, cerebriform with irregular foveolate surface; ascospores slightly and irregularly twisted, 2.0–3.0 μm broad; hyphophores absent.

Remarks.—This species was first reported as *Gomphillus ophiosporus* from Papua New Guinea (Aptroot et al. 1997) and as *G. calycioides* from Chile (Buck 1998), the latter based on collections made by Henry Imshaug. Restudy of these collections by the second author revealed that it deals with an undescribed species, differing from other species of the genus by its cerebriform, shortly stalked apothecia. The ascospores are most similar to those of *G. calycioides* (Lücking & Sérusiaux 2005).

Distribution.—Thus far Southern Hemispheric, in Chile and the upper montane zone in Papua New Guinea (Lücking & Sérusiaux 2005).

Specimen examined.—CHILE. X Región (Los Lagos): Chiloé, Patagonian Channels, along shore of harbor, Pto Ballena, Sep 1969, *Imshaug & Ohlsson 43151* (MSC).

GOMPHILLUS OPHIOSPORUS Kalb & Vězda, *Biblioth. Lichenol.* 29: 30 (1988). Type. Ecuador, *Kalb s.n.* (holotype: hb. Kalb!; isotypes: GZU!, UPS!, hb. Vězda!).

Diagnostic characters.—Apothecia vertically elongate, dark brown; ascospores spirally twisted, 1.5–2.0 μm broad; hyphophores absent.

Remarks.—*Gomphillus ophiosporus* seems to be the only genuinely tropical species of the genus. It is rather widespread and common throughout the Neotropics, although certainly undercollected (the report from Papua New Guinea by Aptroot et al., 1997, is *G. morchelloides*). Among the five species known so far, *G. ophiosporus* is easily recognized by its very thin ascospores which are strongly spirally twisted within the asci.

Distribution.—Neotropics. Reported from Costa Rica, Ecuador, and Brazil (Buck 1998; Kalb & Vězda 1988).

Specimens examined.—HAITI. Sud: Massif de la Hotte, along W ridge leading to Pic Macaya, Morne Macaya, Jul 1958, *Wetmore & Imshaug 3246* (MSC); *ibid.*, Morne Macaya, Jul 1958, *Wetmore & Imshaug 3246, 3299* (MSC); *ibid.*, near summit of Morne Macaya, *Wetmore & Imshaug 3332* (MSC). DOMINICAN REPUBLIC. Cordillera Central, Armando Bermúdez National Park, on slope of Pico del Yaque, above Río Yaque del Norte valley, Aug 1958, *Imshaug & Wetmore 23633* (MSC). JAMAICA. St. Thomas Parish: Blue Mountains, trail to Main Ridge Gap from Monkey Hill, Feb 1953, *Imshaug 14606* (MSC); New Haven Gap, Mar 1953, *Imshaug 15131* (MSC). LESSER ANTILLES. GUADELOUPE: Basse-Terre, La Soufrière, laudes et fourrés sur laves récentes et perturbées, 1,450 m, 27 Apr 1995, *Sérusiaux s.n.* (LG).

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