

On some Species of the Genus *Disciseda* and other *Gasteromyces*.

By Zdeněk Moravec (Prague).

In the present paper I have worked some finds of *Gasteromyces* from South America, which Dr. J. E. Wright had been so kind as to send me. Further I have added also some remarks on European representatives of the genus *Disciseda*.

It is my pleasant duty to thank Dr. R. W. G. Dennis (Herbarium, Royal Botanic Garden, Kew, England) for sending me spores of Berkeley's type, Professor K. Cejp and Dr. A. Pilát for lending me some literature and for making accessible to me the herbarium of the National Museum, Prague, as well as Dr. G. Bohus (Budapest, Hungary) and Dr. R. A. Maas Geesteranus (Rijks-herbarium, Leiden, Netherland) for sending me comparative material. I tender my best thanks also to Mrs. Doc. Dr. Julie Moschelesová, for translation of a greater part of the manuscript.

Method of measuring the spores: to the descriptions has usually been added an evaluation of the size of the spores after the valid biometrical principles (Hrubý 23). A mann's lactophenol was used as medium for measuring the spores. An objective-immersion (95X) was used.

Saccardo (36) was used as basis for indicating the colours.

Abbreviations used:

Herbarium of the Botanical Institute of the Charles University, Prague — Czechoslovakia	PRC
Herbarium of the Botanical Departement of the National Museum, Prague — Czechoslovakia	PR
Herbarium, Royal Botanic Garden, Kew — England	K
Herbario Crittogamico del Instituto Miguel Lillo Universidad Nacional de Tucumán — R. Argentina	LIL
Herbario — Ministerio de Agricultura de la nacion — Direccion de sanidad vegetal — Division de Fitopatologia, Buenos Aires — R. Argentina	BAB

Disciseda pila R. E. Fries (1909) in Ark. f. Bot. 8 (11): 15.

Syn.: *Catastoma pila* Long in litt.

Icon: R. E. Fries ibid. Taf. 4, fig. 1—4.

Fruitbody subglobose, on the lower part finely depressed, 20 mm diam. The outer peridium persists at maturity on the basal part of the fruitbody firmly attached to endoperidium and forms quite insignificant disc. The inner peridium coriaceous, rather tough,

umber brown with fine purple tinge, at periphery furfuraceous, the mouth at the top round, regular, 2—3 mm diam. Spores are globose, ochraceous, with dark brown, coarsely verrucose epispore, pedicel short (max. 2 μ), colourless, (6.4)—7.9—9.4—(11) μ , ($x \pm 3. s^x = 8,66 \pm 3.0, 10 \mu$, $s^x = 1,01 \mu$). Capillitium threads tortuous, mostly broken, only 3 μ thick.

Hab.: Ad terram in silva subxerophytica. — Texas, Argentina.

Specimens examined: South America: Argentina: Rio Nio, prov. de Tucumán, d. 13. 4. 1949, leg. R. Singer (LIL — T 440).

The first to mention this fungus is already Lloyd (27) who records in his Notes Long's find in Texas. But it was first described only by Fries, whose description agrees very well with our specimen. In its appearance it is more reminiscent of some species of the genus *Bovista* (esp. *B. pila*), and just because of its resemblance it was called *Disciseda pila*.

Disciseda bovista (Kl.) P. Henn. in Hedw. **42**: (128) (1903).

Syn.: *Geaster Bovista* Klotzsch (1843) in Nov. Act. Leop. **19**: 243 suppl. 1. — *Disciseda compacta* Czern. (1845) in Bull. Soc. Nat. Moscou **18**: 153; R. E. Fries (1909) in Ark. f. Bot. **8** (11): 13; Th. C. Fries (1921) in Ark. f. Bot. **17** (9): 21; Velenovský (1926) in Mykologie **3**: 37; Veselý (1949) in Česká Mykologie **3**: 45. — *D. Debrececiensis* (Hazsl.) Hollós (1901) Termész. Fü. **25**: 102; (1904) Gaster. Ung. p. 119. — *D. subterranea* (Peck) Coker et Couch (1928) Gaster. p. 142. — *D. bovista* (Kl.) Kambly in Kambly et Lee (1936) Univ. of Iowa Stud. **17**: 153; Eyndhoven (1942) in Meded. Ned. Myc. Ver. **27**: 3; Gilman (1945) in Iowa Acad. of Sci. **52**: 118; Perdeck (1950) in Blumea **6**: 485. — Non *D. cervina* (Berk.) Holl. (1902). — *Globaria Debrececiensis* Hazsl. (1877) in Verh. zool.-bot. Ges. Wien **26**: 226. — *Bovista subterranea* Peck (1879) in Bot. Gazette **4**: 216. — *Catastoma subterraneum* (Peck) Morgan (1892) in Journ. Cinc. Soc. Nat. Hist. **14**: 143; Lloyd (1901) Myc. Notes No. **8**: 78; (1903) *ibid.* No. **13**: 122. — *C. Bovista* (Kl.) Holl. ap. P. Henn. (1901) Verh. Bot. Ver. Prov. Brand. **43**: VI.

Icon.: Lloyd (1903) Myc. Not. Nr. **13** pl. 7 fig. 1—3. — Hollos (1904) Gast. Ung. Tab. **22**, fig. 20—24, Tab. **29**, fig. 36.

Exs. Rabh.-Wint. F. europ. Nr. 3740 (sub *Bovista circumscissa* (B. et C.) — Savulescu. Herb. myc. rom. Nr. 698 (sub *Disciseda cervina* Berk.).

Fruitbody depressed globose, 19—21 mm in diam. The outer peridium forms at the base a standing off, strong disc. The inner peridium is tough, thick, ash-brown, sometimes radiately cracking, at the top with small, fimbriate mouth. Spores globose, honey-yellow, with spiny brownish epispore, inside a small oil-drop. They are a little smaller than in the typical *Disciseda bovista*, 5.5—7.1—(8.7) μ , ($x \pm 3. s^x = 6,5 \pm 3.0, 06 \mu$, $s^x = 0,612 \mu$). Capillitium threads undulate, broken, colourless, thin-walled, 4—5 μ thick.

Hab.: Ad terram arenosam. — Europe, USA., Canada, Argentina, Peru.

Specimens examined: South America: R. Argentina, prov. de Tucumán, Tafí del Valle, 2000 m s. m., d. 23. 10. 1949, leg. A r g e n -

tino Martínez (BAB — sub *Disciseda anomala* (Cke. et Mass.) Cunn). — Europe: USSR—Charkow (l. Czernaiew—PR 485943), Roumania (l. Săvulescu et Alexandri—PRC), Hungary—Ujpest (l. Bernatsky—PRC), Czechoslovakia: Bohemia: Prague's environment (l. Příhoda, Reisner, Moravec), Czech Středo-
hoří (l. Šimr, Moravec), Moravia: Brno, Znojmo (l. Komárek), Hodonín (l. Štefan, Moravec), Slovakia: Král. Chlumeč (l. Holub) (All specimens in PRC), Italy: Piemont (l. Mattiolo—PR 485944), Netherlands: Wassenoar, pr. Zuid—Holland (l. M.R.S. Boetje—PRC).

Our specimen was originally determined as *Disciseda anomala*, but because it lacks completely a characteristic feature — the tubular aperture — I regard it rather as the species *Disciseda bovista*, which I know well from autopsy and to which it also corresponds well.

In their paper Kambly and Lee form a new combination of *Disciseda Bovista* (Klotzsch) and mention also that already Lloyd in 1906 considered such a possibility but did not express his opinion nomenclatorically. But Lloyd as well as Kambly and Lee overlooked Henning's review of Lloyd's work on the g. *Catastoma* in *Hedwigia* (18), where he writes about the conspecificity of the species of Klotzsch and of Peck and already at that time formed the right name.

In recent years this species was also often confused with the species *Disciseda cervina* (Berk.) Holl., especially by the New Zealand mycologist G. H. Cunningham on the basis of Lloyd's erroneous finding that *Bovista cervina* is conspecific with *Bovista subterranea*. Also many European mycologists accepted his opinion (Săvulescu, Alexandri, Šmarda). After studying the original descriptions the disagreement in the size and sculpture of the spores must strike everybody. Already van Eynhoven in 1942 (10) refuted Cunningham's conception, in his paper he ascribed, however, the combination of *Disciseda bovista* erroneously to Hollós.

I had the opportunity to study microscopically the spores of Berkeley's type (Patagonia, Rio Negro, leg. Ch. Darwin — Herb. Berk., K, no. 4586), and found that they are different not only from the spores of our species but at the same time also from the descriptions of Cunningham (6,7) and Bottomley (4). They are namely entirely smooth, light ochraceous, only rarely with a short, hyaline pedicel, $4.6-5.6 \mu$, ($x \pm 3. s_x = 4,61 \pm 3. 0,029 \mu$, $s_x = 0,367 \mu$). In size they approach therefore rather the species *Disciseda candida* (Schw.) Lloyd.

Disciseda candida (Schw.) Lloyd var. *candida*.

Syn.: *Disciseda candida* (Schw.) Lloyd (1902) Myc. Not. Nr. 10: 100; Cok. et Couch (1928) Gaster. U.S. p. 139—141; Cunningham. (1927) Proc. Linn.

Soc. N.S.W. 52: 238; (1942) Gaster. of Austr. p. 137; Kambly et Lee (1936) in Univ. of Iowa Stud. 17: 152; Bottomley (1948) in Bothalia 4: 570; Dennis (1953) in Kew Bull. no. 3: 325, non pro spec. eur. — *D. circumscissa* (B. et C.) Holl. (1901) in Termész. Fü. 25: 126, tantum pro spec. amer. — *Bovista candida* Schw. (1822) Syn. Fung. Car. no. 333, p. 126; de Toni in Sacc. (1897) Syll. Fung. 7: 105. — *Bovista circumscissa* B. et C. (1873) in Grevillea 2: 50; Massee (1888) Journ. of Bot. 26: 131; de Toni in Sacc. (1897) Syll. Fung. 7: 104. — ? *Bovista uruguayensis* Speg. (1882) Fungi Arg. Pug. IV: 102; Massee (1888) in Journ. of Bot. 26: 134. — *Catastoma circumscissa* (B. et C.) Morgan (1892) in Journ. Cinc. Soc. Nat. Hist. 14: 143; Lloyd (1903) Myc. Notes no. 13: 216.

Icon.: Lloyd (1901) Myc. Not. Nr. 8 fig. 41; l. c. (1903) Nr. 13 pl. 6, fig. 1—7. — Cok. et Couch (1928) Gaster. U.S. p. 78, 79, 99, 118, fig. 1—7. — Cunn. (1944) Gast. Austr. p. 18, fig. 6, 7, pl. 35, fig. 20. — Bottomley (1948) in Bothalia 4, pl. 64, fig. 1, 2.

Fruithody subglobose or depressed globose, up to 20 mm in diam. The outer peridium falls off at maturity and forms only on the lower part a little disc. The inner peridium rigid, not too thick, ash- or umber-brown, at the top with a small fimbriate, mostly round mouth. Between the exo- and endoperidium a gelatinous, spongy layer, which later dries and forms upon disc a fimbriate border. It is from thin-walled, tortuous threads, yellow or colourless, about 5 μ thick, to the end slowly narrowing, 2 mm long. Spore mass olive umber. Spores globose, pallid yellowish or ochraceous, epispore darker, smooth or sometimes very delicately punctate, often with a short pedicel, within one central drop, 3.1—4.1 μ , ($x \pm 3$. $s^x = 3,61 \pm \pm 3$. 0,16 μ , $s^x = 0,28 \mu$). Capillitium threads tortuous, pallid ochraceous or colourless, broken into short pieces, only 2,5 μ thick.

Hab.: Ad terram in graminosis apricis. — USA., S. Domingo, South America, South Africa, Australia, N. Zealand.

Specimens examined: South America: R. Argentina: Quilmes, Parque „Derechos de la Ancianidad“ d. 24. 9. 1950, leg. A. S a r a s o l a (BAB). — Prov. de Tucumán, Las Ramadas, d. 6. 11. 1950, leg. R. S i n g e r (LIL no. T 1012).

The first to draw attention to the presence of a gelatinous layer was B. O. L o n g y e a r, and immediately after this L l o y d determined the presence of this layer in all samples in his herbarium. Later also other authors paid attention to this layer, and usually it is always well visible also in photographs.

In comparing the descriptions of this species by European authors I noted, however, that M a a s G e e s t e r a n u s was the first to draw attention to the lack of the spongy layer in the European specimens, in contradistinction to the descriptions of the American and European authors. As, however, he had not any large comparative material, he kept only to the authority of H o l l ó s and regarded all as the current species *Disciseda candida* (S c h w.) L l o y d.

I examined not only my own collections from Czechoslovakia but as far as possible also material from the rest of Europe, and I found that the gelatinous layer does not occur either in entirely fresh, nor in old specimens. Furthermore the size of the spores is relatively larger than that given for the type of *Disciseda candida* (C o k e r et C o u c h 5). For these reasons I regard the European items as a variety of the American species *Disciseda candida* (S c h w.) L l o y d var. *candida*.

Disciseda candida (Schw.) Lloyd var. **calva** var. n.

Syn.: *Disciseda candida* (Schw.) Lloyd fide Maas Geesteranus (1951) in Fungus 21: 51—53 et fide Šebek (1951) in Čs. bot. listy 3: 159—160 et fide Moravec (1952) in Čas. čs. houb. 29: 14—15. — *Disciseda circumscissa* (B. et C.) Hollós (1901) Termész. Fü. 25: 126, tantum pro spec. eur.; (1904) Gaster. Ung. p. 119; Velenovský (1922) České houby p. 833, 834; Favre et Ruhlé (1947) in Schweiz. Zeitschr. f. Pilzk. 25: 60—61; Veselý (1949) in Česká Mykologie 3: 49.

Icon.: Hollós (1904) Gaster. Ung. Tab. 22, fig. 25—27. — Favre et Ruhlé (1947) in Schweiz. Zeitschr. f. Pilzk. 25: 60, fig. 2, 3. — Veselý (1949) in Česká Mykologie 3: 48. — Maas Geesteranus (1951) in Fungus 21: 52. — Šebek (1951) in Čs. bot. listy 3: 160.

Fruitbody depressed globose, in old usually lens-shaped, 8—15 mm in diam., only sometimes reaching up to 20 mm. The outer peridium thin, fragile, for the most part it peels off and persists on the basis of the fruitbody as a small disc with adherents particules of soil. The inner peridium rigid, mostly ash-gray, it changes sometimes to dirty white or umber brown. There is not any gelatinous layer between the exo- and endoperidium, endoperidium is bald, smooth. The mouth at the top of the fruitbody is small, round, fimbriate. Spore mass olive umber. Spores globose, light ochraceous, smooth or punctate, sometimes with a short, colourless pedicel, 4,1—5,6 μ , ($\bar{x} \pm 3. s_x = 4,74 \pm 3.0,025 \mu$, $s_x = 0,31 n$). Capillitium threads tortuous, pallid yellowish, thin-walled, broken, 4 μ thick.

Fungus depresso-globosus, 8—15 mm. diam., exoperidio fragili, ad basim patellam formante, endoperidio rigido, cinereo-cano usque sordide albido vel fusco-umbrino, calvo, sine strato gelatinoso inter endo- et exoperidium, ore apicali, fimbriato, gleba umbrino-olivacea, sporis globosis, laevibus vel punctatis, magn. 4,1—5,6 μ ($\bar{x} \pm 3. s_x = 4,74 \pm 3.0,025 \mu$, $s_x = 0,31 \mu$), capillitio pallide ochraceo, 4 μ diam., undulato.

A *Disciseda candida* (S c h w.) L l o y d var. *candida* differt absentia strati gelatinosi et sporis maioribus.

Hab.: Ad terram aridam solo calcareo.

Holotypus: Bohemia centralis: caput Praga XVI — Hlubočepy, loco „Děvín“ dicto, 300 m. s. m. d. 30. 9. 1952, leg. Z d. M o r a v e c (PRC).

Specimens examined: Bohemia centr.: in valle sti. Prokopii, Hádovín (l. K. Cejp) Motol, Kunratice, Kopeč, Sedlec, Nymburk (l. Moravec). — Bohemia sept.: České Středohoří (l. Šimr, Moravec). — Bohemia merid.: Blatná, Orlik (l. Moravec). — Moravia merid.: Znojmo, montes „Pálavské“ dictae (l. Komárek). — Slovacia merid. occ.: Ťahanovce pr. Košice (l. Kotlaba), Tarbucka pr. Kr. Chlumec (l. Holub), M. Trňa (l. Heřmanská). — Hungaria: Sükösd (l. Greinich). — Hollandia: Loosduinen, pr. Zuid-Holland (l. A. C. Perdeck). — All specimens are preserved in PRC.

***Disciseda singeri* Moravec sp. n.**

Fruitbody subglobose or depressed-globose, 20—28 mm in diam. The outer peridium is deciduous and forms at maturity on the lower part of the fruitbody a big disc, dirtied by adhering particules of soil. The inner peridium is firm, thick, avellaneous. The mouth is apical, fimbriate, round, 2—4 μ mm in diam. Spores globose, bright-olivaceous, slightly verrucose, the epispore is colourless, with the pedicels 2 μ long, 5.5—6.6—(7.6) μ , ($x \pm 3. s_x = 6,21 \pm 3.0,052 \mu$, $s_x = 0,50 \mu$). Capillitium threads yellowish-olive, tortuouses, smooth, usually 3 μ thick.

Fungus subglobosus vel depresso-globosus, 20 usque 28 mm in diam., peridio externo decidente, formante ad basim patellam robustam, peridio interno firmo, crasso, avellaneo (Sacc. no. 7), ore apicali rotundato, fimbriato, 2—4 mm in diam. Sporibus globosis, claro-olivaceis, tenuiter verrucosis, pedicellatis, magn. 6,2 μ in diam., capillitio flavo-olivaceo, undulato, 3 μ crasso, laeve.

Haec species differt a *Disciseda bovista* (Kl.) Henn. sporibus minoribus, minus verrucosis, a *Disciseda cervina* (Berk.) Holl. sensu Cunningham et Bottomley endoperidio crasso, firmo.

Hab.: Ad terram in pascuis.

Holotypus: America merid.: R. Argentina: prov. de Tucumán — Al Norte de Tafí del Valle cca. 2100—2200 m. s. m. d. 14. 12. 1949, leg. R. Singer (LIL no. T 841).

Speciem descriptam inventori, viri clarissimo R. Singeri, mycologo notatissimo dedico.

This species is quite good distinguished from *Disciseda bovista* by its spores, which are smaller and with colourless slender warts. I think it is very closely related to *Disciseda cervina* (Berk.) Holl. sensu Cunningham et Bottomley, but only the rich comparative material will us show the possible conspecificity.

Lycoperdon abscissum R. E. Fries (1909) in Ark. f. Bot. 8 (11): 8—11. Taf. 3, fig. 1—9.

Fruitbody, reaching up to 25 mm in height and 35 mm in diam., enlarges conically to the top, where is it sharply cut off, the upper

side is flat or finely convex. The outer peridium is formed by white spines, 5 or 6 of them are usually joined at the top together; at maturity they are isabel-coloured and only on the lower part of the fruitbody are left. The inner peridium is one-coloured, brown, thin, papyraceous, at the top with a round mouth, 6—7 mm in diam. The subgleba fills in nearly $\frac{4}{5}$ of the fruitbody, formed by large chambers, yellow-olivaceous or umber-brown coloured, by the diaphragma, usually concave, is it sharply distinguished from the gleba. The gleba is ashy-umber, pulverulent. The spores are globose, smooth, pallid or ochraceous yellowish, 3—4 μ in diam., usually with a short, colourless pedicels. The capillitium threads almost colourless or ochraceous coloured, smooth, often septate, varying in the thickness up to the diameter of the spores.

Hab.: solo arenoso.

Specimen examined: South America: R. Argentina: Espinillo, Formosa, d. 1. 11. 1950, leg. M. M. de Monros (BAB no. B-388 sub *Disciseda candida* (Schw.) Lloyd).

This fungus was described by R. E. Fries from South America, where it is said by the author to be rather frequent. Since then it has never been reported. Our specimens agree accurately with the original description and figuring.

Originally I took it to be the species *Calvatia depressa* (Bonorden) Moravec (= *Lycoperdon hiemale* Bull. ex Vitt), which it approaches very closely. Of course only a more thorough study of the variability will enable us to place this species more accurately.

Chlamydopus meyenianus (Klotzsch) Lloyd (1903) Myc. Notes no. 14: 134; Cunningham (1944) Gaster. Austr. p. 199; Bottomley (1948) in *Bothalia* 4: 625.

Syn.: *Tulostoma Meyenianum* Klotzsch (1843) Nova Acta Leop. 19: 243.

Hab.: solo arenoso.

Specimen examined: South America: R. Argentina: Rio Negro, m. 3. 1945, leg. L. A. Ibarro Grasso (BAB — sub *Disciseda* sp.).

This species is very badly preserved, there is only one peridium without stipe. But by the rusty ochraceous colour of the gleba, characteristic for the *Tulostomataceae*, and after the basal part of the peridium, where traces of the breaking off of the stipe are well visible, it could be determined with relative certainty as *Chlamydopus meyenianus*.

O některých druzích rodu *Disciseda* a jiných břichatek.

Autor ve svém článku nejprve popisuje dosti málo známý druh *Disciseda pila* R. E. Fries z Argentiny. Dále vyjasňuje synonymiku druhu *Disciseda bovista* (Kl.) Henn. a ukazuje, že ztěšování tohoto druhu s druhem *Disciseda cervina* (Berk.) Holl. je zcela neopodstatněné, neboť oba druhy mají rozdílnou velikost i skulpturu výtrusů.

Při srovnávání popisů v literatuře i herbářových položek druhu *Disciseda candida* se objevila nápadná nesourodost materiálu, který se rozpadl na skupinu evropskou a skupinu položek z Ameriky, Afriky a Austrálie. Prvá je charakterisována lysou vnitřní peridií a většími výtrusy, oproti druhé, která mezi vnitřní a vnější peridií má zvláštní houbovitou, gelatinosní vrstvu, za zralosti tvořící hrvitý okraj plodnice a výtrusy pouze necelé 4 μ veliké. Z těchto důvodů se autor rozhodl vytvořit pro evropskou skupinu novou varietu *Disciseda candida* (Schw.) Lloyd var. *calva* Moravec var. n. a. pro druhou skupinu, která souvisí s typem druhu, je správný název *Disciseda candida* (Schw.) Lloyd var. *candida*.

Tvoří též nový druh *Disciseda singeri* Moravec sp. n. nápadný plavě hnědou, tuhou endoperidií a jemně bradavčitými, průměrně 6–6,5 μ velkými výtrusy.

Na závěr článku připomíná ještě dvě houby z Argentiny. Je to *Lycoperdon abscissum* R. E. Fries, který je velmi příbuzný *Calvatia depressa* (Bon.) Morav. a *Chlamydopus meyenianus* (Kl.) Lloyd, dosti běžný druh v jižní Americe.

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