MEDDELELSER OM GRØNLAND
UDGIVNE AF
KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND
Bd. 147 · Nr. 4.

THE BOTANICAL EXPEDITION TO WEST GREENLAND 1946

MACROMYCETES

PART I

THE GASTEROMYCETES OF GREENLAND

BY

MORTEN LANGE

WITH 6 FIGURES IN THE TEXT
AND 4 PLATES

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI
1948

INTRODUCTION

While our knowledge of the *Micromycetes* of Greenland is rather good, thanks mainly to the various papers by ROSTRUP and LIND, very little is known about the fleshy fungi. No fungiologist ever before paid a visit to Greenland, and the *Macromycetes* brought home by various collectors in most cases have been badly preserved and hardly determinable.

The *Gasteromycetes* might be expected to form an exception, and this is so far the case, as rather large collections from Greenland, mostly of dried and fairly well preserved specimens, are to be found in the Arctic Herbarium of the Botanical Museum, University of Copenhagen.

The major part of the specimens were collected by N. HARTZ and C. KRUUSE from 1888—1905 and were published by ROSTRUP (1888, 1891, 1894, 1904), some few by FERDINANDSEN (1910).

As the conception of the different species in this group of fungi was rather vague before the important work of HOLLÓS (1904), it was to be expected, that many of the determinations made by ROSTRUP would prove to be erroneous. I therefore went through the material in the herbarium mentioned, and the present paper is intended to give a revised enumeration of the species there preserved as a supplement to the description of the rather large collection of *Gasteromycetes* gathered by me on the 1946 expedition. Also included are some specimens collected in West Greenland in the summer 1947 by C. A. JØRGENSEN, who kindly placed them at my disposal.

I hope in this way to give a fairly complete conspectus of our present knowledge of this group of fungi in Greenland. Some more information on the *Gasteromycetes* will appear in a later paper, dealing in general with the distribution and ecology of the *Macromycetes* of Greenland.

Material and Technique.

All descriptions of *Gasteromycetes* dealt with in this paper were drawn up from dried material, though occasionally supported by field notes and observations. The microscopical details were studied by means of

a REICHERT microscope with a 10 × HUYGENS eyepice and a 100 ×, 1.25 oil immersion lens. For drawing and measuring the spores and capillitium were mounted directly in water, if not otherwise stated, but mounts in 5 % KOH and in iodine (MELZER's reagent) were made from nearly all specimens, and many details have been brought out by staining with methylene blue (saturated or somewhat weaker solution in water). Alcohol in many cases proved useful as wetting agent.

The measures given for the spores always include the spines, but not the hyalin envelope if present. The colour of spores and capillitium as seen under microscope is rather difficult to characterize in a precise manner. The values given refer to diffuse daylight, strong magnification, the diaphragm rather much open.

The drawings fig. 2, 3 and 6 have been executed by Miss INGEBORG FREDERIKSEN. Lektor CALVERT has gone through my English manuscript.

Localities visited on the present expedition, mentioned in this paper:

Ivigtut, 61° 15' N.
Godthaab, 64° N.
The Søndre Strømfjord area:
Itivdlińguaq, 66° 30' N., in the middle of the fjord.
All other localities are near the very head of the fjord, about 67° N., mostly in area 3 on the map, fig. 1.
For further information about the expedition see BÖCHER (1948).

Special abbreviations:

Arct. herb.: The Arctic Herbarium, Botanical Museum, University of Copenhagen. Fungi.
Sdr. Strfj.: Søndre Strømfjord.

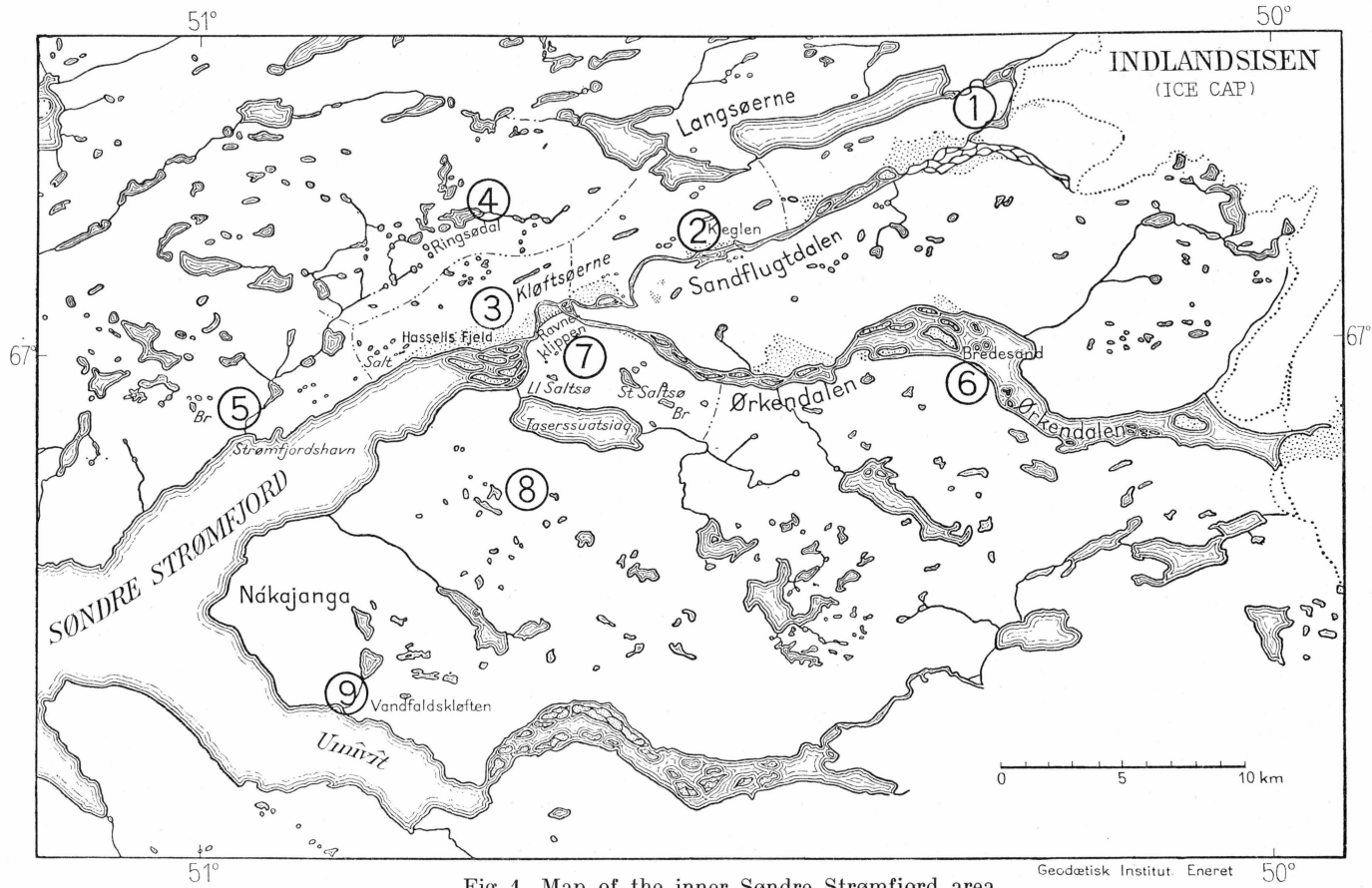

Fig. 1. Map of the inner Søndre Strømfjord area.

GEASTER Mich.

1. GEASTER MINIMUS Schwein.

Fig. 1, pl. 1; fig. 4a, p. 19.

Rather small to small, mostly about 2 cm broad and high. Exoperidium revolute, cut approximately half way in into 7—10 rays; mycelial layer adnate, somewhat shaggy, with leaves and sand adhering; fleshy layer rimose, cracked, peeling off on old specimens, forming a low collar around the pedicel; Vinaceous-Buff (R)[1]) to Tilleul Buff (R); the rather thin fibrous layer darker, Russet (R) when old. Endoperidium subglobose or slightly acuminate, about 1 cm broad; in specimens not too old and outwashed covered with minute, glistening granules; Drab Gray—Light Drab (R), Fuscous (R) when older. Peristome low or rather low, conical, somewhat fimbriate when old, outline distinctly circumscribed; apophysis generally well developed; pedicel short (2 mm) and rather stout.

Gleba blackish brown (dark Bone Brown (R)), with remnants of a slender columella.

Spores globose or slightly irregular, with rather low and somewhat irregular warts and ridges; often shortly mucronate; Isabella Color to Dresden Brown (R), (4) 4.5—5 μ broad. Capillitium paler than the spores, Honey Yellow — Chamois (R) to nearly colourless, solid, unbranched, up to 4.5 μ broad; in some mounts mixed with a few threads of darker brown colour, 10—18 μ broad, thickwalled, sparingly septate and very sparingly branched.

Coker and Couch (1928 p. 129) identifies this species with *G. coronatus* (Schaeff.) with which it has nothing to do. *G. coronatus* differs not only in being fornicate, but also in very rarely having more than 4—5 rays. I have studied rich American material of both species (in the Herbarium of the University of Michigan) and find them quite distinct.

The plant is common in all parts of U. S. A. (Lloyd 1902 p. 27), but seems to be rare in Europe, though on record from different parts, the northernmost record being Torne Lappmark in Sweden (S. Hertz 1947).

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[1]) The colours marked (R) given after Ridgway: Color Standards and Color Nomenclature. Washington 1912.

According to HOLLÓS (1904 p. 77) also known in Australia, South Africa and Asia (Tiflis). In Greenland only found once, the record given below being the only find of a species of *Geaster* in Greenland.

Greenland material studied:

319. Sdr. Strfj. South slope of Hassells Fjeld; alt. 150 m, Aug. 20. On south slope (20° S.) on very dry loess, under isolated *Salix glauca* in sparse ground vegetation (*Calamagrostis purpurascens*, *Carex supina*), leaf layer poorly developed. A flock of 26 mature, mostly rather old specimens.

CALVATIA Fries emend. Morgan.

Species of the genus *Calvatia* are very common in Greenland. ROSTRUP did not separate the genus from *Lycoperdon*, and his conception of the species in this group was altogether very vague. FERDINANDSEN (1910) mentions two species of *Calvatia* from the material he studied in the arct. herb., one of which, *C. arctica*, he described as new. The material from this expedition contains two species and a distinct variety (here described as var. nov.); several collections of them all were already preserved in the arct. herb. No new material of *C. arctica* was brought home.

1. CALVATIA CRETACEA (Berk.) Lloyd.

Syn: *Lycoperdon cretaceum* Berkeley 1878
Calvatia borealis Th. C. E. Fries 1914.

Fig. 2, pl. 1; fig. 4 b, p. 19.

Large or rather large, up to 10—12 cm broad and high, subglobose, depressed, or more oval, pearshaped. Exoperidium white at first, at maturity brownish grey, some of the spines remaining white; very variable, but in most cases very thick; breaking up, especially near the apex, into more or less prominent polygones or warts, with clusters of spines of variable size and shape; towards the base remaining nearly smooth with inconspicuous spines; peeling off in rather large flakes together with the upper part of the endoperidium, and leaving the lower part of this glabrous, polished, horn grey. Gleba dark or rather dark brown when fully ripe (Prouts Brown (R)). Subgleba rudimentary to rather prominently developed (in more highstemmed specimens), chambered, dark olive brownish, often with a lilaceous tint.

Spores dark yellowish brown (pale Buckthorn Brown — Dresden Brown (R)), echinate, with a smaller or larger central gutta and generally a short, hyaline mucro; (4.5) 5.5—6.2 (7) μ broad, warts about 0.8 μ high, generally somewhat embedded in mucilage; in most mounts mixed with fallen pedicels, up to about 15 μ long. Capillitium concolorous or slightly darker, much paler towards the attenuated ends; sparingly branched, rather much septate, generally fragmented at the septa;

walls rather thin, pitted, often somewhat incrusted; mostly 3—5 μ broad, rarely up to 7 μ, outer ends about 2.5 μ, walls up to 0.8 μ thick, rarely more.

Very variable in most macroscopical characters, but the exoperidium seems constantly to peel off in the peculiar way described. The microscopical characters seem to be very constant and characterize the species well.

LLOYD (1917 p. 650) brought to light the original description of *Lycoperdon cretaceum* (BERKELEY 1878 p. 15) together with new studies of the type material, and could demonstrate, that the species was identical with *C. borealis* Th. Fries. Furthermore, he thought *C. arctica* F. & W. to be identical, but described from unripe material (see below, p. 11). The specimen referred by FERDINANDSEN and HOLLÓS (FERDINANDSEN 1910 p. 142) to *C. cyathiformis* must be identical with *C. cretacea*, not differing materially in any detail. On the label of arct. herb. 7. (see below) HOLLÓS correctly states spores 5—6 μ, capillitium 4—6 μ "flavo-brunneis umbra"; but this disagrees with his own description of *C. cyathiformis* (HOLLÓS 1904 p. 84), where he gives the spores and capillitium as pale lilac. Also the collection arct. herb. 1., by FERDINANDSEN referred to *C. arctica*, probably belongs here, the identification being somewhat difficult on material preserved in alcohol.

Widely distributed, but exclusively to be met in far northern stationes. Known in several places in arctic North America (Bellot Island, type locality, BERKELEY l. c.; Mackenzie River Delta etc., DEARNESS 1923 p. 17 c.; Baffin Island, ZELLER 1947 p. 297), in Svalbard and Lappland[1]) (FRIES 1914 p. 239; LANGE 1947 p. 164), in the Swedish mountains as far south as Härjedalen (FRIES 1922 p. 23). I have found no specimen from Iceland in the arct. herb. A very frequent species in the inner Sdr. Strømfjord area, mostly inhabiting fairly dry heaths, where often large numbers of specimens are found. Outside the fjord I made only a somewhat dubious find (coll. 598. Ivigtut). Most of the earlier records are from East Greenland.

Greenland material studied:

Arct. herb. 1. Skarvefjæld, Godhavn, Disko (W. Greenland, 69° N.), July 27, 1886; leg. TH. HOLM; ROSTRUP (1888) as *Scleroderma vulgare* Fr.; by FERDINANDSEN labelled *C. arctica*, citing *C. borealis* as synonym. (Unripe specimens in alcohol).

Arct. herb. 6. Hvalrosodden (E. Greenland, 77° N.), June 13. and 16.; leg. LUNDAGER; FERDINANDSEN (1910) as *L. cyathiforme* Bosc.

[1]) There is a very fine specimen in the herbarium in Copenhagen, from Lappland, collected by TH. FRIES and referred by him to *C. borealis*, while FERDINANDSEN on the label gives *C. arctica*, citing *C. borealis* as a synonym.

Arct. herb. 7. Ibid., Aug. 1906; leg. LUNDAGER, det. FERDINANDSEN and HOLLÓS (FERDINANDSEN l. c.).
Arct. herb. 8. Kap Dalton (E. Greenland, 69° N.), 1900, leg. C. KRUUSE; ROSTRUP (1904) as *Lycoperdon favosum* Bon., FERDINANDSEN (l. c.) as *L. cyathiforme*.
Arct. herb. 9. Island in the Sydostbugten (W. Greenland, 69° N.), 1890; leg. HARTZ; ROSTRUP (1891) as *Lycoperdon Bovista* L.
Arct. herb. 11. S. Kangerdluarssuk (W. Greenland, 61° N.), Aug. 5. 1884; leg. TH. HOLM; ROSTRUP (1888) as *L. Bovista* (in alcohol).
Arct. herb. 12. Renodden (E. Greenland, 70° N.), May 13. 1892; between flat stones in an old house wall; leg. HARTZ; ROSTRUP (1894) as *Lycoperdon excipuliforme*. (See also HARTZ 1894 p. 234).
Arct. herb. 13. Gaasefjord. (E. Greenland, 70° N.), June 2. 1892; leg. HARTZ; ROSTRUP (1894) as *L. excipuliforme*.
110 b. Sdr. Strfj. Itivdlińguaq, alt. 150 m, July 24. On a dry heath.
221. Ibid. South slope of Hassells Fjeld, alt. 300 m, Aug. 4. On a rather dry *Vaccinium microphyllum* heath with *Betula nana*, *Salix glauca* and *Calamagrostis purpurascens*. A large flock, forming part of a fairy ring.
284. Ibid.
332 a. Ibid., alt. 450 m.
361. Ibid., alt. 400 m, Aug. 22. In rather moist *Kobresia myosuroides* sociation with scattered *Salix glauca*.
598. Ivigtut. Grønnedal, alt. 25 m, Sept. 18. In *Alnus* copse on nearly naked ground among grass and weeds.

Two collections, 332f. and 332h., both from Sdr. Strfj. are supposed to belong here, but the determination is uncertain, the specimens being unripe.

(BÖCHER (1933) brings a photo (pl. 2. fig. 2) evidently representing this species, found north of Kap Ravn (E. Greenland, 68° N.); it was referred by AA. LUND to *Lycoperdon* (*Calvatia*) *maximum*, but material is no longer conserved.).

2. CALVATIA ARCTICA Ferdinandsen et Winge.

Fig. 4 c, p. 19.

Emended description: Subreniform or depressed globose, about 6 cm broad and 3 cm high; base plicate, protracted, acuminate, rooting with a mycelial cord. Exoperidium white at first, Cinnamon (R) when ripe, the upper part remaining much paler, with very conspicuous, pyramidal warts, which are up to 0.7 cm broad and 0.25 cm high, ornated by lines parallel with the base, and by another set of lines converging at the pointed apex; points only rarely connivent, slightly darker than the rest of the wart. In the lower part of fruiting body, the exoperidium forms a rather thick crust, only slightly sculptured with inconspicuous, small granules. Upper part falling off at maturity, often in single warts, together with endoperidium, lower part peeling off later, in single warts and in more irregular patches below, leaving the rather thick endoperidium smooth, polished or slightly floccose, Pale Olive-Buff (R). Gleba rather pulverulent, white at first, then Snuff Brown (R). Sterile base very inconspicuous, occupying only the protracted part of the base, of minute chambers, whitish pale.

Spores (4.7) 5.2—6.0 (6.3) μ, pale Honey Yellow (R), with blunt, low, hyaline warts about 0,4 μ high, often with a hyaline envelope and a rather short, hyaline pedicel. Capillitium concolorous, fragmented, branched, thinwalled, with some round pits; 3—8 μ broad, outer ends 3—4 μ, walls rarely more than 0.7 μ.

C. subcretacea Zeller (1947 p. 298) from western U. S. A., is very close, possibly only a form of this species, differing in darker spores and a somewhat furfuraceous endoperidium. From *C. cretacea* it is clearly separated by the characters of the exoperidium, the paler gleba, the small-chambered subgleba, and by the microscopical characters, the spores being less warty and paler, the capillitium being paler, the outer branches somewhat thicker. First described by FERDINANDSEN and WINGE (FERDINANDSEN 1910 p. 144). The above description is drawn from the original material, arct. herb. 2. and arct. herb. 3.; the same two specimens which are depicted by FERDINANDSEN (l. c. pl. IX). The unripe specimen is from arct. herb. 3., which collection also contains a somewhat larger, unripe specimen, in all respects appearing like a typical *C. cretacea*. The basidia described by FERDINANDSEN (l. c.) are picked from this specimen. I am inclined to regard arct. herb. 3. as a mixed collection, and have not included the description of the basidia in my description, as basidia in the small specimen are without sterigmata. The collection is by FERDINANDSEN labelled "specimen minimum typis", so the above mentioned disposition will not alter the legal status of the species.

The Copenhagen Herbarium contains three more collections labelled *C. arctica* by FERDINANDSEN. For two of them (vide p. 9) he has accepted *C. borealis* Th. Fries as synonym, and I think both of them belong in *C. cretacea*. The third specimen, arct. herb. 5., Thule (W. Greenland, 79° N.) 1919; leg. NYGAARD, seems distinct from both these species; the gleba, though fully ripe, is vivid Orange Citrine (R), the subgleba of large chambers, the capillitium with more tapering ends than in *C. arctica*, but much paler than in *C. cretacea*. This material is very poor, without remnants of the exoperidium, but probably an undescribed *Calvatia*. No other collections of *C. arctica* are known to me. It is recorded from Iceland by CHRISTIANSEN (1941 p. 223) but his description runs somewhat different. His material is not in the arct. herb., nor is any other specimen of *C. arctica* from Iceland.

Although FERDINANDSEN's own conception of the species evidently was somewhat vague, I find it well established on the material cited, and it is not possible to include it in *C. cretacea* as suggested by LLOYD (1917 p. 650).

Greenland material studied:

Arct. herb. 2. Hurry Fjord, Liverpool Land (E. Greenland, 70° N.); leg. C. KRUUSE; ROSTRUP (1904) as *Lycoperdon favosum;* FERDINANDSEN and WINGE (coop. HOLLÓS) as *C. arctica* (FERDINANDSEN 1910).

Arct. herb. 3. Lille Snenæs (E. Greenland, 77° N.) July 19, 1907; leg. LUNDAGER; FERDINANDSEN and WINGE (FERDINANDSEN l. c.). Unripe specimen in alcohol labelled "specimen minimum typis". Also containing a specimen of *C. cretacea* (arct. herb. 4.).

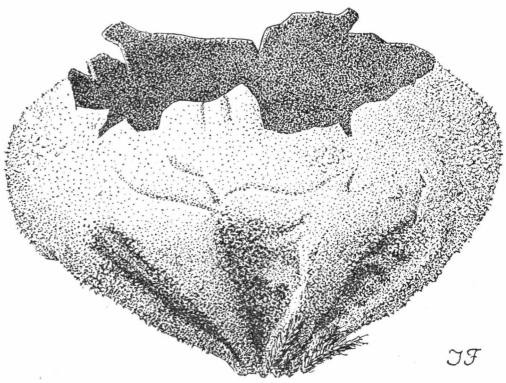

Fig. 2. *Calvatia tatrensis* Hollós. Coll. 567. Mature specimen. Ingeborg Frederiksen del.

3. CALVATIA TATRENSIS Hollós.

Fig. 1, pl. 2; fig. 2, p. 12; fig. 4 f, p. 19.

Of medium size; nearly globose with a pointed base, which is strongly grooved. Exoperidium of fine spines with tips connivent, pale brownish, rather persistent, falling off in some places. Endoperidium thin, pale Cinnamon-Buff (R), somewhat polished, brittle, the upper (nearly half) part breaking up in flakes at maturity and falling off together with the exoperidium. Gleba of a rather vivid colour, Light Brownish Olive — Buffy Citrine — Isabella Color (R), Subgleba not prominent, chambered, most often with a purplish violaceous tint.

Spores rather finely echinulate, embedded in a clear envelope, pale Honey Yellow (R), with a prominent central gutta and most often a short mucro; 5.5—6.5 μ broad. Capillitium almost concolorous, somewhat more yellowish (Chamois (R)); freely branched, branches abruptly acuminate, often with peculiar protracted ends; fragmented; walls thin, mostly without pits; 3—5 μ broad, outer ends 3—4 μ, walls 0.5 μ.

In good accordance with the description in HOLLÓS (1904 p. 90); his figures (pl. XIV fig. 6—10) illustrate my specimens excellently. I have not noticed in any specimen the peculiar pedicels HOLLÓS describes from unripe specimens. As far as I have been able to find, the species is

recorded only two or three times in Hohe Tatra (up to an altitude of more than 2200 m, HOLLÓS l. c.), and very recently from western U. S. A. in the mountains of Oregon in similar hights as given by HOLLÓS (ZELLER 1941 p. 213, 1947 fig. 9). Most likely not very common in Greenland.

Greenland material studied:

Arct. herb. 16. Ikerasaussaq (E. Greenland, 66° N.), June 30. 1902; leg. C. KRUUSE; ROSTRUP (1904) as *Globaria furfuracea* (Schaeff.) Schroet.

Arct. herb. 21. Íkáteq (E. Greenland, 66° N.); leg. C. KRUUSE; ROSTRUP (1904) as *Lycoperdon gemmatum* var. *minuta*.

562. Ivigtut. South of the town, alt. 30 m, Sept. 14. In rather dry moss (*Dicranum* etc.) under low *Betula verrucosa*.

567. Ibid. Near the top of Guldfjeld, alt. 400 m, Sept. 15. In *Salix herbacea* with high grass and weeds.

(Two unripe specimens from Sdr. Strfj. (coll. 332 g. and 394.) and an unripe specimen from Ivigtut (coll. 40.) should probably be referred to this species; the unripe specimen (arct. herb. 24.) from Tungnudliarfik, July 20. 1888; leg. ROSENVINGE, det. ROSTRUP as *Lycoperdon gemmatum*, is also supposed to belong here).

4. CALVATIA TATRENSIS Hollós var. GROENLANDICA var. nov.

Fig. 2, pl. 2; fig. 3, p. 14; fig. 4 g, p. 19.

Medium or rather small, mostly 3—5 cm high, pearshaped or oval, stem but little pronounced; base rounded, somewhat grooved. Exoperidium a thin coat of minute spines, tips somewhat connivent, long persistent (fine white "crystals" are often seen between), pale brownish. Endoperidium rather thick and stiff, somewhat shining, pale Cinnamon-Buff (R); cracking away in the top at maturity. Gleba Snuff Brown — Saccardos Umber (R). Subgleba rather prominent, about one third of the peridium, of fair sized chambers; with a more or less pronounced purplish sheen (Light Brownish-Drab — Dark Vinaceous-Drab (R)).

Spores echinulate, embedded in a clear envelope, Honey Yellow (R); with an often rather small, central gutta; shortly mucronate, (4.5) 5—5.8 (6) μ broad, warts 0,5 μ high. Capillitium slightly darker, pale Buckthorn Brown (R), or concolorous, shortly attenuated, fragmented at most septa in rather short segments, branched; walls rather thin, pitted with rather conspicuous, roundish or oblong pits; 3—5 μ, rarely up to 8 μ broad, outer ends 2—3 μ, walls rarely more than 0.6 μ.

Differing from the type by thicker and less brittle endoperidium, darker gleba, larger subgleba; microscopically by slightly darker and smaller spores, and darker, nearly always pitted capillitium. It is evident that the two plants are very closely related, the exoperidium being of the same type and the microscopical data very similar. Recalls in several

ways *Calvatia saccata* var. *brevipes* Hollós (var. *arctica* C. Th. Fries jun.), which is known to be frequent in alpine zones in Lappland (FRIES 1914 p. 237). HOLLÓS (1904 p. 89) describes this species as a much darker one, and at any rate the microscopical data will not permit the inclusion of the species here described in *C. saccata.* (Furthermore the spines are uniform, not mixed with larger ones in rows as given by FRIES (l. c.)).

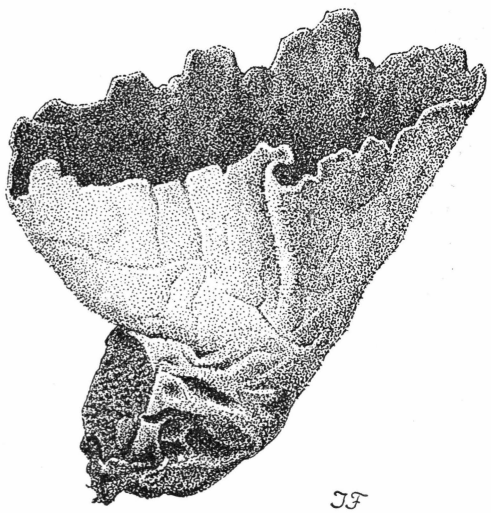

Fig. 3. *Calvatia tatrensis* var. *groenlandica* var. nov. Coll. 419. (type), old specimen, base cut open. Ingeborg Frederiksen del.

I have found only one specimen from other countries in the Copenhagen Herbarium which might represent this variety; from Hof in Iceland, July 14. 1899; leg. Ó. DAVIÐSSON; det. E. ROSTRUP as *L. gemmatum.* In Greenland apparently a common plant, with a wide distribution; mostly found in rather humid and mossy places on the heaths.

Diagn: *A typo differt endoperidio crassiore, minus fragili, gleba obscuriore, subgleba validiore, colore sporarum paulo obscuriore et latitudine earum minore, capillitio obscuriore, semper fere poris ornato.*

Søndre Strømfjord, Groenlandia occidentalis, 67° N. 28. Aug. 1946. M. Lange n. 419.

Greenland material studied:

Arct. herb. 10. Tasiussaq (E. Greenland, 66° N.), Nov. 1901; leg. C. KRUUSE; ROSTRUP (1904) as *Globaria Bovista* (L.).

Arct. herb. 18. Danmarks Ø (E. Greenland, 70° N.), June 1892; leg. HARTZ; ROSTRUP (1894) as *Lycoperdon gemmatum* Batsch.

Arct. herb. 19. Lilleø (E. Greenland, 66° N.), July 7. 1899; leg. C. KRUUSE; ROSTRUP (1904) as *L. gemmatum.*

Arct. herb. 20. (Camp no. 7) (E. Greenland), 1898; leg. C. KRUUSE; det. ROSTRUP as *L. gemmatum.*

Arct. herb. 26. Upernavik (W. Greenland, 72° N.), July 18. 1886; leg. ROSENVINGE; ROSTRUP (1888) as *L. gemmatum.*

Arct. herb. 28. (Iko---ut Ø), Aug. 31. 18(9)7; det. ROSTRUP (label impossible to decipher).

Arct. herb. 30. N. Bræfjord (E. Greenland, 66° N.), 1902(?); leg. C. KRUUSE.

419. Sdr. Stfj. South slope of Hassells Fjeld, alt. 300 m, Aug. 28. On a terrace, with *Betula nana*, *Ledum* and *Aulacomnium turgidum.* (Type).

420. Ibid., alt. 200 m, Aug. 28. In rather humid *Kobresia* soc. Dwarfish specimen.

421. Ibid. N. slope of Hassells Fjeld, alt. 480 m, Aug. 28. On a terrace with *Betula nana* and *Salix glauca.*

563. Ivigtut. South of the town, in wet moss on a heath with low *Salix glauca* and *Betula verrucosa.*

Coll. 347. from Sdr. Strfj. Very humid locality, alt. 500 m; a dwarfish specimen, probably belongs here.

(ROSTRUP (1888) mentions *Lycoperdon saccatum* from Upernavik (RYDERS Expedition); the material is no longer preserved, and until confirmed by new finds I deem it better to exclude *C. saccata* from the list of Greenland species).

LYCOPERDON Tournef. (p. p.) emend. Morg.

(Taxonomy: — The subdivision of this genus, proposed by HOLLÓS (vide HOLLÓS 1904 p. 93), seems neither natural nor good. The group *Asterosporae*, comprising not much more than *L. echinatum* and *L. umbrinum* et var. is very likely a rather natural one. This is certainly not the case with the other two groups — *Subleiosporae* and *Leiosporae*. A high power lens will show nearly all fully ripe spores finely echinulate or sculptured in some way, and furthermore, the roughness is subject to variation within the same species. When HOLLÓS, adhering to his system, widely separates closely allied species as *L. furfuraceum* and *L. spadiceum*, he is clearly wrong.

More sense will be found in the system roughly outlined by LLOYD (1905 p. 207). The distinction between the *polymorphum* section and the neighbouring *spadiceum* section I think is purely artificial, and LLOYD himself states, that transitions are said to exist, connecting *L. polymorphum* and *L. spadiceum*.).

While the material brought home from this expedition is comparatively large, only little is to be found in the arct. herb. The major part of the species which ROSTRUP included in *Lycoperdon* belongs in *Calvatia;* not only the species generally referred to this genus, but also most of the specimens published as *L. gemmatum* and *L. excipuliforme*, as will be seen from the list p. 29.

1. LYCOPERDON UMBRINUM Pers. sensu Hollós.

Fig. 1—2, pl. 3; fig. 4 e & h, p. 19.

As understood by HOLLÓS (1904 p. 96 seqq.) this plant is very variable and split up into a number of varieties, which most authors regard as distinct species, several of which are represented in this material. I consider it unwise to try to give descriptions of the different varieties or to keep them apart at all in a material like the present — most of them only represented by a single collection — and a general description is of no value.

Especially the macroscopical characters are very variable, but microscopically only slight differences in size and colour of the spores are

noticed, (5—6.5 μ and rather dark spores or 4.5—5.5 μ and somewhat paler spores respectively, always with prominent or rather prominent, blunt warts or spines, and mixed with fallen pedicels).

The capillitium is extremely uniform, concolorous or slightly darker brown, sparingly branched, nearly without septa and pits, generally not exceeding 4 μ in diam.

For pictures and drawings the following specimens were examined: Coll. 422, fig. 1, pl. 3; fig. 4 h, p. 19, the largest and darkest form, rather close to *L. atropurpureum* as conceived by LLOYD (1905 p. 208) and COKER and COUCH (1928, p. 71, pl. 4); coll. 362, fig. 4 e, p. 19, a smaller and paler form with small spores and more flaccid peridium and with a gleba without purplish sheen, very likely approching *L. umbrinum* sensu COKER and COUCH (l. c. p. 76, pl. 48) and also identical with the form from Lappland mentioned below; coll. 332 d., fig. 2, pl. 3, is a peculiar form from *Dicarnum* tufts, of a rather light, brownish cast, but probably not fully ripe.

Widely distributed and common in several varities both in Europe and America. On record from the far north-west of Canada (Mackenzie River Delta, DEARNESS 1923 p. 18c.) and from Lappland, (up to 1400 m above sea level, in a form which never acquires a purplish gleba, FRIES 1914 p. 29). Also represented in the arct. herb. from Iceland (Möðruvellir 1892, leg. STEFÁNSSON, ROSTRUP (1903) as *L. echinatum*). Seems to be rather rare in most places in Greenland. On this expedition met with only in the inner part of Sdr. Strømfjord, but here found to be very abundant, being the most common species of the family, especially in the dwarf shrub communities in the valleys. Rarely encountered in very dry localities.

Greenland material studied:

Arct. herb. 27. Kap Seaforth (E. Greenland, 72° N.); leg. C. KRUUSE, (no date); ROSTRUP (1904) as *L. gemmatum*. (Dubious determ., *Calvatia* sp.?).

Arct. herb. 32. Julianehaab (W. Greenland, 60° N.) 1880; leg. cand. PETERSEN; ROSTRUP 1888 (?) as *L. gemmatum* (in alcohol).

Arct. herb. 34. Ingigssuaq, Disko (W. Greenland, 69° N.), Aug. 28. 1890; leg. HARTZ; ROSTRUP (1891) as *L. gemmatum*.

See also arct. herb. 15, sub *L. pusillum*.

110 c. Sdr. Strfj. Itivdlińguaq, alt. 250 m, July 24. On dry heath.

280. Ibid. North slope of Nákajanga, alt. 350 m, Aug. 10. In rather dry tufts of *Aulacomnium turgidum* on terrace.

332 b. Ibid. South slope of Hassells Fjeld, alt. 75 m, Aug. In *Salix* copse on dry soil among rocks.

332 d. Ibid. Near Airport, alt. 60 m, Aug. 2. On rather dry heath with scattered *Salix* and *Betula*, in dry tufts of *Dicranum*.

332 e. Ibid., alt. 50 m, July 28. On rather moist *Rhododendron* heath.

332 i. Ibid., alt. 60 m. On rather dry heath with scattered *Salix* and *Betula nana*. (Unripe, determ. uncertain).

332 l. Ibid. (No altitude or date; unripe, uncertain determ.).
362. Ibid. Slope of Hassells Fjeld, alt. 375 m, Aug. 22. On *Vaccinium microphyllum* heath sloping 45° E.
422. Ibid. Large radiostation, alt. 80 m, Aug. 28. On dry sand in open vegetation of grass etc. (*Calamagrostis purpurascens*, *Carex supina*).
– – – Kûtsiaq, Nûgssuaq (W. Greenland, 71° N.), August 1947; leg. C. A. JØRGENSEN.
– – – Godhavn (W. Greenland, 69° N.), Sept. 19. 1947; leg. C. A. JØRGENSEN.

(A find from Upernavik (W. Greenland) referred by BERKELEY (1878 p. 16) to *L. atropurpureum* Vitt. belongs without doubt to *L. umbrinum* as here conceived, as also a plant from Sabine Island (E. Greenland, 75° N.), referred by BONORDEN (187– p. 88) to *L. fuscum*).

2. LYCOPERDON NIGRESCENS Pers.

Fig. 4 d, p. 19.

Broadly pearshaped, about 2,5 cm high and broad, with a short, thick, somewhat attenuated, rather distinct stem. Exoperidium on upper part of fruitbody made up of long, dark brown (Bistre (R)) spines, connivent in 3's or 4's and mixed with some smaller ones; towards the base the spines gradually become smaller. In parts of the peridium, especially near the apex, the spines have fallen off and have left the endoperidium naked, pale brownish (Light Buff — Cinnamon Buff (R)), distinctly reticulate. Gleba olive brownish (Isabella Color (R)); subgleba not very prominent, distinctly chambered, rather pale.

Spores Honey Yellow (R), faintly echinulate, with a small mucro; central gutta small to rather large; (3.8) 4.3—4.7 (5.0) μ diam. Capillitium slightly darker and brighter coloured, acuminate, sparingly branched, breaking into rather short segments at the septa, quite densely pitted with large pits; main branch mostly 3—4 μ, rarely up to 8 μ, pointed ends about 1.5 μ, walls up to 1 μ broad.

The material, which is well preserved, is made up of two specimens attached to each other, growing on a *Sphagnum* plant. The specimens not opened, but almost ripe. Macroscopically the specimens somewhat recall *L. echinatum*, especially as depicted by COKER and COUCH (1928 pl. 45), but the microscopical characters clearly refer to *L. nigrescens*.

FRIES (1914 p. 240) mentions this plant from regio subalpina in Lappland. I have seen no material from Iceland, but the description of *L. ehinulatum* B. et Br. as given by CHRISTIANSEN (1941) might as well cover this species. Not recorded from Hungary by HOLLÓS, but according to LLOYD (1905b p. 229) widely distributed in Europe. LLOYD finds *L. nigrescens* to be extremely rare in America. However it is highly doubtful whether *L. Peckii* Morg., of which I have studied good American material in the Herbarium of the University of Michigan, is distinct from this species. From Greenland only a single find is on record.

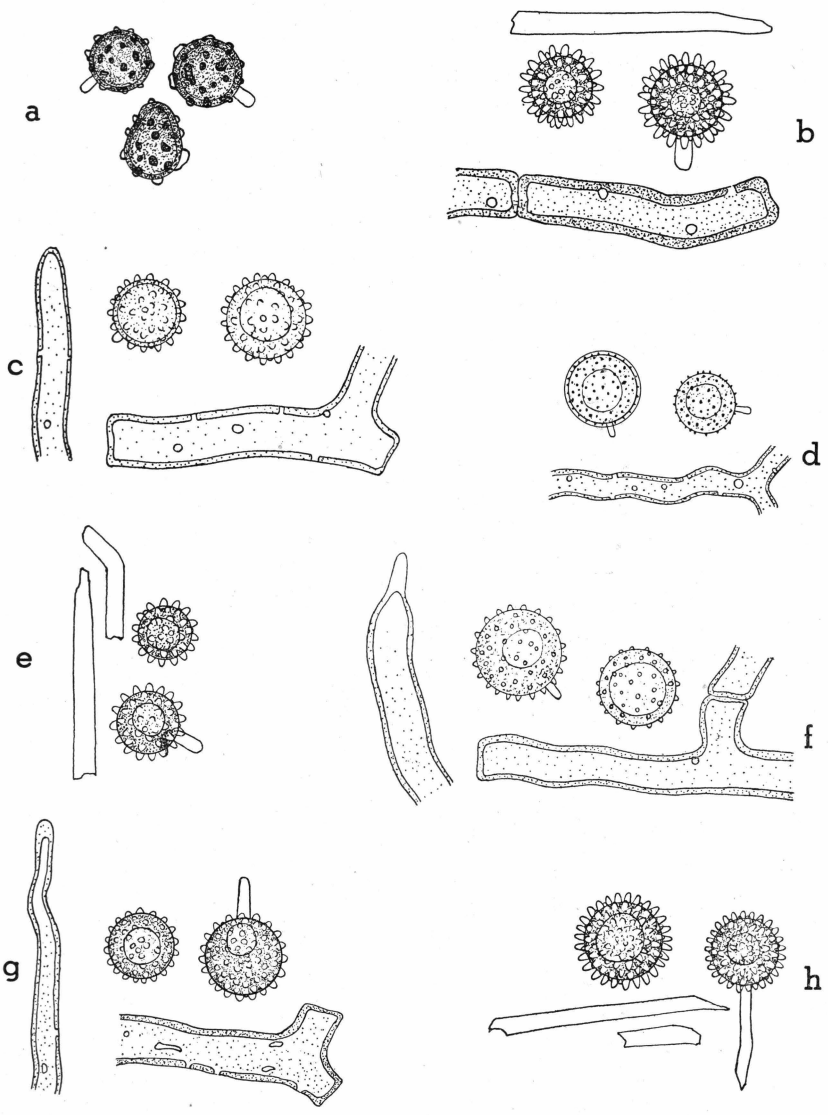

Fig. 4. a: *Geaster minimus;* spores (coll. 319). b: *Calvatia cretacea;* spores, pedicel and capillitium (coll. 361). c: *C. arctica;* spores and capillitium (arct. herb. 2). d: *Lycoperdon nigrescens;* spores (stained with methylene blue) and capillitium (arct. herb. 23). e: *L. umbrinum;* spores and pedicels (coll. 362). f: *Calvatia tatrensis;* spores and capillitium (coll. 567). g: *C. tatrensis* var. *groenlandica;* spores and capillitium (coll. 419, type). h: *Lycoperdon umbrinum;* spores and pedicels (coll. 422). Spores and pedicels × 2000, capillitium × 1000.

Greenland material studied:

Arct. herb. 23. Tasiussaq (E. Greenland, 66° N.); leg. C. KRUUSE (no date); ROSTRUP (1904) as *L. gemmatum.*

3. LYCOPERDON SPADICEUM Pers.

Fig. 5 e, p. 23.

Small, 1—1.5 cm broad, pearshaped, oval or somewhat depressed, base more or less tapering with coarse mycelial cords. Exoperidium on ripe specimens at the apex with small and low warts of a pale dirt-brown colour, towards the base with fine, furfuraceous scales. Endoperidium flaccid, thin, greyish brown, darker brown towards the base, opening in a small, indefinite, apical hole. Gleba Isabella Color (R) to Dresden Brown (R); Subgleba rather small, convex, distinctly chambered, of a darker brown colour.

Spores Honey Yellow (R), nearly smooth, with a hyaline envelope; under immersion or enclosed in air very inconspicuous low warts are observed; central gutta rather small; most often with a short mucro; (3) 3.5—4.5 (5) μ diam. Capillitium concolorous or slightly darker than the spores, acuminate, sparingly branched, somewhat sinuate, rather thin-walled with numerous and conspicuous, round pits; only few septa noticed; main branch mostly 3—4 μ, rarely up to 7 μ, outer ends of branches about 1 μ, walls up to 0.5 μ broad.

None of the few specimens in the collections are quite in accordance with current descriptions. The warts of the exoperidium are somewhat more conspicuous, but in all specimens attacked by some fungus parasite. CUNNINGHAM (1926 p. 635) found no pits in the capillitium wall; I find rather perfect microscopical likeness, also regarding the pits, with material in the Herbarium of the Botanical Museum in Copenhagen identified by LLOYD (leg. J. LIND; LLOYD 1905 b p. 216, pl. 54). It is possible that *L. Turneri* as understood by LLOYD (1905b p. 236) is identical, but the description is very incomplete and the plant is not to be found in the large monograph of COKER and COUCH (1928).

Closely allied forms seem to be found throughout the world, but little is really known about the distribution. I have only noticed the three finds mentioned — all from the inner part of Sdr. Strømfjord, where it seems to prefer dry or moderately humid localities with a rather open vegetation.

Greenland material studied:

275. Sdr. Strfj. Top of Nákajanga, alt. 700 m, Aug. 10. In scattered vegetation of *Dryas*, *Vaccinium microphyllum*, creeping *Salix glauca* and small lichens and moss.

329. Ibid. South slope of Hassells Fjeld, alt. 100 m, Aug. 20. On dry loess in *Kobresia* sociation with *Calamagrostis purpurascens*, *Cornicularia aculeata*, *Cladonia pyxidata* etc.

360. Ibid., alt. 350 m, Aug. 22. On loess in rather humid *Kobresia* sociation with *Salix glauca*.

4. LYCOPERDON PUSILLUM Batsch.

Fig. 5 d, p. 23.

Small, diam. 1.3 cm, nearly globose, tapering in a very prominent "root" with sand adhering. Exoperidium on ripe specimens nearly disappeared, leaving very fine, furfuraceous scales on lower part. Endoperidium pale brown, flaccid and very thin, opening by a small pore. Gleba Cinnamon-Brown (R) to Prouts Brown (R); no subgleba. Spores Honey Yellow (R), walls finely echinulate (or pored); with a small central gutta and a small mucro; diam. 4—5 μ, not including a rather distinct, hyaline envelope. Capillitium freely branched, branches finely attenuated, paler or somewhat darker than the spores, not brittle, sparingly septate, walls with few and inconspicuous pits; main branch 3—5 μ, outer ends about 1 μ, walls up to 0,8 μ broad.

The description is drawn from the Sdr. Strømfjord collection. The specimen from Gaaselandet, which is macroscopically very similar, differs widely as to the microscopic characters; Spores very variable in size, 3.8—6.6 μ diam., with fine or more prominent spines, generally darker than given above and mixed with fallen pedicels (mostly rather short). Capillitium darker than above, walls slightly thicker, with some pits. Very reminiscent of the spores and capillitium of forms of *L. umbrinum*, but the capillitium is more frequently branched and pitted. *L. pusillum* is known to be very variable in the size and shape of the spores, and though I never saw a description as deviating as this, I find it defensible to refer the specimen to this species.

Cosmopolitan, but not much is known about its range towards the north. The material in arct. herb. from Iceland, referred by ROSTRUP to *L. pusillum* (ROSTRUP 1903) all belongs somewhere else. In Sweden it is only known as far north as Jämtland (INGELSTRÖM 1940). Very likely a rare species in Greenland, found only once by me.

Greenland material studied:

Arct. herb. 15. Gaaselandet (E. Greenland, 70° N.), July 1892; leg. HARTZ; ROSTRUP (1894) as *L. furfuraceum* Schaeff.

289. Sdr. Strfj. Ørkendalen, alt. 70 m, Aug. 14. On naked sand in a dune, 2 specimens.

(*L. gemmatum* Batsch is recorded as common in the various publications of ROSTRUP. As not a single specimen preserved in the herbarium belongs here, I think it best to exclude the species from the list of Greenland fungi. For *L. excipuliforme* Scop. the same holds true.).

BOVISTA Dill. ex Pers.

Three species are on record from Greenland (Rostrup 1891, 1896) two of which are found represented in the arct. herb. by five collections, including the oldest Greenland collection of a fleshy fungus still preserved; a fine specimen of *Bovista nigrescens* collected by J. Vahl 120 years ago.

In the material from this expedition are ten collections of two species, all from the inner Søndre Strømfjørd area.

1. BOVISTA ECHINELLA Pat. 1891.

Syn: *Bovistella echinella* (Pat.) Lloyd 1906.
Bovista limosa Rostrup 1896.

Fig. 5 b, p. 23.

Peridium globose, 0,3—0,8 cm broad. Exoperidium pure white and smooth at first, partly peeling off when ripe, leaving small grains or very low warts on the thin, flaccid, dark grey-brownish endoperidium; mouth definite, with an almost Geaster-like peristome of five to eight more or less distinct, fimbriate teeth. Slightly rooting, with a very reduced, stem-like base. Gleba white at first, then Buffy Brown (R) to Wood Brown (R); when fully ripe Verona Brown (R) to Warm Sepia (R). Sterile base absent.

Spores sub-spherical, slightly oblong, with a small central gutta, finely punctate-rough, Honey Yellow (R); (4.5) 5—5.5 (6.5) μ broad, with a hyaline pedicel (1.5) 5—8 (12) μ long. Capillitium of separate threads, 1—2 mm long, branched 0—5—10 times into slender, pointed branches; rather dark brown (Hazel, Russet to Liver Brown (R)), much paler towards the ends; main branch rather thin, 4—8 μ, thick-walled, walls up to 2 μ, the pointed ends about 1 μ broad; more or less septate. (In coll. 336. the capillitium is made up of separate threads, which most often are unbranched, more rarely branched 1—2 times).

The descriptions, especially in Coker and Couch (1928 p. 96), including study of type material, and in Lohwag (1933), leaves no doubt

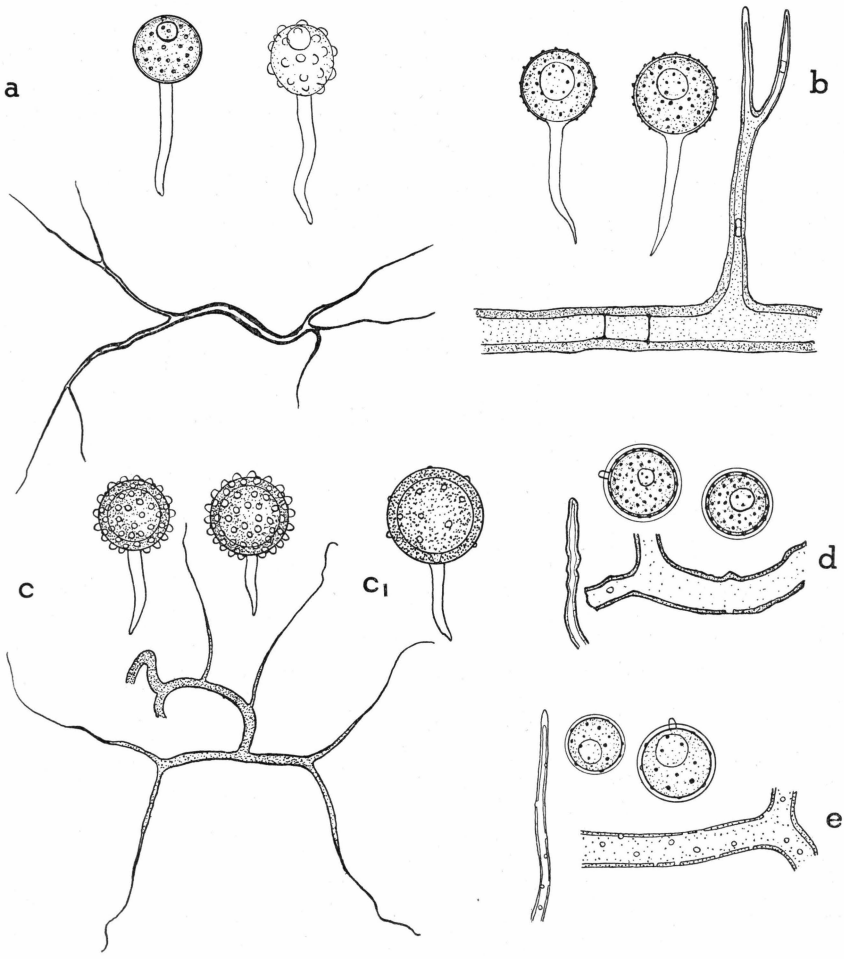

Fig. 5. a: *Bovista tomentosa;* capillitium (× 50) and spores (spore to the left drawn as seen enclosed in air) (coll. 175). b: *B. echinella;* spores (stained in methylene blue) and capillitium (coll. 332k). c: *B. nigrescens;* capillitium (× 75) and spores (arct. herb. 37, c 1 from arct. herb. 35). d: *Lycoperdon pusillum;* spores (stained in methylene blue) and capillitium (coll. 289). e: *L. spadiceum;* spores (stained in methylene blue) and capillitium (coll. 329).

Spores × 2000, capillitium (except in a and c) × 1000.

of the identity of this plant, so Rostrup's name must be cancelled. Lloyd (1906 p. 286) referred the species — together with several others — to the genus *Bovistella*, mostly on account of its being permanently fixed to the ground. With Lohwag (l. c.) I do not consider this sufficiently justified. A further study might prove it reasonable to remove it to a separate genus on account of the peculiar peristome, unique in this genus.

Very widely distributed. Originally described from Equador and according to LLOYD (l. c.) also known in Jamaica, Mexico, U. S. A. and Denmark [1]), — Lappland (R. FRIES 1909, depicted by LLOYD 1910 p. 452 fig. 270) Osttirol (LOHWAG l. c.). *Bovistella trachyspora* LLOYD (1906) is probably identical and on record from N. W. Himalaya. In Greenland only on record from localities with very low precipitation. Quite frequent in the inner part of the Sdr. Strømfjord area on rather bare ground with small mosses etc., mostly in somewhat humid localities on the lower part of the south slopes.

Greenland material studied:

Arct. herb. 33. Gaasefjord ca. 67 km from Gaasepynten (E. Greenland, 70° N.); leg. HARTZ, May 31st. 1892 (HARTZ 1894 p. 234) ROSTRUP (1896) as *Bovista limosa* (type material).

332 k. Sdr. Strfj. South slope of Hassells Fjeld, alt. 300 m, Aug. 4. On fairly dry and naked soil (loess) in *Kobresia* sociation; several specimens.

332m. Sdr. Strfj. South of Ravneklippen, alt. 100 m, Aug. 18. In moist *Kobresia* sociation near spring.

336. Sdr. Strfj. South slope of Hassels Fjeld, alt. 150 m, Aug. 21. In moist *Kobresia* sociation near spring.

2. BOVISTA TOMENTOSA (Vitt.) de Toni.

Fig. 6, p. 25; fig. 5 a, p. 23.

Peridium globose or slightly ovate, 1.2—2.0 cm broad, up to 2,5 cm high. Exoperidium at first of a rather dull whitish colour, when ripe greyish, somewhat granulate, cracking off in patches. Endoperidium rather thin, dark Chestnut Brown (R) at maturity, dull, towards the apex fading to a paler brownish grey colour; mouth definite, small. Gleba white at first, then yellowish; when ripe Chestnut Brown (R) to Vandyke Brown (R) with a faint olivaceous tint from the spores. Without a sterile base. Slightly rooting; attached to the ground.

Spores olive-brownish yellow (Honey Yellow — Buckthorn Brown (R)) slightly oblong, rarely spherical, finely echinulate, with a small central gutta, 4.4—5.1 × 4.1—4.9 μ broad, pedicellate, hyaline pedicel (7) 8—10—12 μ long. Capillitium somewhat darker than the spores and of a purer brownish colour (Russet — Hazel (R)), branched, mostly 5—8 times, with pointed branches; main branch 10—18 (25) μ thick, with thick walls (up to two thirds of total diam.); sparingly septate, sometimes pored.

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[1]) I have studied the Danish material mentioned by LLOYD, preserved in the Botanical Museum in Copenhagen. There is no indication of where it has been collected, but it might very well be outside Denmark. It is now without any spores, and habitually not much like other collections of the species. Until confirmed by new finds, the species should be excluded from the Danish flora.

Seems quite perfectly to agree with the description of this species given by HOLLÓS (1904 p. 125). The species is a much disputed on and only few records are known. It is clearly separated from *B. plumbea* by the small spores and the dark endoperidium, from *B. nigrescens* by the size, the shape of the mouth and the colour (and size) of the spores. It bears a certain likeness to the North American species *Bovistella dealbata* LLOYD, and to another American species, *B. minor* Morgan, but are clearly distinct from both already by the microscopical characters, as demonstrated by COKER and COUCH (1928 p. 100). I have studied American collections of *B. minor* in the University of Michigan Herbarium and I can fully

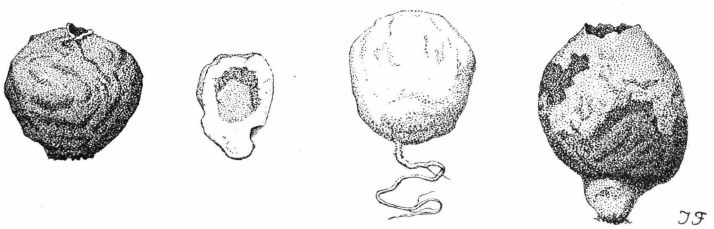

Fig. 6. *Bovista tomentosa* (Vitt.) de Toni. Coll. 175 (specimens to the left), ripe specimen, section of unripe specimen. Coll. 211 (centre, right), unripe specimen. Coll. 423 (far right), ripe specimen, exoperidium only partly cracked off. (all × 1). INGEBORG FREDERIKSEN del.

second the opinion of COKER and COUCH, as I find the spores constantly smaller (3.7—4 × 3.4—4.5 μ) with a longer pedicel; the capillitium much thinner, not exceeding 14 μ in diam. HOLLÓS (l. c.) wrongly gives both these names as synonymes of *B. tomentosa*. LLOYD (1908 p. 392) considers *B. brunnea* Berk., described from Australia and also known from Mexico, identical. This species is described as having a brown exoperidium, even when immature, and so not in accordance with the species depicted by HOLLÓS, and the description given above.

Not very much can be said about the distribution. HOLLÓS finds his plant on sandy places in the Hungarian lowland, never in the mountains; BRESADOLA has found it in northern Italy. In Greenland only on record from regions with low precipitation, in Sdr. Strømfjord rather strictly confined to extremely dry south slopes, being a very common species in the xerophile grass-communities and in dry willow copses on the loess.

Greenland material studied:

175. Sdr. Strfj. South slope of Hassells Fjeld, alt. 150 m, Aug. 2. On loess in low vegetation (*Dryas* etc.); 2 finds.
211. Ibid., alt. 300 m, Aug. 4. In rather dry *Salix glauca* copse in *Kobresia — Campanula rotundifolia* sociation in the outskirts of the copse.
275. Ibid. Top of Nákajanga, alt. 750 m, Aug. 10. Dry locality (fell-field).

328. Ibid. South slope of Hassells Fjeld, alt. 150 m, Aug. 20. Under *Salix glauca* shrub on very dry loess in scattered phanerogamic vegetation (*Calamagrostis purpurascens, Carex supina*).
332 bb. Ibid., alt 100 m, Aug. On very dry loess with *Salix glauca.*
332 j. Ibid., alt. 80 m, Aug. 1. On very dry loess in *Carex supina* and *Calamagrostis purpurascens.*
423. Ibid., alt. 150 m. Aug. 28. On loess with very scattered vegetation, mostly *Carex supina;* together with *Sepultaria* sp.
– – – Nûgssuaq, Kûtsiaq, Ikorfat, (W. Greenland, 71° N.), Aug. 10. 1947, leg. C. A. JØRGENSEN.

(Not represented in the arct. herb., but the description of *Bovista plumbea* in ROSTRUP (1896 p. 52) from material gathered by HARTZ at the head of Gaasefjord (E. Greenland, 70° N.), June 1892, leaves little doubt that he was confronted with the same species. (Small size, dark brown colour, slightly rough spores).

3. BOVISTA NIGRESCENS Pers.

Fig. 1, pl. 4; fig. 5 c, p. 23.

5—7 cm broad, subglobose, somewhat depressed, obscurely lobed, with a large, elliptical, indefinite, apical hole. (Exoperidium totally disappeared). Endoperidium rather thick, smooth, shining, dark brown, (Carob Brown — Chestnut Brown (R)), faded in places to Tilleul Buff (R); at the base with a small depression after a mycelial cord. Gleba Chestnut Brown — Vandyke Brown (R); no subgleba.

Spores (4.8) 5.7—6.2 (6.5) μ broad, Ochraceous Tawny (R) to Hazel (R); spherical, some few slightly oblong; thick walled, with rather prominent, hyaline warts embedded in a hyaline envelope; hyaline pedicel acuminate, 3—8 μ long. Capillitium of separate threads, much branched; concolorous or slightly darker than the spores, outer ends much paler; main branch 10—17 μ, tapering to 1.5 μ, walls up to 4 μ thick.

The description is drawn from the specimen from Sermilik; the spores of the Julianehaab material are faintly paler and with smaller warts (hardly ripe?), while the specimen from Ûnartoq has smooth spores mixed with spores with a more or less warty epispore; this specimen is collected 120 years ago.

ROSTRUP noted the rough spores of the Sermilik specimen (ROSTRUP 1891 p. 601) but this is the only place in the literature I have seen this character mentioned. For comparison I have studied a number of specimens from Denmark, Norway, Iceland and Germany in the Herbarium of the Botanical Museum, University of Copenhagen, and found all of them with a rough epispore, so I consider the character to be constant, at least in North European forms.

The species is common all over Europe, but not on record in America (COKER and COUCH 1928 p. 98) where it is replaced by the closely related *B. pila* B. & C. There are several specimens in the arct. herb. from Ice-

land, and FRIES (1914 p. 241) reports it to be fairly common in Lappland up to 900 m above sea level. Very likely a southern species in Greenland. In the Ivigtut area (61° 15' N.) and further to the north I sought it in vain on this expedition.

Greenland material studied:

Arct. herb. 35. Julianehaab (W. Greenland, 60° N.); leg. HARTZ (?); ROSTRUP (1891).

Arct. herb. 36. Ûnartoq (W. Greenland, 60° N.), leg. J. VAHL, July 1828, ROSTRUP (l. c.).

Arct. herb. 37. Sermilik Fjord (W. Greenland, 61° N.); leg. ROSENVINGE, Aug. 18. 1888, ROSTRUP (l. c.).

To be excluded from the list of species known from Greenland: *B. plumbea* Pers. (see above, p. 26).

CYATHUS Hall.

CYATHUS OLLA (Batsch) Pers.

This species is mentioned by ROSTRUP (1894 p. 48) as found at Ilua by E. LUNDHOLM. As mentioned below I think the record is very dubious, and the species is better excluded from the list until verified by new finds.

CRUCIBULUM Tul.

1. CRUCIBULUM VULGARE Tul.

Fig. 2, pl. 4.

The collections from Greenland show full accordance with the current descriptions, and call for no further remarks.

Very cosmopolitan. Recorded from Lappland (FRIES 1914 p. 243), from Iceland (LARSEN 1932, CHRISTIANSEN 1941) and from Bear Island (KARSTEN 1872) (on imported wood). No previouse records from Greenland are known, though I find it highly possible that *Cyathus olla* mentioned by ROSTRUP (1894) from Ilua (W. Greenland, 60° N.) is identical. The material is no longer preserved, but might have been old, outwashed specimens of *Crucibulum*. I found the species exclusively in the Ivigtut area, where it was quite frequent.

Greenland material studied:

582. Ivigtut. In the valley south of the town, alt. 50 m, Sept. 16. On *Salix glauca* twig and on *Lycopodium annotinum* in *Salix* copse.
611. Ibid., alt. 60 m, Sept. 21. On *Lycopodium annotinum* in *Salix* copse.
635. Ibid., alt. 50 m, Sept. 25. On an old board (imported pine).
646. Ibid. Nordlandet, alt. 150 m, Sept. 27. In large flocks on small twigs of *Vaccinium microphyllum* in heath.
668. Ibid. West of the town, alt. 25 m, Sept. 31. On *Salix glauca* twigs in large number under isolated *Salix*.

SPHAEROBOLUS Tode.

1. SPHAEROBOLUS STELLATUS Tode.

The Greenland collections call for no special description. The rather scanty material is typical in all respects.

Cosmopolitan, though not on record from other far northern stations (Iceland, Lappland etc.) On this expedition found only twice; it might be an introduced species.

Greenland material studied:

636. Ivigtut. South of the town, alt. 50 m, Sept. 25. on an old board (imported (pine)wood).

637. Ibid., alt. 60 m, Sept. 25. On an old trunk of *Sorbus americana*.
(Also known from Julianehaab (W. Greenland, 60° N.). On a timber bridge (imported wood); leg. HARTZ; ROSTRUP (1891). The material no longer preserved).

Gasteromycetes from Greenland.

Revised list of collections preserved in the Arctic Herbarium of the Botanical Museum, University of Copenhagen.

No.	Name on label	Locality	Published (det.) by:	Revised determination
1(a)	*Scleroderma vulgare*	Disko	ROSTR. 1888	*Calvatia cretacea*
2	*Calvatia arctica*	Liverpool Land	FERD. 1910	» *arctica*
3(a)	» »	Lille Snenæs	» »	» »
4(a)	» »	(same coll.)	» »	» *cretacea*
5	» »	Thule	» (unpub.)	» *sp.*
6(a)	» *cyathiformis*	Hvalrosodden	» 1910	» *cretacea*
7	» »	»	» »	» »
8	» »	Kap Dalton	» »	» »
9	*Lycoperdon Bovista*	Sydostbugten	ROSTR. 1891	» »
10	*Globaria* »	Tasiussaq	» 1904	» *tatrensis* v. *groenlandica*
11(a)	*Lycoperdon* »	Kangerdluarssuq	» 1891	» *cretacea*
12(c)	» *excipuliforme*	Renodden	» 1894	» »
13(c)	» »	Gaasefjord	» »	» »
14(a)	» *favosum*	Danmarks Ø	» »	» *sp.*
15	*Globaria furfuracea*	Gaaselandet	» »	*Lycoperdon pusillum*
16	» »	Ikerasaussaq	» 1904	*Calvatia tatrensis*

(continued).

Gasteromycetes from Greenland (continued).

No.	Name on label	Locality	Published (det.) by:	Revised determination
17	*Lycoperdon gemmatum*	Hold with Hope	ROSTR. 1894	(indeterminable)
18	» »	Danmarks Ø	»	*Calvatia tatrensis* v. *groenlandica*
19	» » v. *min.*	Lilleø	» 1904	*Calvatia tatrensis* v. *groenlandica*
20	» »	(Camp no. 7)	» (unpubl.)	*Calvatia tatrensis* v. *groenlandica*
21	» » v. *min.*	Íkáteq	» 1904	*Calvatia tatrensis*
22	» » »	Kap Brown	» »	(indeterminable)
23	» »	Tasiussaq	» »	*Lycoperdon nigrescens*
24	» »	Tungnudliarfik	» (unpubl.)	*Calvatia sp.*
25	» »	Qagsiarssuk	» 1888	» »
26	» »	Upernavik	» »	» *tatrensis* v. *groenlandica*
27	» »	Kap Seaforth	» 1904	*Lycoperdon umbrinum*
28	» »	Ik...iut	» (unpubl.)	*Calvatia tatrensis* v. *groenlandica*
29	» »	(Grønland, VAHL)	» »	*Calvatia sp.*
30	» *sp.*	N. Bræfjord		*Calvatia tatrensis* v. *groenlandica*
31(a)	» *gemmatum*	Disko	» (unpubl.)	*Calvatia sp.*
32(a)	» »	Julianehaab	» (1888?)	*Lycoperdon umbrinum*
33	*Bovista limosa*	Gaasefjord	» 1894	*Bovista echinella*
34(c)	» *nigrescens*	Disko	» 1891	*Lycoperdon umbrinum*
35(c)	» »	Julianehaab	» »	*Bovista nigrescens*
36(c)	» »	Ûnartoq	» »	» »
37(c)	» »	Sermilik	» »	» »

When nothing is added to the number, the specimen is dry and pressed, preserved in the regular herbarium; numbers marked (c) indicate that the specimen is preserved in cardbord box, unpressed, while (a) indicates preservation in alcohol.

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Færdig fra Trykkeriet den 30. September 1948.

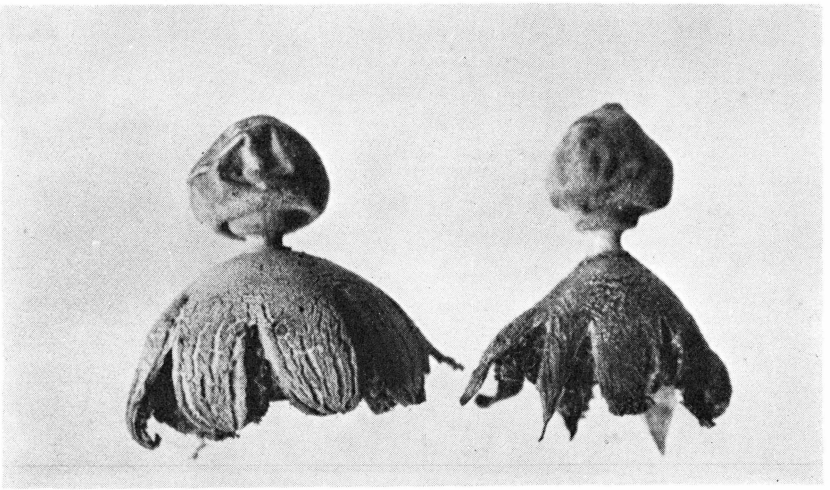

Fig. 1. *Geaster minimus* Schwein. (coll. 319) ×2.

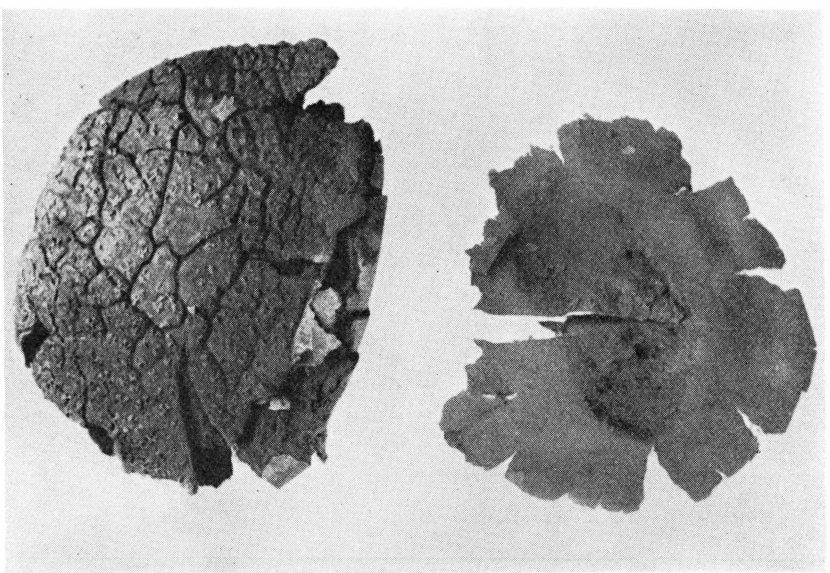

Fig. 2. *Calvatia cretacea* (Berk.) Lloyd (coll. 284) ×$^3/_4$.

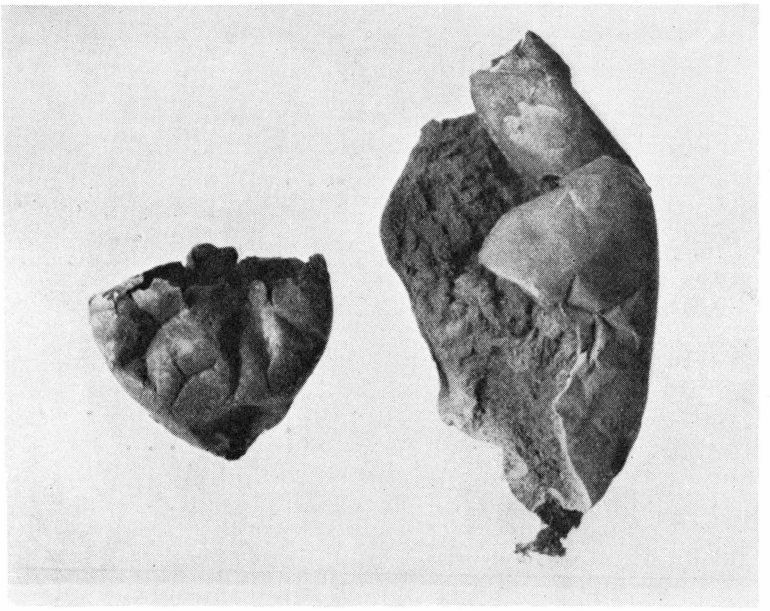

Fig. 1. *Calvatia tatrensis* Hollós (coll. 562) × 1.

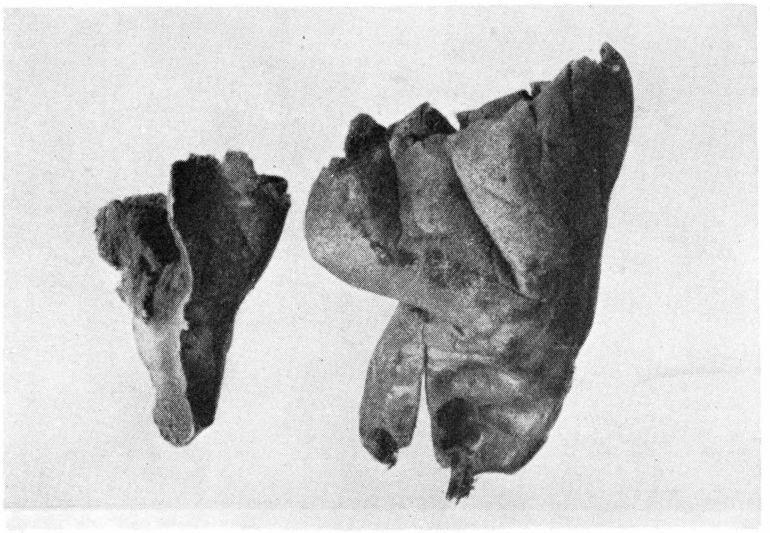

Fig. 2. *Calvatia tatrensis* var. *groenlandica* var. nov. (coll. 419, type) × 1.

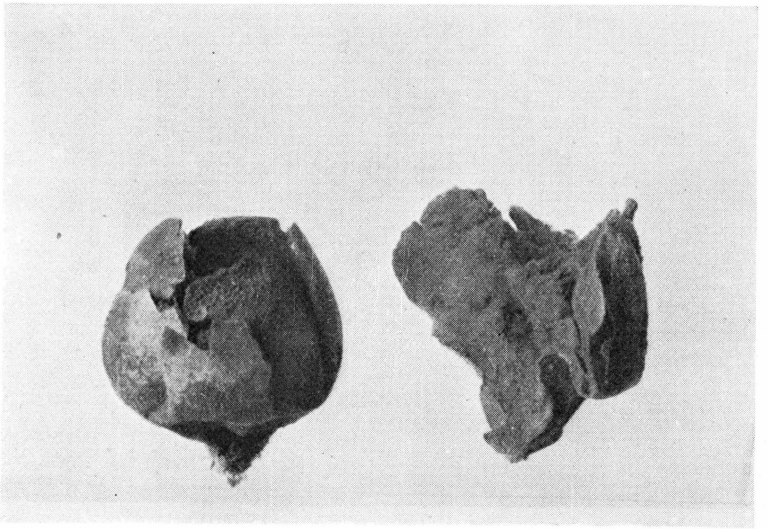

Fig. 1. *Lycoperdon umbrinum* Pers. (coll. 422) × 1.

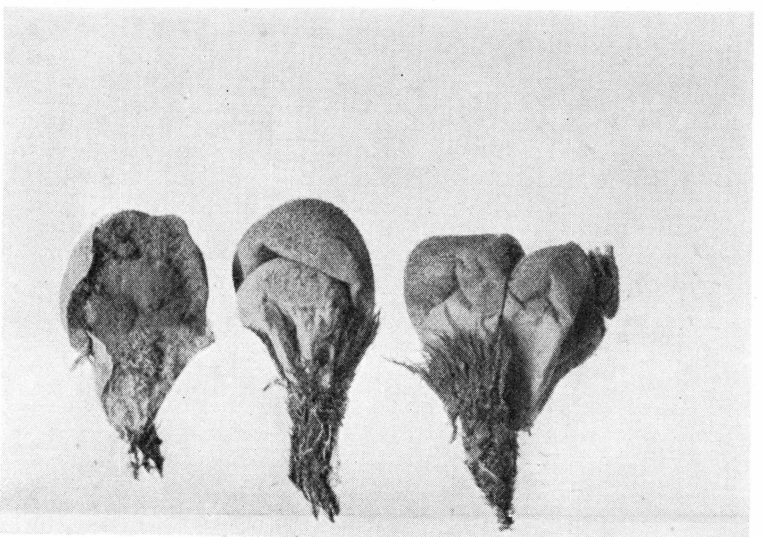

Fig. 2. *Lycoperdon umbrinum* Pers. (coll. 332 d) × 1.

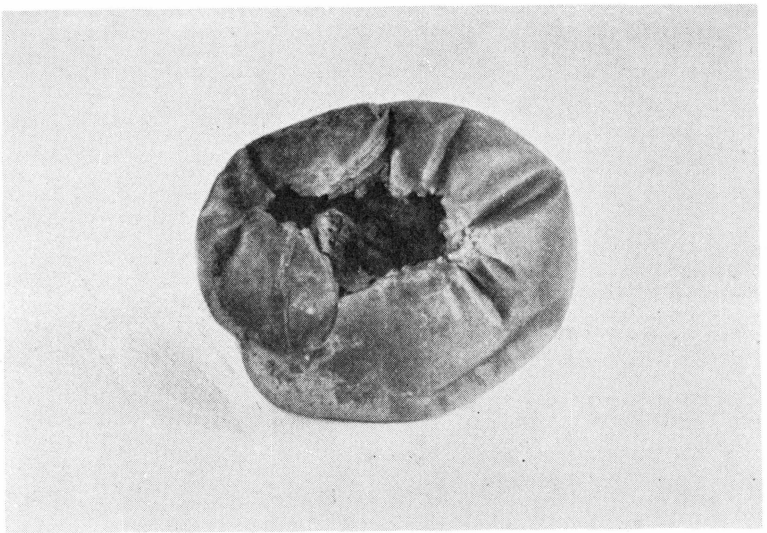

Fig. 1. *Bovista nigrescens* Pers. (arct. herb. 37) × 1.

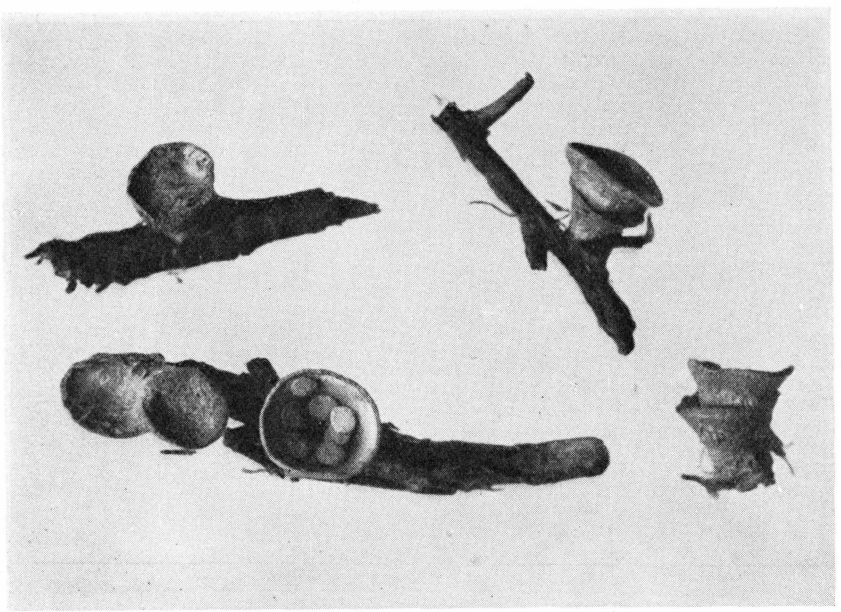

Fig. 2. *Crucibulum vulgare* Tul. (coll. 668) × 2.