Karstenia 21: 21—25. 1981

Gambian Myxomycetes developed in moist chamber cultures

MARJA HÄRKÖNEN

HÄRKÖNEN, M. 1981: Gambian Myxomycetes developed in moist chamber cultures. — Karstenia 21: 21—25.

Plant material was collected from three localities in Gambia, West Africa. In moist chambers 22 species of Myxomycetes emerged. Five seem to be new to Africa: *Cribraria minutissima* Schw., *Echinostelium minutum* deBary, *Macbrideola martinii* (Alexop. & Bekene) Alexop., *Perichaena minor* (G. Lister) Hagelst. and *Stemonitopsis hyperopta* (Meylan) Nann.-Brem. Both the number and diversity of the Myxomycetes that emerged are higher than in moist chambers prepared with Finnish material.

Marja Härkönen, Department of Botany, University of Helsinki, Unioninkatu 44, SF-00170 Helsinki 17, Finland.

Gambia is a lowland tropical country in West Africa, lying along the River Gambia at about lat. 13.5° N. The vegetation is savanna with forest along the sides of the streams. The temperature stays between 20 and 30°C throughout the year (Eriksen & Mikkelsen 1979).

My visit to Gambia in December 1979, occurred during the dry season, and no Myxomycetes were found. As there is no information about Gambian Myxomycetes and, according to Ing (1968), recent investigations indicate a paucity of West African material in the major herbaria, I made an attempt to obtain specimens by the moist chamber culture method (see Gilbert & Martin 1933).

Material and methods

Several kinds of plant remains and bark from living trees were collected at three localities: the Abuko nature reserve, the town Bakau, on a roadside and in the botanical garden, and the surroundings of the Hotel Wadner Beach, which lies about 2 km south of the capital Banjul.

The plants were identified mainly with the aid of a guide to the Abuko nature reserve (Anonymons 1978). The names were checked with the Flora of West Tropical Africa (Hutchinson & Dalziel 1958, 1968). Material of the following plants was collected:

1. *Andropogon* sp., a savanna grass (leaves and panicles)
2. *Borassus aethiopicum* Mart., a fan palm (leaves)
3. *Delonix regia* (Boj. ex Hook.) Raf., Caesalpiniaceae, tree (pods)
4. *Cassia* sp., Caesalpiniaceae, tree (pods)
5. *Elaeis guineensis* Jacq., oil palm (fibres from the trunk and fallen male inflorescences)
6. *Eucalyptus* sp., (bark from a living tree)
7. *Ficus* sp. (aerial roots)
8. *Musa* sp., a small banana plant (dry leaves)
9. *Parinari excelsa* Sabine, Chrysobalanaceae (bark from living trees)
10. *Pseudospondias microcarpa* (A. Rich.) Engl., Anacardiaceae (bark from living trees)

In January 1980 the plant material was used to establish 117 moist chamber cultures, which were kept in an incubator at a temperature of 26—29°C, lighted artificially in a 12:12 h light:dark cycle. The cultures were moistened with distilled water adjusted with KOH to pH 7. After two days the pH of the moisture in the dishes was measured with pH sticks (Merck Universalindikator). The moist chambers were then examined every second or third day under a dissecting microscope.

When developing Myxomycetes were found, the moist chamber was allowed to dry slowly and the Myxomycetes were then removed. After four weeks the rest of the chambers were dried for a week. All the chambers were then rewetted for another four-week period and examined as before.

The species of Myxomycetes

Eighty-three specimens of Myxomycetes developed. (In fact there were more specimens, but when representatives of a species appeared twice in the same moist chamber culture, they were counted as one specimen.) They were identified mainly from

Lister (1925), Martin & Alexopoulos (1969), Mitchell (1980) and Nannenga-Bremekamp (1974). Representative specimens are deposited in H and the private collection of Mrs N.E. Nannenga-Bremekamp, Doorwerth, the Netherlands. The specimens represent the following 22 species (one could be determined only to the genus):

Arcyria cinerea (Bull.) Pers.

A. insignis Kalchbr. & Cooke

A. pomiformis (Leers) Rost.

Comatricha elegans (Racib.) G. Lister.
The only earlier African report is from Morocco (Malençon & Bertault 1967). Fig. 3.

C. laxa Rost. See Fig. 1.

Cribraria minutissima Schw.
There are several specimens with many sporangia, but none has any cup. Apparently first record from Africa. Fig. 4.

C. violacea Rex

Diderma hemisphaericum (Bull.) Hornem.

Didymium anellus Morgan

D. difforme (Pers.) S.F. Gray

D. quitense (Pat.) Torrend.

In several moist chambers with *Andropogon* sp. there appeared first watery and then milky white phaneroplasmodia, which developed into sporangiate fructifications of *Didymium*. The sporangia are 0.4—0.8 mm in diam., deeply umbilicate, and have a double peridium. The outer peridium is white, eggshell-like, made of closely compacted star-like crystals, while the inner one is membranous, smoky to bluish, iridescent. The stipe is flattened, furrowed, black, 0.5 mm to very short, or wholly obscured by the umbilicate sporangium. Columella poorly to well developed, yellowish; absent from some sporangia. Capillitium reticulate, colourless to light brown, having broadened nodes. Spores in mass black, in transmitted light very dark purplish brown, strongly warted and having dark lines along which they wrinkle. After having swollen some hours in Hoyer's medium, the spores lose their wrinkles and look slightly apiculate with a pale line of dehiscence (Fig. 5). Spore diam. 9.5—11.7—14 μm. In all respects but the spore size, the specimens fit with the description of *D. quitense* given by Farr (1976). (The original description by Patouillard (see Patouillard & Lagerheim 1895) is very scanty.) I tried to cultivate the specimens on boiled oat grains and succeeded with one specimen, in both the warm incubation cabinet and in room temperature. The stipitate ancestors gave rise to non-stipitate or even plasmodiocarpous descendants, whose peridium is not eggshell-like, but much more roughened. These sporangia fit well with the description and figures of *D. quitense* in Nannenga-Bremekamp & al. (1978). The spore size and ornamentation did not change in cultivation. The spores also conform with the description of those of *D. saturnus* Keller (Keller 1970). Mrs. Nannenga-Bremekamp kindly sent me part of an isotype of *D. saturnus* for comparison. Its spores really look very like those of the present specimen, but the plasmodiocarps differ in having a straw-brown colour, which is mentioned in the original description of the author. After having seen two of my specimens, Keller himself wrote (in litt.) that they clearly differ from *D. saturnus*. However, the two species must be closely related, *D. quitense* being so variable in its appearance.

Echinostelium minutum de Bary
The species has not been reported from Africa before, but Martin & Alexopoulos (1969) suggest that its distribution is probably worldwide.

Macbrideola martinii (Alexop. & Beneke) Alexop.
Only three sporangia appeared, but they were easily identified by scanty capillitium with slender tips, and spores with clusters of dark warts (see Alexopoulos 1967).
New to Africa.

Paradiacheopsis sp.
Not well matured, impossible to determine to the species.

Perichaena chrysosperma (Currey) A. Lister

P. corticalis (Batsch) Rost.

P. depressa Libert

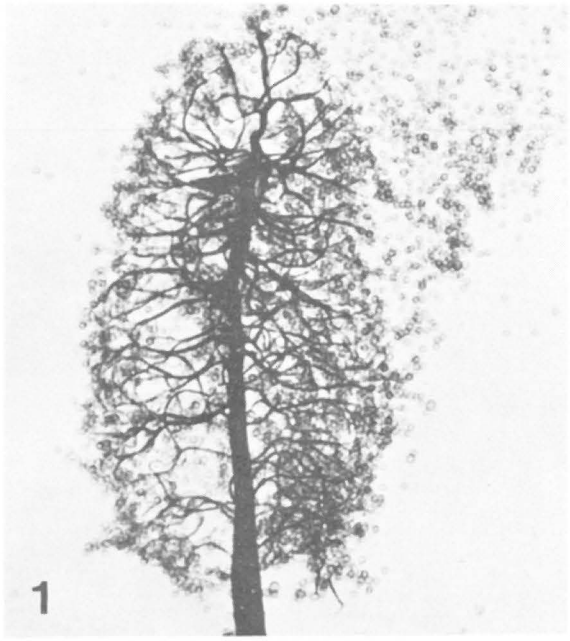
P. minor (G. Lister) Hagelst.
First record from Africa.

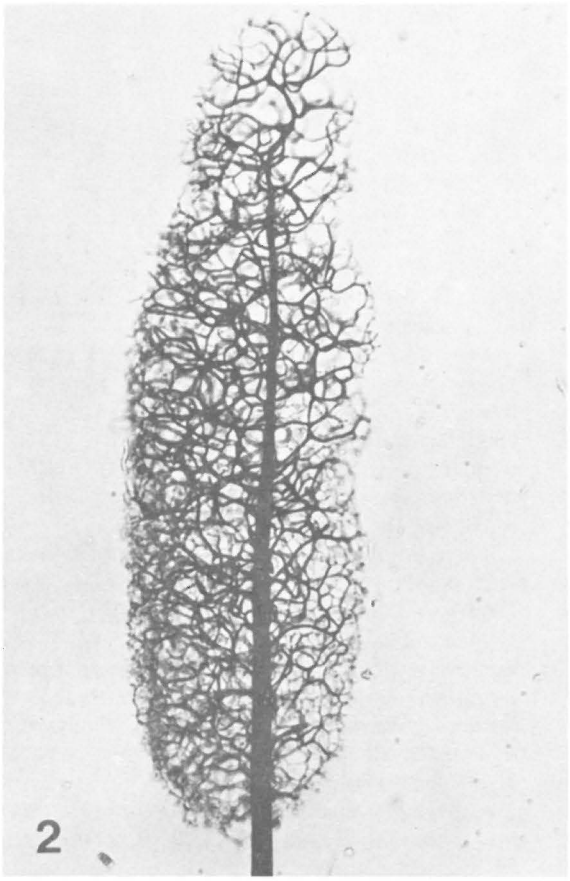
Physarum cinereum (Batsch) Pers.

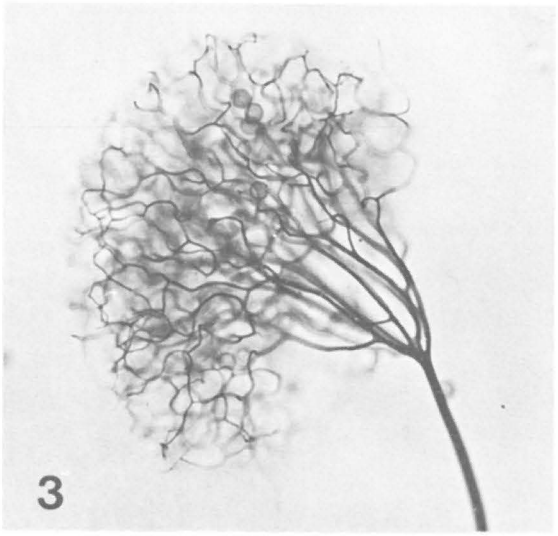
P. compressum Alb. & Schw.

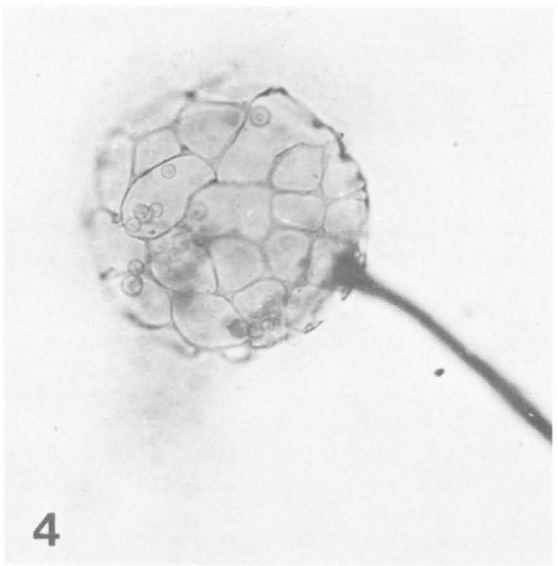
P. pusillum (Berk. & Curt.) G. Lister
Not quite typical, because the reddish brown stalk is not translucent (Nannenga-Bremekamp 1974) and is absent from some sporangia, and the capillitium is

Figs. 1—6. Microscopical details of Gambian Myxomycetes. — 1: *Comatricha laxa* (No. 1545), × 160. — 2: *Stemonitopsis hyperopta* (No. 1553), × 160. — 3: *Comatricha elegans* (No. 1543), × 310. — 4: *Cribraria minutissima* (No. 1547), × 290. — 5-6: *Didymium quitense* (No.1500), spores in surface view and in optical section, × 2000. — Photo: Tuuli Timonen (1-3) and Mauri Korhonen (4-6).


1


2


3


4

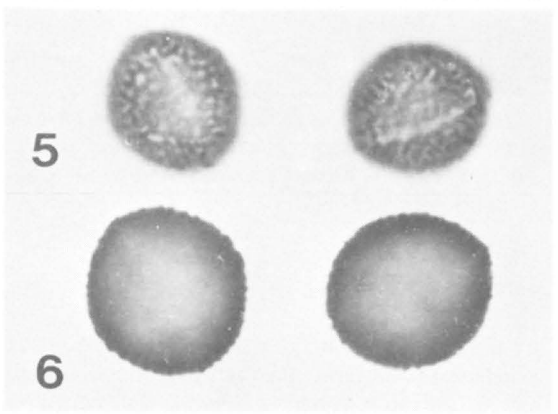

5
6

Table 1. The Myxomycete species, their collecting locations, habitats and known distribution in Africa.

	No. of spec.	Loc.[1]	Hab.[2]	pH of hab.	Reported[3] from W.A.	N.A.	E.A.	S.A.	Cosmop.[4]
Arcyria cinerea	8	A,B,W	4,5,8,9	4.5—7	x	x	x	x	x
A. insignis	2	A,W	5	5.5	x			x	x
A. pomiformis	4	A,B	4,9	4.5—6		x		x	
Comatricha elegans	2	A	9	4.5		x			
C. laxa	5	A	9	4.5	x	x			
Cribraria minutissima	7	A	9	4.5					
C. violacea	4	A	10	6—6.5	x				x
Didymium hemisphaericum	2	W	5,8	5.5—6	x	x		x	x
D. anellus	2	W	8	6.5—7.5	x	x			
D. difforme	2	W	8	6.5—7	x	x	x	x	
D. quitense	7	B	1	7—7.5		x			
Echinostelium minutum	5	A	9	4.5					?
Macbrideola martinii	1	A	10	6					
Paradiacheopsis sp.	1	A	9	4.5					
Perichaena chrysosperma	1	W	5	5.5	x	x			x
P. corticalis	9	A,B,W	1,2,5,10	6—7.5	x	x		x	x
P. depressa	1	W	8	7.5	x	x	x	x	x
P. minor	1	A	5	5.5					
Physarum cinereum	10	B,W	1,4,8	6—7	x	x		x	x
P. compressum	3	A	5	7—8.5	x	x		x	x
P. pusillum	5	B,W	4,5	6—7	x	x	x	x	x
Stemonitopsis hyperopta	1	A	9	4.5					

1) A = Abuko, B = Bakau, W = Wadner Beach
2) The figures refer to the list on page 21
3) According to the literature listed in the references
4) According to Martin & Alexopoulos (1969)

partially badhamioid. *P. pusillum* is suggested, however, by the small (diam. 0.2—0.6 mm), greyish white rugose sporangia with a reddish brown base, and the fairly pale minutely warted spores with clusters of bigger warts, 10—11.4—12.5 μm in diam.

Stemonitopsis hyperopta (Meylan) Nann.-Brem. (syn. *Stemonitis hyperopta* Meylan)
Only one, lilaceous-grey sporangium emerged. It is very typical, however, having a delicate surface net in its lower portion. Spores small, 4.7—5.1—5.5 μm in diam., and faintly reticulate (Fig. 2). First record from Africa.

In Table 1 the emerged species, their substrata, collecting sites and distribution in Africa are listed. The various African countries or districts have been united in four groups: North, West, South and East Africa. Zaire is listed with West Africa, the Canary Islands with North Africa.

Discussion

The ratio of the emerging Myxomycete specimens to the number of moist chambers prepared is as high as 71 %. In moist chamber cultures with Finnish and Norwegian material (Härkönen 1977, 1978 and Härkönen & Koponen 1978), the ratio was only 45 % for bark of living trees and 11 % for grains. (However, on the highly oceanic coast of northern Norway the ratio reached 100 %). In the chambers with Gambian material the number of Myxomycete species is also relatively larger than in moist chambers with Finnish plant material.

According to Alexopoulos (1970) and Farr (1976), Myxomycetes are relatively rare in tropical rain forests. The present investigation shows that in the Gambian savanna region there is a rich variety of dormant stages of Myxomycetes. This may indicate that many more species are to be found if searched for during the rainy season.

Three of the Myxomycete species that emerged seem to be widely distributed in Africa: *Arcyria cinerea, Perichaena depressa* and *Physarum pusillum*. For five of the species I did not find any earlier African records. They are: *Cribraria minutissima, Echinostelium minutum, Macbrideola martinii, Perichaena minor* and *Stemonitopsis hyperopta*. All of these species have been found in the Neotropics (Farr 1976), however, which shows that they are widely distributed, and also serves to indicate how poor our present knowledge is of the African Myxomycetes.

Acknowledgements. I want to thank Mrs. N. E. Nannenga-Bremekamp for help in the identification of the specimens, Dr. H.W. Keller for comments on two specimens of *Didymium quitense* and Miss Tuuli Timonen, M.Sc., and Mr. Mauri Korhonen, Conservator, for the photographs. Mrs. Anna A. Damström, M.A., revised the English of this paper.

References

Alexopoulos, C. 1967: Taxonomic studies in the Myxomycetes 1. The genus Macbrideola. — Mycologia 59: 103—116.
— 1970: Rain forest Myxomycetes. — In: Odum, H. (ed.): A tropical rain forest: U.S. Atomic Energy Commission: F 21—23.
Almeida, M. 1973: Contribuição para o conhecimento dos Myxomycetes de Angola 1. — Bol. Soc. Brotheriana 47: 277—297.
— 1974a: Contribuição para o conhecimento dos Myxomycetes de Angola 2. — Bol. Soc. Brotheriana 48: 187—203.
— 1974b: Contribuição para o conhecimento dos Myxomycetes de Moçambique. — Bol. Soc. Brotheriana 48: 205—210.
Anonymous 1978: 50 trees of Abuko Nature Reserve. — 10 pp. Wildlife Conservation Department, Banjul.
Bresadola, J. 1899: Fungi Congoenses. — Bull. Soc. Roy. Belg. 38: 152—168.
Dixon, P. 1959: Myxomycetes of Ghana 1. Stemonitis and Comatricha. — J.W. Afr. Sci. Ass. 5: 101—104.
Doidge, E. 1950: The South African fungi and lichens to the end of 1945. — Bothalia 5: 1—1094.
Duthie, A. 1917a: South African Myxomycetes. — S. Afr. J. Sci. 14: 456—460.
— 1917b: African Myxomycetes. — Trans. R. Soc. S. Afr. 6: 297—310.
Eliasson, U. & Lundqvist, N. 1979: Fimicolous myxomycetes. — Bot. Notiser 132: 551—568.
Eriksen, T. & Mikkelsen, B. 1979: Afrika i kartor och siffror. — 102 pp. Köpenhamn.
Farquharson, C. & Lister, G. 1916: Notes on South Nigerian Mycetozoa. — J. Bot. 54: 121—133.
Farr, M. 1959: O.F. Cook's myxomycete collection from Liberia and the Canary Islands. — Llyodia 22: 295—301.
— 1976: Flora Neotropica 16. Myxomycetes. — 304 pp. New York.
Faurel, L., Feldmann, J. & Schotter, G. 1965: Catalogue des Myxomycètes de l'Afrique du Nord. — Bull. Soc. Hist. Nat. Afr. N. 55: 7—35.
Faurel, L. & Schotter, G. 1965: Notes Mycologiques 6. Sur quelques champignons coprophiles d'Afrique Équatoriale. — Cah. Maboké 3: 123—132.
Gilbert, H. & Martin G. 1933: Myxomycetes found on bark of living trees. — Univ. Iowa Stud. Nat. Hist. 15: 3—8.
Härkönen, M. 1977: Corticolous Myxomycetes in three different habitats in southern Finland. — Karstenia 17: 19—32.
— 1978: On corticolous Myxomycetes in northern Finland and Norway. — Ann. Bot. Fennici 15: 32—37.
Härkönen, M. & Koponen, H. 1978: Myxomycetes developed on grain in moist chamber cultures. — Karstenia 18: 58—62.
Hutchinson, J. & Dalziel, J. 1958: Flora of West Tropical Africa 1 (2): 297—828. 2nd ed., revised by R. Keay. — London.
— 1968: Flora of West Tropical Africa 3 (2): 1—276. 2nd ed., revised by F. Hepper. — London.
Ing, B. 1964: Myxomycetes from Nigeria. — Trans. Brit. Mycol. Soc. 47: 49—55.
— 1967: Myxomycetes from Sierra Leone. — Trans. Brit. Mycol. Soc. 50: 549—553.
— 1968: Myxomycetes from Nigeria 2. — Trans. Brit. Mycol. Soc. 51: 215—220.
Keller, H. 1970: Didymium saturnus, a new myxomycete occurring on straw stacks. — Mycologia 62: 1061—1066.
Lister, A. 1925: A monograph of the Mycetozoa. 3rd ed., revised by G. Lister. — 296 pp., 222 pls. London.
Martin, G. & Alexopoulos, C. 1969: The Myxomycetes. — 560 pp. Iowa City.
Maire, R., Patouillard, N. & Pinoy, E. 1926: Myxomycètes de l'Afrique du Nord. — Bull. Soc. Hist. Nat. Afr. N. 17: 38—43.
Malençon, G. & Bertault, R. 1967: Champignons du Maroc. — Bull. Soc. Sci. Nat. Phys. Maroc 47: 237—281.
Mitchell, D. 1980: A key to the corticolous Myxomycetes. — 63 pp. Cambridge.
Nannenga-Bremekamp, N. 1974: De nederlandse myxomyceten. — 440 pp. Zutphen.
Nannenga-Bremekamp, N., Mukerji, K. & Singh, N. 1978: On two coprophilous Myxomycetes from India. — Proc. K. Nederl. Akad. Wetenschappen C 82: 217—221.
Patouillard, N. 1897: Additions au catalogue des champignons de la Tunisie. — Bull. Soc. Myc. France 13: 197—216.
Patouillard, N. & de Lagerheim, G. 1895: Champignons de l'Équateur. — Bull. Soc. Myc. France 11: 205—234.
Rammeloo, J. 1973: Contribution à la connaissance des Myxomycètes du Maroc. — Bull. Soc. Sci. Nat. Phys. Maroc 53: 31—35.
Tejera, E. 1975: Nota sobre los Myxomycetes presentes en el Archipiélago Canario. — Vieraea 6: 17—24.
Wildpret, W. & Beltran, E. 1974: Contribucion al estudio de la flora micologica del Archipiélago Canario. — Anal. Inst. Bot. Cavanilles 31: 5—18.

Accepted for publication
on April 29, 1980

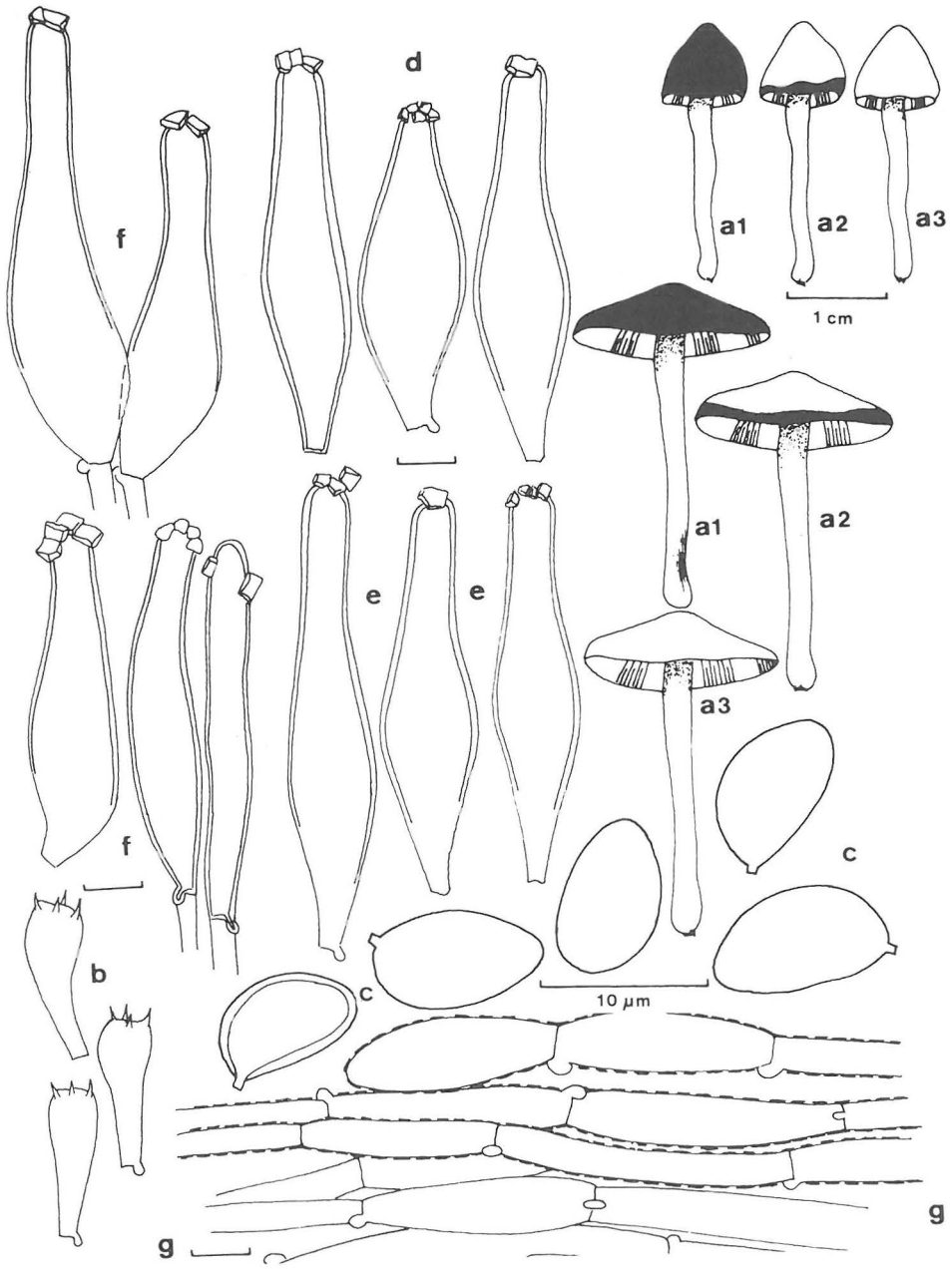


Fig. 1. *Inocybe hygrophana*. a) Fruchtkörper (a1 durchfeuchtet, a2 halbtrocken, a3 trocken), b) Basidien, c) Sporen, d) Cheilozystiden, e) Pleurozystiden, f) Kaulozystiden, oben, g) Hyphen der Hutbedeckung.

erscheinend *Fleisch* im Hut weiss, 1—1.5 mm dick, durchfeuchtet hyalin. Im Stiel violettblau, im oberen Stieldrittel sich lange so haltend und zur Basis hin verblassend, fein faserig. Geruch mehr oder weniger stark spermatisch. *Sporenstaub* tabakfarben.

Basidien 27—30 × 8—10 µm, vorwiegend mit 4

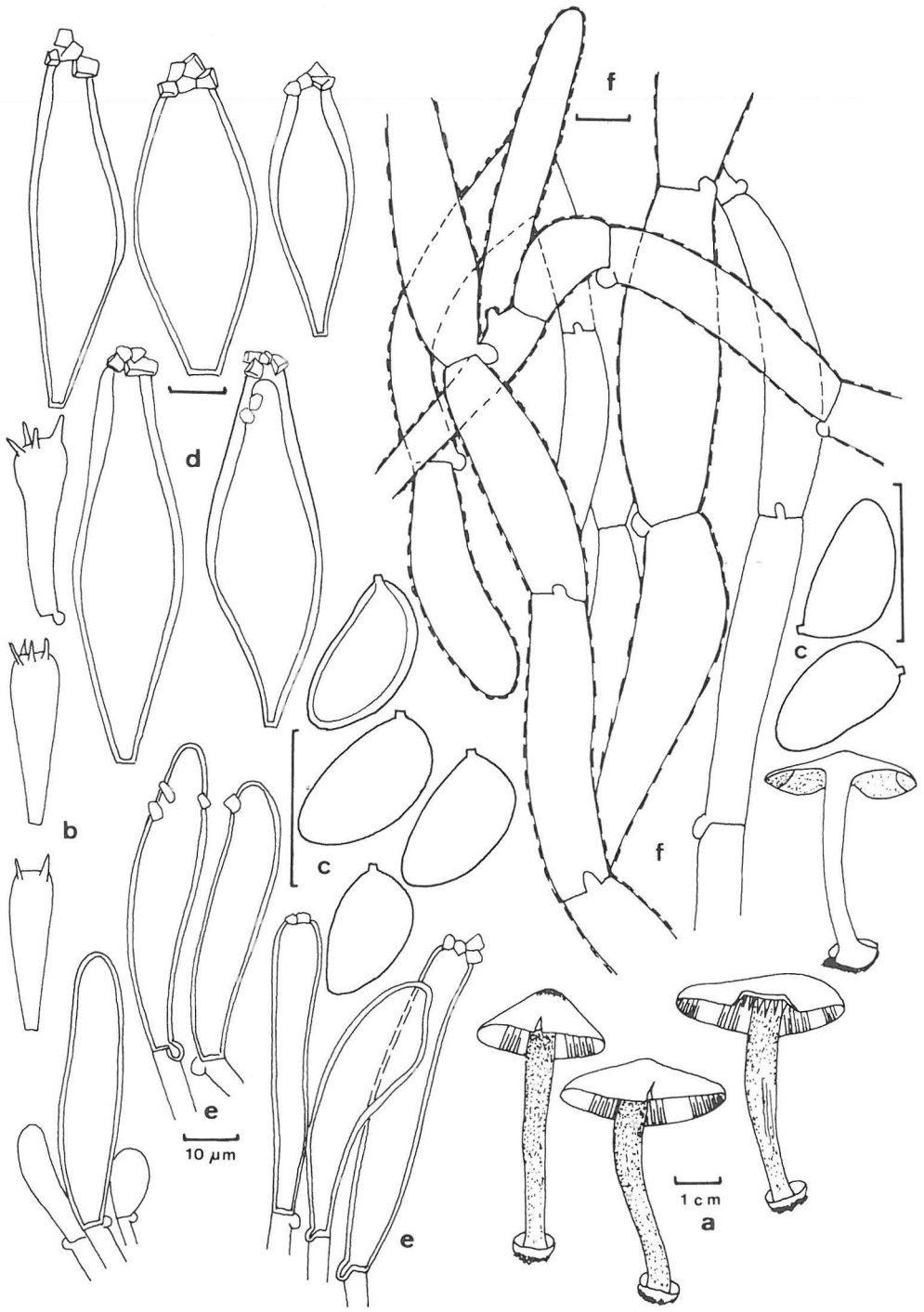


Fig. 2. *Inocybe pseudoreducta*. a) Fruchtkörper, b) Basidien, c) Sporen, d) Hymenialzystiden, e) Kaulozystiden, unten, f) Hyphen der Hutbedeckung.

Sterigmen. *Basidiosporen* 8—10—10.5 × (5—) 5.5—6.5 µm, bauchig, oval. *Cheilozystiden* 45—70 (—80) × 14—21 µm, mit Kristallen, dünnwandig, in NH_4OH gelb. *Pleurozystiden* 50—80 (—95) × 12—18 µm, mit Kristallen, dünnwandig, in NH_4OH gelb. Nich auffällig verschieden von den Cheilozystiden. *Kaulozystiden* nur ganz oben, 50—80—90 × (8—) 10—20 µm, dünnwandig. *Epikutis* aus Hyphen, die bis 13 µm breit werden.

Holotypus: Bundesrepublik Deutschland, Müggenbusch prope Lübeck, MTB 2130, 16. VIII. 1980 H. Glowinski (Herb. M).

Inocybe pseudoreducta Stangl & Glowinski sp.n.

Pileus 3—5.5 cm in diam., conice convexus, dein plane convexus usque expansus, obtuse et late umbonatus, particulis terrae obtectus, vertice lanato, satis brunneo vel fusco-rubro, marginem versus sature brunneo-fibrillosus in fundo ochraceo-brunneo usque argillaceo-ochraceo; cortina non visa. Lamellae plus minusve confertae, adnatae, conspecte sordide citrinae, postremo sordide brunneolae, usque 0.7 cm latae, acie albo-fimriatae. Stipes 3.5—6 cm altus, 0.4—0.6 (—0.7) cm latus, aequalis vel etiam interdum ad basim subattenautus, bulbo albo, manifeste marginato et usque 1.2 cm lato, tenelle incarnatus, ab apice fere usque ad basim dense, sed decrescenter pruinosus, striatus, sericeo nitidus. Caro alba in apice stipitis et in bulbo, alibi incarnate tincta, omnino subaquosa, odore acidulo.

Basidiosporae 9—11.5 × 5.5—6 µm, ovales vel amygdaliformes, distincto apiculo. Cystidia hymenii 40—70 × 17—25 µm, membranis tenuibus, sed in collo usque 2.5 cm crassis et in NH_4OH luteis. Caulocystidia basi 37—60 × 10—19 µm, tenuiter tunicata. Epicutis pilei e hyphis oblongis usque 25 µm crassis et copiose fibulatis. Habitatio: congregatim et singillatim sub dumeto picearum juvenilium in gramine et in stramento acuum.

Hut: 3—5.5 cm in Durchmesser, jung konisch gewölbt mit abgerundetem Scheitel, bald sich ausbreitend, flach konisch werdend, mit abgerundetem, breitem und mit Erdpartikelchen bedecktem Buckel. Rand jung schwach eingerollt, ohne sichtbare Cortina, bald winklig abgebogen, alt scharf abstehend und wenig einreissend. *Hutfarbe:* Jung tiefbraun mit rötlichen Beitönen und deutlich durchscheinender ockerlicher Grundfarbe, alt am Scheitel sattbraun, zum Rande hin ockerlich-braun und bisweilen auch lehmfarben aufhellend. *Hutbedeckung:* Scheitel wollig, zum Rande hin jung dicht und fein befasert, dann gröber und aufgelockert-faserig besonders im Randgebiet. *Lamellen:* Eher etwas gedrängt, untermischt, bis 0.7 cm breit, mehr oder weniger 1/4 bogig und hakig angewachsen; jung zitronfarben mit schmutzigen Beitönen, alt schmutzig beige bis lichtbraun, etwas olivlich, mit glatter, weissbewimperter Schneide. *Stiel:* 3.5—6 × 0.4—0.6 (—0.7) cm, zylindrisch, gleichdick oder oben verdickt und unten etwas verdünnt, mit weisser, deutlich abgesetzter, berandeter Knolle, die bis 1.2 cm breit und 0.7 cm hoch werden kann. Die zart fleischfarbenen, zart ockerlichen Stiele sind mehr oder weniger rötlich angehaucht und bis unterhalb der Mitte dicht bereift. Dieser Reif nimmt zur Basis hin ab und kann auch übersehen werden. Leicht seidig glänzend. *Fleisch* im Hut weiss und dort bis 2.5 mm dick; im Stiel oben und auch in der Knolle weiss, sonst zart fleischfarben oder wässerig-braun getönt, faserig. Geruch deutlich säuerlich. *Sporenstaub* tabakfarben.

Basidien 28—33 × (7—) 8—10 µm, vorwiegend mit 4 Sterigmen. *Basidiosporen* 9—11.5 × 5.5—6 µm, oval bis mandelförmig, mit deutlichem Apikulus. *Hymenialzystiden* 47—70 × 17—25 µm, im Hals mit bis zu 2.5 µm dicken Wänden, die nach unten hin dünn werden und sich in NH_4OH gelb färben. Pleuro- und Cheilozystiden unterscheiden sich voneinander kaum. *Kaulozystiden* 37—60 × 10—19 µm, im unteren Stieldrittel, dünnwandig. *Hyphen der Hutbedeckung* bis 23 µm breit und reichlich mit Schnallen versehen.

Holotypus: Bundesrepublik Deutschland, Müggenbusch bei Lübeck, MTB 2130, 2. VII. 1980 H. Glowinski (Herb. M).

Literatur

Engel, M. & Engel, H. 1980: Inocybe reducta Lge. im südlichen Holstein. — Westfälische Pilzbriefe 11: 184—185.

Heim, R. 1931: Le genre Inocybe. — 431 pp., 35 pls. Paris.

Huijsman, H. 1955: Observations on Agarics. — Fungus 25: 18—43.

Kühner, R. & Romagnesi, H. 1953: Flore analytique des champignons supérieurs. — 557 pp. Paris.

Kühner, R. 1955: Compléments à la Flore analytique 5. Inocybe leiosporés cystidiés. — Suppl. Bull. Soc. Nat. Oyonnax 9: 3—95.

Lange, J. 1935—1940: Flora Agaricina Danica. — 515 pp. Copenhagen.

Moser, M. 1978: Die Röhrlinge und Blätterpilze: In: Kleine Kryptogamenflora II b 2, Basidiomyceten 2. — 532 pp. Stuttgart.

Angenommen zur Publikation
4. Februar 1981