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NOTULAE AD FLORAM AGARICINAM NEERLANDICAM – XXXII
Macrolepiota

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Critical notes on the taxonomy and nomenclature of the Dutch *Macrolepiota* species with ring with double crown are given. *Macrolepiota bohemica* (Wichanský) Krieglst. & Pázmány is regarded as a synonym of *M. rachodes* (Vitt.) Sing. The new combination *M. rachodes* f. *olivieri* (Barla) de Kok is made. *Macrolepiota mastoidea* (Fr.: Fr.) Sing., *M. gracilenta* (Fr.) Mos. and *M. rickenii* (Velen.) Bellù & Lanzoni are synonymized. *Macrolepiota permixta* (Barla) Mos. is considered merely a variant of *M. procera* (Scop.: Fr.) Sing.; notes on the nomenclature of *M. nympharum* (Kalchbr.) Wasser are presented. *Agaricus emplastrum* Cooke & Mass. and *A. tepidarius* Weinm. are regarded as nomina dubia.

The genus *Macrolepiota* Sing. is, within the family Agaricaceae, characterized by having dextrinoid, strongly congophilous, metachromatic and large (7–20 × 5–10 µm) spores, with a truncate apex and a large germ pore. The velum universale is an intricate trichoderm, and a volva is absent. The number of species recognized in western Europe varies from 11 (Moser, 1983) to 18 (Bon, 1993). Six species occur in the Netherlands (de Kok, 1992). Only *M. rachodes* and *M. procera* are common; *M. excoriata* is uncommon, and has declined considerably since 1950 due to changes in agriculture; *M. konradii* and *M. mastoidea* are both rare species in the country, and *M. nympharum* was found once in southern Limburg in 1986 (see also Nauta & Vellinga, 1995 and Vellinga in Arnolds et al., 1995).

Macrolepiota rachodes and its synonyms, and the complex of *M. mastoidea* are discussed in detail. Nomenclatural notes on *M. procera* and *M. nympharum* are provided.

Fresh and herbarium material of all Dutch species have been studied. Colour codes are according to Munsell (1975). Spores were measured in 5% $KOH_{(aq)}$ or 10% $NH_{3(aq)}$, stained with Congo red; spores were measured in side view. The notation [630, 59, 53] stands for '630 spores from 59 basidiocarps of 53 collections measured'. The following abbreviations are used: Q = quotient of length and width, av. = average. All collections are in L.

This research was begun as part of an undergraduate project in 1990–1991 at the Rijksherbarium in Leiden. An unpublished report contains more data and a detailed discussion on the Dutch *Macrolepiota* species (de Kok, 1991).

1. **Macrolepiota rachodes** (Vitt.) Sing.

Agaricus rachodes Vitt., Descr. Funghi. Italia (1835) 158; *Agaricus procerus rachodes* Rab., Deutschl. Krypt. Fl. 1 (1844) 574; *Lepiota rachodes* (Vitt.) Quél., Mém. Soc. Émul. Montbéliard. sér. II, 5 (1872) 5 (Champ. Jura Vosges 1); *Leucocoprinus rhacodes* (Vitt.) Pat., Ess. tax. Hym. (1900) 171; *Lepiotophyl-*

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lum rhacodes (Vitt.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Macrolepiota rachodes* (Vitt.) Sing., Lilloa 22 ('1949'; 1951) 417. — *Hypophyllum columella* Paul., Tr. Champ. (1808–1835) pl. 135, fig. 15 (not validly published, art. 41.2). — *Agaricus subtomentosus* Krombh., Nat. Abb. Beschr. Schw. (1836) 9, pl. 4; *Agaricus procerus subtomentosus* (Krombh.) Rab., Deutschl. Krypt. Fl. (1844) 574. — *Lepiota subprocera* Saut., Hedwigia 15 (1876) 152. — *Lepiota bohemica* Wichanský, Mykol. Sb. 38 (1961) 103; *Macrolepiota bohemica* (Wichanský) Krieglst., Z. Mykol. 47 (1981) 83 (not validly published, basionym not mentioned); *Macrolepiota bohemica* (Wichanský) Krieglst. & Pázmány, Z. Mykol. 51 (1985) 52; *Macrolepiota rachodes* var. *bohemica* (Wichanský) Bellù & Lanzoni, Beitr. Kenntn. Pilze Mitteleur. 3 (1987) 191.

Misapplied. Lepiota badhamii B. & Br. sensu Michael & Hennig, Handb. Pilzfr. 3 (1964) 139, pl. 16. — *Lepiota rachodes* var. *hortensis* sensu Pilát & Usák, Naše Houby 1 (1952) 111; *Macrolepiota rhacodes* var. *hortensis* sensu Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298.

The spelling of the name rachodes is somewhat controversial. The word rachodes lacks a meaning, but the word rhacodes is derived from the Greek word 'ραχος' meaning rag (Muller, 1926). This has led many authors (Fries, 1857; Locquin, 1942; Wasser, 1980) to believe that Vittadini (1835) had made a spelling mistake. This however is unlikely, as he is very consistent in the spelling of this taxon. We therefore agree with Singer (1951) in using Vittadini's spelling for the name of this taxon.

The taxon *M. rachodes* is macroscopically very variable; this has led some authors to split the species up. Two names are important in this aspect, viz. hortensis and bohemica. Pilát (1951: 422) described a new variety *Lepiota rachodes* var. *hortensis*; as no Latin description was given this variety is not validly published. Pilát presented only a macroscopical description and a reference to an illustration in Michael (1918: pl. 195). The thin ring of the species illustrated makes it clear that this new species belongs to the *Excoriata*-group of *Macrolepiota* (simple ring and smooth stipe), and not to the *Rachodes*-group (ring with a double crown and smooth stipe). This same plate (Michael, 1918: pl. 195) was cited by Bon (in Bon et al., 1979: 13), when he described the new species *M. venenata*, which is characterized by a thin annulus.

In Pilát & Usák (1952: pl. 111) another illustration of *Lepiota rachodes* var. *hortensis* is given. The specimen depicted here, has a distinct ring with a double crown, implying that this specimen belongs to the *Rachodes*-group. And this interpretation of var. *hortensis* has been followed by subsequent authors.

Macrolepiota bohemica, described by Wichanský (1961: 102), is considered to be very closely related to *M. rachodes*. All material of *M. bohemica* and *M. rachodes* available in Leiden was examined, and the following observations were made. According to the original description of *M. bohemica* the variation in spore length and width is 11–13 × 7.5–9.5 µm. In Fig. 1 the average spore length and width of all examined specimens are depicted. Clearly *M. rachodes* is very variable in spore length and width, and the variation of *M. bohemica* falls completely within its range. This is in accordance with the results of other authors (Bon, 1981: 73–74; Candusso & Lanzoni, 1990: 534, 540).

The germ pore is mentioned by some authors (Bon, 1981: 73–74 and Candusso & Lanzoni 1990: 534–540) as a good character to distinguish *M. bohemica* (germ pore narrower than 1 µm) from *M. rachodes* (germ pore wider than 1 µm). In the specimens examined no discontinuity was found for this character.

Bon (1981: 73–74), Candusso & Lanzoni (1990: 532 & 538) and Bellù & Lanzoni (1987: 191–192) mentioned that the stipe and the bulb of *M. bohemica* are wider than those of

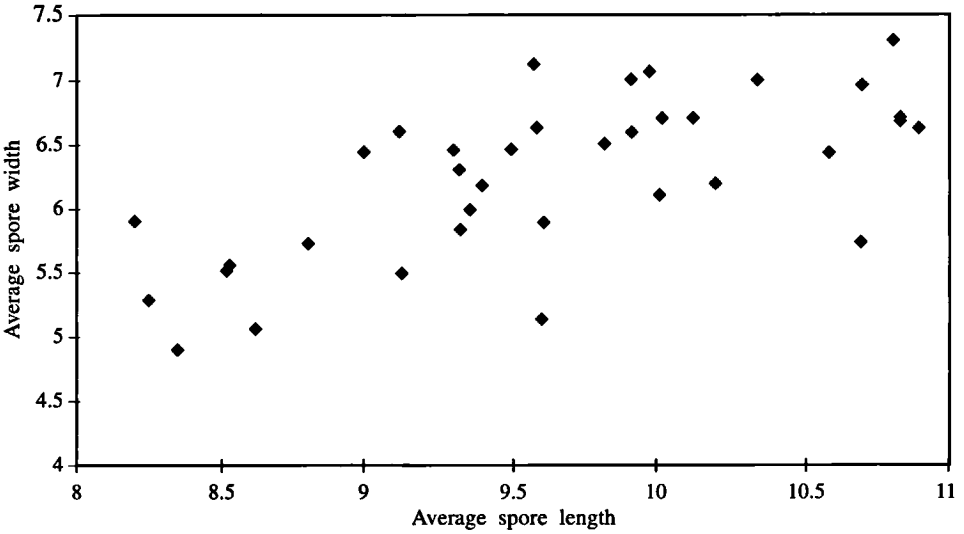

Fig. 1. *Macrolepiota rachodes.* Scatterdiagram of average spore length against average spore width (in µm).

M. rachodes. In accordance with the results of Lavorato (1989: 274–276), no discontinuity in the variation of this character was found.

Other characters used to distinguish the taxa are: shape of velum, colour of velum and shape of the annulus (Moser, 1983: 245, and Bellù & Lanzoni, 1987: 191–192). Environmental factors like moisture and temperature influence the expression of these characters, and can therefore not be used to separate the taxa. As a result *M. bohemica* is considered a synonym of *M. rachodes.*

During fieldwork in the Netherlands it was observed that *M. rachodes* specimens found in conifer woods were generally darker than the ones from other habitats (Fig. 2). If one plots the average spore length of a specimen against the light/dark indicators (Munsell colour code) of its pileus surface (i.e. not the veil) (Fig. 2), a separation based on these two characters is visible. The small-spored specimens (average spore length < 9.2 µm) have in general a darker pileus than the larger spored specimens (average spore length > 8.6 µm). Furthermore all small-spored darker specimens have been found near conifers (Fig. 2) (in the Netherlands near *Picea*). There is overlap between the two groups, but most specimens can be easily assigned to one or to the other. No doubt this darker, smaller spored group of *M. rachodes* represents a different forma. Fortunately, a name is already available. In examining the type of *Lepiota olivieri* Barla, Bellù & Lanzoni (1987: 195) found that it had a spore range of 7–8.5(–9.5) × 4.5–6 µm. The average spore length must be well below 8.6 µm. The specimen depicted by Barla (1889: pl. 9bis, figs. 6–10) is also darker then the typical *M. rachodes* specimen depicted on the same plate. Furthermore the type of *Lepiota olivieri* Barla is clearly depicted as standing in the litter of a conifer. This specimen must be a representative of the small-spored dark form of *M. rachodes.*

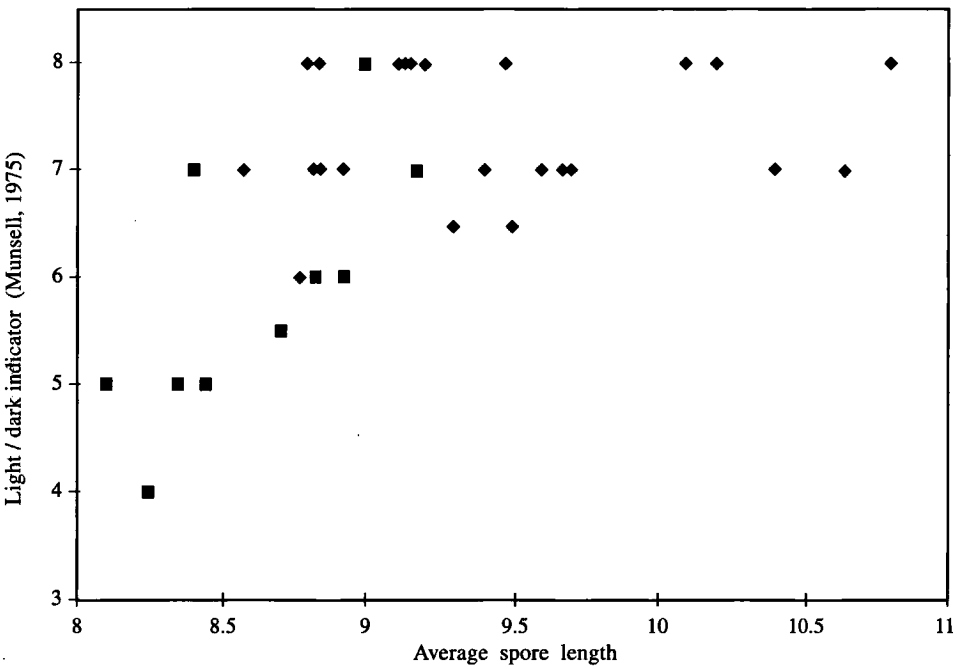

Fig. 2. *Macrolepiota rachodes* f. *rachodes* and f. *olivieri*. Scatterdiagram of average spore length (in µm) against light/dark indicator (Munsell, 1975); ■ = found in *Picea* woods, ◆ = found in other habitats.

KEY TO THE FORMAE OF MACROLEPIOTA RACHODES

1a. Pileus surface (not the veil) white to (very) light brown or reddish yellow, sometimes light yellow or yellowish red (10 YR 8/2, 5–8/3–4, 7.5 YR 6/4, 7/6, 2.5 Y 7/4, 6/6, 5 YR 5/8, 6/4); spores in average 8.7–11 × (5.2–)5.5–7.5 µm .. *M. rachodes* f. *rachodes*

b. Pileus surface (not the veil) yellowish brown to light brown (10 YR 5–6/3–4, 7/3, 7.5 YR 6/4, 3/2); spores in average 8.1–9.0 × 5.0–6.0 µm ..... *M. rachodes* f. *olivieri*

Macrolepiota rachodes f. rachodes

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 9bis, figs. 1–5; Candusso & Lanzoni, Lepiota s.l. (1990) pl. 69 (as *M. rachodes* var. *bohemica*); Cetto, Funghi Vero, Ed. 5, 1 (1975) pl. 21 (as *L. rhacodes*); R. Phillips, Paddest. Schimm. (1981) 25 (as *M. rachodes* var. *bohemica*); Vitt., Descr. Funghi. mang. Italia. (1835) pl. 20; Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) pl. 27 (except for dark specimen at the right).

Pileus 42–205 mm, when young hemispherical, expanding to plano-convex, depressed to umbonate, white to (very) light brown or reddish yellow, sometimes light yellow or yellowish red (e.g. 10 YR 8/2, 10 YR 5–8/3–4, 7.5 YR 6/4, 7.5 YR 7/6, 2.5 Y 7/4, 6/6, 5 YR 5/8, 6/4), smooth to ragged; velum at centre 24–100 mm in diameter, starshaped to round,

with indistinct border, sometimes cracked, surrounded by irregular concentric rings of squamular patches, flat or curved upwards, dark red to yellowish red or (deep) brown (2.5 YR 3/6, 5 YR 3–6/2–8, 10 YR 4–5/3–4, 10 YR 6/3–6, 5/6, 7.5 YR 5/8, 3/4, 6/4, 5/6, 4/4), always the darkest at centre. Lamellae, L = 7–17 per 10 mm halfway radius, free, 1–4 mm remote from stipe, 4–18.5 mm wide, sometimes forked, white (10 YR 8/3), when touched reddish yellow (5 YR 7/6) to light red (10 R 6/8), orange (7.5 YR 7/8), or yellow, later brown (7.5 YR 5/4), usually with light to dark brown, sometimes olive (5 Y 5/6), even to eroded edge. Stipe 26–160(–225) × 7–26(–29) mm, cylindrical with (marginate) bulb, 17–45(–60) mm wide, hollow, white, when touched light brown or yellowish red (10 YR 7/4, 5/4, 6/6, 5 YR 5/6, 7.5 YR 6/4, 5/6, 7/6, 4/4, 5/8), smooth, sometimes with rhizomorphs at base. Ring membranous, with double crown, 18–57 mm wide, 1–12 mm thick, whitish to buff brown (5 YR 7/3) above, sometimes adhered, brown (5 YR 6/3–10 YR 6/6, 8/4) at underside. Context white, turning brown when aging (7.5 YR 5/4), when cut sometimes first turning yellow (10 YR 7–8/6), then reddish yellow (7.5 YR 8–6/6–8, 5 YR 6–7/6–8 or 5 YR 5/8) to weakly red (10 R 5–6/6–8 or 2.5 YR 6/6, 4/8, 6/8), and finally brown (5 YR 3/3, 10 R 5/8), in pileus 5–18 mm thick. Smell fungoid, earth-like or like rubber. Taste fungoid or earth-like.

Spores [± 630, 59, 53] 7.5–12(–14) × 4.5–8.5 µm, in average 8.7–11 × (5.2–)5.5–7.5 µm, Q = 1.1–2.1, av. Q = 1.35–1.9. Basidia 4-spored, with clamp-connections. Cheilocystidia clavate, after a frost-period sometimes rostrate. Velum on pileus an intricate trichoderm, with clavate terminal elements, with vacuolar pigment, usually situated in upper part of trichoderm. Hymenophoral trama (sub)regular. Clamp-connections present.

Habitat & distribution – Solitary or gregarious, saprotrophic and terrestrial, on rather nutrient-rich soil, in gardens, orchards, grasslands, greenhouses, deciduous and coniferous woods, and on roadsides and compost heaps. Common, (April–)Sept.–Dec.

Collections examined. THE NETHERLANDS: prov. Friesland, Beetsterzwaag, 9-IX-1953, collector unknown; prov. Groningen, Boertange, 15-X-1990, 'excursie NMV'; Egypteseind, 18-X-1990, *de Kok*; Haren, X-1966, *Wildevanck*; prov. Drenthe, Zwarte meer, 17-X-1990, *de Kok* (2 collections); prov. Overijssel, Mastenbroek, 21-XI-1990, *Chrispijn*; Singraven, 23-X-1960, *Kits van Waveren*; prov. Flevoland, Zuidelijk Flevoland, Horsterwold 7-XI-1990, *van Zanen*; Noordoostpolder, Schokkerbos 7-XI-1990, *de Kok* (2 collections); Urkerbos, 4-XI-1987, *Vellinga*; Urkerbos, 7-XI-1990, *de Kok*; prov. Noord-Holland, Amsterdam, 4-5-XII-1986, and 8-XII-1986, *Ietswaart*; Amsterdam, 21-VIII-1987, *Ietswaart*; Amsterdam, 4-X-1990, *Chrispijn*; Amstelveen, 25-9-1990, *Reijnders*; Amstelveen, 26-9-1990, *van Zanen*; 's-Graveland, Boekesteijn, IX-1969, *Daams*; 's-Graveland, 20-IX-1958, *Daams*; 's-Graveland, IX-1969, *Daams*; 's-Graveland, 28-X-1969, *Daams 474*; Kortenhoef, 18-XI-1982, *Daams 82-25*; prov. Zuid-Holland, Boskoop, 24-IX-1990, *Uljé*; Den Haag, 17-X-1990, *Jalink*; Leiden, 24-X-1944, *Koster 992*; Leiden, 7-IV-1961, *Ballego*; Leiden, 10-IX-1990, *Bas*; Leiden, 25-IX-1990, *Adema*; Leiden, De Bak, 5-X-1990, *Kienjet*; Leiden, Witte Singel, 8-X-1990, *de Kok*; Leiden, Bizetpad, 18-XI-1990, *Bas*; Leidschendam, 1-XII-1979, *Prud'homme van Reine*; Meyendel, 30-X-1955, *Schravesande*; Oegstgeest, 12-XII-1953, *Bas*; Rijnsburg, 15-XII-1989, *Ietswaart*; prov. Gelderland, Hoog-Keppel, 17-IX-1990, *Piepenbroek*; Wageningen, 8-XII-1972, *Huijsman 379*; Wichmond, 4-XI-1982, *Boekhout 1082*; Wilp, 26-IX-1990, *Piepenbroek 1814b*; prov. Zeeland, Goes, 13-X-1982, *Kuijs*; prov. Noord-Brabant, Breda, summer 1969, *Jansen*; Breda, 13-14-VI-1969, *Jansen 69-113*; prov. Limburg, Mook, 12-X-1964, *Kits van Waveren*; Wijlre, 14-X-1969, *Jansen*; Gulpen, 12-X-1952, *Uffelie*. — GERMANY: Rheinland-Pfalz, Dohm, 21-IX-1990, collector unknown. — GREAT BRITAIN: Surrey, Boxhill, 23-IX-1963, *Pegler 458635*. — HUNGARY: Budapest, 25-VI-1985, *Albert*. — CZECH REPUBLIC: Moravia, Palkovice, 16-XI-1981, *Kuthan*. — USA: Massachusetts, Brighton, IX-1907, *Farlow*; California, Berkeley, IV-1961, *Tavares*. SWITZERLAND: ct. Bern, Ins, 17-X-1959, *Huijsman*; ct. Neuchâtel, Neuchâtel, 15-IX-1966, *Huijsman*.

Macrolepiota rachodes f. **olivieri** (Barla) de Kok, *comb. & stat. nov.*

Lepiota olivieri Barla, Bull. Soc. mycol. Fr. 2 (1886) 113; *Lepiota rachodes* var. *olivieri* (Barla) Barla, Fl. mycol. ill. (1889) 27; *Macrolepiota olivieri* (Barla) Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298.

Excluded. Macrolepiota olivieri sensu Wasser, Fl. Fung. R.S.S. Ucrainicae, Agaricaceae (1980) 298 (= *M. rachodes* f. *rachodes*); sensu Wasser, Libri bot. 9 (1993) 87 (= *M. rachodes* f. *rachodes*).

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 9bis. figs 6–10; Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 113 (as *M. rhacodes* var. *rhacodes*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 67 (as *M. rachodes* var. *rachodes*); J. Lange, Fl. agar. dan. 1 (1935) pl. 9C. (as *L. rhacodes*); R. Phillips, Paddest. Schimm. (1981) 25 (as *M. rachodes* var. *rachodes*); Pilát & Usák, Naše Houby 1 (1980) pl. 110 (as *L. rhacodes*).

Pileus 46–127 mm, when mature plano-convex, applanate, sometimes (sub)umbonate, yellowish brown to light brown (10 YR 5–6/3–4, 7/3, 7.5 YR 6/4, 3/2), smooth to ragged; velum star-shaped to circular, with indistinct border, 21–38 mm wide, with concentrical zones of applanate or upwards curving squamulose patches, dark brown to reddish brown (7.5 YR 3/4, 3/2, 5 YR 3/4, 10 YR 5/4–6, 7/3), at centre always the darkest. Lamellae 10–14 per 10 mm halfway radius, free, 1–7 mm remote from stipe, 8.5–15 mm wide, whitish, when touched light red (2.5 YR 6/8) to yellowish red, with dark brown eroded edge. Stipe (45–)80–190 7–13 mm, smooth, bulbous to subbulbous, with 21–32 mm wide bulb, white, when touched (darker) yellowish brown or darker reddish brown (10 YR 4/4, 10 YR 5/4–6, 5 YR 3/4, 7.5 R 3/4). Ring membranous, with double crown, 25–30 mm in diameter, 1–5 mm thick, very light brown (10 YR 7/4) at upper side, sometimes adhered, lower side coloured as pileus. Context white, 7–17 mm thick in pileus, when cut turning reddish yellow (7.5 YR 6–7/8, 5 YR 6/8), later red (10 R 4–6/6–8 or 2.5 YR 5/6). Smell none, earth-like or fungoid. Taste unpleasant.

Spores [± 200, 13, 13] 7.0–10.5(–11.2) × 4.0–6.5 µm, on average 8.1–9.0 × 5–6 µm, Q = 1.2–2, av. Q = 1.4–1.7. Basidia 4-spored, with clamp-connection. Cheilocystidia clavate, not rostrate. Velum on pileus an intricate trichoderm with clavate terminal elements, with vacuolar pigment. Hymenophoral trama subregular.

Habitat & distribution – Solitary or gregarious, saprotrophic and terrestrial in woods with coniferous trees (in the Netherlands only with *Picea*). Rather rare, Sept.–Nov.

Collections examined. THE NETHERLANDS: prov. Groningen, Sellingerbeetse, 17-X-1990, *Sieben*; prov. Noord-Holland, Hilversum, 9-IX-1956, *Daams*; prov. Flevoland, Noordoostpolder, Schokkerbos, 7-XI-1990, *de Kok* (several collections); Urkerbos, 25-IX-1990, *van Zanen*; Urkerbos, 7-XI-1990, *de Kok* (3 collections); prov. Utrecht, Soest, 5-IX-1912, *Lefebure*; prov. Gelderland, Wilp, 26-IX-1990, *Piepenbroek 1814a*; Windesheim, 2-IX-1954, *Bas.* — SWITZERLAND: ct. Bern, Ins, 28-X-1968, *Huijsman 266*.

2. **Macrolepiota mastoidea** (Fr.: Fr.) Sing.

Agaricus mastoideus Fr.: Fr., Syst. mycol. 1 (1821) 20; *Lepiota mastoidea* (Fr.: Fr.) Kumm., Führ. Pilzk. (1871) 135; *Lepiota excoriata* subsp. *mastoidea* (Fr.: Fr.) Quél., Fl. mycol. (1881) 301; *Leucocoprinus mastoideus* (Fr.: Fr.) Sing., Rev. Mycol. 4 (1939) 67; *Lepiotophyllum mastoideum* (Fr.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Leucocoprinus mastoideus* (Fr.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 46; *Macrolepiota mastoidea* (Fr.: Fr.) Sing., Lilloa 22 ('1949'; 1951) 417. — *Agaricus gracilentus* Krombh., Nat. Abb. Beschr. Schw. 4 (1836) 8, pl. 24. figs. 13–14; *Lepiota gracilenta* (Krombh.) Quél., Mém. Soc. Émul. Montbéliard, sér. II, 5 (1872) 71 (Champ. Jura Vosges 1);

Macrolepiota gracilenta (Krombh.) Mos., Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota gracilenta* (Krombh.) Wasser, Ukr. Bot. Zh. 35 (1978) 516. — *Lepiota rickenii* Velen., Novit. mycol (1939) 47; *Macrolepiota rickenii* (Velen.) Bellù & Lanzoni, Beitr. Kenntn. Pilze Mitteleur. 3 (1987) 196.

Excluded. Lepiota excoriata subsp. *mastoidea* sensu Konr. & M., Ic. sel. Fung. 1 (1924) pl. 10 (= *M. konradii*).

Selected icons. Barla, Fl. mycol. ill. (1889) pl. 11. figs. 1–10; M. Bon, Champ. Eur. occid. (1989) 291 (as *M. gracilenta* & *M. konradii*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) 251; Bres., Iconogr. mycol. 1 (1927) pl. 21 (as *L. gracilenta*) & 23 (as *L. mastoidea*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 73 & 74, fig. 127; Cooke, Ill. Brit. Fung. 1 (1881) fig. 24, (23) (as *Agaricus mastoideus*); J. Lange, Fl. agar. dan. 1 (1935) pl. 8c (as *L. umbonata*).

Ever since the description of *M. gracilenta* in 1836, taxonomists have struggled to find characters to separate *M. mastoidea* from *M. gracilenta*. Among the characters used, are spore length and width. *Macrolepiota gracilenta* is supposed to have slightly smaller spores than *M. mastoidea*. In this research, based on 18 collections from seven countries, no gap in the variation of the average spore width and length was found (de Kok, 1991).

According to Pázmány (1985: 54–55), who studied ten collections from Rumania in detail, in *M. mastoidea* the ratio of pileus diameter and stipe length (measured on exsiccates) is 0.5–0.83 and in *M. gracilenta* 0.35–0.6. Furthermore, he found a correlation between this character and the spore length and width. After combining Pázmány's data with the present data (measured on exsiccates), no discontinuity or correlation between these two characters was found (Fig. 3).

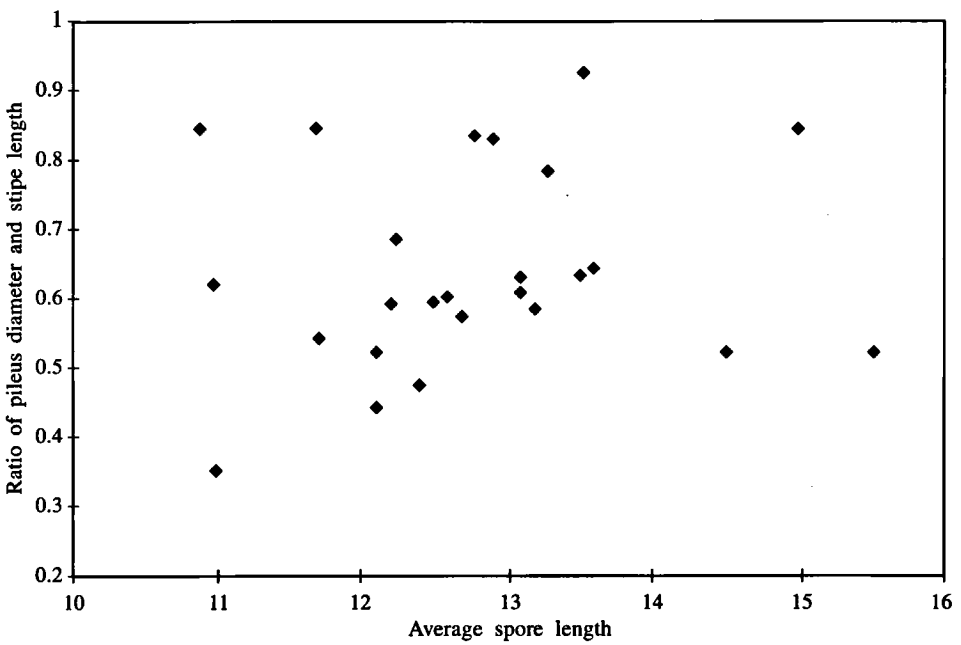

Fig. 3. *Macrolepiota mastoidea*. Scatterdiagram of average spore length (in µm) against ratio of pileus diameter and stipe length.

Table I. Velum colour in *M. mastoidea*, *M. gracilenta*, and *M. rickenii* according to various authors.

M. mastoidea	*M. gracilenta*	Authors
Ocker-gelbbräunlich	hellbraun	Pázmány (1985)
Ockerbräunlich	hell fleischocker	Moser (1983)
Café au lait	ochrace grisâtre	Bon (1981)
M. mastoidea	*M. rickenii*	Authors
(not mentioned)	dunkelbraun-intensiv milchkaffeebraun	Bellù & Lanzoni (1987)
Ocra	bruno caffelatte	Candusso & Lanzoni (1990)
Brun ochracé	brun châtain	Bon (1993)
Ocker-gelbbräunlich	intensiv milchkaffeebraun	Candusso & Lanzoni (1990)

Pázmány (1985: 54–55) stated that the ratio of stipe length and stipe diameter of *M. mastoidea* is 10–23 and in *M. gracilenta* 25–30 (measured on exsiccata). In the combined data set, most collections have relatively short stipes (ratio 10–15; measured on exsiccates), the longest stiped specimens having been found in Rumania. However, there is a continuum, and no correlation between this character and the average spore length could be found.

Velum colour is considered to be an important character by several authors. An overview of the literature is given in Table I. *Macrolepiota mastoidea* is considered darker, and more distinctly ochraceous, whereas *M. gracilenta* is paler, and slightly pink-coloured. Two collections, among the 18 studied, clearly show an intermediate colour range: *Bas 7381* from Austria: reddish yellow to very light brown (7.5 YR 6/6 to 10 YR 8/3), and *Boekhout 1026* from Belgium with pileus pink (7.5 YR 7/3) to beige brown.

Other characters like pileus and stipe diameter, pattern of velum on pileus and stipe, and shape of the cheilocystidia are either too much influenced by environmental factors, or else the differences are too small to justify a separation into separate species. Therefore, *M. gracilenta* is considered a synonym of *M. mastoidea*.

Some authors (Bellù & Lanzoni, 1987; Bon, 1993) do not use the name *M. gracilenta* anymore, as in the original diagnosis the lamellae are stated to be pale greenish ('pallide virescentibus'), reminding of a representative of the genus *Chlorophyllum*. The name *M. rickenii* (Velen.) Bellù & Lanzoni is used instead, for the interpretation of *M. gracilenta*, without greenish lamellae. *Macrolepiota rickenii* is considered to be as dark as or even darker than *M. mastoidea* (Bellù & Lanzoni, 1987; Candusso & Lanzoni, 1990; Bon, 1993). For an overview of the colours see also Table I. In view of the colour variation, and the absence of correlating characters, *M. rickenii* is also synonymized with *M. mastoidea*.

3. **Macrolepiota procera** (Scop.: Fr.) Sing.

Agaricus procerus Scop., Fl. carn. 2 (1772) 418; *Agaricus procerus* Scop.: Fr., Syst. mycol. 1 (1821) 20; *Lepiota procera* (Scop.: Fr.) S.F. Gray, Nat. Arr. Brit. Pl. 1 (1821) 601; *Mastocephalus procerus* (Scop.: Fr.) Pat., Essai tax. Hym. (1900) 171; *Lepiotophyllum procerum* (Scop.: Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Macrolepiota procera* (Scop.: Fr.) Sing., Papers Mich. Acad. Sci., Arts Letters 32 (1946) 141. — *Lepiota permixta* Barla, Bull. Soc. mycol. Fr. 2 (1886) 114. *Leucocoprinus permixtus* (Barla) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 91; *Macrolepiota permixta* (Barla) Mos.,

Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota permixta* (Barla) Pacioni, Micol. ital. 8 (3) (1979) 13; *Macrolepiota procera* var. *permixta* (Barla) Candusso in Candusso & Lanzoni, Lepiota s.l. (1990) 518.

Selected icons. Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 120 (as *M. permixta*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) pl. 253, 254 (as *M. permixta* and *M. procera* resp.); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 63 & 65 (as *M. procera* var. *procera* and var. *permixta* resp.); Dähncke, 1200 Pilze (1993) 521; J. Lange, Fl. agar. dan. 1 (1935) pl. 8b; R. Phillips, Paddest. Schimm. (1981) 24.

Macrolepiota permixta Barla (1886) has always been considered to be very closely related to *M. procera*. The main difference between the two species is that unlike that of *M. procera*, the context of *M. permixta* turns red when cut (Barla, 1886). Most *Macrolepiota* species turn reddish brown when they are cut. Such reddening of basidiocarps is considered to be a sign of tyrosinase activity (Marr, 1984). In some cases, varietal status is given on account of this discoloration (e.g. *M. excoriata* var. *rubescens* (Dufour) M. Bon, *M. mastoidea* var. *coccineobasalis* (Locq.) M. Bon). The discoloration largely depends on the age of the fruit-body and other conditions like moisture and temperature. Collections of *Macrolepiota* species (including *M. procera*) can be found in which some specimens discolour red when cut, while others, in the same collection, hardly discolour at all. Therefore, discolouring is considered an unreliable character within this genus. Consequently, *M. permixta* is regarded as a synonym of *M. procera*.

4. **Macrolepiota nympharum** (Kalchbr.) Wasser

Agaricus nympharum Kalchbr., Ic. sel. Hymenomyc. Hungariae (1873) 10, pl. 2, fig. 2; *Lepiota nympharum* (Kalchbr.) Kalchbr., Fungi Sibiria America Austr. (1879) 7; *Leucoagaricus nympharum* (Kalchbr.) M. Bon, Doc. mycol. 7 (27–28) (1977) 19; *Macrolepiota nympharum* (Kalchbr.) Wasser, Agarikovye Griby S.S.S.R. (1985) 114. — *Lepiota densesquamosa* Velen., Česká Houby (1920) 206. — *Agaricus rhacodes* var. *puellaris* Fr., Monogr. Hymenomyc. Suec. 2 (1863) 285; *Agaricus rhacodes puellaris* Fr., Hymenomyc. eur. (1874) 29; *Lepiota rhacodes* var. *puellaris* (Fr.) Sacc., Syll. Fung. 5 (1887) 29; *Lepiota procera* var. *puellaris* (Fr.) Mass., Brit. Fung. Fl. 3 (1893) 235; *Lepiota puellaris* (Fr.) Rea, Brit. Basidiomyc. (1922) 65; *Lepiotophyllum rhacodes* var. *puellaris* (Fr.) Locq., Bull. mens. Soc. linn. Lyon 11 (1942) 40; *Leucocoprinus puellaris* (Fr.) Locq., Bull. mens. Soc. linn. Lyon 14 (1945) 91; *Macrolepiota puellaris* (Fr.) Mos., Blätter-, Bauchpilze, 1. Aufl. (1953) 114 (not valid, basionym not mentioned); *Macrolepiota puellaris* (Fr.) Mos., Röhrlinge Blätterpilze, 3. Aufl. (1967) 184.

Misapplied. Lepiota cepaestipes Sow. sensu Michael, Führ. Pilzfr., Ausg. B, 2 (1918) pl. 194.

Excluded. Leucoagaricus nympharum sensu M. Bon, Doc. myc. 7 (27–28) (1977) 19 (= ?); *Lepiota puellaris* sensu Rea, Brit. Basidiomyc. (1922) 65 (= ?); *Macrolepiota puellaris* sensu M. Bon, Doc. myc. 7 (27–28) (1977) 19 (= *M. rachodes*).

Selected icons. Bellù, Boll. Gr. micol. G. Bres. 25 (1982) 112 (as *M. puellaris*); Breitenb. & Kränzl., Pilze Schweiz 4 (1995) pl. 255 (as *M. puellaris*); Candusso & Lanzoni, Lepiota s.l. (1990) pl. 66 (as *M. puellaris*); Cetto, Funghi Vero, Ed. 5, 1 (1975) pl. 23 (as *L. puellaris*); J. Lange, Fl. agar. dan. 1 (1935) pl. 9b (as *L. rhacodes* var. *puellaris*); Kalchbr., Ic. sel. Hymenomyc. Hungariae (1873) pl. 2, fig. 2; Migl. & Bizio, Funghi Amb. 66 (1994) 14 (as *M. puellaris*).

Macrolepiota nympharum was first described by Fries (1863: 285) as *Agaricus hacodes* puellaris* (i.e. *Agaricus rhacodes* var. *puellaris*). Later authors named this taxon as a subspecies or forma of *M. rachodes* or *M. procera*. Only as late as 1922 was it recognized on species level (Rea, 1922: 65).

Kalchbrenner's (1873: 10, pl. 2, fig. 1) description and illustration of the new species *Agaricus nympharum* clearly show a *Macrolepiota* of the *Rachodes*-group (double crowned ring and smooth stipe). The colour of the pileus and habitat (conifer woods) makes it clear

that this taxon is similar to *M. puellaris*. *Macrolepiota nympharum* is the oldest valid name on species level, and is therefore the correct name for this taxon.

NOMINA DUBIA

Agaricus tepidarius Weinm. in Hornschuch, Syll. Pl. nov. 1 (1822) 69; non *Agaricus tepidarius* Otth in Trog, Mitth. naturf. Ges. Bern (1857) 27.

Agaricus tepidarius Weinm. was described as a large mushroom, growing in a greenhouse, hence the name. Judging from the description it is clear that this taxon belongs to the genus *Macrolepiota*. However, a ring is not mentioned. Without particulars of the ring or a microscopical examination of the type specimen it is impossible to identify this species as either *M. rachodes* or *M. venenata*. The epithet was well known in the last century. Fries (1836–1838: 13), Saccardo (1887: 29) and also Kickx (1867: 130) mentioned it as a synonym of *M. rachodes*. However, until the type collection is found *Agaricus tepidarius* remains a nomen dubium.

Agaricus emplastrum Cooke & Mass. in Cooke, Grevillea 18 (1889) 51; *Lepiota emplastrum* (Cooke & Mass.) Sacc., Syll. Fung. 9 (1891) 8.

Lepiota emplastrum resembles *M. rachodes*, except for the spores. The spores of *Lepiota emplastrum* measure 20 × 10–12 µm, and are angular. No material of the type or other Cooke & Massee specimens of this taxon could be found at Kew. However, a drawing of this species by Miss Wakefield exists. She worked with Massee in her early years, and she might have known the species. In her drawing the spores are smaller than those of the original description, but are still too large for *M. rachodes*. In Miss Wakefield's drawing a ring is conspicuous in the mature specimen, and there is even a young specimen depicted with a closed partial veil.

Hora (1960: 447–448) described a collection, which he identified as *L. emplastrum*, on account of the striking resemblances with Cooke & Massee's fungus, as depicted in Cooke, 1890: pl. 1164 (1106), and because of the same habitat. Hora's collection, however, is provided with a fugacious ring, but also with distinct evidence of a volva. Hora suggested that Massee, who made the drawing of *L. emplastrum*, mistook the circumscissile volva for a dropped movable ring, and lifted it in his painting. A volva is absent in *Macrolepiota* species, but present in the closely related genus *Volvolepiota*, which is so far only known from South America (Singer, 1986; Heinemann & de Meijer, 1996). The spores of Hora's specimen are 10–12 × 7–8 µm, and lack a germ pore. According to Hora a germ pore is lacking in *M. rachodes* as well, which is contradictory to our findings. Hora also presumed that the original Cooke & Massee collection had been contaminated with *Entoloma*-spores.

Until the type collection or better material of *L. emplastrum* is found this epithet is best regarded as a nomen dubium.

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