

Chorology of the European Hypogeous *Ascomycetes*. II. *Tuberales*

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In this part of the paper, chorology of the Tuberales in Poland with regard to their
areals in Europe is discussed. It is a continuation of the previous paper by Lawrynowicz,
published in the *Acta Mycol.* vol. 25(1).

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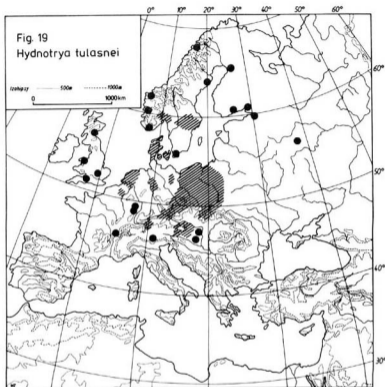
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7. CHOROLOGY OF SPECIES OF *HYDNOTRYA*

7.1. *Hydnotrya tulasnei* Berk. et Br.

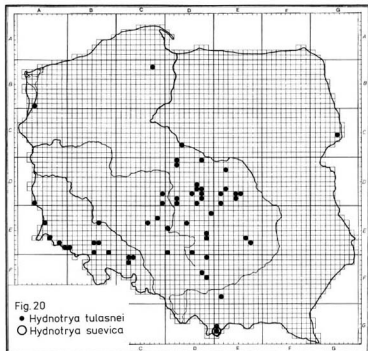
Distribution in Europe (Fig. 19). The species is common throughout Central Europe and southern Scandinavia in lowlands, uplands and mountains. Exceeding 1000 m alt. Some few localities in W Europe, S and E rims of Alps, the Hungarian Highland, and E Europe indicate more the insufficiency of herbarium material than the real lack of localities. In fact they extend far to the north: in the oceanic climate of Norway (the northernmost site at Rana n. Narvik), in Sweden and Finland approaching northern outskirts of Bothnia (Umeå and environs of Oulu). The eastern most site known in Europe is at Mikhailovskoe n. Moscow. Among the analysed exsiccata there was nos specimen from S Europe and the S Carpathian Mtns. The species was originally described from England by Berkeley and Broom (1946) who had collected it in Devonshire and Wiltshire. Hawker (1954) gives some localities in Herfordshire, Caernarvonshire, and Perthshire. Szemeré (1965), quotes a few sites in Hungary, and Schwärrzel (1969) in Switzerland.

Hypothetical distribution. All Europe in the range of deciduous forests shedding their leaves in winter and in the zone of boreal coniferous forests in areas with a maritime or sub-maritime climate. Also at the forest level of Alps, Carpathians, and the Scandinavian Mtns. Avoiding regions with a dry summer, with the preference of maritime climate. The density of



localities distinctly increases nearby the Baltic, North and Norwegian Seas (Fig. 19).

Habitat. Occurring in deciduous and mixed forests, under *Quercus*, *Carpinus betulus*, *Fagus sylvatica*, *Tilia*, *Betula*, and others, less frequently in coniferous forests. In the Tatra Mts in pure stand spruce forests on the lime subsoil. Appearing in rather exposed sites with a scant undergrowth, sometimes with no litter cover, in soil with pH 4.5-5, here and there covered by moss turfs. The fruitbodies, usually numerous, formed not deep under the soil surface or, in part, epigeically. They can be found in much frequented, even intensively trodden places, along roads and wood footpaths as well as in patches with litter cover raked away, but more rarely inside the wood or forest with a normally developed undergrowth and outspread litter cover. Occurring together with *Elaphomyces granulatus*, *E. asperulus*, *E. muricatus*, and also *Genea hispidula*,



Barssia oregonensis, certain species of *Tuber* and of the hypogeous *Basidiomycetes*.

Distribution in Poland (Fig. 20). One of the most common hypogeous fungi throughout the entire country. Poland is situated in the centre of its occurrence range, and the density of known localities just reflects the intensity of exploration. The localities known from the literature, such as Caspary (1886) from the Mazurian Lakeland, Eichler (1904) from Podlasie, and Zyber (1979) from environs of Szczecinek, have not been carted because of the lack of herbarium material. They may serve as a hint at further exploration.

Localities in Poland. Pobreże Bałtyckie – AB 93 Puszcza Bukowa Res. Bukowe Zdroje, Pa Ps Cb Qrp, 06.74: MŁ, LOD 20872. – Pojezierze Wschodniopomorskie – CB 17 Bukowe Pole n. Nowy Barkoczyn, Fs, 07.73: MŁ LOD 20871. Pradolii-

na Toruńsko-Eberswaldzka — DD 07 Zdwońsk FI Łąck, Qrp Cb, 07.79: MŁ, LOD 20937; — DC 73 Włocławek, Fs Qrp Cb Aps Fe, 09.79: RO, LOD 20870. Pojezierze Wielkopolskie — DD 02 Kujawy fr. Rogoźno, Fs, 09.79: RO, LOD 20869. Niziny Sasko-Łużyckie — AB 93 Mużaków on the Nysa Łużycka, 10.02: Herb. Sydow S. Nizina Południowowielkopolska — CD 79 Sokółów n. Koźminek, Ul Rp Qrp Fs, 10.78: MŁ & RO, LOD 20866; — CD 79 Jasionna n. Błaszki, Qrp Cb Ps, 08.79: KM, LOD 20844; — CE 28 Res. Ryś n. Lututów, Fs Qrp Bpp, 07.79: MŁ & RO, LOD 20841-43; — CE 36 Ustronie n. Kępno, Qrp Cb, 09.80: MŁ, LOD 20861; — DD 12 fr. Kobylatka FI Koło, Qrp Cb, 07.79: RO, LOD 20867; — DD 75 Łódź Park Ludowy, Qrp Bpp Cb, 07.82: KM & MK, LOD 20824-26; — DD 82 Res. Wojsławice n. Szadek, Cb, 10.81: MŁ, LOD 20838; — DD 92 env. of Res. Jodły Oleśnickie, Ps, 07.82: MK, LOD 20845; — DE 34 fr. Wola Wydrzyna n. Szczerców, Cb TC, 09.79 & 08.80: MŁ & RO, LOD 20836-37. Nizina Śląska — CF 02 Wierzbie n. Niemodlin, 07.1885: Herb. Schroet. WRSL; — CF 03 Goszczowice n. Niemodlin, 07.1886: Herb. Schroet. WRSL; — CF 12 Korfantów, 07.1884: Herb. Schroet. WRSL; — CF 13 Brzeźnica n. Prudnik, 07.1982: Herb. Schroet. WRSL; — DE 90 Lubliniec, 07.1888: Herb. Schroet. WRSL. — Nizina Środkowomazowiecka — ED 22 Piasecznica n. Sochaczew, Cb, 07.81: RO, LOD 20857, — Teresin n. Szymanów, Cb, 08.81: RO, LOD 20924. Wzniesienia Południowomazowieckie — DD 56 fr. Szczawin FI Grotniki, Cb Qrp, J. Józefowicz, LOD 20829; — DD 69 Łódź Las Łagiewniki, Qrp, 08.80: A. Czerniecki, LOD 20827; — DD 67 fr. Janinów n. Brzeziny, Fs, 08.74: E. Najmanowicz, LOD 20833; — DD 77 fr. Wiączyń, Fs Cb, 06, 07 & 10.74, 75 & 78: MŁ & KM, LOD 20830-31; — DD 87 Justynów n. Łódź, Qrp Ps Cb Fs Bpp, 08.80: MŁ, LOD 20835, — Janówka n. Justynów, Fs Qrp Cb, 08.82: L. Samosiej, LOD 20834; — DD 96 Res. Wolbórka n. Łódź, Ps Ag, 08.74: MŁ, LOD 20828; — DE 19 Res. Lubiaszów, TC, 08 & 09.72: G. Drzeń & B. Rzerzycha, LOD 20858-60; — ED 62 Res. Babsk, Qrp Cb, 06 & 07.80, KM, LOD 20846-47; — ED 71 Podlas n. Rawa Mazowiecka, Ps Qrp, 08.81: RO, LOD 20851; — ED 74 Res. Trębaczew, 07 & 08.69, 70 & 72: MŁ, LOD 20852-56; — ED 75 fr. Górki n. Mogielnica, Qrp, 06.72: MŁ, LOD 20865; — ED 84 fr. Brzostowiec FI Grójec, Qrp, 06.72: MŁ, LOD 20864; — ED 91 Res. Spała, Cb Qrp Ps TC, 08.80: MŁ & RO, LOD 20848; — ED 91 Res. Konewka, Qrp Fs PaQ, 08.81 & 82: RO, LOD 20849-50 & 20919. Przedgórze Sudeckie — BE 75 Świdnica, 07.1881: Herb. Schroet. WRSL; — BE 76 Mt. Ślęza n. Wrocław, 06.1881: Herb. Schroet. WRSL; BE 98 Res. Muszkowicki Las Bukowy, Fs, 06.82: RO, LOD 20925. Pogórze Zachodniosudeckie — AE 34 Zgorzelec, 05 & 08.42: M 1572 & 1851. Sudety Zachodnie — AE 66 env. of Czerniawa Zdrój, Pa, 07.22: H. Sydow, *Mycotheca germanica* 1958 [sub nom. *H. carnea* (Corda) Zo-

bel f. *intermedia* Buch.] K, L, M, S, W; — AE 78 Waterfall of the Kamięńczyk n. Szklarska Poręba, Rabenhorst, Herb. Mycol. & KRA, Schroet. WRSL, K, L, PAV, S; — BE 80 env. of Karpacz, Pa 08.22: H. Sydow, *Mycotheca germanica* 1959 [sub nom. *H. carnea* (Corda) Zobel f. *intermedia* Buch.] K, L, M, S, W. Wyżyna Woźnicko-Wieluńska — DE 40 f.r. Mierzyce, Qrp Fs, 07.82: MK, LOD 20839-40. Wyżyna Krakowsko-Częstochowska — DE 95 Złoty Potok Res. Parkowe, Fs, 09.82: RO, LOD 21112; — DF 37 env. of Jaroszewiec n. Olkusz, Fs Ca, 08.61: WW, KRA; — DF 48 OjNP env. of Smardzowice, TC, 08.61: WW, KRA. Wyżyna Przedborska — DE 58 Mt. Chełmo, Qrp Cb, 08.79: MŁ, LOD 20868; — DE 68 Res. Dębowiec n. Maluszyn, Cb Qrp TC, 08 & 09.69 & 70: MŁ, LOD 20862-63; — DF 08 f.r. Gąszczce FI Szczekociny, Qrp Ca, 09.82: RO, LOD 21110-11. Wyżyna Kielecko-Sandomierska — EE 66 Święta Katarzyna n. Kielce, Fs, 07.75: MŁ, LOD 21113; — EE 78 Mt. Chełmowa, Qrp, 08.63: Z. Domański, WA 014191. Pogórze Zachodniobeskidzkie — EF 81 Czaślaw n. Myślenice, 08.12: K. Rouppert, KRAM 2471. Tatry — EG 40 Murzasichle n. Zakopane 850 m alt., 08.71: L. Plewicky, KRAM 15821; — EG 50 Olczyńska Dale (Dolina O.), Pa, 07.82: AS & MŁ, LOD 20917-18. Nizina Północnopodlaska — GC 55 BiNP, Tc, 10.81: MŁ, LOD 21132.

7.2. *Hydnotria ploettneriana* (Henn.) Hawker

Distribution in Europe (Fig. 21). Rare. The herbarium material comes from a few localities. In the Central-European Lowland it occurs in the Brandenburg (Berlin Rathenow), German Highland (environs of Dresden and Leipzig in Saxony, Elsterberg in the Erz Mtns), and the tectonic foreland of Alps (Stechau n. Munich). Besides, it is known from environs of Cambridge and some other places in England reported by Hawker (1954), and from Strovrata n. Uppsala in central Sweden.

Hypothetical distribution. C and W Europe, N from the Alps and Carpathian Mtns, the British Isles, and southern Scandinavia. A lowland-upland species but absent from mountains.

Habitat. Under coniferous trees such as *Picea abies*, *Pinus sylvestris* and *Pseudotsuga taxifolia*, in sandy soils, usually quite deep under the soil surface.

Distribution in Poland. Not yet discovered.

7.3. *Hydnotria michaelis* (Fischer) Trappe

Distribution in Europe (Fig. 21). Very rare. Only a few localities are known in the zone of uplands and ancient mountains of C Europe: environs of Karl-Marx-Stadt. Dessau on the Elbe, Schlesingen in

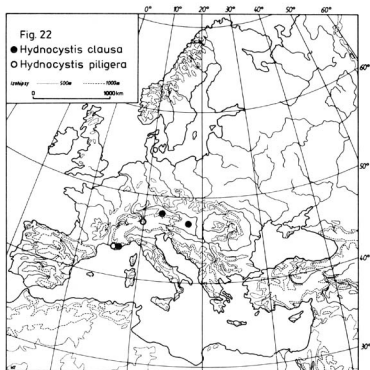
7.4. *Hydnotrya suevica* (Soehner) Trappe

Distribution in Europe (Fig. 21). Very rare. A few localities exist in the Alps: Engadin (Switzerland) at ca 1000 m alt., Memmingen & Kaufbeuren (Swabia) and Tulfes Tal (Tirol), and in the E Tatra Mtns. Also reported by Szemere (1965) from Maroshéviz in the Carpathian Basin.

Hypothetical distribution. A mountain species: Alps and Carpathian Mtns.

Habitat. Under coniferous trees, in Poland in the *Piceetum montanum*; often on rubbles and on the granite.

Distribution in Poland (Fig. 20). Discovered by the author, when analysing the herbarium material, as a species new for Poland: Tatry – EG 50 Rusinowa Glade (R. Polana) ca 1300 m alt., 09.72: H. Blaszczyk, KRAM 13620; – DG 59 Olczyska Dale (Dolina O.) ca 950 m alt. Pa, 09.83: LOD 21135.



8. CHOROLOGY OF SPECIES OF HYDNOCYSTIS, *GENEA*, AND *GENABEA*8.1. *Hydnocystis clausa* (Tul.) Ceruti

Distribution in Europe (Fig. 22). A very rare species. In the herbaria, it has been possible to seek out the specimens from three localities only: Hyeres n. Nice and Sonntagsberg n. Salzburg (rims of the Alps), and Veszprem (Hungarian Highland).

Hypothetical distribution. C, S and W Europe; regions with warm, humid climate.

Habitat. The specimens were collected under *Quercus cerris*, *Cistus* and *Helianthemum*, in rinsed sandy soils.

Distribution in Poland. Not discovered.

8.2. *Hydnocystis piligera* Tul.

Distribution in Europe (Fig. 22). One of the most rare species of hypogeous fungi. The herbarium material comes only from two Alpine localities. Feldkirch (Austria) and Hyeres n. Nice (France). From the literature still one distant site is known: the park at Pleskov in the Moscow guberniya (province) (B u c h o l t z, 1902). The lack of herbarium specimens unables to clarify whether the species was determined correctly.

Hypothetical distribution. Probably the range is as in the case of *H. clausa*.

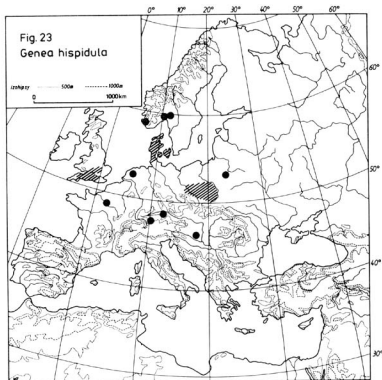
Habitat. In upland deciduous forests, under the litter cover.

Distribution in Poland. Not discovered.

8.3. *Genea hispidula* (Berk. et Br.) Tul.

Distribution in Europe (Fig. 23). The species is widely distributed, frequent, and in places even common. The condensation of known localities is reflecting the intensity of exploration in Denmark, Poland, and also in the U.K., where *G. hispidula* is annotated from several sites to be probably one of the most common British species (H a w k e r, 1954). Besides, individual localities are known from southern Norway (environs of Oslo and Eigersund), the Netherlands (Garderen and Baarn), France (env. of Paris), the tectonic foreland of Alps (env. of Munich) and the Alps themselves (Allgau), and the Hungarian Highland (Somogy); the Polish locality at Białowieża is the most easterly in Europe, but very likely still does not determine the range border.

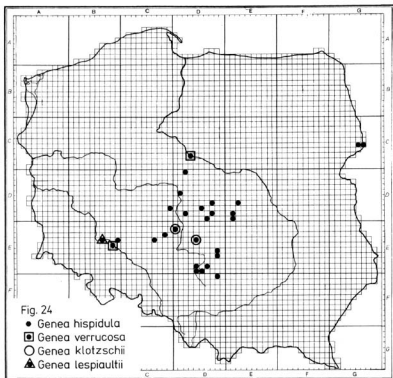
Hypothetical distribution. C & W Europe and southern Scandinavia in the deciduous forest zone of temperate climate.



Habitat. Under *Carpinus betulus*, *Corylus avellana*, *Fagus sylvatica*, *Betula*, *Tilia*, etc., in deciduous and mixed forests, usually in the humus layer not deep under the soil surface.

Distribution in Poland (Fig. 24). On the map only the present state of exploration is shown. In fact it is one of the most frequently appearing hypogeous fungi in Poland, but difficult to be observed because of its small size.

Localities in Poland. Pojezierze Wielkopolskie – DD 02 Kujawy f.r. Rogoźno, Qrp Sa, 09.79: RO, LOD 20529. Nizina Południowowielkopolska – DD 79 Sokółów n. Koźminek, Qrp Fs, 10.78: ME, LOD 20520; – CE 28 Res. Rys n. Lututów, Cb Fs Pa Aa, 10.79 & 09.80: RO & ME, LOD 20530 & 20542; – CE 36 Ustronie n. Kępno, Tc, 09.80: ME, LOD 20540; – DD 41 f.r. Wielenin n. Uniejów, Qrp

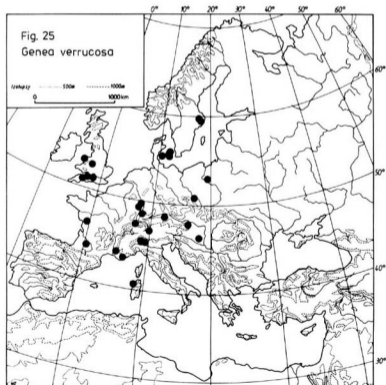


Cb Ps, 10.78: MŁ, LOD 20525; – DD 75 Łódź Park Ludowy, Qrp Cb Bpp, 10.78: MŁ & KM, LOD 20524; – DD 82 f.r. Wojślawice n. Szadek, Qrp Aa, 10.79 & 81: MŁ & KM, LOD 20533 & 20911; – DE 10 Res. Komarówka n. Złoczew, Pt, 10. 80: MŁ & RO, LOD 20541; – DE 34 f.r. Wola Wydrzyna n. Szczerców, Cb, 10.80: MŁ, LOD 20539. Nizina Śląska – BE 39 Wrocław Rędzin, 09.1980: Herb. Schroet. WRSL. Wzniesienia Południowomazowieckie – DD 67 f.r. Janinów n. Brzeziny, Fs Cb Ps, 10.78: MŁ, LOD 20521-23 & 20527-28; – DD 87 Justynów n. Łódź, Fs Qrp, 08.80: A. Ławrynowicz, LOD 20906; – DD 96 Res. Molenda, Qrp Cb Pa Fs Aa, 10.79: MŁ, LOD 20535-37; – ED 62 Res. Bąbsk, Qrp, 09.80: KM, LOD 20538; ED 81 f.r. Wielka Wola FI Spała, Ps Qrp, 08.81: RO, LOD 20546; – ED 91 f.r. Konewka, Qrp Ul, 10.78 & 09.81: MŁ & RO, LOD 20526, 20544 & 20907. Wyżyna Krakowsko-Częstochowska – DE 84 Mirów – Hektary, Qrp, 08.81: MŁ, LOD 20545; – DE 94 Res. Sokole Góry

n. Olsztyn, Fs Cb, 09.81: MŁ, LOD 20552; – DE 95 – Złoty Potok, Fs, 09.82: MK, LOD 21108. Wyżyna Przedborska – DE 58 Res. Góra Chelmo, Cb Pt, 08.79: MŁ, LOD 20532; – DE 68 Res. Dębowiec n. Maluszyn, TC, Tc Cb Qrp Aps Ps, 08.79: MŁ, LOD 20531; – DE 86 f.r. Knieja n. Święta Anna, Qrp Bpp Cb Pa, 10.79: MŁ, LOD 20534; – DF 08 f.r. Gąszcze FI Szczekociny, Cb, 09.82: MŁ, LOD 21109. Nizina Północnopodlaska – GC 55 BiNP, Tc, 10.81: MŁ, LOD 20912.

8.4. *Genea verrucosa* Vitt.

Distribution in Europe (Fig. 25). Quite frequent throughout Europe from Stockholm to Sardinia, but on single stands. In lowlands, more rarely in low mountain sites in the cool, temperate climate zone. No



herbarium data from E Europe; reported by Bucholtz (1902) from the village Mikhailovskoe n. Moscow. According to Knapp (1950) it is the most frequent hypogeous fungus in Switzerland in beech forests on the lime subsoil. By Hawker (1954) considered as quite frequent in England and cited from Wiltshire, Shropshire, environs of Bristol, Caernarvonshire, and Somersetshire. Quoted by Szemere (1965) from three localities in Hungary, and by Hesse (1894) from Hessen-Nassau, Hannover, environs of Kassel, and Kirchditmold in Germany.

Hypothetical distribution. Throughout Europe, except for the northern, steppe, and high mountain areas. A stenothermal species, also appearing in the Mediterranean climate.

Habitat. Under *Quercus*, *Fagus sylvatica*, and *Corylus avellana*, often on the lime subsoil, in loams rich in humus.

Distribution in Poland (Fig. 24). The herbarium material gives two localities: Pradolina Toruńsko-Eberswaldzka — DC 73 Res. Szpetal n. Wloclawek, Cb Fs Fe Qrp Aps, 09.79: RO, LOD 20910. Nizina Śląska — BE 48 Wrocław — Kozanów, 08.1890: Herb. Schroet. WRSL.

8.5. *Genea sphaerica* Tul.

Distribution in Europe (Fig. 26). Fairly rare; mainly in C and W Europe. Herbarium material comes from a few localities nearby Paris and Munich, individual sites in south-western France (Nérac in Aquitaine), eastern France (Côte d'Or), Bavaria (environs of Würzburg), and western Bohemia (Černošín). Southwards from the Alps, it occurs in Tuscany. A few localities are in England: close to Bristol, Wotton-under-Egge & Dursley, and in Gloucestershire (Hawker 1954). Also reported from Switzerland by Knapp (1950). A lowland-upland species.

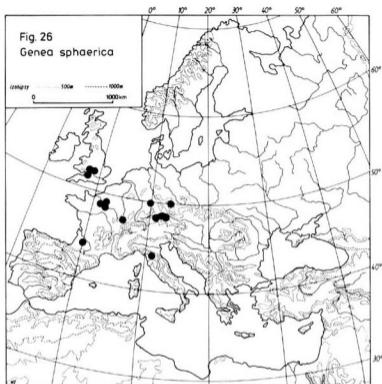
Hypothetical distribution. Lowlands and uplands of C & W Europe, and low mountain sites in S Europe. A stenothermal species connected with the temperate and submediterranean climatic zone of deciduous forests.

Habitat. Under *Quercus*, *Fagus sylvatica*, and *Picea abies*. Often on the lime subsoil, in soil with the litter cover.

Distribution in Poland: Not yet discovered.

8.6. *Genea klotzschii* Berk. et Br.

Distribution in Europe (Fig. 27). Rarely in lowlands and tectonic forelands of Europe from northern Italy (Florence, Forli & Como) and southern France (Apt in Provence) to the British Isles (Gloucestershire) and

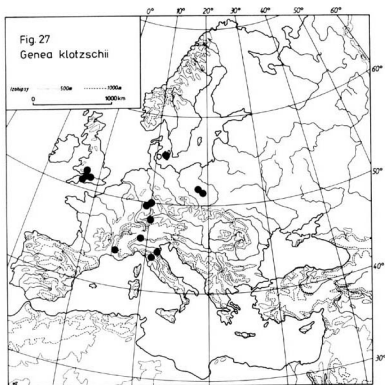


Denmark (Zealand). Only nearby Würzburg there is a concentration of three localities, besides its sites are individual and scarce everywhere. The most easterly localities are in central Poland. Also reported from Hungary (S z e m e r e, 1965) and England: environs of Bristol, Wiltshire, Somersetshire, and Surrey (H a w k e r, 1954).

Hypothetical distribution. C, W and S Europe, within borders of warm and wet zone of temperate climate. In lowlands found only exceptionally in regions of the last glaciation; rare in mountainous areas. A stenothermal, subatlantic and submediterranean species.

Habitat. Under *Quercus*, *Betula*, *Fagus sylvatica*, and *Carpinus betulus*; in loams in the humus layer.

Distribution in Poland (Fig. 24). Only twice collected till now: Nizina Południowowielkopolska – DE 10 fr.

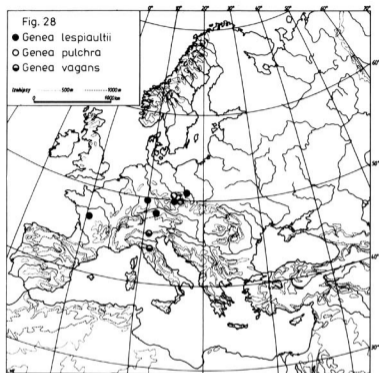


Pyszków n. Złoczew, Qrp Cb, 10.80: ML, LOD 20209; — DE 34 f.r. Wola Wydrzyna n. Szczerców, Cb Qrp Bpp, 09.79: RO, LOD 20908.

8.7. *Genea lespiaultii* Corda

Distribution in Europe (Fig. 28). The herbarium material gives very few localities confined to the upland and tectonic foreland zone in C and W Europe: environs of Wrocław, Prague, Munich, Würzburg, and the Vienne department in western France. Also reported by Szemere (1965) from Hungary.

Hypothetical distribution. Probably the species range contains all nemoral zone of Europe.



Distribution in Poland (Fig. 24). Known from one locality: Nizina Śląska – BE 36 Piskorzowice n. Środa Śląska, 08.1890: Herb. Schroet. WRSŁ. Remark: The locality given on a hand-written herbarium label had probably been erroneously read and cited by Fischer (1897), p. 25: "Peisterwitz bei Neumarkt (Schlesien) im August (Herb. Schroet.). According to the personal analysis of the author the locality name reads: "Neumarkt: Peiskerwitz", i.e. Środa Śląska: Piskorzowice (Peisterwitz means Bystrzyca n. Oława). Szemere quotes the species from Germany probably on the basis of Fischer's work.

8.8. *Genea pulchra* Corda

Distribution in Europe (Fig. 28). Currently known only from Prague and Srbsko in Bohemia.

Distribution in Poland. Not discovered; further exploration needed.

8.9. *Genea vagans* Matt.

Distribution in Europe (Fig. 28). Till now known from northern Italy: Vallombrosa np. Florence and Trent in the Dolomite Mtns. Reported by Bucholtz (1902) from Mikhailovskoe n. Moscow. The site, distant and different in its habitat from the others, has not been carted because of the lack of herbarium material and a possibility to verify the determination.

Habitat. Probably connected with the lime subsoil; in the both carted localities it occurs in mountains consisting of carbonate rocks. Bucholtz (*l.c.*) collected his species under *Populus tremula* and *Betula* in riverside areas.

Distribution in Poland. Not discovered.

8.10. *Genabea fragilis* Tul.; *G. spaerospora* Matt.; *G. cerebriformis* (Harkn.) Trappe

Distribution in Europe. The genus cannot be carted because of a very scant herbarium material referring to single localities, often unreliable.

Genabea fragilis — only one locality. Nérac in Aquitaine (south-western France).

G. spaerospora — no locality documented by herbarium material; reported from Italy (Vallombrosa n. Florence) and France (Szemere, 1965).

G. cerebriformis — only one locality: Basle in the northern foreland of the Swiss Jura.

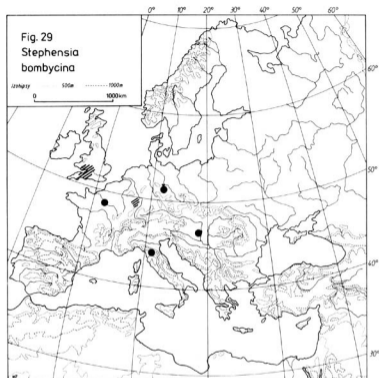
Distribution in Poland. Not discovered.

9. CHOROLOGY OF *STEPHENSIA BOMBYCINA* (VITT.) TUL.

Distribution in Europe (Fig. 29). Rare, but widely distributed throughout W and C Europe. Some localities in the Saar region and southern England, in environs of Paris, Florence & Leipzig (Weißenfels), and in the Hungarian Highland (Szekszard). Schwärzel (1969) reported his collecting in 17 sites nearby Basle in Switzerland.

Hypothetical distribution. A lowland-upland species of the nemoral zone of W and C Europe, usually on the carbonate subsoil.

Habitat. Collected under various tree and shrub species: *Fagus sylvatica*, *Carpinus betulus*, *Abies alba*, *Picea abies*, *Corylus avellana* & *Sambucus nigra*, and also between roots of *Impatiens noli-tangere*. The fruitbodies usually not deep under the surface, exceptionally at 5 m.

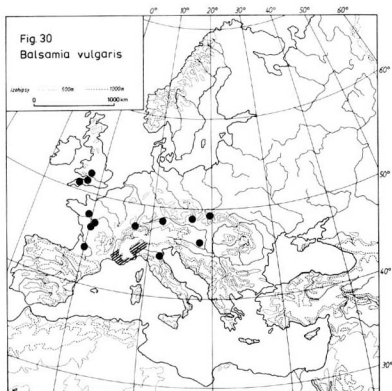


Distribution in Poland. Not yet discovered; further exploration needed.

10. CHOROLOGY OF SPECIES OF *BALSAMIA*

10.1. *Balsamia vulgaris* Vitt.

Distribution in Europe (Fig. 30). Quite often in S, W and C Europe, but the most of data (exsiccata) comes from the last century. Numerous localities are in Piedmont and rims of the seaside Alps, single ones in Aquitaine (Nérac) along the lower Loire river and in the Vienne department, in the Po valley (Faenza), and besides nearby Basle & Munich, in Moravia (Zarošín), the Hungarian Highland (Somogy), and the Tatra Mtns. Some

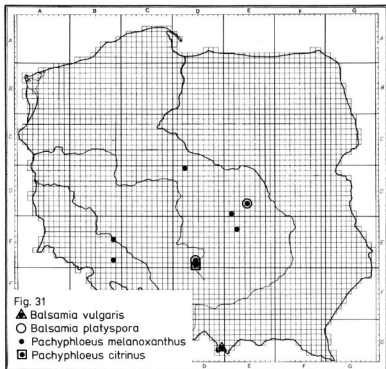


further sites are in Hungary (S z e m e r e, 1965) and England: in Devonshire, environs of Bristol, and at Cotswold Hills in Gloucestershire (H a w k e r, 1954).

Hypothetical distribution. Southern part of the nemoral zone and all submediterranean zone of Europe with the preference of S Europe, in lowlands and at forest level of mountains.

Habitat. Under *Pinus*, *Picea*, *Populus*, *Acer*, *Ulmus* & *Philadelphus*, and also between roots of *Urtica*. The fruitbodies formed in soil rich in humus just under the litter cover.

Distribution in Poland (Fig. 31). Known from one locality: Tatry – DG 59 Mała Łąka Dale (Dolina Malej Łąki), Pa, 08.11, K. Rouppert, KRAM 2469.

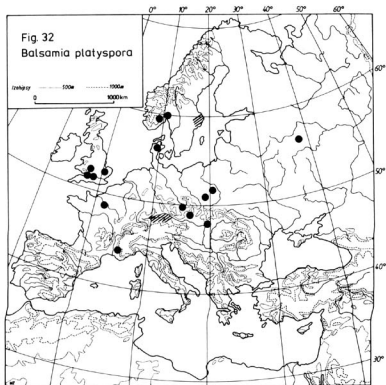


10.2. *Balsamia platyspora* Berk. et Br.

Distribution in Europe (Fig. 32). Not too often, but widely distributed: from the vicinity of Moscow (Mikhailovskoe) to the British Isles and from Oslo & Stockholm to the south of France (Apt). Numerous localities are confined to the tectonic foreland of Alps (nearby Munich and in Swabia), apart from that area they are scattered within C Europe. The most common species among *Balsamia*.

Hypothetical distribution. All Europe except the extreme north and south. The range centre in lowlands, in the deciduous and mixed forest zone; towards the north the range encroaches also upon low mountain sites.

Habitat. Under *Fagus sylvatica*, *Carpinus betulus*, *Quercus* and *Alnus glutinosa*, in places with a scant undergrowth. Not deep under the soil surface

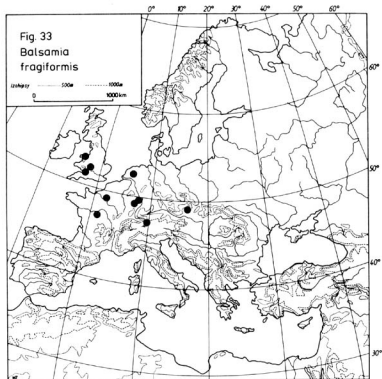


which is, in general, bald, without the litter cover. Often together with *Hymenogaster*.

Distribution in Poland (Fig. 31). Currently known from two localities: Wzniesienia Południowomazowieckie – ED 54 fr. Skuły Wschód, Cb Ag, 09.81: RO, LOD 20928-29. Wyżyna Krakowsko-Częstochowska – DE 84 Res. Zielona Góra, Cb, 08.81: MŁ, LOD 20930.

10.3. *Balsamia fragiformis* Tul.

Distribution in Europe (Fig. 33). Rarely in C and W Europe. Some localities are in the Saar region, England (H a w k e r, 1954), and Moravia (Zarošice); individual ones in France (environs of Paris and



Camille in the Indre et Loire department) and The Netherlands (Wilp in the Gelderland province).

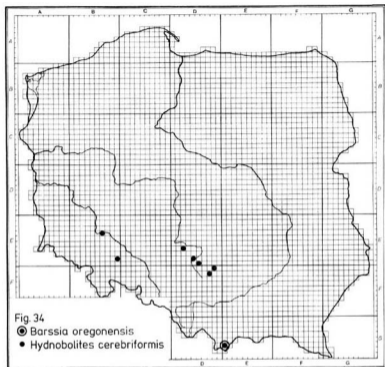
Hypothetical distribution. All nemoral zone of Europe, in lowlands and low mountain sites.

Distribution in Poland. Not yet discovered; further exploration needed.

11. CHOROLOGY OF *BARSSIA OREGONENSIS* GILK.

Distribution in Europe: Unknown in Europe until its discovery in the Tatra Mtns (Lawrynowicz, Skirgiello, 1984).

Habitat: Under *Picea abies*, at ca 950 m alt., on the lime subsoil in loam with pH 6-6.5, much soaked in trickling water, in a well insulated site exposed towards the east.

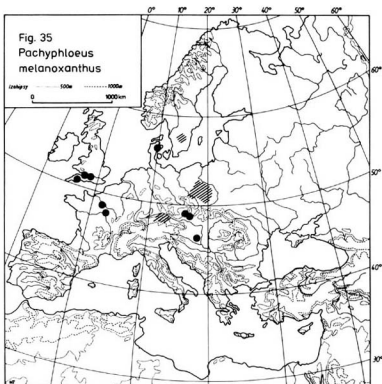


Distribution in Poland (Fig. 34). Tatry – DG 59 Olczyńska Dale (Dolina O.), Pa, 08.81 and 82; K. and T. Sałata, BS, As and MŁ, LOD 20612 and 21133.

12. CHOROLOGY OF SPECIES OF *PACHYPHLOEUS*

12.1. *Pachyphloeus melanoxanthus* Tul.

Distribution in Europe (Fig. 35). Rather rare in C and N Europe, a bigger condensation of localities in England (H a w k e r, 1954), in central and south-western Poland, in the south of Bavaria (close to Munich & Mühldorf), and southern Sweden (Småland); cf. K e r s (1981). Individual localities appear in France (Meudon n. Paris and Gien on the Loire; collections



Brno), Hungary (Somogy), and Norway (Bodó), the latter being the most northern site, at 67°N, beyond the arctic circle.

Hypothetical distribution. All Europe, within borders of temperate maritime transition climate. Almost absent from dry regions. No data exists for areas southwards from the Alps.

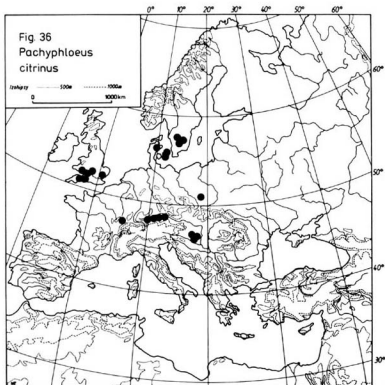
Habitat. In deciduous forests, under *Carpinus betulus*, *Fagus sylvatica*, and *Quercus*, in exposed places with a scant undergrowth. Not deeply in soil; sometimes the top of a fruitbody may stick out of its surface.

Distribution in Poland (Fig. 31). The most common species of *Pachyphloeus*, currently known from seven localities: Pojezierze Wielkopolskie – DD 02 Rogoźno, Qrp Sa, 09.79: RO, LOD 20933. Nizina Śląska – BE 48 Wrocław Pilczyce, 07.1880: Herb. Schroet. WRSL. Wzniesienia Południowomazowie-

ckie – ED 74 Res. Trębaczew, Cb PaQ, 08.70: MŁ, LOD 20934; – ED 91 Res. Konewka n. Spała, Cb Qrp PaQ, 09.81: RO, LOD 20932. Przedgórze Sudeckie – BE 89 Górzec n. Strzelin, 07.1890: Herb. Schroet. WRSL. Wyżyna Krakowsko-Częstochowska – DE 84 Mirów – Hektary, Qrp, 08.81: MŁ, LOD 20936. Wyżyna Przedborska – EE 22 Res. Białaczów n. Opoczno, Cb, 08.82: MŁ, LOD 20935.

12.2. *Pachyphloeus citrinus* Berk. et Br.

Distribution in Poland (Fig. 36). In lowlands of C and W Europe, fairly rare. Some condensation of localities is observed in England (Hawker, 1954), FRG (nearby Munich and in Swabia), southern Sweden (Småland and Västergötland) – cf. Kers (1981), and in Hungary (the



Carpathian Basin). Single exsiccata come from Denmark, southern Poland, and France.

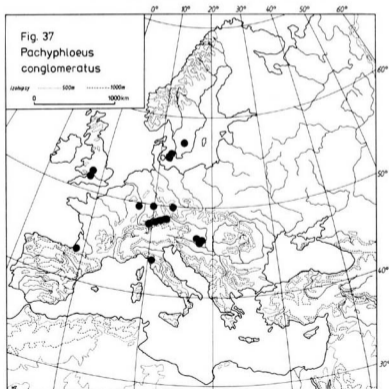
Hypothetical distribution. The nemoral zone of Europe, in temperate maritime and transition climate. A lowland-upland species.

Habitat: In deciduous forests, under *Quercus*, *Fagus sylvatica*, *Carpinus betulus*, *Corylus avellana*, *Salix*, and *Crataegus*; under abundant litter cover.

Distribution in Poland (Fig. 31). Currently known from one locality: Wyżyna Krakowsko-Częstochowska – DE 95 Res. Sokole Góry n. Olsztyn, Fs, 09.8!; MŁ, LOD 20931.

12.3. *Pachyphloeus conglomeratus* Vitt.

Distribution in Europe (Fig. 37). Rather rarely in W Europe from southern Sweden (Småland) – cf. Kers (1981), Denmark, and



England (Hawker, 1954) to the south of France (Landes) and northern Italy (Lucca). Individual localities in the Bohemian and German Highlands; more exsiccata originate from the tectonic foreland of Alps (Svabia and Bavaria) and from the Carpathian Basin.

Hypothetical distribution: The nemoral and submediterranean zones of Europe, within borders of temperate warm and maritime climate.

Habitat. In deciduous forests, under *Carpinus betulus*, *Fagus sylvatica*, and *Quercus*, in compact soils with no undergrowth, not deep under the surface.

Distribution in Poland. Not yet discovered.

13. CHOROLOGY OF SPECIES OF *TUBER*

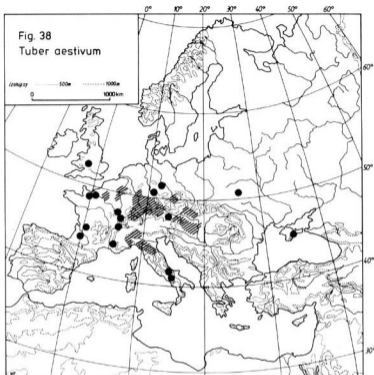
13.1. *Tuber aestivum* Vitt.

Distribution in Europe (Fig. 38). According to herbarium material, the species is frequently found in areas round the Alps. Numerous localities are in northern Italy (Piedmont & Tuscany), in Bavaria and the Rhine countries, in Bohemia, Moravia, the Lower Austria, and the Hungarian Highland. In the south it grows only in the mountains (Avellino n. Naples, southern Appenine Mtns — "sylvis Sommii", and the Crimean Mtns). In the west and north it occurs only in lowlands: in England (among others in Herefordshire) and in all France. In the German Highlands it approaches Bernburg, far to the east it is reported from Rovno (Ukraine). The species is widely known from the literature, but since the range of that taxon is not uniquely interpreted, the analysis of its distribution had to be restricted to the examined exsiccata. Several ones, cited by Hawker (1954) from Gloucestershire, Somersetshire, environs of Bristol, Caernarvonshire, and Sussex in England are not marked on the map as that author included into them those belonging to *T. mesentericum*.

Hypothetical distribution. In lowlands and uplands of Europe, in the temperate warm and maritime climate, and submediterranean climate zones. Almost aut of regions with crystalline rock subsoils and glacial drifts (the localities shown on the map end at the borderline of the pleistocene glaciation range).

Habitat. Under *Quercus*, *Fagus sylvatica*, *Fraxinus*, *Corylus avellana*, and many other species of deciduous trees and shrubs. In the Lower Austria (the vicinity of Wiener Neustadt) occurring in pure stand pine forests (*Pinus nigra* var. *austriaca*), but, as everywhere, on the lime subsoil.

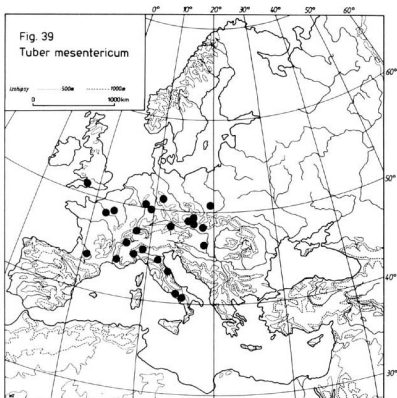
Distribution in Poland. There are numerous reports on localities in Poland, mostly dating back to the last century, but no one has been



confirmed when analysing the herbarium material. Not yet discovered. Exploration has to be focused on limy areas, chiefly in the Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland).

13.2. *Tuber mesentericum* Vitt.

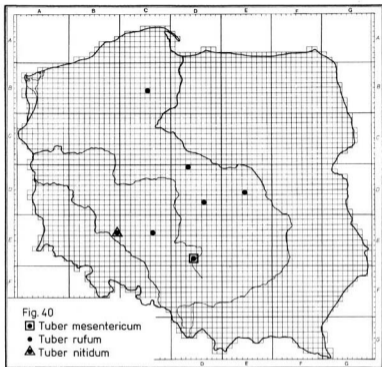
Distribution in Europe (Fig.39). More rare than *T. aestivum* everywhere, but similarly distributed: in C Europe without lowland regions in its northern part, W Europe, and the Appenine Peninsula. In the north approaching England (Wiltshire), Thuringia (Sondershausen), and southern Poland (environs of Częstochowa). No data exist from E Europe. In the literature often treated together with *T. aestivum*.



Hypothetical distribution. The temperate warm and transition maritime climate, and Mediterranean climate zones of Europe.

Habitat. Under *Quercus*, *Carpinus betulus*, *Fagus sylvatica*, *Betula*, and *Corylus avellana* on the lime subsoil. In exposed places with no litter cover and a very scant undergrowth, in soils with pH 7.5-8.

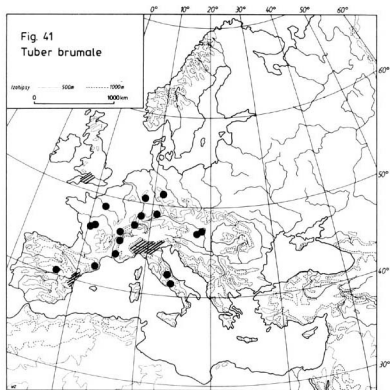
Distribution in Poland (Fig. 40). Cited by Hesse (1894) and Lubelska (1953), after German references, from the lower Vistula valley, but the lack of herbarium material refrains from marking that site on the map. Besides known from one locality: Wyżyna Krakowsko-Częstochowska – DE 84 Res. Zielona Góra, Cb, 08.81: ML & RO, LOD 20927.



13.3. *Tuber brumale* Vitt.

Distribution in Europe (Fig. 41). In the light of herbarium material, the species is fairly frequent in W and S Europe, particularly in France and Italy. Known from numerous localities in Piedmont and Lombardy, both in the Plain of the Po and in the tectonic forelands of the Alps and Appenines. In the middle part of the Appenine Peninsula (Caserta & Norcia) and in the Iberian Peninsula (Centellas n. Barcelona) occurring (in comparison with the other regions) in higher mountain sites. In the north approaching 52°N (Somersetshire in England, Dillenburg and Sondershausen in Germany), in the east reaching as far as Budapest (Szentgal and Buda). Collected by H a w k e r (1954) at Stocke Bishop and nearby Bristol, and cited by her from Wiltshire, Somersetshire, and Dorsetshire.

Hypothetical distribution. S and W Europe, in the temperate warm and maritime climate, and Mediterranean climate zones. In S



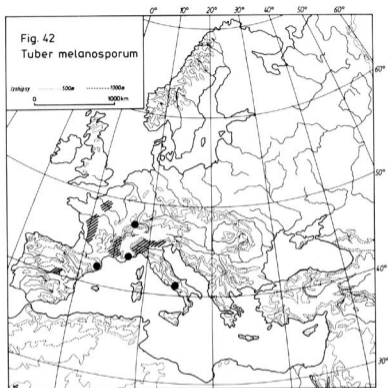
Europe in uplands and low mountain sites, in the west and south in lowlands only. Not entering the region affected by glaciation and covered with glaciation drifts.

Habitat. Under *Quercus*, *Fagus sylvatica*, *Tilia*, and other deciduous trees, in fertile soils containing the calcium carbonate, of a cloddy structure facilitating the access of air and water to their more distant layers. The fruitbodies found at the depth 20-40 cm.

Distribution in Poland. Not discovered.

13.4. *Tuber melanosporum* Vitt.

Distribution in Europe (Fig. 42). An abundant herbarium material comes from many localities in S and W Europe, chiefly from western



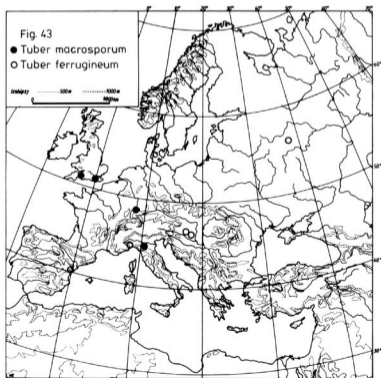
and southern France and northern Italy. Because of its agricultural importance, in many areas introduced to cultivation, which caused no expansion of its range. All known localities are situated between 40°N and 48°N, but rarely to the north from the Alps. In France the main region of its appearance lies between the Alps and the Massif Central complex and further west; also several times found nearby Paris. In the Iberian Peninsula occurring close to Guadalajara and in south-eastern Spain, at Centellas n. Barcelona. In the Appenine Peninsula mainly gathered in the Plain of the Po, in the tectonic forelands of the Alps, and in the S Appenine Mtns (Lombardy, Piedmont, and Liguria); till now the site at Caserta n. Naples is the most southerly in Europe.

Hypothetical distribution. When comparing with all other species of hypogeous fungi, the natural range of this truffle is probably the nearest to that obtained by listing and showing on the map all the

information about its appearance. The range contains all W and S Europe between 40°N and 48°N, with exception of the Alps, mountains consisting of crystalline massifs, and regions with sandy soils. Confined to the range of *Quercus pubescens*.

Habitat. Under the S-European oak species, as *Quercus ilex*, *Q. pubescens*, *Q. faginea*, *Q. coccifera* as well as *Q. robur* and *Q. petraea*, on the lime subsoil. Sites where that truffle grows are without vegetation and are called "scorched". The soil is of a cloddy structure securing the access of air and water to its more distant layers. The fruitbodies are formed at the depth 20-40 cm, at some distance from the tree trunks, usually corresponding their crown outlines, i.e. in the places where rain water flows down from leaves into the soil and where the daily darkness changes are maximized.

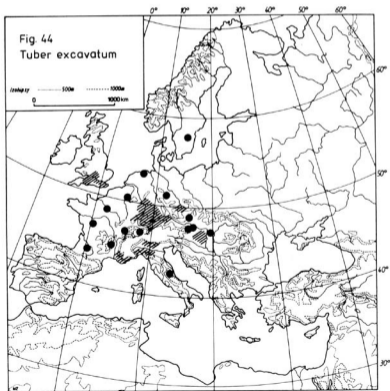
Distribution in Poland. Not discovered.



13.5. *Tuber macrosporum* Vitt.

Distribution in Europe (Fig. 43). Rare. The herbarium material comes from three localities only: in Somersetshire (England), at Rastadt on the Rhine and Castigliano n. Parma (Italy). In addition, the Kew herbarium (K) contains a specimen from Ukraine within no locality indicated. The species is somewhat more widely known from the literature. It is quoted by Hawker (1954) from the vicinities of Bristol and Elmhurst, and from Sussex. The specimen cited from Somersetshire is deposited in the Helsinki herbarium (H). Some localities are reported by Hesse (1894) from Germany and by Szemere (1965) from Hungary.

Hypothetical distribution. Probably all Europe within the temperate warm climatic zone, continental and maritime as well.



Habitat. Under *Quercus*, *Populus*, *Salix*, and *Castanea*, in the humus layer, not deep under the soil surface.

Distribution in Poland. Not yet discovered.

13.6. *Tuber excavatum* Vitt.

Distribution in Europe (Fig. 44). Common in W and C Europe, most of all on both sides of the Rhine, in rims of the Alps, and in the Carpathian Basin. In the north gathered in the Östergötland county of Sweden, on the North Sea-coast (Emden in the FRG), and in southern England. In the south found in the C Appenine Mtns (Fiesole in Abruzzi). Further localities exist in lowlands of France and Belgium, in Moravia, Bohemia, and the Lower Austria. Stated by **Hawker** (1954) to be fairly common in England and quoted from several localities as well as stated by **Szemere** (1965) to be frequent in the Carpathian Basin and cited from a number of sites there.

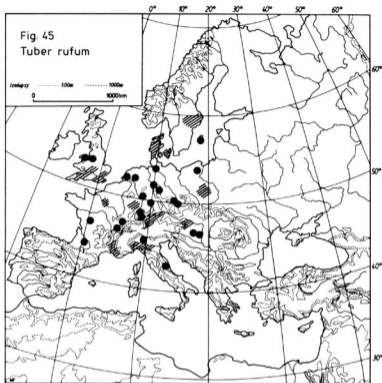
Hypothetical distribution. All Europe, within borders of the temperate and submediterranean climatic zones, more often in its warm strip than in the cool or transition ones. Always on the lime subsoil.

Habitat. Under *Quercus*, *Fagus sylvatica*, *Carpinus betulus*, *Corylus avellana*, and also *Pinus nigra*, on subsoils rich in the calcium carbonate. The fruitbodies just under the soil surface when found or, in part epigeically, as a rule in threes, dozens or so, side by side, often together with *Tuber aestivum*.

Distribution in Poland. Not yet discovered; further exploration in limy areas needed.

13.7. *Tuber rufum* Pico

Distribution in Europe (Fig. 45). Occurring frequently, here and there commonly, in a big part of Europe. Numerous localities known from southern Norway, central Sweden (environs of Stockholm, Uppland, Västmanland, and Gotland), Denmark, central Poland, Bavaria, the areas along the Saar and Lower Rhône Rivers, nearby Paris, and in Piedmont. Further many localities exist in England (Audley and Salisbury), western and south-western France (Civray in the Vienne department and Nérac in Aquitaine), in the C-European Lowland (among others environs of Rotterdam & Hamburg, and the Bory Tucholskie – Tuchola Coniferous Forests in northern Poland), in Bohemia and Hungary. The extreme site in the south appears at Ascoli in the C Appenine Mtns. No data exist as far as E Europe is concerned. The species is often quoted in the literature. Stated to be pretty common and known from numerous sites in England, Hungary and Germany by **Hawker** (1954), **Szemere** (1965) and **Hesse** (1894), respectively.



Hypothetical distribution. Throughout Europe in regions with a temperate or submediterranean climate. In lowlands and uplands; in mountains only in the southern part of its range.

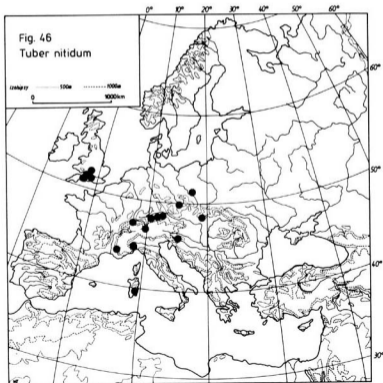
Habitat. Under *Quercus*, *Tilia*, *Corylus avellana*, *Fagus sylvatica*, and other species of deciduous trees; more rarely under the coniferous trees, as *Larix*. In the humus layer of light soils, often together with *Hymenogaster tener* and many other species of hypogeous fungi. Prefers places with bare soil, at roads and footpaths with removed litter cover, in woods and in habitat areas as well.

Distribution in Poland (Fig. 40). Currently known from five localities: Pojezierze Południowopomorskie – CB 55 Bory Tucholskie Żukowo, Ldp Qrp, 08.74: MŁ, LOD 20898. Pojezierze Wielkopolskie – DD 00 Kromszewice n. Chodecz, Aps TC,

07.82: RO, LOD 20926. Nizina Południowielkopolska – CE 36 Ustronie n. Kępno, Po Tc, 09.80: ML, LOD 20896. Wzniesienia Południowomazowieckie – DD 86 Łódź Matejki Str., Tc, 10.82: KM, LOD 20894-95; – ED 54 Skuły Wschód, Cb Ag, 09.81: RO, LOD 20897.

13.8. *Tuber nitidum* Vitt.

Distribution in Europe (Fig. 46). Rather rarely in C and S Europe, in localities scattered round the Alps (Piedmont, Apt, Basle, Feldkirch, and environs of Munich), in the W Carpathian Mtns (Preňčov in Slovakia), Bohemia (Karlštejn), and the Lower Silesia (vicinity of Wrocław). The Berkeley's specimen, dated 1843, comes from England (without indicated locality), and the Mattiolo's specimen from Sardinia. The species has



been quoted quite often in the literature: B u c h o l t z (1902) cited it from the village Mikhailovskoe n. Moscow, and H a w k e r (1954) from Bristol, Gloucestershire, Wiltshire, and Somersetshire in England. Some authors, like L a n g e (1956) and D e V r i e s (1971) treated the species as a synonym of *T. rufum*.

Hypothetical distribution. All Europe, within borders of the temperate warm and submediterranean climate, with the preference of mountainous forest layers.

Habitat. Under *Quercus*, *Fagus sylvatica*, *Fraxinus excelsior*, *Pinus*, and other deciduous and coniferous tree species.

Distribution in Poland. (Fig. 40). Currently known from one locality: Nizina Śląska BE 39 Wrocław — Rędzin, Herb. Schroet. WRSŁ & Herb. Sydow S.

13.9. *Tuber ferrugineum* Vitt.

Distribution in Europe (Fig. 43). The species meagrely represented by herbarium material; it seems to be rare, but was found in the same surrounding many times in various places a good many years (S z e m e r e, 1965). There are its abundant collections from the Komitat Somogy in the Hungarian Highland, from Piedmont, and from a distant Mikhailovskoe n. Moscow. Left out from many papers because of its susceptibility of various taxonomical interpretations (Ł a w r y n o w i c z, 1988).

Hypothetical distribution. Probably in all Europe, in the temperate and submediterranean climatic zones with an inclination to areas of continental rather than maritime climate.

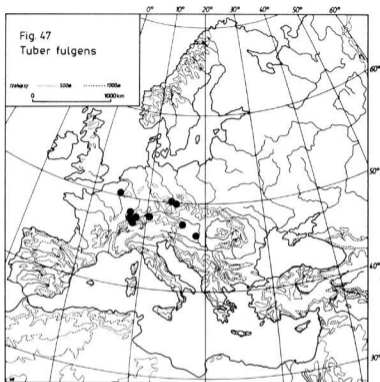
Habitat. Under *Quercus*, *Carpinus betulus*, *Fraxinus excelsior*, *Alnus*, *Populus*, and *Ulmus*, sometimes in wet places: collected by S z e m e r e (1965) nearby fish ponds.

Distribution in Poland: Not yet discovered.

13.10. *Tuber fulgens* Quél.

Distribution in Europe (Fig. 47). The herbarium material originates only from C Europe, where the species is rather rare. Found nearby the upper Rhine and Danube (Basle, Olten, Nenzlingen, the Vosges Mtns, and Planegg), in Belgium (Namur), Bohemia (vicinity of Prague & Zadni Kopanina), and in Hungary (Szekszard). By some authors considered as identical with *T. excavatum* or as its variety (Ł a w r y n o w i c z, 1988).

Hypothetical distribution. The nemoral zone of Europe with a temperate warm or transition climate.

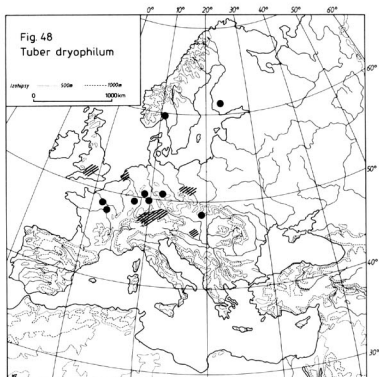


Habitat: Under *Quercus*, *Fagus sylvatica*, *Crataegus*, and other trees and shrubs on subsoils rich in the calcium carbonate.

Distribution in Poland. Not discovered.

13.11. *Tuber dryophilum* Tul.

Distribution in Europe (Fig. 48). Not too often in C, W and N Europe. In groups of a few localities in Bavaria and the tectonic foreland of the Alps (environs of Munich, Mühlendorf, Mindelheim, and Hirschleim), in Allgau and Vorarlberg, in the Lower Silesia, on the North Sea-coast (The Hague, Rotterdam & Renesse), and in the Hungarian Highland (Somogy). Besides found in the Paris Basin (Gien on the Loire and Meudon n. Paris, from where the first description dates), German Highlands (Eimersdorf on the Saar,

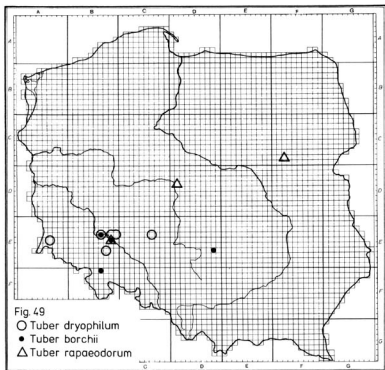


Würzburg, Brückenau & Treuen), and Slovakia (Prenčov). In the north occurring in southern Norway and Finland. Stated by Hawker (1954) to be fairly common in England and quoted from a number of sites there (nearby Bristol, Gloucestershire, Oxfordshire, and Wiltshire). In the mycological literature the taxonomical interpretation of this species is not unique (cf. Lawrynowicz, 1988).

Hypothetical distribution. Probably throughout Europe, within borders of the temperate climate, from seaside lowlands to forest layers of the Alps and Carpathians.

Habitat. Under various species, of trees and shrubs, chiefly in forests and woods, but also out of those habitats. Twice (in Finland and Bavaria) found in potato fields.

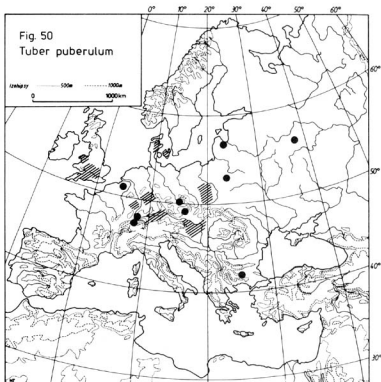
Distribution in Poland (Fig. 49). Until now found in south-western Poland.



Localities in Poland. Nizina Południow Wielkopolska – CE 36 Ustronie n. Kępno, Qrp Po, 08.90: ML, LOD 20880-81. Nizina Śląska – BE 36 Piskorzowice n. Środa Śląska, 07.1893: Herb. Schroet. WRSL; BE 38 Wrocław Osobowice, 08.1892: Herb. Schroet. WRSL & Herb. Sydow S; – BE 39 Wrocław – Rędzin, 09.1981: Herb. Schroet. WRSL; – BE 68 Pasterzyce n. Wrocław, 11.1892: Herb. Schroet. WRSL. Przedgórze Sudeckie – BE 67 env. of Sobótka n. Wrocław, 10.1895: Herb. Schroet. WRSL. Pogórze Zachodniosudeckie – AE 46 env. of Lubań Śląski, 09.1889: Herb. Schroet. WRSL.

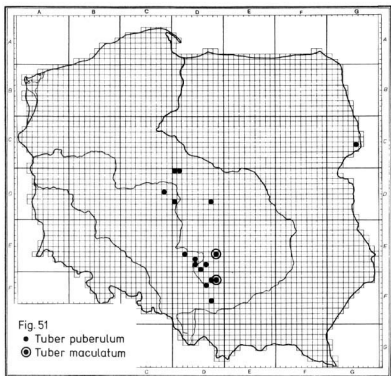
13.12. *Tuber puberulum* Berk. et Br.

Distribution in Europe (Fig. 50). Distributed widely, but not homogeneously, from western England to central Russia (Mikhailovskoe n. Moscow) and from the Baltic Sea-coasts (Denmark and Latvia – Kemerī n.



Riga) to the Rhodope Mtns (Zdravec n. Plovdiv). Big concentrations of localities exist in the western part of the Carpathian Basin, in central Poland, Bavaria, Franconia, Hessen, and Saarland. Individual localities are found in Belgium (environs of Antwerp), on the upper Rhine (env. of Basle and Schweningen on the Neckar), in Bohemia (Zadni Kopanina) and Moravia (Zarošice), on the Danube (env. of Vienna), and in the Puszcz Białowieża (Białowieża Primaevial Forest). According to H a w k e r (1954) it is the most common species of hypogeous fungi in England, widely distributed in the south; during her four-years exploration she has found it more than 100 times. Also S z e m e r e (1965) states it to be one of the most frequent hypogeous *Ascomycetes* in Hungary and ranks it with some species of *Elaphomyces*.

Hypothetical distribution. All Europe in the nemoral zone of temperate climate; a lowland-upland species which seems to avoid a warm climate.



Habitat. Under different species of trees and shrubs, in deciduous and mixed forests and woods as well as in grassy places and low peatbogs. The fruitbodies formed in fertile soils just under the litter cover or even in its deeper layers.

Distribution in Poland (Fig. 51). The most frequent species of *Tuber*, probably throughout the whole country in suitable habitats. The condensation of currently known localities seems rather to express the intensity of exploration than to show the real situation.

Localities in Poland, Pojezierze Wielkopolskie – DD 00 Res. Kawęczyńskie Brzęki n. Lubotyń, Cb TC, 10.78: MŁ, LOD 20885; – DD 02 Kujawy f.r. Rogoźno, Qrp, 09.79: RO, LOD 20564. Nizina Południowowielkopolska – CD 48 Piętno n. Turek, Tc Fe Ap, 10.78: MŁ, LOD 20565; – DD 60 f.r. Stefanowo n. Dobra, Pt Qrp Pa, 10.78: RO, LOD 20553; – DE 34 f.r. Wola Wydrzyna n. Szczerców, Cb Bpp Aa, 09.79 and

10.80: RO, MŁ and AS, LOD 20556 and 20562-63. Wzniesienia Południowomazowieckie DD 67 fr. Janinów n. Brzeziny, Fs, 11.73: E. Najmanowicz, LOD 20884. Wyżyna Woźnicko-Wieluńska — DE 62 Miedzno n. Kłobuck, Qrp Ps, 04.79: MŁ, LOD 20555. Wyżyna Krakowsko-Częstochowska — DE 74 Jaskrów, Qrp Fs Bpp, 10.79: MŁ, LOD 20557-59; — DE 84 Res. Zielona Góra, Cb, 09.82: W. Maliński, LOD 21115; — DE 95 Res. Sokole Góry n. Olsztyn, Fs Cb, 09.81: MŁ, LOD 20566; — DF 17 Sierbowice — Pradła, Fs, 09.82: MŁ, LOD 20886; — DF 26 Rodaki n. Ogrodzieniec 440 m alt., Fs, 05.80: MŁ, LOD 20561; — DF 57 Res. Dolina Raclawki, Fs, 08.73: WW, KRAM 15750. Wyżyna Przedborska — DE 86 fr. Knieja n. Święta Anna, Qrp Cb TC, 10.78 & 79: RO & MŁ: LOD 20554 & 20560. Nizina Północnopodlaska — GC 55 BiNP, Ag, 09.66: M. Babos, BP 16895.

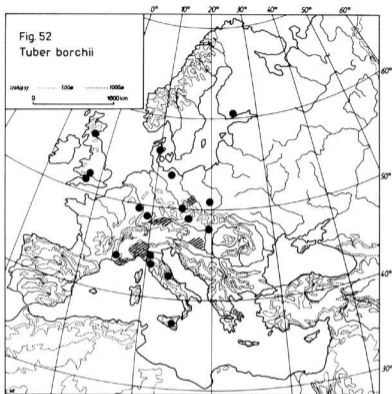
13.13. *Tuber borchii* Vitt.

Distribution in Europe (Fig. 52). The range is quite long in the NS direction: from southern Finland (Espoo n. Helsinki) to Sardinia (Caltagirone). Numerous localities exist in northern Italy (Piedmont and Lombardy), the Azure Coast (nearby Nice and Hyères), the tectonic foreland of the Alps (especially close to Munich), the Hungarian Highland (Somogy, Baranya, and Nograd), the Lower Silesia, and the Sudetic Plateau. Besides occurring in Denmark (Århus), Mecklenburg (Waren), Bohemia (Karlštejn), Moravia (Zarošice), on the middle Rhine (Simmerberg and Altbach), and in the Appenine Peninsula (vicinity of Pisa and of Fiesole in Abruzzi). Further exsiccata, from some localities in England, are reported by Hawker (1954); they came from environs of Bristol, Gloucestershire, Perthshire, Devonshire, and Somersetshire.

Hypothetical distribution. All Europe, within borders of the temperate climatic zone (in lowlands and plateaux) as well as of the subtropical one (in lowlands and mountains).

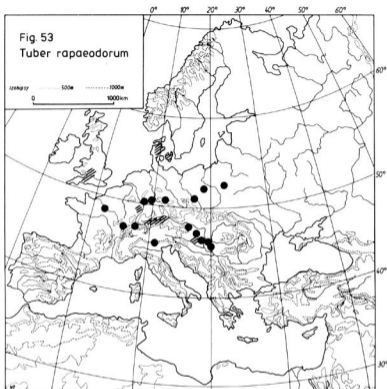
Habitat. Under *Quercus*, *Carpinus betulus*, *Tilia*, and other deciduous tree species, in loams rich in the calcium carbonate. Also found in cultivated areas, e.g. in a rose plantation (in Finland). The fruitbodies formed in the humus layer, just under the soil surface.

Distribution in Poland (Fig. 49). Currently known from four localities: Nizina Śląska — BE 36 Piskorzowice n. Środa Śląska, 08.1890: Herb. Schroet. WRSL; — BE 48 Wrocław Pilczyce, 07.1890: Herb. Schroet. WRSL. Sudety Środkowe — BF 06 Srebrna Góra n. Ząbkowice Śląskie, 10.24: M 1140. Wyżyna Przedborska — DE 68 Res. Dębowiec n. Maluszyn, TC Cb Tc, 08.70: MŁ, LOD 20879.

13.14. *Tuber rapaeorum* Tul.

Distribution in Europe (Fig. 53). Fairly often in C Europe: southern Germany (Bavaria, Saarland, Hessen, Franconia, and Svabia), the Hungarian Highland (Somogy, Szekszard, and Veszprem), the Great Hungarian Plain (Szeged and Kiskunfélegyháza), Denmark, and Poland. Rarely in France (nearby Paris, from where it had been described for the first time, and in the Jura), Switzerland (Basle), Austria (Vienna), and southwards from the Alps (only Cavelonte in the Southern Tiro). There is also a specimen from Ukraine with no locality indicated (Herb. Berkeley, K). Finally, some exsiccata from England are quoted by Hawker (1954): Bristol, Gloucestershire, and Somersetshire.

Hypothetical distribution. A lowland species whose range probably contains all Europe in the forest and steppe zones of temperate



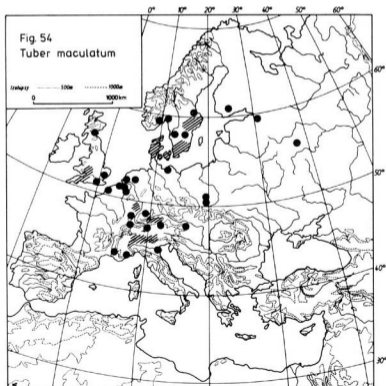
warm and transition climate. In the southern part of its range it can occur at the forest level of mountains.

H a b i t a t. Under *Larix*, *Pinus*, *Tilia*, *Quercus*, *Carpinus*, *Betula*, *Corylus*, and other species of trees and shrubs, inside and outside forests and woods. In general it occurs in the humus layer, just under the soil surface. In Poland a locality is known (Stoczek Węgrowski) which is situated in a cultivated decorative garden-plot attached to a homestead.

Distribution in Poland (Fig. 49). Till now known from three localities: Nizina Południowowielkopolska – DD 31 env. of Dąbie, Cb Ps Bpp, 10.78: MŁ, LOD 20893. Nizina Śląska – BE 48 Wrocław Pilczyce, 05.1873: Herb. Schroet. WRSL. Nizina Środkowomazowiecka – FC 82 Stoczek Węgrowski, Ca, 09.77 & 10.79: M. Korycka, AS, MŁ & R. Pachlewski, LOD 20887-92.

13.15. *Tuber maculatum* Vitt.

Distribution in Europe (Fig. 54). Quite often throughout Europe between 45°N and 60°N. Numerous localities are in central and southern Sweden (Uppland, environs of Stockholm, Närke, Skåne, and Småland), the whole Denmark, the tectonic foreland of Alps, the German Highlands (env. of Munich & Kirchheim, and Saarland), Tirol (Feldkirch in Vorarlberg and Berchtesgaden), the Austrian Calcium Alps (Wiener Neustadt), and along the southern slopes of the Alps (Piedmont, Ticino, Trent, Milan, and Cavalese in the Dolomite Mtns). In the north gathered nearby Oslo (Ostfold and Skien in the Telemark country), Gävle on the Gulf of Bothnia, Toijala in Finland, and close to Leningrad. The most distant sites in the south are in Tarascon on the Rhône and in env. of Antibes. Many single localities exist in England (Somersetshire), northern France (Somme in the Vosges Mtns),

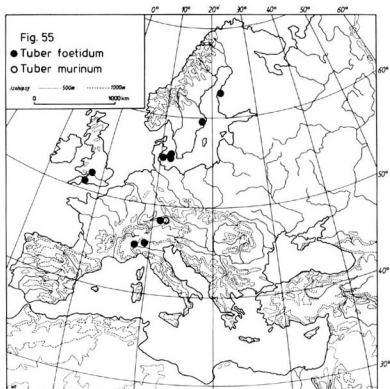


Switzerland (Porrentruy in the Jura), The Netherlands (Rotterdam, Tilburg, Renesse, and Gelderland), Belgium (Liège), Mecklenburg (the Darss Peninsula), southern Poland, and in the East-European Lowland (Mikhailovskoe n. Moscow – the easternmost site). Several localities are cited by H a w k e r (1954) from England (Gloucestershire, Herefordshire, Somersetshire, Devonshire, Sussex, Suffolk et Perthshire) and some by S z e m e r e (1965) from the Carpathian Basin.

Hypothetical distribution. The nemoral and boreal zones of temperate climate of Europe. In the southern part of the range (Alps) occurring rather in mountainous forest layers.

Habitat. Under *Quercus*, *Betula*, *Fagus sylvatica*, and *Tilia*, in mixed forests, often with *Pinus*, in soil rich in humus, not deep under the surface.

Distribution in Poland (Fig. 51). Currently known from two localities: W y ż y n a K r a k o w s k o - C z ę s t o c h o w s k a –

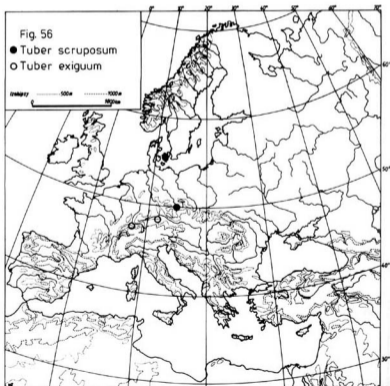


DF 18 Wola Libertowska n. Wolbrom, Qrp Fs Bpp, 09.82: MŁ, LOD 20883.
 Wyżyna Przedborska – DE 68 Res. Dębowiec n. Maluszyn, Qrp
 Cb Tc, 08.79: MŁ, LOD 20882.

13.16. *Tuber foetidum* Vitt.

Distribution in Europe (Fig. 55). Rare and scattered throughout a vast area in the NS direction: from Kaivulahti on the Gulf of Bothnia and Stockholm, through the Danish islands Zealand and Fyn, to Munich, Piedmont, and Milan. Cited by H a w k e r from Somersetshire and Gloucestershire.

Hypothetical distribution. Lowland Europe in the temperate maritime climatic zone and subalpine forests.

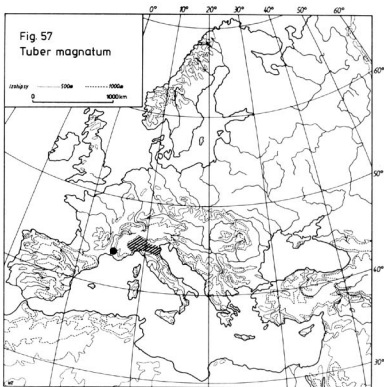


Habitat. Under several deciduous tree species and often under *L. arix* on the lime subsoil.

Distribution in Poland. Not yet discovered.

13.17. *Tuber de baryanum* Hesse; *T. murinum* Hesse; *T. scruposum* Hesse;
T. exiguum Hesse

All four species are very poorly represented by herbarium material. They are included here since they were described from C-European areas not too distant from Poland, from habitats analogous to those existing in our country. Some authors resist accepting them as separate species (Gross, 1975a, 1975b). It seems that a definitive standpoint in this question will be possible only after further exploration and investigation of more complete collections.



Tuber de baryanum — a few exsiccata (Herb. M) from Bavaria, after revision by J. M. Trappe and then by the author, have been classified as *T. dryophilum*.

T. murinum (Fig. 55) — very rare in the light of the existing collections: found twice in Munich — in 1925 (Engl. Garten) and 1941 (Hirschau); probably occurring in all Europe, within borders of the temperate climate, but very rarely.

T. scruposum (Fig. 56) — very rare: Denmark (Ryget Valrose in Zealand) and Bohemia (Karlštejn southwards from Prague); probably occurring throughout lowland Europe in its nemoral zone.

T. exiguum (Fig. 56) — very rare: only two localities in northern rims of the Alps (Basle and Munich); possibly a mountain species confined to C Europe including the Alps.

13.18. *Tuber magnatum* Pico

Distribution in Europe (Fig. 57). Frequent in northern Italy in the Plain of the Po and the adjacent hills of Piedmont and Lombardy (Castigliole, Cereseto, Milan, Parma, Faenza, and Faventino). Occurring also in southern France, in Tarascon on the lower Rhône.

Hypothetical distribution. Probably all S Europe, within borders of the Mediterranean zone, in suitable soils, out of mountains.

Habitat. Under *Populus*, *Salix*, and *Quercus*; in loams, often wet, close to streams.

Distribution in Poland: Not discovered.

14. CHOROLOGY OF *FISCHERULA* AND *PARADOXA*

14.1. *Fischerula macrospora* Matt.

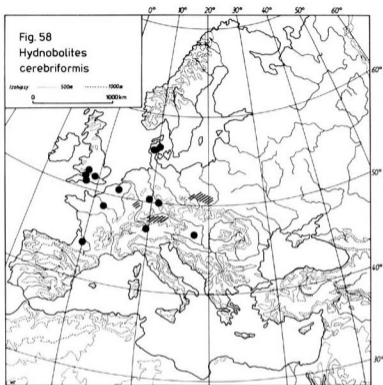
Described by Mattiolo (1935) from Vallombrosa in Tuscany. Cited also by Trappe (1975) from Sora in Campania. Until now not found outside central and northern Italy.

14.2. *Paradoxa monospora* Matt.

Discovered and described by Mattiolo (1935) from the mountains nearby the bank of Lago di Como in northern Italy, under *Fagus* and *Castanea* — the only locality currently known.

15. CHOROLOGY OF *HYDNOBOLITES CEREBRIFORMIS* TUL.

Distribution in Europe (Fig. 58). The species is quite frequently found in C and W Europe. Many localities exist in the German



Highlands and tectonic foreland of the Alps (vicinity of Munich, Saarland, Upper Franconia, Rhön & Swabia), and south-western Poland. Moreover it occurs in western England (Bristol and Gloucestershire), nearby Brussels and Paris, as well as in Jutland and Hungary (Somogy); also on the northern side of the Alps (Feldkirch). The southernmost locality is at Nérac in the Aquitaine Basin. Further sites in England are given by Hawker (1954): in Somersetshire, Dorsetshire, and Berkshire. Several localities in the Carpathian Basin are published by Szemere (1965).

Hypothetical distribution. In Europe within borders of the temperate climate: the nemoral zone with the preference of a maritime climate; in lowlands, more rarely in mountainous forest layers of C Europe.

Habitat. Under various tree species in deciduous and mixed tree stands; most often under *Quercus*, *Fagus sylvatica*, *Carpinus betulus*, and *Pinus*

sylvestris: in loams just under the soil surface or, in part epigeically, among the litter cover and on remnants of timber mouldering away.

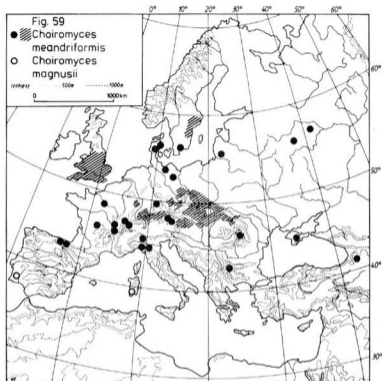
Distribution in Poland (Fig. 34). Till now known from eleven localities in south-western Poland, but probably occurring in the whole country.

Localities in Poland. Nizina Śląska — BE 36 Brzezinka Średzka, 07.1892: Herb. Schroet. WRSŁ; — BE 38 Wrocław Osobowice, 08.1890: Herb. Schroet. WRSŁ; — BE 48 Wrocław Pilczyce, 10.1888: Herb. Schroet. WRSŁ; — Wrocław — Kozanów, 01.1888 & 08.1890: Herb. Schroet. WRSŁ. Przedgórze Sudeckie — BE 89 Górzec n. Strzelin, 08.1891: Herb. Schroet. WRSŁ. Wyżyna Woźnicko-Wieluńska — DE 62 Miedzno n. Kłobuck, Qrp Ps, 09.79: MŁ, LOD 20547 & 20916. Wyżyna Krakowsko-Częstochowska — DE 84 Mirów — Hektary, Pt Qrp, 08.81: MŁ & RO, LOD 20549-50, — Res. Zielona Góra, Cb, 08.81: MŁ, LOD 20548; — DE 95 Res. Sokole Góry n. Olsztyn, Fs, 09.81: MŁ, LOD 20551; — DF 17 Sierbowice — Pradła, Ps, 09.82: RO & MŁ, LOD 20915. Wyżyna Przedborska — DF 08 Gąszcze n. Szczekociny, Qrp, 09.82: MŁ & W. Maliński, LOD 21114.

16. CHOROLOGY OF SPECIES OF *CHOIROMYCES*

16.1. *Choiromyces meandriformis* Vitt.

Distribution in Europe (Fig. 59). Widely distributed in all Europe between 40°N and 60°N, but not equally frequent everywhere. The most abundant material comes from numerous localities in Central Europe and central-eastern Sweden. Frequent in the Alpine, Sudetic and W-Carpathian Plateaux, in England, along the slopes of the Cantabrian Mtns in Spain (the Vizcaya and Guipuzcoa prov.) as well in the upland and highland zone of C. Europe. In the south occurring in the Ligurian Alps, along the slopes of the Witosha Mt. n. Sofia, in the Crimean Highland close to Simferopol, and in the Little Caucasus (Bakuriani in Georgia). The localities nearby Moscow and Ivanovo—Voznesensk are the most easterly in Europe. Individual sites exist in France and Denmark; in the Central-European Lowland only close to Wismar and Berlin Spandau; in the East-European Lowland only in Samogitia. The highest recorded localities are Važec (Tatra Mtns) at 850 m alt., a site in Transylvania and the slopes of the Witosha Mt., both at ca 1000 m alt., and Bakuriani (Little Caucasus) at over 1800 m alt. A remarkable concentration of localities is noted in Sweden (environs of Stockholm and the counties of Södermanland, Östergötland and Närke) in a lowland where rocks of the Baltic Shield are covered with drifts of the last glaciation, whereas no localities are recorded within areas of the last glaciation southwards from the Baltic Sea.



As announced by Hawker (1954), the species is also widely distributed in England. In fact its distribution has already been worked out in some European countries: in Hungary by Hollós (1911) and Babos (1981), in Poland by Lubelska (1953) and Skirgiełło (1976), in the FRG by Gross (1977), and in the GDR by Kreisel, Dörfelt & Benkert (1978). The present author has shown on the maps only the localities from where the exsiccata had been analysed by her personally. This concerns both Poland and the other European countries. This line of conduct is motivated by the cases of errors noted. For instance, in a widespread collection (cf. the herbaria B, K, WRSL, and others) "Erbario Crittogamico Italiano 185 (1185)" there are specimens of *C. magnusii* dating from 1864, determined there as *C. meandriformis*.

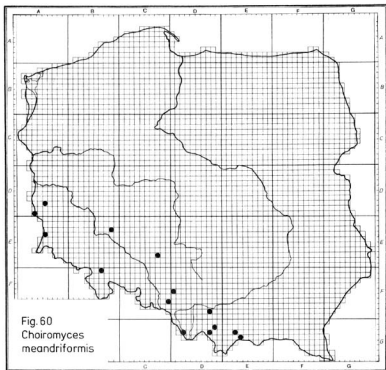


Fig. 60
Choiromyces
meandriformis

Hypothetical distribution. All Europe except the northern part of the boreal zone, the steppe zone, and the alpine layer in mountains; on the lime subsoil.

Habitat. Under *Quercus*, *Fagus sylvatica*, *Pinus sylvestris*, and *Picea abies* in fertile soils containing the calcium carbonate; usually not deep under the soil surface or in part epigeically.

Distribution in Poland (Fig. 60). Quoted in the literature from many localities both in the south and in the north of the country (Lubelska, 1953; Skirgiello, 1976). The present author takes into account only the localities with a herbarium documentation including, besides the exsiccata from Poland appearing in the local herbaria, also those present in the foreign ones, at Budapest (BP), Bratislava (BRA), Munich (M), and Stockholm (S). In the light of examined material, the species occurs in fourteen

localities documented by collections, all of them situated in the south-western part of the country.

Localities in Poland. Niziny Sasko-Łużyckie – AD 93 Mużaków on the Nysa Łużycka, 07.1896: H. Sydow, Mycotheca Marchica 4532, BRA & S. Wał Trzebnicki – AD 75 Jabloniec, 23: S; – BE 28 Oborniki Śląskie, 06.28: Pogórze Zachodniosudeckie – AE 34 Zgorzelec, 08.42: M. Nizina Śląska – CE 77 Laskowice Wielkie n. Kluczbork, 11.1888: Herb. Schroet. WRSL. Sudety Środkowe – BF 06 Żdanów n. Srebrna Góra, 07.18: M. Wyżyna Śląska – DF 40 env. of Gliwice, 07.1873: Herb. Schroet. WRSL; – CF 69 env. of Rybnik, Herb. Schroet. WRSL. Pogórze Zachodniobeskidzkie – DF 87 Stronie – Bugaj n. Wadowice, Fs, 07.66: H. Błaszczyk, KRAM 13028. Beskidy Zachodnie – DG 18 Wysoka n. Jordaków, Pa, 07.59: C. Gazdowa, KRA; – DG 22 Istebna, BP 1478; – EG 22 env. of Maniowy 700-800 m alt., Ps Pa, 08.62: J. Kornaś, KRA & KRAM 13029. Obniżenie Orawsko-Podhalańskie – EG 33 The Pieniny Mtns National Park (Pieniński Park Narodowy) above Gródek, Aa, 08.66: BG, KRA; DG 27 Jablonka n. Nowy Targ, 07.1895: L. Hollós, BRA.

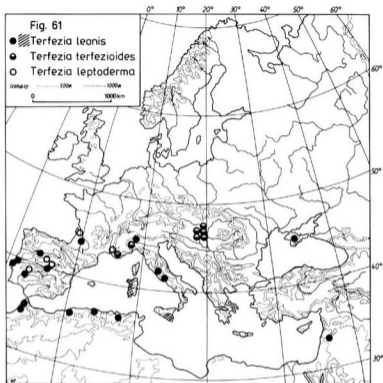
16.2. *Choiromyces magnusii* (Matt.) Paoletti

Very rare (Fig. 59). Recorded only twice: at Mertola in the Alentejo region (Portugal) and Iglesias in Sardinia (Italy). Probably restricted to the Mediterranean part of Europe.

17. CHOROLOGY OF SPECIES OF *TERFEZIA*

17.1. *Terfezia leonis* Tul.

Distribution in Europe (Fig. 61). The species is quite frequently found in lowland and Piedmont areas of S Europe with a concentration of localities in Sardinia (close to Sassari, Terrabla, Oristano and Cagliari) and Sicilia (Caltagirone, Dorillo and Alcerito). Single sites are recorded in the Iberian and Appenine Peninsulas: Toledo, Zamora and Barcarrota n. Badajoz in Spain, Lisbon – Calharis and Alcanede in Portugal, and Roma – Notturmo, Porto d'Anzio and Terracina in Italy. In the north not crossing the Alps. Some specimens were collected in the Aquitaine Basin (Nérac), Piedmont (nearby Vercelli), and the Crimean Peninsula (Crimean Foreland and environs of Simferopol). Also occurring on the African and Asian coasts of the Mediterranean Sea (Alger, Constantine, Moustaghanim & Tanger, and Damascus, respectively), in Iraq, the Canary Islands, and on the



Atlantic coast of Africa (Rabat and Saffi). The most frequent species of *Terfezia* in the Mediterranean Sea Basin.

Hypothetical distribution. S. Europe within borders of the Mediterranean climatic zone, in lowlands and uplands, but not in mountains.

Habitat. Forests and macchias (brushwoods of rigid leaves); also warm oak forests, steppes, and even semideserts. In Spain found under *Cistus malvifolius*, *C. ladaniferus*, and *C. monspeliensis* (Calonge, de la Torre & Ławrynowicz, 1977).

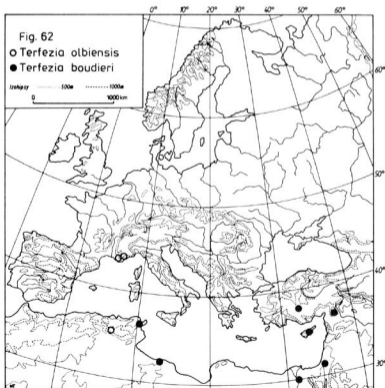
17.2. *Terfezia terfezioides* Matt.

Distribution in Europe (Fig. 61). In the Carpathian Basin: both the Hungarian Highland (numerous localities round Budapest and in the

Komitat Pest) and the Great Hungarian Plain, even its part adjacent to the Danube valley (Szekszard, Kiskunlaháza, Kecel, and Kajdacs). Besides that area very rare: at Moncalieri in Piedmont (Italy) and Le Thoronet in the Var department (France).

Hypothetical distribution. Throughout SE Europe in the warm strip of the temperate continental climate and the northern strip of the Mediterranean climate in S Europe.

Habitat. Under *Cerasus avium* and *Robinia pseudoacacia*, as well as in mixed forests on the sandy subsoil, but also found in an old cemetery with almost no vegetation (S z e m e r e, 1965).



17.3. *Terfezia leptoderma* Tul.

Distribution in Europe (Fig. 61). Rarely in SW Europe. Scattered far inside the Iberian Peninsula (environs of Madrid, Avila, and San Pedro de Mérida n. Badajoz), northwards from the Pyrenees at the mouth of the Garonne (env. of Bordeaux), and on the lower Rhône (Fontville in the Vaucluse department).

Hypothetical distribution: SW Europe to the south from 45°N, in lowlands and dales.

Habitat. Under *Helianthemum* and *Cistus* in sandy soils.

17.4. *Terfezia olbiensis* Tul.

Distribution in Europe (Fig. 62). Very rarely in southern France: vicinity of Hyères, the Porquerolles Island, Pasquier, Barbentare. Outside Europe in Algeria (Batna) and the Canary Islands (Lansarote). The occurrence of the species in Italy, including Sardinia, quoted in some references as Knapp (1951) and Ceruti (1960), has not been confirmed in herbarium material.

Hypothetical distribution. The western part of the Mediterranean Sea-coast.

Habitat. Under southern species of *Quercus* and *Pinus*.

17.5. *Terfezia claveryi* Chat.

No findings from Europe. Reported from Africa: Algeria (no locality indicated), Tunisia (individual sites), the Canary Islands and SW Africa (Windhoek), and from Asia: C Asia (Kizyl-Arvat) and the Near East (Kuwait, Iraq and Syria).

Habitat. Dry steppes and deserts.

17.6. *Terfezia boudieri* Chat.

No material from Europe. Fairly often (Fig. 62) in N Africa and SW Asia (the Near East): Tunisia, Egypt (close to Cairo), Israel (Halutsa), Cyprus, Turkey (Konya, Gaziantep), Kuwait, and Riyadh.

Habitat. Dry steppes and deserts.

18. CHOROLOGY OF SPECIES OF *TIRMANIA*18.1. *Tirmania nivea* (Desf.: Fr.) Trappe

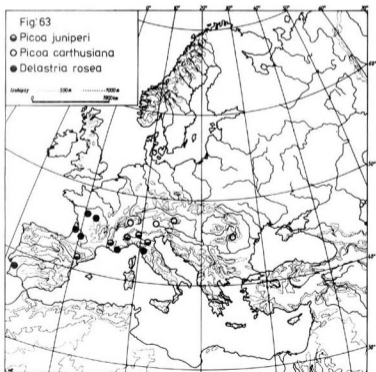
Lack of material from Europe. Occurring in N Africa (Algeria, Tunisia & Libya) and SW Asia (Israel, Saudi Arabia & Qatar). Reported by Malençon (1973) from southern Morocco (Hamada de la Daoura).

Habitat: Dry steppes and deserts.

18.2. *Tirmania pinoyi* (Maire) Malençon

No data from Europe. Existing in SW Asia (Iraq, Kuwait & Saudi Arabia) and N Africa (Algeria); also quoted by Malençon (1973) from environs of Bou-Bernous in southern Morocco.

Habitat: Deserts and steppes.



19. CHOROLOGY OF SPECIES OF PICOA

19.1. *Picoa juniperi* Vitt.

Distribution in Europe (Fig. 63). Very rare; collected in the Plain of the Po, Lombardy and Piedmont (Bologna, Milan & Turin), on the lower Rhône (Fontville in the Vaucluse department), and in Catalonia (Spain) on the lower Ebro.

Hypothetical distribution. S Europe in the Mediterranean climatic zone; a lowland species sometimes appearing in plateaux.

Habitat: Under *Juniperus*, on the sandy subsoil.

19.2. *Picoa carthusiana* Tul.

Distribution in Europe (Fig. 63). The herbarium material comes from a few localities: Pilatus (Swiss Alps) at 1400 m alt., Schneeberg (Austrian Calcium Alps), Wildkogel (Austrian Tirol), and nearby Braşov (S Carpathians, Romania), all of them at over 1000 m alt. According to Knapp (1951) the species occurs between 44°N and 48°N at the feet or along the slopes of well known mountain chains: the Etruscan Appenines, E and W Alps including env. of Lausanne, the French Jura, Black Forest (Schwarzwald), and E Carpathian Mtns.

Hypothetical distribution. Mountainous regions, mainly the upper forest layer in the Alps and Carpathians.

Habitat. Under *Picea*, *Abies*, and *Fagus* in the mountains.

20. CHOROLOGY OF *DELASTRIA ROSEA* TUL.

Distribution in Europe (Fig. 63). Occurring rather rarely in SW Europe: the Iberian and Appenine Peninsulas (Torrão in Portugal, respectively Tenuta di Tombolo nearby Pisa), on the French Riviera (Saint Tropez), and in lowlands of western France (Nérac in the Aquitaine Basin, La Teste on the Bay of Biscay, and Lignières & Chatellerault in the Loire river-basin).

Hypothetical distribution. S and W Europe in the Mediterranean and temperate warm maritime climatic zones. A lowland, facultatively halophilous species.

Habitat. Found on the sea-coast between halophilous therophytes and, besides, under *Quercus* and *Pinus*, in wet sandy soils.

21. CONCLUSIONS

With the use of cartographical methods the current state of investigation has been presented concerning distribution of 82 species of hypogeous

Ascomycetes. The method of 10 × 10 km squares grid was applied to perform 14 maps showing localities in Poland of 30 species discovered there until now and represented by herbarium material. In order to illustrate the distribution of 67 species in Europe, the point method was utilized to prepare further 49 maps. The remaining 15 species are known either from a few individual localities or from the "locus classicus" only, or from adjacent areas (the north coast of Africa and the Near East).

The list of species analysed chorologically has been established on the basis of a critical taxonomic examination of the material from 44 european herbaria (Lawrynowicz, 1988), collected by several dozen mycologists and amateurs during about 150 years. The chronology of forming collections shows how irregular and, finally, slow the rate of material increase is, while the maps point out the small area covered by the exploration. A part of findings had to be eliminated not only as a result of taxonomic examination, but also because of the lack or illegibility of topographical names indicating the locality concerned.

Thus the distribution image obtained on the ground of the verified material has substantial gaps restraining us from carrying out the generalisation too far. Simultaneously it points us out the most pressing investigation needs concerning both the European regions and individual species. The scarcity of data is the most explicitly appearing in the case of SE Europe, especially of the Balkan Peninsula.

21.1. Distribution of hypogeous fungi in Poland

Owing to its geographical situation in Europe, Poland is near the centre of the occurrence region of the genus *Elaphomyces* and the majority of genera of the *Tuberales*. Only a few genera of the hypogeous *Ascomycetes*, namely *Terfezia*, *Tirmania* and *Delastria* (and, probably, *Genabea*, *Fischerula*, *Paradoxa*, and *Picoa*, which are rare everywhere), are not encroaching with their ranges upon the Polish territory. The place of the country causes that the flora of the Polish hypogeous fungi should not be less rich than that of any other European country save for S Europe. It is only a matter of time and the intensity of exploration to discover it to the full.

Within Poland, the occurrence of the following 30 species of hypogeous *Ascomycetes* has been stated (the names of species new for Poland being preceded by an asterisk):

<i>Elaphomyces granulatus</i>	<i>Balsamia vulgaris</i>
<i>E. asperulus</i>	<i>B. platyspora</i>
<i>E. muricatus</i>	* <i>Barssia oregonensis</i>
* <i>E. papillatus</i>	<i>Pachyphloeus melanoxanthus</i>
<i>E. maculatus</i>	* <i>P. citrinus</i>
* <i>E. leveillei</i>	<i>Tuber mesentericum</i>
* <i>E. anthracinus</i>	<i>T. rufum</i>

* <i>E. cyanosporus</i>	<i>T. nitidum</i>
<i>Cenococcum graniforme</i>	<i>T. dryophilum</i>
<i>Hydnotrya tulasnei</i>	<i>T. puberulum</i>
* <i>H. suevica</i>	<i>T. borchii</i>
<i>Genea hispidula</i>	<i>T. rapaeodorum</i>
<i>G. verrucosa</i>	* <i>T. maculatum</i>
* <i>G. klotzschii</i>	<i>Hydnobolites cerebriformis</i>
<i>G. lespiaultii</i>	<i>Choiromyces meandriiformis</i>

In the above list there is also a species new for Europe, *Barssia oregonensis*, known hitherto only from mountainous areas of N America, in the States of Oregon and California on the Pacific coast, recently discovered in the Tatra Mtns (Ł a w r y n o w i c z, S k i r g i e l l o, 1984).

In the literature there are quoted from Poland also some species without herbarium documentation, namely:

<i>Hydnotrya michaelis</i>	<i>Tuber aestivum</i>
	<i>T. melanosporum</i>

Moreover, there are several species which probably can be sought out owing to the situation of the country within their range, stated or anticipated in connection with an analogy of climatic and habitat conditions:

<i>Elaphomyces leucosporus</i>	<i>E. aculeatus</i>
<i>E. virgatosporus</i>	<i>Hydnotrya ploettneriana</i>
<i>Hydnocystis piligera</i>	<i>Tuber excavatum</i>
<i>Genea sphaerica</i>	<i>T. ferrugineum</i>
<i>Stephensia bombycina</i>	<i>T. fulgens</i>
<i>Balsamia fragiformis</i>	<i>T. foetidum</i>

The occurrence in Poland of the remaining European species of hypogeous *Ascomycetes* is very unlikely, but one cannot put an end to that specification since our expectations are based upon the presence of the fruitbodies, while we know very little about the presence of the mycelium in the subsoil. In fact it may happen that the change of one of habitat components, e.g. when a new tree species is introduced, will cause the appearance of the fruitbodies of its mycorrhizal associate.

Among the species recorded in Poland the most frequent ones are *Elaphomyces granulatus*, *E. asperulus*, and *E. muricatus*. Each of them is known from over 100 localities scattered throughout all country, and their distribution is practically the same. Yet, they differ in their habitats and, in particular, in the choice of mycorrhizal associates. Only a chorological analysis of their whole ranges clearly shows the mutual differentiation. The greatest range corresponds to *E. muricatus* which, in addition, is internally differentiated as a species in dependence of an admissible habitat and of its mycorrhizal associates. *E. granulatus* leans towards the west; to the east a disappearance of its localities

is observed. Conversely, the localities of *E. asperulus* multiply to the east of Europe, and in Poland the distributions of the both species practically coincide.

Still there are few other species of wide distribution and a remarkable frequency in Poland, but preferably associated with deciduous forests of the temperate climatic zone: *Hydnotrya tulasnei*, *Genea hispidula*, and *Tuber puberulum*. Special habitats are required by *Hydnotrya suevica* and *Barssia oregonensis* — (rather high) mountainous sites, as well as by *Tuber mesentericum* and *Choiromyces meandriformis*, calciphilous species — sites on the lime subsoil.

The following species are very rare in Poland and, at the same time, rare in all Europe: *Elaphomyces papillatus*, *E. cyanosporus*, *Hydnotrya suevica*, and *Genea lespiaultii*. Their Polish localities are the most easterly (currently known) in Europe.

The majority of herbarium material concerned with occurrence of the species in question comes from the Lower and Upper Silesia, the Tatra and Sudete Mtns, the Beskid Sądecki (Mtns), the Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), and from central Poland.

21.2. Distribution of hypogeous fungi in Europe

In the light of our knowledge on distribution of the hypogeous Ascomycetes, illustrated by the attached maps, the following conclusions arise, especially as far as the differentiation of species is concerned in dependence of their ranges and habitat needs.

1. Two groups of species: of wide respectively restricted ranges are distinguishable, the former including also those rare everywhere. Thus the first group, containing species ranging from the boreal to Mediterranean vegetation zone inclusively, consists of those:

(a) frequent within their range borders — *Elaphomyces granulatus*, *E. asperulus*, *E. muricatus*, *Hydnotrya tulasnei*, *Genea hispidula*, *Tuber borchii*, and *T. maculatum*;

(b) rare within their range borders — *Elaphomyces papillatus*, *E. maculatus*, *E. anthracinus*, *E. aculeatus*, *Genea verrucosa*, *G. sphaerica*, *Stephensia bombycina*, *Balsamia vulgaris*, *B. fragiformis*, *Pachyphloeus melanoxanthus*, the majority of species of *Tuber*, and *Hydnobolites cerebriformis*.

The second group, containing the species

(c) restricted in their range, includes (according to the contemporary state of investigation): *Elaphomyces mutabilis*, *E. citrinus*, *Hydnotrya suevica*, *Genea pulchra*, *Tuber magnatum*, and *Terfezia olbiensis*.

2. Some species are confined in their occurrence due to their particular climatic or habitat requirements; they may be connected with:

(a) the warm climate of S Europe — *Tuber melanosporum*, *Choiromyces magnusii*, *Terfezia leonis*, and the other species of *Terfezia* and *Tirmania*;

(b) the boreal zone (in spite of their wide range) — *Elaphomyces granulatus*, *E. asperulus*, *E. muricatus*, *E. leveillei*, *Hydnotriza tulasnei*, *Tuber rufum*, and *T. maculatum*;

(c) the carbonate soils — *Tuber aestivum*, *T. mesentericum*, *T. excavatum*, and *Choireomyces meandriformis*;

(d) the halophilous needs — *Delastria rosea*;

(e) the mountainous regions — *Hydnotriza suevica*, *Genea vagans*, *Barssia oregonensis*, and *Picoa carthusiana*;

(f) the lowland regions — *Elaphomyces maculatus*, *Genea hispidula*, and *Tuber rapaeodorum*.

Certain species are occurring in:

(g) lowlands in the northern part of their range, and uplands or mountains in its southern part — *Elaphomyces granulatus*, *Tuber aestivum*, and *T. nitidum*;

(h) sites exposed towards the north in the southern countries (such as Italy or Spain), and to the south-east or south-west in the northern part of their range (as Bavaria) — some species of *Tuber* (cf. G r o s s, 1975a, 1975b); probably this fact expresses a relationship between the fungus and all phytocenosis, most of all with its arborescent mycorrhizal associate.

3. There are a few sites in Europe which may be considered as hypogeous oases. In Poland Wola Wydrzyna n. Szczerców is one of them: 11 species of hypogeous *Ascomycetes* were collected there, including five new for Poland. In Italy Vallombrosa and Conegliano are of this kind, and Somogy in Hungary. At the end of the last century such oases existed in some forests surrounding Paris: Meudon, Vincennes, and Montmorency.

4. A care is indispensable when admitting the extreme localities in Poland as the most easterly in Europe because of the scarcity of data from the east and south-east of Europe.

5. Our knowledge on fungal ranges is the most precise in the case of agriculturally important mushrooms: it is well known that the localities of *Tuber melanosporum* extend to the north to 48°N only, and those of *Choireomyces meandriformis* southwards to 40°N.

6. Among hypogeous fungi the pairs of vicarious species (i.e. species of the same genus with distinct ranges) can be noticed. For instance, *Choireomyces meandriformis* is located to the north with respect to *C. magnusii* with 40°N as the border line; *Terfezia leptoderma* and *T. boudieri* occur on the western and eastern coast of the Mediterranean Sea, respectively; *Picoa carthusiana* is a mountain species, while *P. juniperi* — a lowland, exceptionally upland species.

7. The northern and southern rims of the Alps and the intermediate strip between the temperate and subtropical climatic zones are the richest in hypogeous fungi. Farther north a condensation of localities is observed for the most of species of *Elaphomyces*, and then all the hypogeous fungi gradually disappear. The northernmost ranging species are *E. asperulus*, *E. muricatus*, and

E. granulatus, but no one is limited in its range to the boreal zone. Southwards from the Alps localities of certain species of *Elaphomyces*, *Hydnotrya*, *Genea*, *Pachyphloeus*, and *Tuber* disappear, being replaced by others, mainly those of *Terfezia*. The south of Europe enjoys the tropical and subtropical species, absent from the remaining part of the continent, having there their northernmost localities. No such species, coming from an external climatic zone, occur in N, E or W Europe.

8. In addition to very explicit changes of the hypogeous mycoflora in the NS direction, a differentiation can also be noticed in the WE direction: some species such as *Elaphomyces granulatus* and *Terfezia leptoderma* are more western, i.e. related rather to a maritime climate, while *E. asperulus* and *T. boudieri* are more eastern, preferring a continental climate.

9. A satisfactory big amount of data on distribution of species within a vast area helps in arriving at a standpoint in taxonomical matters: to recognize requirements of the species in question and determine its systematical position, as well as in chorological matters: to find out the distribution and gain a definitive knowledge about trends concerning its range. Individual localities are always enigmatic, their importance consists in signaling the insufficiency of observation and need for further exploration.

10. There is a natural tendency to connect the distribution of a fungus species with its mycorrhizal associate, i.e. usually with a definite tree species. The relationship has not to be overestimated since it is obligatory quite rarely. Only in a few cases it is strict enough to be confirmed by the geographical parallelism of the fungus and its arborescent associates, e.g. *Tuber melanosporum* is connected with certain Mediterranean oak species (*Quercus ilex*, *Q. coccinea*, *Q. faginea*, and *Q. pubescens*), and does not exceed their ranges. Yet, some other species such as *Tuber aestivum* are, in a part of their ranges, related to oaks, beeches, and hornbeams, but sometimes they may as well appear in pure stand pine forests, e.g. of *Pinus nigra* in southern France (Gross, 1975a, 1975b) of *P. nigra* var. *austriaca* in the Lower Austria. The phenomenon is even more distinct in the case of *Elaphomyces muricatus*.

11. The hypogeous fungi, just as all living organisms, are depending in their occurrence and geographical distribution on a great many factors (climatic, edaphic, biotic, historical, etc.). These factors act in common and sometimes are mutually compensative, so a specified range of a fungus cannot be explained in terms of a single factor, e.g. termic or biotic.

REFERENCES

- Ainsworth G. C., 1983, Ainsworth and Bisby's Dictionary of Fungi. 7th ed. Kew.
Azema R. C., 1973, *Geoporella Michaelis* (Ed. Fischer) Soehner 1942. Bull. Soc. Myc. Fr.,
Suppl. T. 89: 6 pp.

- Babos M., 1981, *Choiromyces venosus* and *Terfezia terfezioides* in Hungary. A fehér szarvasgomba és a mohoki szarvasgomba elterjedése Magyarországon. Mikol. közl. 1-2: 47-56.
- Berkeley M. J., Broome C. E., 1844, Notices of British Fungi. Ann. Mag. Nat. Hist. (1) 13: 340-360.
- , 1846, Notices of British hypogeous fungi. Ibid. (1) 18: 73-82.
- Bisby G., 1933, The distribution of fungi as compared with that of phanerogams. Amer. J. Bot. 20 (4): 147-192.
- Bucholtz F., 1902, Beiträge zur Morphologie und Systematik der Hypogäen (Tuberaceen und Gasteromyceten etc.) nebst Beschreibung aller bis jetzt in Russland angetroffenen Arten. Riga.
- Calonge F. D., de la Torre M. and Ławrynowicz M., 1977, Contribution al estudio de los hongos hipogeos de Espana. Anal. Inst. Bot. Cavanilles 34 (1): 15-31.
- Caspary R., 1886, Trüffeln und trüffelähnliche Pilze in Preussen. Schrift. physik.-ökonom. Gesellschaft Königsberg 27: 177-185.
- Ceruti A., 1960, *Elaphomycetales* and *Tuberales*. In: J. Bresadola. Iconographia Mycologica 28, Suppl. II. Trento.
- Chatin A., 1892, La Truffe. Botanique de la Truffe et des plantes truffières. Paris.
- CORDA A. C. J., 1837-42, Icones Fungorum hucusque cognitorum. I-V. Pragae.
- Delmas J., 1978, *Tuber* spp. In: S. T. Chang, W. A. Hayes (Editors). The Biology and Cultivation of Edible Mushrooms. Acad. Press, New York-San Francisco-London, pp. 645-681.
- De Vries G. A., 1971, De Fungi van Nederland. 3. *Hypogaea*. Wetenschappelijke Mededelingen Koninklijke Nederlandse Natuurhistorische Vereniging 88: 1-64.
- Eckblad F.-E., 1954, Studies in the hypogean fungi of Norway. I. *Endogone* and *Tuberales*. Nytt. Mag. Bot. 3: 35-41.
- , 1962, Studies in the hypogean fungi of Norway. II. Revision of the genus *Elaphomyces*. Ibid. 9: 199-210.
- Eichler B., 1904, Drugi przyczynek do flory grzybów okolic Międzyrzecza. Pamiętnik Fizjogr. 18: 1-31.
- Fischer E., 1897, *Tuberaceae* und *Hemiasceae*. In: L. Rabenhorst: Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. 2. Aufl. Bd. I. Pilze. V. Abt. *Ascomycetes*. 5. Ordn. *Tuberaceae*. Leipzig.
- Gross G., 1975a, Die Sommertrüffel (*Tuber aestivum* Vitt.) und ihre Verwandten im mittleren Europa (1). Zeitschr. f. Pilzkunde 41: 5-18.
- , 1975b, Die Sommertrüffel (*Tuber aestivum* Vitt.) und ihre Verwandten im mittleren Europa (2). Ibid. 41: 143-154.
- , 1977, Rund um die "Deutsche weisse Trüffel", *Choiromyces meandriformis* Vitt. Ibid. 43: 85-96.
- Hawker L. E., 1954, British Hypogeous Fungi. Phil. Trans. Roy. Soc. London 237: 429-546.
- Hesse R., 1894, Die Hypogäen Deutschlands. Die Tuberaceen und Elaphomyceten. II. Halle/Saale.
- Hollós L., 1911, Magyarország földalatti gombái, szarvasgombaférei. Fungi Hypogaei Hungariae. Budapest.
- Kers L. E., 1978, *Elaphomyces maculatus* found in Sweden. Bot. Notiser 131: 419-422.
- , 1979a, *Genea verrucosa* funnen i Sverige (*Genea verrucosa* found in Sweden). Svensk Bot. Tidskr. 72: 309-311.
- , 1979b, *Elaphomyces aculeatus* funnen i Sverige (*Elaphomyces aculeatus* found in Sweden). Ibid. 73: 123-126.
- , 1980, A new species of *Elaphomyces* Nées ex Fr. subgen *Malacoderma* Vitt. Bot. Notiser 133 (2): 149-153.

- 1981, On the identity of *Elaphomyces uliginosus* Hesse (Ascomycetes). Nord. J. Bot. 1: 795-800.
- 1983, *Elaphomyces anthracinus* och *E. leveillei* i Norden (*Elaphomyces anthracinus* and *E. leveillei* in Norden). Svensk Bot. Tidskr. 77: 43-56.
- Knapp A., 1950-52, Die europäischen Hypogaeen-Gattungen und ihre Gattungstypen. Schweiz. Zeitschr. Pilzk. (1950) 28 (3): 29-42, 28 (7): 101-116, 28 (10): 153-179; (1951) 29 (4): 65-92, 29 (7): 133-148; (1952) 30 (3): 33-43, 30 (6): 81-92.
- Kondracki J., 1977, Regiony fizyczno-geograficzne Polski. Warszawa.
- Kreisel H., Dörfelt H., Benkert D., 1980, Karten zur Pflanzenverbreitung in der DDR. Herceynia 17 (3): 233-291.
- Lange L., 1974, The distribution of Macromycetes in Europe. Dansk Bot. Arkiv 30 (1): 1-105.
- Lange M., 1956, Danish Hypogeous Macromycetes. Ibid. 16 (1): 1-84.
- Lawrynowicz M., 1970, Występowanie grzybów z rodzajów *Elaphomyces* i *Cordyceps* w województwie łódzkim. Zeszyty naukowe Uniwersytetu Łódzkiego 36: 89-93.
- 1983, Rodzaj *Cenococcum graniforme* w Polsce. Acta Mycol., 19: 31-40.
- 1988, Workowce (Ascomycetes), jeleniakowe (*Elaphomycetales*), truflowe (*Tuberales*). In: Flora Polska, Grzyby (*Mycota*). 18. Warszawa-Kraków.
- , Skirgiello A., 1984 (1986), *Barssia* a new genus in Europe. Acta Mycol., 20: 277-279.
- Lubelska B., 1953, O występowaniu trufli (*Tuber* Mich. i *Choiromyces* Vitt.) w Polsce. Fragm. Flor. Geobot. 1: 87-96.
- Malençon G., 1973, Champignons hypogés du nord de l'Afrique — I. Ascomycetes. Persoonia 7: 261-288.
- Mattirolo O., 1935, Catalogo regionale dei funghi ipogei raccolti nel canton Ticino e nelle provincie italiane confinanti. Contr. stud. flora critt. Svizzera 8 (2): 1-53. Zurigo.
- Nicolas J. J., 1973, La Trufa. Bot. Est. Central Ecologia 3: 3-28.
- Raitviir A. G., 1964, Geografischeskoje rasprostranenie heterobazidialnykh gribov. Eesti NSV Tead. Akad. Toim. 13: 106-122.
- Schröter J., 1889, Pilze. In: Cohn Kryptogagen Flora von Schlesien, 3 (1). Breslau.
- 1908, Pilze, Ibid. 3 (2).
- Schwärzel C., 1954, Etwas über Trüffeln und Trüffelkunde. Schweiz. Zeitschr. Pilzk. 32: 133-140.
- 1967-69, Beitrag zur Hypogeenflora des Kantons Basel-Stadt und seiner Umgebung. Ibid. (1967) 45 (9): 129-141; (1968) 46 (12): 189-198; (1969) 47 (8): 149-161.
- Skirgiello A., 1976, Materiały do poznania rozmieszczenia geograficznego grzybów wyższych w Europie. V. Acta Mycol. 12 (2): 155-189.
- Wosińska A., 1963, O rozmieszczeniu jeleniaków (*Elaphomyces*) w Polsce. Monogr. Bot. 15: 361-371.
- Szemere L., 1965, Die unterirdischen Pilze des Karpatenbeckens. Budapest.
- Teodorowicz F., 1928, Über massenhaftes Vorkommen der *Geopora Michaelis* (Fisch.) Löchertrüffel in Polen. Zeitschr. Pilzkunde 15: 79-80.
- 1933, Grzyby Zachodniej i Południowej Polski. Wydawn. Okręg. Komit. Ochr. Przyr. na Wielkop., Poznań.
- 1936, Grzyby wyższe polskiego wybrzeża. Towarzystwo Naukowe w Toruniu. Bad. Przyr. Pomorskie, Toruń.
- Trampler T., Smykała J., Bosiak A., 1980, Instrukcja urządzania lasu. I. PWRiL, Warszawa.
- Trappe J. M., 1975, The genus *Fischerula* (*Tuberales*). Mycologia 67: 934-941.
- 1979, The orders, families, and genera of hypogeous Ascomycotina (truffles and their relatives). Mycotaxon 9 (1): 297-340.

- Tulasne L. R., Tulasne C., 1851, Fungi Hypogaei. Histoire et monographie des champignons hypogés. Paris.
- Vacek V., 1947, Lenýž pýřitý (*Tuber rapaeodorum* Tul.) na Moravě. Česka Mykol. 1 (1): 23-26.
- Vasileva L. N., Agarikovyje ili shlapochnye griby (por. *Agaricales*) Primorskogo kraja. Avtograf. dis. Erevan.
- 1975, Agarikovyje shlapochnye griby Primorskogo kraja. Izd. „Nauka”, Leningrad.
- Vasilkov B. P., 1955, Oчерk geograficheskogo rasprostranenia shlapochnykh gribov v SSSR. Izd. Akad. Nauk SSSR, Moskva-Leningrad.
- Vittadini C., 1831, Monographia *Tuberacearum*. Mediolani.
- 1842, Monographia *Lycoperdineorum*. Mediolani. Also in: Reale Acad. Sci. Torino (2) 5.
- Wasser S. P., 1980, Flora gribov Ukrainy. Agarikovyje griby. Izd. „Naukova Dumka”, Kiev.
- Zajac A., 1978, Założenia metodyczne „Atlasu rozmieszczenia roślin naczyniowych w Polsce”. Wiad. Bot. 22 (3): 145-155.
- Zobel J. B., 1854, In: A. C. J. Corda. *Icones Fungorum hucusque cognitorum*. Pragae.
- Zyber G., 1979, Truflica kasztanowata *Hydnotria tulasnei* w okolicach Szczecinka. Chronimy przyrodę ojczystą 35 (6): 29-31.

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Streszczenie

W drugiej części pracy przedstawiono występowanie *Tuberales* wraz z omówieniem ich zasięgu w Europie. Jest to kontynuacja pracy autorki, opublikowanej w *Acta Mycologica*, vol. 25 (1).