

Distribution and diversity of *Gentianella austriaca*, *Gentianella austriaca* ssp. *fatrae* (Borb.) em. SzL. and *Gentianella livonica* (Eschholz apud Grisebach) em. SzL.

By

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(Received November 30, 1981)

Abstract: Both species are grown in submountain and mountain regions in relative tall-grass communities and in edge of the *Fagus silvatica* forests, only the *G.a.* var *paludosa* occur in wet meadow in the lowland, on soils, developed on limestone or andesite baserock. The species extending to the N-W-part of the Hungarian Central Mountain as refugium territories from the higher Carpathian Basin out of the investigated area. Diversity values higher in *G.a.* ssp. *fatrae* than in *G.l.* according to altitude, habitat and baserock.

Introduction

Within the framework of the "Flora of Central Europe" area investigation has been continued concerning two *Gentianella* taxa. These species occur in Bükk National Park (BNP) also where the investigation studiums of the natural flora was begun by us in 1981.

Taxonomical and nomenclatorial problems raised by these two taxa (of SOÓ 1966, PRITCHARD & TUTIN 1972) answer to the questions which occurred in field while revising the herbarium sheets in BP, and gathering the localities from the schedae and also from the literature.

In the territoria of BNP there are two species of *Gentiana* SZUJKÓ-LACZA & SEN (1977) and also two of the Genera *Gentianella* (SZUJKÓ-LACZA 1982). These two taxa of the *Gentianella* stand near each other in morphology and they often grow in the same places which have resulted in confusions upto now. Mapping the data after having revised the herbarium sheets referring to the two *Gentianella* taxa will result on the completion of the distribution of the species of the *Gentiana* and *Gentianella* found in Hungary. The whole area of the *Gentiana austriaca* = *Gentianella austriaca* were published by WETTSTEIN (1898) and the geographical territories of this species also (cf. PRITCHARD & TUTIN 1972) without any detailed data of the localities. This general "mapping" resulted in insufficient information with respect to the floristical evaluation of any species in connection with a local flora in a protected area (BNP) or also to the history of vegetation studied by us.

That is the reason why it seems to be necessary to map the localities of these species in detail.

The data of the herbarial labels, enumerated below, are given in alphabetic order: within the datum-packages, are listed: the locality bordering the village(s) followed by the name of the county in brackets, the name of the collector in shortened form and the date, and the same order. The code number(s) of grid(s) are also given, if the locality can be found in the list published by NIKLFELD (1971) or is included in the list, compiled by BORHIDI and coworkers for the present-day territory of Hungary. The names of the localities are given in accordance with herbarial labels and the changes in name of the villages and counties after the world war II. were not taken into consideration. But we did not give code numbers outside of the grids that are beyond Hungary. Data of localities are mapped.

Gentianella austriaca (A. J. Kerner) Kusnezow
and Gentianella austriaca var. castanetorum Borb.

Jarabó (Com. Zólyom), L. 01.08.1927. - Kőszeg 8665 (Com. Vas), Bo. 26.09.1920., 24. 09.1925., Pi. 30.10.1889., 03.09.1892., S.-W. 12.09.1889., Vi. 21.09.1938., W. 10.09.1889., 20.09.1892., 03.08.1898., 25.09.1898. - Krivan (Com. Turóc), Ma. 12.07.1928. - Őcsém (Com. Csik), L. 11.07.1911., Topa, E. (1961). - Pieniny (Com. Szepes), Sz. 11.07.1907., Dostal (1950).

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Aranyosmarót (Com. Bars), M. 13.08.1910. - Árvaváralja (Com. Árva), Jáv. 30.08.1911. - Baksa (Com. Turóc), Ma. 10.08.1914., 23.08.1914. - Barlangliget (Com. Szepes), Jáv. 12.08. 1907. - Bella (Com. Turóc), Lcs. 20.08.1906. - Bélai havasok (Com. Szepes), B. 06.08.1874., F. 07.1895., Pax 25.08.1898., Be. 08.1899., Jáv. 20.08.1915., Cs. 17.07.1933. - Bisztrai hegyek (Com. Ung.), D. 24.07.1882. - Blatnica (Com. Turóc), H. 01.08.1908., 13.08.1913. - Bozsok 8665 (Com. Vas), Borbás, V. (1892) W. 28.08.1889. - Breznóbánya (Com. Zólyom), L. 21.08.1913. - Bilych Karpat, Dostal, J. (1950) - Brasov, Topa, E. (1961) - Mt. Bucegi (reg. Ploesti), Topa, E. (1961). Brandza, D. (1879-1883) - Choecs (Com. Liptó, Com. Árva), We. 24.08.1871., B. 28.07.1974., Pax 22.08.1893., Dostal, J. (1950). - Mt. Cahlau (reg. Bacau), Topa, E. (1961) - Cserenyés (Com. Turóc), Ma. 06-09.1913. - Csergőhegy (Com. Sáros), V. 14.09.1913. - Csorba (Com. Szepes), S. 16.07.1890. - Darázsfalva (Com. Sopron), Uh. et Alb. 13.08.1844. - Diósjenő 8080 (Com. Nógrád), Bo. 14.09.1920. - Dobogókő 8279 (Com. Pest), Jáv. 22.09.1938. - Dobsina (Com. Gömör), L. 08.1910., 08.1923., 09.08.1924., 06.07.1929. - Donovan (Com. Zólyom), L. 08.07.1931. - Dömös 8279 (Com. Esztergom), S. 08.09.1907., Jáv. 08.09.1907., Sz. 22.09.1907., Bo. 26.09.1926. - Dryenok (Com. Turóc), Ma. 1912. - Facskó (Com. Trencsén), Bcs. 03.08.1900. - Felsőhámor 8879 (Com. Borsod), Bo. 04.08.1922., H. 22.08.1937. - Felsőszilvás 7988 (Com. Borsod), H. 09.09.1927. - Galyatető 8025 (Com. Heves), L. 12.07.1941., Bá. 1950. - Gölnic. (Com. Gömör), Ko. 15.08.1927., L. 06.07.1938. - Gyilkos tó (Com. Csik), V. 02.08.1941. - Mt. Ghilcos (reg. Mures aut.), Topa, E. (1961) - Gyömbér (Com. Zólyom), L. 11.08.1927. - Haglímásul Mare (reg. Mures aut.), Topa, E. (1961) - Havran (Com. Sáros), Szt. 08.1876. - Homoród (Com. Udvarhely), Br. 18.07.1899. - Kassa (Com. Abauj-Torna), Th. 25.06.1908., 07.09.1908. - Kesztlőc 8279 (Com. Esztergom), S. 02. 10.1904., Feichtinger S. (1899) - Kismarton (Com. Sopron), Alb. 09.10.1840. - Kiskőhát 7988 (Com. Borsod), Bo. in: Soó (1943) - Kistöröki völgy (Com. Zólyom), Th. 11.07.1911. - Kobilá (Com. Máramaros), Ma. 17.07.1932. - Kohlbachthal (Com. Szepes), Z. 01.08.1877., Pax 08.09. 1908. - Kőszeg 8665 (Com. Vas), W. 01.10.1889., Ká. 29.05.1933., Borbás, V. (1892) - Kralova Hola (Com. Liptó), Pax 03-08.1895., L. 05.08.1938. - Králicska (Com. Zólyom), L. 04.08.1938. - Krivan (Com. Turóc), Pax 08.08.1893. - Krizna (Com. Zólyom), Pax 06.08. 1894. - Leutschovia (Com. Szepes), Gre. 08.1916. - Lillafüred, Mts. Bükk 7989 (Com. Borsod),

Jáv. 15.06.1944. - Liptószentmiklós (Com. Liptó), Pax 16.08.1905. - Lublófürdő (Com. Szepes), F. 08.1926. - Lucsa (Com. Gömör), H. 17.07.1941. - Lucski (Com. Liptó), Borb. 30.07.1892., Ri. 08.1895. - Luzsnam (Com. Liptó), L. 16.08.1928. - Madarashegy (Com. Bars), M. 05.08.1909. - Molkovka (Com. Liptó), P. 05.08.1913. - Nagygalya, Mts. Mátra 8085 (Com. Heves), Jáv. 05.09.1933., 01.09.1955., 08.1958., Pé. 05.09.1933. - Nagymező, Mts. Bükk 7988 (Com. Borsod), Boros, in: Soó (1943) - Nedozer (Com. Turóc), Ma. 26.08.1914. - Ohegy (Com. Zólyom), L. 22.08.1913. - Pikuj (Com. Bereg), Ma. 27.07.1910. - Mt. Pilis 8379 (Com. Pest), De. 23.09.1903., Ku. 02.10.1904., L. 02.10.1904., Tau. ?, Neilreich, A. (1866) - Borbás, V. (1879) - Pressburg (Com. Pozsony), Neilreich, A. (1866) - Répáshuta, Mts. Bükk 7989 (Com. Borsod), H. 03.09.1933. - Rohonc (Vas m.), W. 09.09.1902. - Rosudec (Com. Trenčín), ? 12.08.1889., Jáv. 27.08.1911., Neilreich, A. (1866) - Scotarsko (Com. Bereg), Ma. 22.07.1927. - Selmechánya (Com. Hont), Jáv. 27.08.1936. - Sompataki Kishuta 7594 (Com. Borsod), Bá. 18.09.1948. - Stósz (Com. Abauj-Torna), Lyka 08.07.1912. - Mt. Suhardu (reg. Mures aut.), Topa, E. (1961) - Szokola Kamen (Com. Ung), Di. 20.08.1881. - Sztracena (Com. Gömör, Com. Szepes), L. 15.08.1927., 17.07.1932., 14.07.1933., 07.1938. - Szvidovec (Com. Máramaros), Ma. 26.07.1933. - Tatra (Com. Szepes, Com. Liptó), 700 m, Ha. 09.07.1933., 1250 m, Wol. 20.09.1896., 1600 m, Hv. 07.1904., Ma. 27.07.1930. - Tatra Lomnitz (Com. Szepes), Sch. 18.09.1894. - Torna (Com. Abauj-Torna), H. 21.06.1913. - Ma. 04.06.1932., Aa. 10.06.1939. - Valea Vinului (Reg. Cluj), Topa, E. (1961) - Verner (Com. Gömör), Pax 16.08.1893. - Védény (Burgenland), Gay. 09.09.1930. - Mt. Vértes 8575, 8576 (Com. Komárom-Fejér), Neilreich, A. (1866) - Zakopane (Galicia), Wol. 16.08.1896. - Zinóváralja (Com. Turóc), Ma. 09.1906. - Zöld tó (Com. Szepes), F.-Jáv. 12.08.1907., V. 08.1916. - Zuberec (Com. Árva), Jáv. 23.08.1911. - Zsarnovica (Com. Hont), Ma. 09.1911.

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Dorog (Com. Esztergom), Gr. 09.1875. - Esztergom 8287 (Com. Esztergom), Jáv. 04.10.1946. - Esztergomtábor 8278 (Com. Esztergom), Bá. 07.10.1944., An. 27.08.1946., Kov. 30.08.1951. - Kalaposkő 8665 (Com. Vas), Mol. 09.1945. - Kesztlőc 8278 (Com. Esztergom), Feu. 19.08.1862., Gr. 08.1863. - Lébény 8270 (Com. Moson), Tr. 23.09.1924., Bo.-Po. 12.10.1924., Zó. 11.09.1926., Po. 03.10.1926., Pal. 30.08.1927. - Lillafüred, Mts. Bükk 7989 (Com. Borsod), H. 10.09.1927. - Sopron 8365 (Com. Sopron), Kt. 12.09.1947. - Tárkány 8474 (Com. Komárom), Po. 26.08.1932.

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Barkó (Com. Máramaros), Ma. 07.1926. - Barlangliget (Com. Szepes), Borb. 22.07.1892., Ni. 08.07.1893., Ull. 08.1893., Jáv. 12.08.1907. - Bálvány-Bükk, Mts. Bükk 7988 (Com. Borsod), Cs. 11.08.1933., 12.08.1953., V. 29.08.1951. - Bánkut, Mts. Bükk 7988 (Com. Borsod), Bak. - Cz. 10.09.1953. - Benedekfalu (Com. Liptó), Ull. 17.06.1894., 18.06.1894. - Bélai mész-havasok (Com. Szepes), F.-Kü. 08.08.1916., Pax 03.08.1853. - Bükkfennsík, Mts. Bükk 7988, 7989, (Com. Borsod), Bá. 13.08.1944. - Bükkszentlélek 7889 (Com. Borsod), Bu. 19.09.1915. - Cerni Kauren (Com. Liptó), L. 01.09.1913. - Cohárd mt. (Com. Csik), V. 31.07.1942. - Diós-jenő, "Foltán Kereszt", Mts. Börzsöny 8080 (Com. Nógrád), Bo. 17.09.1920. - Dobsina (Com. Gömör), R. - Borb. 14.07.1901., Ge. 1901., L. 15.08.1927., 19.07.1928., 09.07.1929., 27.08.1929., 04.07.1930., 28.07.1933., 25.09.1940. - Fakut.lápa, Mts. Bükk 7988 (Com. Borsod), Boros in: Soó (1943) - Fekete-sár, Mts. Bükk 7988 (Com. Borsod), P. 10.07.1947., L. 12.08.1956., Boros in: Soó (1943) - Feketevág (Com. Liptó), L. 27.07.1913. - Felsőtárkány 8088 (Com. Borsod), Cs. 15.07.1947. - Fenyőháza (Com. Liptó), Borb. - Ri. 08.1895., H. 13.07.1912. - Felsőhámor-Jávorkút, Mts. Bükk 7989 (Com. Borsod), Bu. 02.08.1907., 01.09.1907., 09.07.1909., Bo. 03.08.1922., 05.07.1924., 06.07.1924., 06.07.1927., H. 02.07.1927., 04.09.1927., 09.07.1928., Jáv. 21.08.1907., 23.07.1949., 25.07.1949., Cs. 06.09.1970., V. 17.07.1927., Boros in: Soó (1943) - Imrichfalu (Com. Szepes), L. 08.1910., 06.09.1926. - Jablonka (Com.

(Com. Árva), Holl. 16.07.1895. - Jasina (Com. Máramaros), Ma. 14.07.1931. - Javorina (Com. Gömör), ? 02.08.1853. - Kassa (Com. Abauj-Torna), Si. 25.05.1941., 21.07.1941. - Káposztafalu (Com. Szepes), L. 06.09.1926. - Káposztás tebek, Mts. Bükk 7988 (Com. Borsod), SzL. 12.09.1981. - Késmárk (Com. Szepes), Bo. 09.07.1933. - Kishuta 7594 (Com. Zemplén), Bá. 18.09.1948. - Kismező, Mts. Bükk 7988 (Com. Borsod), Boros in: Soó (1943) - Kohlbachthal (Com. Szepes), Be. 13.08.1889., Pax 26.08.1909. - Kolozsvár (Com. Kolozs), Borb. 21.06.1901. - Komlócska 7694 (Com. Zemplén), Kiss, 26.07.1938. - Lillafüred 7989 (Com. Borsod), Bo. 06.07.1924., Jáv. 15.07.1949., 20-25.07.1949. - Körmöcbánya (Com. Bars), Ma. 29.06.1913. - Kőrösmező (Com. Máramaros), Ma. 13.08.1918. - Lőcse = Leutschovice (Com. Szepes), Gre. 08.1891. - Mátraháza, Mts. Mátra 8185 (Com. Heves), Győ. 07.09.1949. - Murányhuta (Com. Gömör), L. 17.08.1924., Ri. 10.07.1901. - Nagygalya, Mts. Mátra 8085 (Com. Heves), Po. 05.09.1933, Jáv. 22.09.1955. - Nagyhideghegy, Mts. Börzsöny 8079 (Com. Pest), Szé. 08.1891. - Nagymező, Mts. Bükk 7988 (Com. Borsod), Pé. 20.08.1937., V. 27.08.1951., G. 11.10.1959., Bá. 09.07.1974., Boros in: Soó (1943) - Nyirmező, Mts. Bükk 7989 (Com. Borsod), Jáv. 23.06.1922. - Ohegy (Com. Zólyom), L. 22.07.1913. - Omassa, Mts. Bükk 7989 (Com. Borsod), H. 05.07.1913., Bo. 04.10.1920. - Petrozsény (Com. Hunyad), Tu. 07.07.1910., Kt. 18.07.1935. - Mt. Popova (Com. Gömör), L. 15-16.08.1927. - Remetefa 8185 (Com. Heves), Bo. 08.1920. - Répáshuta 7988 (Com. Borsod), Bu. 20.07.1906., Jáv. 29.07.1922., Bak. 10.07.1947., Vida 13.08.1951., 20.07.1952., K.D. 15.09.1981., Gy. 14.10.1981. - Rosudec (Com. Trencsén), Ma. 07.1912. - Rózsahegy (Com. Liptó), Bl. 09.08.1913. - Sáros-patak 7695 (Com. Zemplén), Kiss 19.08.1934. - Semrekovica (Com. Turóc), Ma. 07.1915. - Sompataki Nagyhuta (Com. Abauj-Torna), V. 05.09.1948. - Szarvasrét (Com. Bereg), Ma. 08.1912. - Szádellői Völgy, Mts. Tornai Karszt (Com. Gömör), Gay. 17.07.1867. - Szilvásvár, Mts. Bükk 7988 (Com. Borsod), H. 4-18.09.1927., 08.07.1933., 05.07.1940., Bo. 12.07.1934. - Sztracena (Com. Gömör), Pax 20.08.1898., L. 09.08.1924., 07.10.1926., 20.08.1929., 15.08.1031., 07.1938., 25.09.1940. - Szvidovec (Com. Máramaros), Fo. 25.08.1959. - Tarkő, Mts. Bükk 7988 (Com. Borsod), Jáv. 29.06.1922., Bá. 09.07.1947. - Telkibánya 7594 (Com. Zemplén), Bo. 19.10.1959., Nagy-Pé. 23.08.1962. - Ujhuta-Bikarét, Mts. Bükk 7988 (Com. Borsod), Boros in: Soó (1943) - Velkaluka (Com. Turóc), Ma. 09.1913. - Veterna Hola (Com. Trencsén), Szé. 02.08.1889. - Zernest (Com. Fogaras), Sag. 18.07.1893.

Abbreviations of collectors' names

Alb.	Albach, S.	Gre.	Greschik, V.
An.	Andreánszky, G.	Gr.	Grundl, I.
Bak.	Baksay, L.	Győ.	Győrffy, I.
Br.	Barth, J.	Gy.	Gyulai, I.
Bá.	Bánó, L.	Ha.	Hanasievicz, O.
Be.	Behusch, R.	Hay.	Haynald, L.
Bl.	Blathny, T.	Hzs.	Hazslinszky, F.
Borb.	Borbás, V.	Holl.	Hollós, L.
Bo.	Boros, Á.	Hv.	Horváth, Ö.
B.	Botasch, F.	H.	Hulják, J.
Bcs.	Brancsik, C.	Jáv.	Jávorka, S.
Bu.	Budai, J.	Kt.	Kárpáti, L.
Cz.	Czakler, M.	Ká.	Kárpáti, Z.
Cs.	Csapody, V.	Kiss	Kiss, Á.
De.	Degen, A.	Kov.	Kovács, É.
Di.	Dicta, S.	Ko.	Kováts, Fr.
D.	Dietz, S.	KD.	Kováts, D.
Feu.	Feuchtiger, S.	Ku.	Kurimay, M.
F.	Filarszky, N.	Kü.	Kümmerle, J.B.
Fo.	Fodor, I.	Lá.	Lányi, Gy.
Gay.	Geyer, Gy.	Lcs.	Lencső, V.
G.	Gálffy, I-né	L.	Lengyel, G.
Ge.	Gesell, J.	Lyka	Lyka, K.

Ma.	Margittai, A.	Szé.	Szépligeti, L.
M.	Moesz, L.	Sz.	Szombathy, K.
Mol.	Molnár, N.	Szt.	Szteho, A.
Nagy	Nagy, B.	SzL.	Szujkó-Lacza, J.
Ni.	Niderleithinger	Tau.	Tauscher, J.
Pal.	Palik, P.	Th.	Thaisz, L.
P.	Papp, J.	Tr.	Treitz, P.
Pax	Pax, F.	Tu.	Tuzson, J.
Pé.	Pénzes, A.	U.	Uhl, J.
Pi.	Piers	Ull.	Ullepits, J.
Po.	Polgár, S.	V.	Vajda, L.
R.	Richt, A.	Vida	Vida, G.
Ri.	Richter, L.	Vi.	Visnya, A.
Sag.	Sagorski E.	W.	Waisbecker, A.
Sch.	Schneider, G.	We.	Wetschky
S.	Simonkai, L.	Wol.	Woloszczak, E.
Sl.	Siroki, Z.	Z.	Zimmermann, Z.
		Zo.	Zólyomi, B.

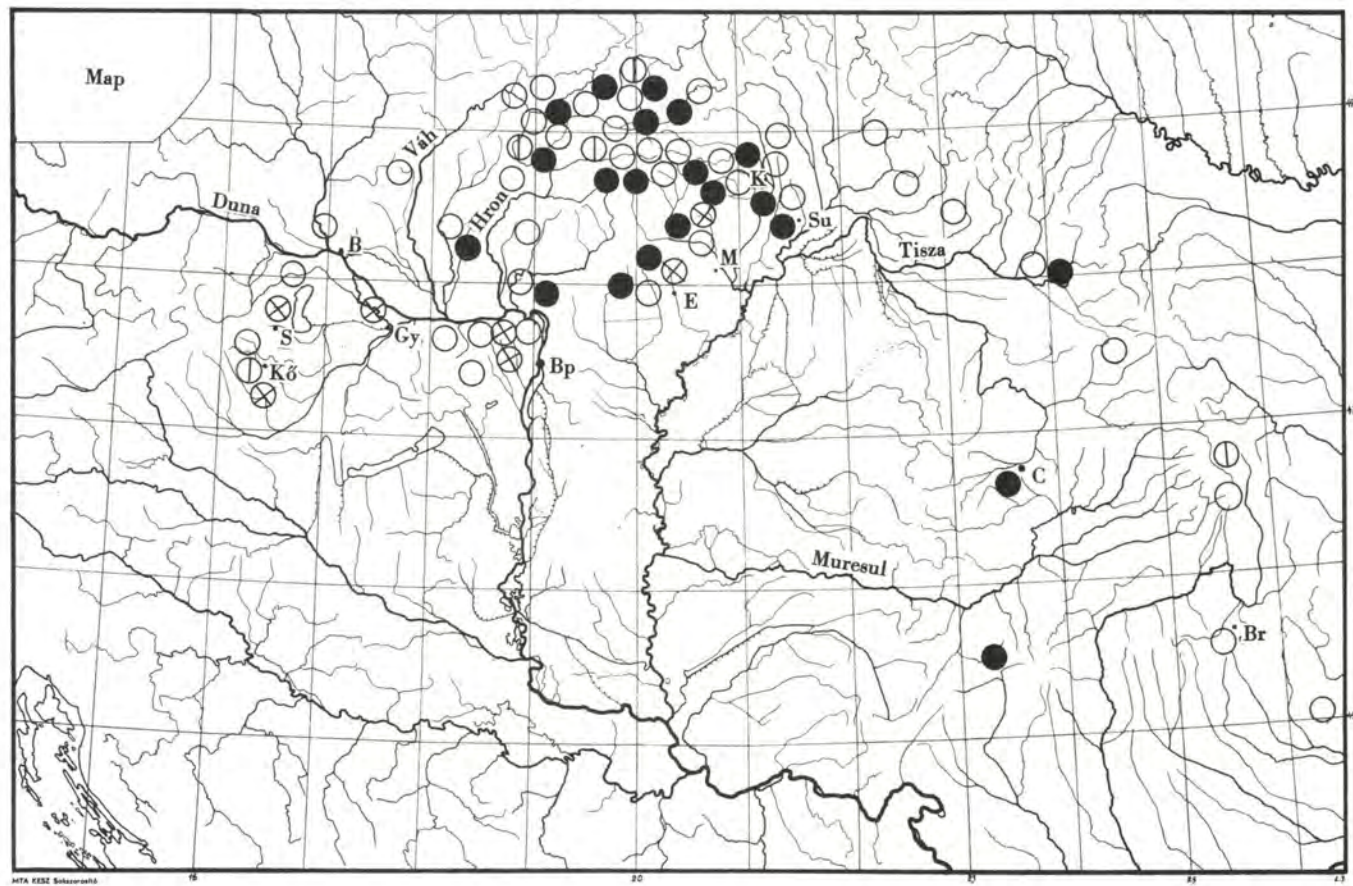
Table 1.
Diversity and evenness values of the *Gentianella austriaca* ssp. *fatrae* and *G. livonica*

	Altitude m				Habitat		Baserock	
	100-500	501-1000	1001-1500	1501-	meadow	forest margin	lime-stone	andezite
<i>G.a. ssp. fatrae</i>	9	33	9	15	57	14	40	13
<i>G. livon.</i>	7	61	1	0	88	14	61	7
<i>G.a. ssp. fatrae</i>	H' Alt. = 1.77		J Alt. = 0.88					
	H' Habit. = 0.72		J Habit. = 0.72					
	H' Baser. = 0.80		J Baser. = 0.80					
<i>G. livon.</i>	H' Alt. = 0.58		J Alt. = 0.37					
	H' Habit. = 0.58		J Habit. = 0.58					
	H' Baser. = 0.48		J Baser. = 0.48					

The analysis based on the label information of the herbaria sheets.

The lowest and highest level are between 300 to 1500 m.s.l. in *Gentianella livonica* and 120 to 2500 m.s.l. in *Gentianella austriaca* (Table 1). The *G.a.* show better adaptation to the various environmental conditions by different morphology variants than *G.livon.*, Both species prefer the limestone as fundamental rock, but occur in andezite in the Hungarian Central Mountain and in granite in the Carpathian Basin.

According to the extending area, the communities in which the two species can be found and the growing period - from late summer to late autumn - (in Central Europe), a cool-continental feature was given for *Gentianella austriaca* ssp. *fatrae* and *G. livonica*.



Map
Distribution of the Gentianella taxa in Carpathian Basin and in Hungary

= Gentianella austriaca and G.a. var. castanetorum
 = G.a. ssp. fatrae
 = G.a. ssp. fatrae var. paludosa
 = Gentianella livonica

Abbreviation of cities:

B	Bratislava (Czechoslovakia)	K	Kosice (Czechoslovakia)
Bp	Budapest (Hungary)	Kő	Kőszeg (Hungary)
Br	Brasov (Rumania)	M	Miskolc (Hungary)
C	Cluj (Rumania)	S	Sopron (Hungary)
E	Eger (Hungary)	Su	Sátoraljaújhely (Hungary)
Gy	Győr (Hungary)		

Conclusions

PRITCHARD & TUTIN (l.c.) have the opinion that the Gentianella austriaca occur in Austria, Czechoslovakia, Germany, Hungary, Yugoslavia, Poland and Rumania.

Considering our Map this species or more exactly the Gentianella austriaca as var. castanetorum grow in W-Hungary (Map), the G.a. ssp. fatrae, occur in the N-E-Central Mountain in Hungary, and in the higher level in Carpathian Basin, except for two localities, the "Hanság" and near Esztergom and Keszthely in the two latter loci the G.a. var. paludosa WETTSTEIN in the wet meadow and marshy land are grown.

The Gentianella livonica area extends to "N- and C-Europe, extending south-eastwards to E-Ukraine" PRITCHARD & TUTIN (l.c.). This species shows a relative sharp line in boundary in the western direction and grows only in the N-Carpathians and in the N-E-Hungarian Central Mountain. The two loci in Rumania seem to be isolated points (Map). The continuation can be found only in the outer - southern - part of the S-Carpathian Mountains (cf. POP 1961).

Both species are absent from the dry lowland - Great Hungarian Plain. The areas show discontinuity in the N-E-Central Mountain and the taxa grown into the Festucetum rubrae, Nardetum strictae, Arrhenatheretum elatioris grass and in the margin of the Melitti-Fagetum subcarpathicum communities. The Gentianella austriaca var. castanetorum Borb. grows in Castaneto sativum norium community in W-Hungary and the var. paludosa in wet meadow and marshy land (see above). Gentianella livonica occurs in the S-W-Central Mountain too, but only in a few loci - in the Mts. Pilis and only 3-400 m above sea level relative near the high N-E-Carpathian.

Acknowledgement

Author gratefully acknowledge Mrs. Zsuzsanna HATTYÁR-HIDAS for her technician help in this paper.

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