

Two new subspecies of *Campanula rotundifolia* L. described from North Europe and lectotypification of *C. rotundifolia* f. *lapponica* Witasek and f. *pusilla* Saelán

Mikko Piirainen & Jaakko Nurmi

Piirainen, M., Botanical Museum, Finnish Museum of Natural History, P.O. Box 7, FI-00014 University of Helsinki, Finland; e-mail: mikko.piirainen@helsinki.fi

Nurmi, J., Botanical Museum, Finnish Museum of Natural History, P.O. Box 7, FI-00014 University of Helsinki, Finland; e-mail: jaakko.nurmi@helsinki.fi

Two new diploid ($2n=34$) subspecies of *Campanula rotundifolia* L. are described from North Europe. *C. rotundifolia* subsp. *fennica* Piirainen & Nurmi is native in the southern half of Finland, adjacent parts of the Karelian Republic (Russia), northern Estonia and the Baltic Islands (Sweden, Estonia, Russia). Its habitats are cliffs and eskers, in the Baltic area also alvars. It is ahemerobic or even hemerophobic. *C. rotundifolia* var. *latifolia* Brenner and f. *pusilla* Saelán (nom. illeg.), are synonymized under it; the latter is also lectotypified. The other new subspecies, subsp. *kemensis* Piirainen & Nurmi, is known from the northern half of Finland, adjacent Sweden, Finnmark (North Norway), and the Kola Peninsula (Russia). The native habitats are alluvial river shores and cliffs. As an apophyte, it grows also in meadows, hayfields, roadsides and villages. In addition, a lectotype is chosen for *C. rotundifolia* f. *lapponica* Witasek, a northern diploid form described based on East Fennoscandian material. The original material in H consists of specimens belonging to three different taxa or their intermediates. The lectotype was chosen in accordance with the original description to stabilize the use of the name. The name is synonymized to the newly described subsp. *kemensis*, representing one extreme end of its variation.

During the preparation of the new checklist of the vascular plants of Finland (Kurtto et al., in press.) and the manuscript for the fifth edition of the Field Flora of Finland (former edition Hämet-Ahti et al. 1998), it became necessary to decide how to deal with two unpublished infraspecific races of *Campanula rotundifolia* L. presented in the earlier editions of the flora (Nurmi 1984, 1986a, 1998), as only validly published names were to be accepted in these two forthcoming publications. The question is treated briefly in this paper.

Campanula rotundifolia in N Europe

Campanula rotundifolia forms a widely distributed and taxonomically difficult complex in the circumpolar areas in most of Europe, northern Asia and northern parts of North America (Hultén & Fries 1986). In North Europe, it is often divided in three subspecies, subsp. *rotundifolia*, subsp. *groenlandica* (Berlin) Á. Löve & D. Löve and subsp. *gieseckeana* (Vest) Witasek (e.g., Nurmi 1998, Lid & Lid 2005, Elven 2018, Mossberg &

Stenberg 2018; as "*gieseckiana*", for the orthography, see Art. 60.8 in Turland et al. 2018). Castroviejo et al. (2010) accepted in Europe only one subspecies in addition to the nominal race. However, their treatment is unsatisfactory, without attention to much of the Central and East European variation of the species.

Nurmi (1986b) studied the variation of *Campanula rotundifolia* in Fennoscandia and made hundreds of chromosome counts in order to find out how much the ploidy level is correlated with the morphology, ecology and geography of the species. His results were in accordance with those of, e.g., Böcher (1966) and Laane et al. (1983), showing the presence of two ploidy levels (diploid $2n=34$, tetraploid $2n=68$) and a strong correlation between the ploidy level and geographical distribution. The ploidy level may also reliably be determined using pollen grain diameter (Böcher 1960, Laane 1968, Laane et al. 1983; the exact measurements, however, differ between these studies probably due to different methods applied). No natural hybrids are formed between the two ploidy levels, except for a very few cases. However, the morphological variation within the species is largely quantitative, and intermediates are found within each of the two ploidy levels.

Campanula rotundifolia subsp. *rotundifolia* as it grows in Fennoscandia is an upright or ascending 25–60 cm tall plant. The lanceolate or almost linear stem leaves are rather uniform and evenly scattered along the stems. The inflorescence is a panicle or raceme, often with secondary branching. Flowers number (1–)2–20, corolla is 16–25 mm long and lobed 31–44% of its length. Capsule is 6–9 mm long, seeds 0.7–0.9 mm long. The chromosome number is tetraploid ($2n=68$). (Nurmi 1980, 1986b, 1998, Lid & Lid 2005, Mossberg & Stenberg 2018). This kind of plants are common in the southern parts of the area in dryish and mesic meadows, roadsides, field and ditch edges and similar usually rather open habitats preferably on sandy, well-drained soil. In Finland, the subspecies is confined to secondary habitats close to human settlements and cultivations and hence interpreted as an archaeophyte. In north Finland, it is rather rare and clearly neophytic in villages, cultivated areas and along roadsides. All the other, native occurrences of the species in Finland on rocks and cliffs, eskers and in the north-

ern mountain areas seem to belong to other races (Nurmi 1980, 1986b, 1998, Suominen & Hämet-Ahti 1993).

The other tetraploid race, subsp. *groenlandica* is limited to a small area in the northwestern mountain areas in Finland; in Sweden and Norway it occupies alpine areas also further south (Nurmi 1980, 1984, 1986b, 1998, Lid & Lid 2005, Mossberg & Stenberg 2018). It is smaller (10–25 cm), the stem leaves are centered in the lower part of the stem, and it has only one large, broadly campanulate flower (or very few flowers) and slightly larger capsules and seeds. A wide range of intermediates between the two tetraploid subspecies occur especially in Norway and north Sweden.

The diploid populations can be divided in three groups (Nurmi 1984, 1986b, 1998). The arctic-subarctic subsp. *gieseckiana* is native in sub-alpine and alpine meadows and alpine heaths in northernmost Finland, north Norway (Finnmark) and adjacent parts of the Kola Peninsula (Russia). It resembles the northern tetraploid subsp. *groenlandica* but is more slender and has smaller flowers, capsules and seeds. Kuzeneva (1966) placed the Kola Peninsula plants in subsp. *groenlandica* (as *Campanula groenlandica*) based on their flower size (20–30 mm in length), which was stated to be too large for subsp. *gieseckiana*. Most records in her distribution map come from the Rybachi Peninsula, which is well represented in the East Fennoscandian collection at H, where the average flower length of the Rybachi plants is similar to N Finnish and N Norwegian plants regarded as subsp. *gieseckiana*, and somewhat smaller than those regarded as subsp. *groenlandica*. However, there is no data on the ploidy level of the Kola Peninsula plants.

Another diploid, so far formally undescribed northern subspecies occurs as native on cliffs and in riverside meadows, and as an apophyte in seminatural meadows, roadsides and other human-influenced habitats in the northern half of Finland and adjacent areas of Sweden, Norway and Russia ("pohjankissankello" in Nurmi 1998). Nurmi (1980) stated that the only name given to plants belonging to this entity is *Campanula rotundifolia* f. *lapponica* Witasek, a one-flowered form described by Witasek (1904) based on East Fennoscandian material. It was accepted (as a variety),

e.g., by Cajander (1906) and Hiitonen (1933), but regarded as "unstable" by Kuzeneva (1966).

The third diploid entity is a native undescribed subspecies growing on cliffs and eskers in southern Finland and adjacent parts of Karelian Republic in Russia and probably on Baltic Islands and in Estonia ("metsäkissankello" in Nurmi 1998). Plants with exceptionally broad leaves from cliffs in Hogland (Gulf of Finland, Russia) were described by Brenner (1871) as *Campanula rotundifolia* var. *latifolia* Brenner. With their small flowers they obviously represent a form or modification which belongs to the southern diploid entity. Also the dwarf plants described as f. *pusilla* Saelán by Saelán (1900) from Hogland belong here.

The morphological characters of the races are given in Table 1.

Though the morphological variation within the species is largely quantitative, Nurmi (1986b) found statistically significant differences between the races. The differences were maintained in cultivation. The tetraploids and diploids mainly occupy separate areas (Fig. 1), with a very small overlap. They meet in southern Finland, where they, however, are ecologically separated due to their clearly different habitat preferences. Also the three diploid races each occupy their own area

with very little overlap. These geographically, cytologically, ecologically and morphologically definable entities should best be handled as subspecies. Accordingly, the two unpublished diploid races are formally described below.

The southern diploid

Campanula rotundifolia L. subsp. *fennica*

Piirainen & Nurmi, **subspecies nova**

Type: ES [Finland, South Savo], Savonlinna: Hevoniemi, Lahnasenvuori, vuoren SW-alarinteellä Tiheäsalmen NW-pohjukan kohdalla; reheväkkö, ohuthumuksinen SSW-kalliorinne, stpc, uc. *Fragaria vesca*, *Poa nemoralis*, *Convallaria majalis*. Populaatio no. 16, näytteet 1, 2, 3a+b. Grid 27°E: 68708:5877, alt. 85 m. 21.VII.1984 Jaakko Nurmi 84-197. H-630390. – Later annotations: "Voucher specimen: 2n=34 counted from root-tip mitosis of plants collected from this locality in 1984, Jaakko Nurmi 1984.", "*Campanula rotundifolia* L. coll. the native diploid (2n=34) race. Det. Jaakko Nurmi 1995." (Fig. 2.)

Synonyms: *Campanula rotundifolia* var. *latifolia* Brenner in Not. Sällsk. Fauna Fl. Fenn. Förh. 11 (N.S. 8): 24. 1871. ≡ f. *latifolia* (Brenner) Saelán in Medd. Soc. Fauna Fl. Fenn. 25: 78. 1900. Holotype: [Karelia australis, Russian part] Hogland, Kappelkallio, 3.VIII.1868 M. Brenner. H-349346(!).

Table 1. Morphological characteristics and chromosome number of the subspecies of *Campanula rotundifolia* in North Europe. Data from Nurmi (1980, 1986b, 1998 and unpublished data).

	subsp. <i>fennica</i>	subsp. <i>kemensis</i>	subsp. <i>gieseckaana</i>	subsp. <i>rotundifolia</i>	subsp. <i>groenlandica</i>
Stem length, cm	20–50	20–50	7–25	25–60	10–25
Distribution of stem leaves	fairly even	fairly even	concentrated in lower 1/3	even	concentrated in lower 1/3
Inflorescence structure	usually only primary branching, rarely unbranched	usually only primary branching, sometimes unbranched	unbranched – only primary branching, branches short	branching, often with secondary branches, branches long	unbranched – only primary branching, branches short
Number of flowers	1–10	1–6	1–4	(1)–2–20	1–3
Corolla length, mm	12–20	16–24	16–26	16–25	19–28
Corolla breadth, mm	13–23	18–27	19–30	19–28	23–34
Corolla length/breadth	0.78–1.08	0.73–1.07	0.75–1.06	0.72–0.99	0.71–0.99
Corolla lobe length/corolla length	0.27–0.40	0.27–0.42	0.28–0.43	0.31–0.44	0.30–0.43
Capsule length, mm	4–7	5–8	5–8	6–9	6–9
Seed length, mm	0.7–0.8	0.7–0.9	0.8–0.9	0.7–0.9	0.9–1.1
Pollen diameter, µm	31–36	32–37	33–37	36–41	37–42
Chromosome number	2n=34	2n=34	2n=34	2n=68	2n=68

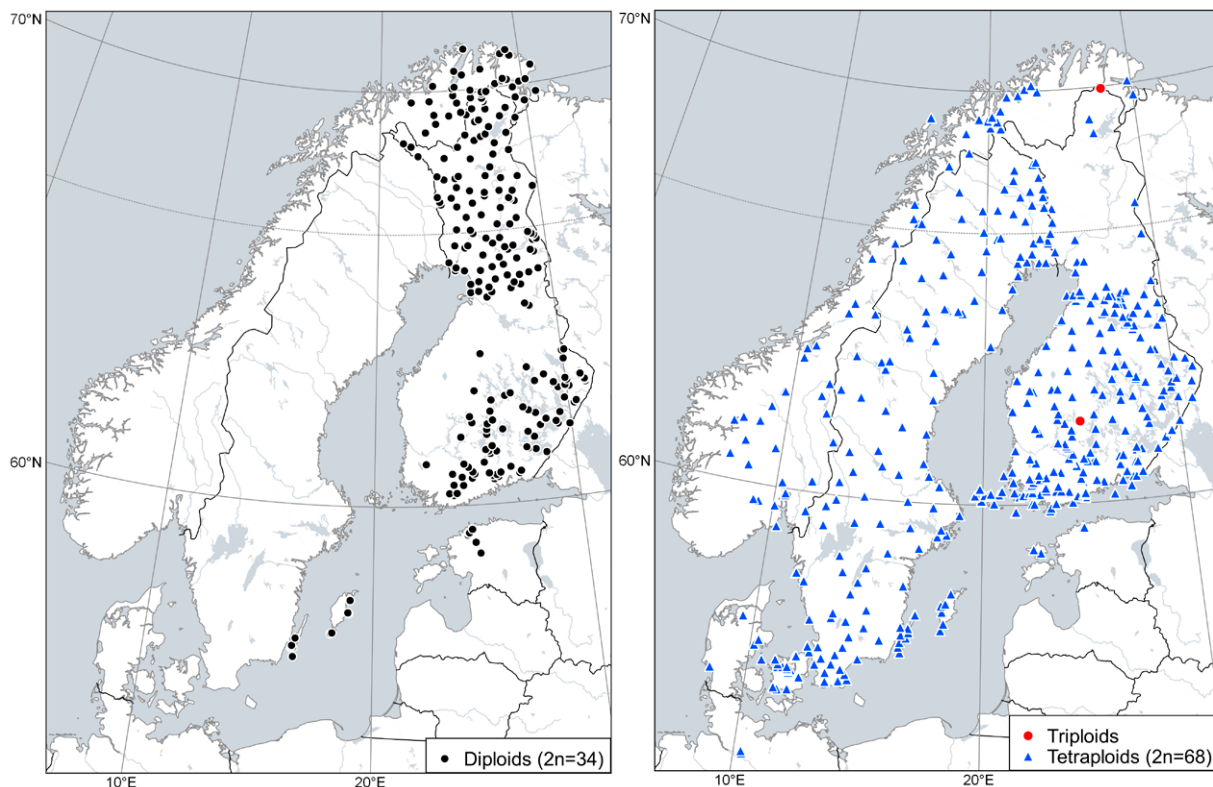


Fig. 1. Distribution of the cytotypes of *Campanula rotundifolia* in N Europe based on c. 750 chromosome counts. Data mainly from Nurmi (1986b: Fig. 1, Fig. 2); c. 50 new counts added. A. Diploid cytotype. B. Triploid and tetraploid cytotypes.

C. rotundifolia f. *pusilla* Sælan in Medd. Soc. Fauna Fl. Fenn. 25: 78. 1900. Nom. illeg. (Art. 24.4., note 2; Turland et al. 2018). **Lectotype** (designated here): [Karelia australis, Russian part] Ka ("N"), ins. Hogland, in cacumine summo montis Lounatkorkia, loco ventoso inter *Cladonia r[h]angiferina*, 13.VIII.1898, Th. Sælan. H-349336(!). Isolectotype: sheet H-682564(!).

Description. Like *Campanula rotundifolia* L. subsp. *rotundifolia* but smaller, 20–50 cm, and more slender; inflorescence usually only with primary branches; flowers usually 1–10; corolla narrowly campanulate, 12–20 mm × 13–23 mm, c. 0.8–1.1 times as long as broad, length of corolla lobes 27–40% of total corolla length; capsule 4–7 mm; seeds 0.7–0.8 mm. $2n=34$ (diploid).

Etymology. Latin *fennica*, Finnish, from Finland

Distribution. Inland of southern Finland and adjacent parts of Russia (Karelian Republic) mostly in areas with an elevation at least c. 50 m a.s.l. to c. 63.8°N; Baltic Islands and Estonia.

Habitat. Native and in Finland and Russia exclusively restricted to cliffs and eskers, mainly to the southern and southwestern slopes; on the Baltic Islands especially on alvars. Ahemerobic or even slightly hemerophobic.

The northern diploid

Campanula rotundifolia L. subsp. *kemensis* Piirainen & Nurmi, *subspecies nova*

Type: SoL [Finland, Sompio Lapland]. Savukoski: kirkolta n. 3 km NW, Kemijoen N-rannalla lanssipaikan alapuolella. Tulvarannan yläosassa somerikkoisella tasanlehdellä cp, uc. *Solidago virgaurea*, *Achillea millefolium*, *Deschampsia flexuosa*, *Dianthus superbus*. Populaatio 10, näytteet 1–3. Grid 27°E: 74693:5478, alt. 170 m. 8.VIII.1985 Jaakko Nurmi 85-197. H-630383. – Later annotations: "Voucher specimen: $2n=34$ counted from root-tip mitosis of plants collected in this locality in 1985. Jaakko Nurmi 1985.", "*Campanula rotundifolia* L. coll.

Fig. 2. Holotype of *Campanula rotundifolia* subsp. *fennica* (H-630390).



the native diploid (2n=34) race. Det. Jaakko Nurmi 1995.” (Fig. 3.)

Synonyms: *Campanula rotundifolia* f. *lapponica* Witasek in Medd. Soc. Fauna Fl. Fenn. 29: 204. 1904. ≡ var. *lapponica* (Witasek) Cajander in Cajander, A. J. Melan Suomen kasvio: 547. 1906. ≡ *Campanula lapponica* (Witasek) C. Regel in Repert. Spec. Nov. Regni Veg. Beih. 82(1): 87. 1935. **Lectotype:** see below.

Description. Like *Campanula rotundifolia* L. subsp. *rotundifolia* but smaller, 20–50 cm, and more slender; inflorescence usually only with primary branches; flowers usually 1–6; corolla campanulate, 16–24 mm × 18–27 mm, 0.7–1.1 times as long as broad, length of corolla lobes 27–42% of total corolla length; capsule 5–8 mm; seeds 0.7–0.9 mm. 2n=34 (diploid).



Fig. 3. Holotype of *Campanula rotundifolia* subsp. *kemensis* (H-630383).

Etymology. Latin[ized] *kemensis*, from Kemi (especially referring to the province of Kemi Lapland in north Finland).

Distribution. Northern Finland from c. 65°N northwards, northeastern Sweden (basin of river Muonioälven), northern Norway (Finnmark),

Kola Peninsula and the northernmost parts of Karelian Republic in Russia.

Habitat. Native on alluvial river shores and cliffs, apophytic in meadows, hayfields, on roadsides, in villages etc.

Typification of *Campanula rotundifolia* f. *lapponica*

Witasek (1904) published *Campanula rotundifolia* f. *lapponica* based on material collected from northern Finland and the adjacent parts of north-western Russia (Kola Peninsula), sent on loan to her from the Botanical Museum (H) of the University of Helsinki, Finland. In the protologue, she cited specimens collected from twelve localities without indicating any of them as the type. In all, in the East Fennoscandian collection of H there are thirteen herbarium sheets (collections) determined by Witasek as *C. rotundifolia* f. *lapponica* on 30.III.1903. These specimens, which form the original material for f. *lapponica* are (in the order listed by Witasek):

1) Obo/OP, Limingo, s.d. Fr. Hellström (H-348430); 2) Obu/PeP, Rovaniemi, prestgården, 11.VIII.1864 M. Brenner (H-348428); 3) Ks (Russia), Kuusamo, Välijärvi, 21.VII.1864 B. A. Nyberg (H-039585); 4) Lki/KiL, sacell. Kolari, prope Äkäslompolo in prato sicco, 27.VII.1877 Hj. Hjelt & R. Hult (H-348440); 5) Lki/KiL, par. Kittilä, prope Riikonkoski, in prato sicco ad flumen Ounasjoki, 6.VII.1877 Hj. Hjelt & R. Hult (H-348439); 6) Le/EnL, Kilpisjärvi, 16.VIII.1867 A. J. Malmberg (H-271626); 7) Li/InL, sacell. Enare, Toivoniemi, in prato humido ripae fluminis Kaamasjoki, 22.VIII.1880 A. Arrhenius & A. O. Kihlman (H-348451); 8) Lim/ImL, in alp. Tuatasch ad lac. Nuotjaur, VIII.1883 R. Enwald & H. Hollmén (H-348443); 9) Lt/TL, prope ostium flum. Nuotjok, in prato, 25.VII.1891 John Lindén (H-348489); 10) Lm/ML, prope pagum Voroninsk in graminosis elevatis 27.VII.1887 A. Osw. Kihlman (H-348493); 11) Lm/ML, prope pagum Voroninsk in ripa glareosa fluvii, 30.VII.1887 A. Osw. Kihlman (H-348494); 12) Lp/PoL, Ponoj, i backe invid byn 2.IX.1899 Iustus Montell (H-348446); 13) Lp/PoL, Orlow (ad lat. bor. c. 67°12') ad scopulos litoreos, 8.VIII.1889 A. Osw. Kihlman (H-348447).

Witasek (1904) circumscribed *Campanula rotundifolia* f. *lapponica* as a slender and tall *C. rotundifolia* with a single, usually very large flower; sparsely situated, narrowly lanceolate leaves in the lower part of the stem; scattered small bract-like leaves in the upper part of the stem, giving the appearance of a long, leafless stalk below the flower; and with either missing or undeveloped flower buds in the axils of the small upper leaves. The description and the geographical area of f. *lapponica* as outlined by Witasek fall within the limits of *Campanula rotundifolia* subsp. *kemen-*

sis published in this paper. However, f. *lapponica* clearly represents an extreme in the variation of subsp. *kemensis*. In addition, the original material seems to consist of three different taxa and one specimen that is intermediate between two of them. Lectotypification is needed to fix the use of the name to one of these entities.

Specimen 6) in the list above consists of four low-grown plants, each of them with one terminal flower, which is not yet fully opened nor full-grown; one of the plants has also three flower buds in the axils of the uppermost stem leaves. J. Nurmi has determined the plants as *Campanula rotundifolia* cf. subsp. *groenlandica* in 1994, which seems to be correct.

Specimen 8) consists of three low-grown plants with almost linear stem leaves densely gathered in the lower part of the stem; each plant has one terminal flower. J. Nurmi has determined the specimen as "*Campanula rotundifolia* subsp. *gieseckeana* (Vest) Witasek" in 1994 ["*gieseckiana*"]; this determination seems to be correct.

Specimen 12) contains six relatively low-grown plants with stem leaves rather densely gathered in the lower part of the stem, and one terminal flower. J. Nurmi has determined the specimen as "*Campanula rotundifolia* coll., the native diploid race (2n=34), including var. *lapponica* Witasek" in 1995. By the habit, this specimen rather seems to represent an intermediate between subsp. *kemensis* and subsp. *gieseckeana*.

Specimens 2), 3) and 11) are medium-sized or tall-grown plants with at least some stems bearing more than one flower. They seem to represent rather typical (though few-flowered) subsp. *kemensis* as understood in this paper.

Specimen 7) consists of seven slender, narrow-leaved plants with leaves that are relatively sparsely situated along the lower half or two-thirds on the stem, showing some resemblance with subsp. *gieseckeana*. The plants may be intermediate between that subspecies and subsp. *kemensis*.

Rest of the plants – specimens 1), 4), 5), 9), 10) and 13) – seem to represent normally developed one-flowered plants of subsp. *kemensis*. Within them, specimen 5) is here chosen as the lectotype. The plants on the sheet have narrowly lanceolate stem leaves, and only one flower.

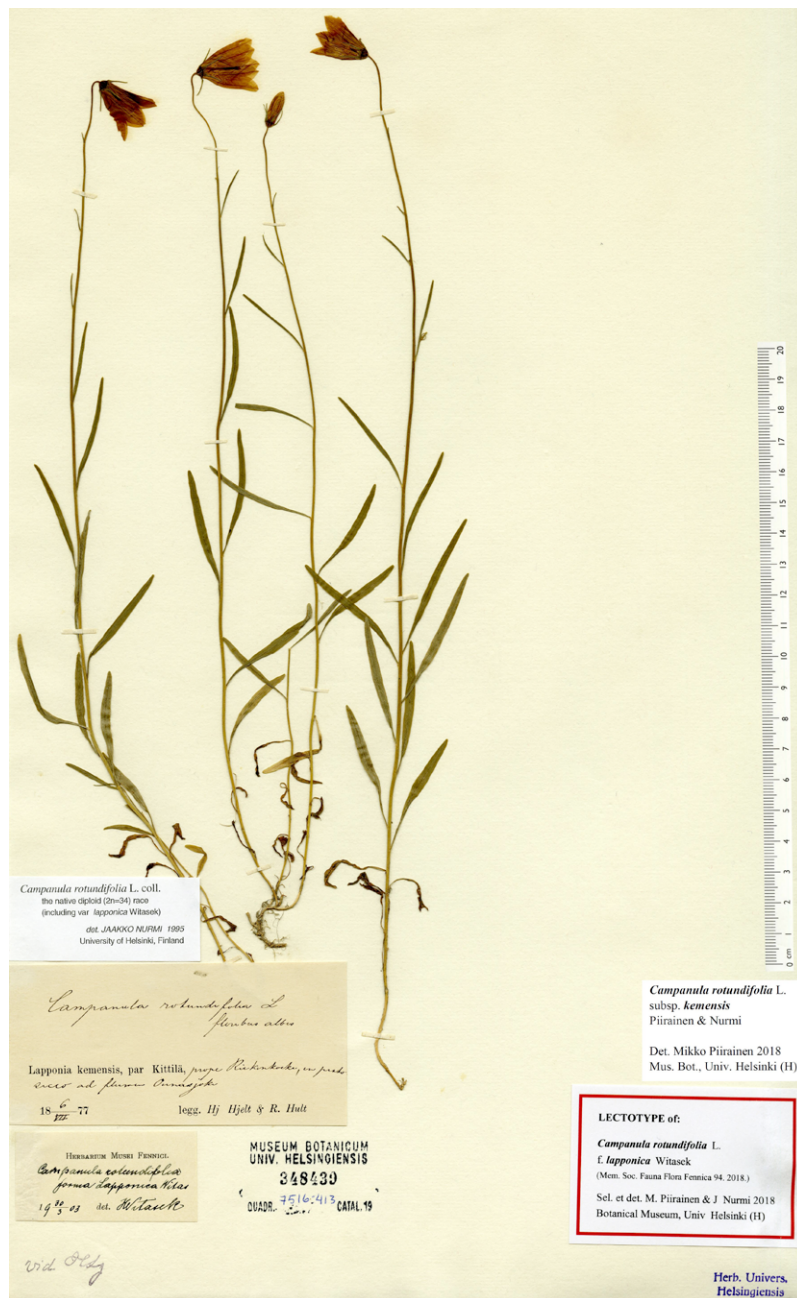


Fig. 4. Lectotype of *Campanula rotundifolia* f. *lapponica* (H-348493).

Campanula rotundifolia* L. f. *lapponica

Witasek, Medd. Soc. Fauna Fl. Fenn. 29: 204. 1904. ≡ *Campanula rotundifolia* L. var. *lapponica* (Witasek) Cajander, in Cajander, A. J. Melan Suomen kasvio: 547. 1906. ≡ *Campanula lapponica* (Witasek) C. Regel in Repert. Spec. Nov. Regni Veg. Beih. 82(1): 87. 1935. – **Lectotype** (designated here):

[Finland] Lapponia kemensis, par. Kittilä, prope Riikonkoski, in prato sicco ad flumen Ounasjoki, 6.VII.1877 Hj. Hjelt & R. Hult. H-348439(!). (Fig. 4.)

= *Campanula rotundifolia* L. subsp. *kemensis* Piirainen & Nurmi, Memoranda Soc. Fauna Flora Fenn. 94: 103. 2018.

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