

# Recent data on rare endemic *Grafia golaka* (Hacq.) Rchb. (Apiaceae) in Croatia

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**Tip članka / article type:** kratko stručno priopćenje / short professional communication

**Povijest članka / article history:** primljeno /received: 30.04.2021., prihvaćeno /accepted: 02.05.2021.

**URL:** <https://doi.org/10.46232/flashbod.9.1.4>

Šegota, V., Borovečki-Voska, Lj., Buzjak, S., Vrbek, M., Surina, B., Alegro, A. (2021): Recent data on rare endemic *Grafia golaka* (Hacq.) Rchb. (Apiaceae) in Croatia. *Glas. Hrvat. bot. druš.* 9(2): 38-43.

## Abstract

The last record of *Grafia golaka*, a very rare relict umbellifer of disjunct Apennine-Dinaric distribution was latest reported from Croatia back in 1904. During our survey, this endemic was found on seven new localities in Gorski Kotar, in altitudinal range between 1273 and 1421 m a.s.l. It was recorded in altimontan-subalpine altitudinal belt within beech forest, in forest clearings and along forest fringes, in dwarf willow shrub as well as within the sinkhole vegetation.

**Keywords:** Dinaric Alps, relict species, Risnjak, Snježnik, umbellifer

Šegota, V., Borovečki-Voska, Lj., Buzjak, S., Vrbek, M., Surina, B., Alegro, A. (2021): Novi podaci o rijetkoj endemičnoj vrsti *Grafia golaka* (Hacq.) Rchb. (Apiaceae) u Hrvatskoj. *Glas. Hrvat. bot. druš.* 9(2): 38-43.

## Sažetak

Vrlo rijetka reliktna vrsta šitarke *Grafia golaka*, koja ima disjunktnu apeninsko-dinarsku rasprostranjenost, posljednji je put u Hrvatskoj zabilježena 1904. godine. Tijekom našeg istraživanja ovu endemičnu vrstu pronašli smo na sedam novih lokaliteta u Gorskom kotaru, u visinskom rasponu između 1273 i 1421 m n.m. Vrsta je zabilježena u pretplaninskom visinskom pojasu, unutar bukove šume, na šumskim čistinama, uzduž rubova šuma, u niskim vrbicama te u vegetaciji ponikvi.

**Ključne riječi:** Dinaridi, reliktna vrsta, Risnjak, Snježnik, štitarka.

*Grafia golaka* (Hacq.) Rchb. (syn: *Athamanta golaka* Hacq., *Hladnikia golaka* Rchb. f., *Malabaila golaka* Walp.) is a tall (50-100 cm) umbellifer, rare in Croatia (Fig. 1). Its morphological features were described in detail by Šilić (1990) and recently by Milović (2015). The major part of its distribution area is typical Dinaric, spreading from NW Slovenia, across Croatia and Bosnia and Herzegovina, finally reaching the mountains of Montenegro and Albania (Šilić 1990, Milović 2015). Accordingly, the species was affiliated to Illyric floral province (Kaligarić et al. 2011). However, its distribution is not limited only to Dinaric Alps, but comes in the southeastern Alps (pre-Alps, *Voralpen* in German) in regions of Trentino-Alto Adige, Veneto, Friuli Venezia Giulia and Lombardy in northeastern Italy (Lasen & Prosser 1995, Pignatti 2018). Moreover, there is another disjunct part of the areal in Central Apennines, which places this species in amph-Adriatic (Barina & Pifkó 2011, Pignatti 2018) or the Apennine-Balkan (Dinaric) mountain (Rakaj 2009) group of taxa, giving its distribution a relict character (Lasen & Prosser 1995).

In Bosnia and Herzegovina, the species is known from mountain areas of Treskavica, Prenj, Čvrsnica, Plasa, Bjelašnica, Velež and Prislav (data derived from SARA herbarium collection). More in the South, the species was recorded in the high Montenegrin mountains of Durmitor, Komovi, Vojnik and Ledenica (Rohlena 1942). The species has quite recently been recorded in Albania in several localities between 1700 and 2000 m a.s.l. on Prokletje Mts (Rakaj 2009, Barina & Pifkó 2011), extending the species' Dinaric distribution more to the (south)east.

In Croatia, the species has been recorded in mountainous regions of Gorski Kotar and Lika (Kapela, Snježnik, Obruč, Delnice, Risnjak and Plješivica) by Árpád Degen and Dragutin Hirc (according to data derived from ZA herbarium collection, summarized in Hirc 1912, Milović 2015). The latest record of *G.*

*golaka* in Croatia was, truth be told, made in 1904 on Mt Snježnik (based on herbarium specimen ZA14184). Being endemic and occurring in the floristically well-studied mountains of the Gorski Kotar region, it is quite unusual that this species was never recorded during the last hundred years. It could be that the botanists simply avoided it since it belongs to the Apiaceae, the plant family including a great many of taxa which are rather difficult to identify particularly without generative organs, e.g. flowers and ripe fruits. Although this endemic species has not been recorded during last hundred years, no targeted research was conducted to confirm the existence of the species in Croatia so far.

In the course of our floristic and vegetation studies of Gorski Kotar, several field excursions were performed in seasons 2003, 2006, 2015, 2016 and 2020, during which *G. golaka* was observed on several occasions. The specimens were identified using several identification keys (Domac 1994, Martinčić 2010, Nikolić 2019) and deposited in the herbarium collection Herbarium Croaticum (ZA) and Herbarium of Croatian Natural History Museum (CNHM) (the acronyms are according to Thiers 2021). Nomenclature of plant taxa follows Flora Croatia Database (Nikolić 2005-onwards).

During our survey of the Risnjak and Snježnik Massifs during the last twenty years, endemic *G. golaka* has been confirmed to thrive on both mountains. In total, four localities on Mt Risnjak, two on Mt Snježnik and one at adjacent Viljska Ponikva have been recorded (Fig. 2).

The first locality on Mt Risnjak was the nameless limestone doline (sinkhole) above Lazac and below peaks of Sjeverni mali Risnjak and Risnjak (1316 m a.s.l.; coordinates: 45.43588 N, 14.61556 E) (Fig. 2 – locality 1), where the species was collected on 30th July 2003 (CNHM 600:ZAG; 4327:BOB) by S. Buzjak and M. Vrbek. The specimens were flowering and bearing unripe fruits. The species grew within

sinkhole vegetation among *Achillea clavennae* L., *Aconitum lycoctonum* L. ssp. *vulparia* (Rchb.) Nyman, *Adenostyles alliariae* (Gouan) A. Kern., *Asarum europaeum* L., *Asplenium fissum* Kit. ex Willd., *Asplenium ruta-muraria* L., *Asplenium viride* Huds., *Asplenium trichomanes* L., *Athamanta cretensis* L., *Bupthalmum salicifolium* L., *Calamagrostis varia* (Schad.) Host, *Campanula scheuzeri* Vill., *Carduus collinus* Waldst. et Kit. ssp. *cylindricus* (Borbás) Soó, *Cirsium erisithales* (Jacq.) Scop., *Clinopodium vulgare* L., *Cyclamen purpurascens* Mill., *Cystopteris alpina* (Lam.) Desv., *Cystopteris fragilis* (L.) Bernh., *Digitalis grandiflora* Mill., *Doronicum austriacum* Jacq., *Dryopteris expansa* (C. Presl) Fraser-Jenk. et Jermy, *Dryopteris villarii* (Bellardi) Schinz et Thell., *Dryopteris filix-mas* (L.) Schott, *Epilobium montanum* L., *Gentiana asclepiadea* L., *Gentiana lutea* L. ssp. *symphyandra* (Murb.) Hayek, *Gymnocarpium robertianum* (Hoffm.) Newman, *Helianthemum nummularium* (L.) Mill. s.l., *Heracleum sphondylium* L., *Hypericum montanum* L., *Laserpitium peucedanoides* L., *Laserpitium siler* L., *Leontodon hispidus* L., *Lilium carniolicum* Bernh. ex Koch, *Lilium martagon* L., *Melittis melissophyllum* L., *Micromeria thymifolia* (Scop.) Fritsch, *Moehringia muscosa* L., *Petrorhagia saxifraga* (L.) Link, *Phyteuma orbiculare* L., *Pinus mugo* Turra, *Polygonatum odoratum* (Mill.) Druce, *Polygonatum verticillatum* (L.) All., *Polystichum aculeatum* (L.) Roth, *Prunella grandiflora* (L.) Scholler, *Rhododendron hirsutum* L., *Salvia glutinosa* L., *Sambucus racemosa* L., *Scrophularia heterophylla* Willd. subsp. *laciniata* (Waldst. & Kit.) Maire & Petitm., *Senecio ovatus* (P. Gaertn., B. Mey. et Scherb.) Willd., *Serratula tinctoria* L., *Sesleria tenuifolia* Schrad., *Heliosperma pusillum* (Waldst. et Kit.) Rchb., *Silene saxifraga* L., *Thesium alpinum* L., *Urtica dioica* L. and *Viola biflora* L.

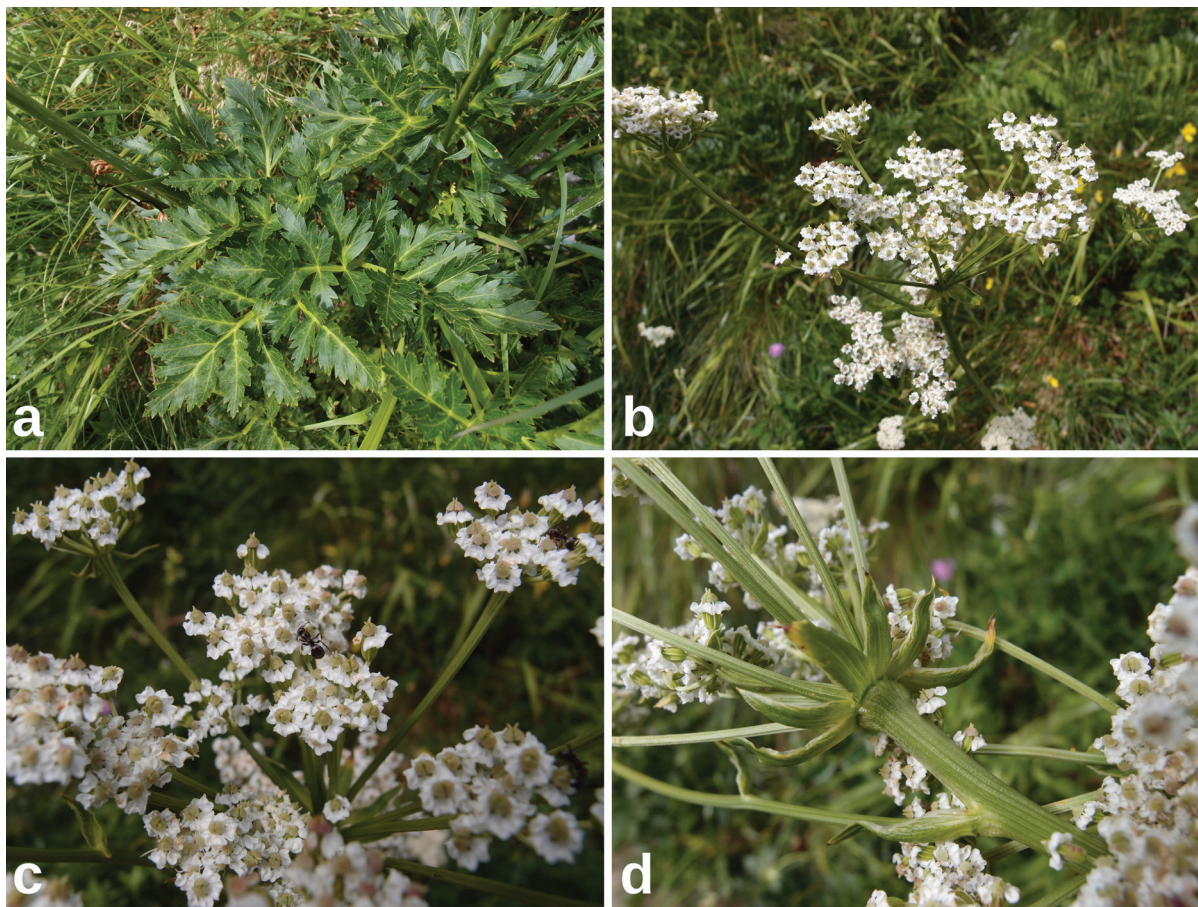
The second locality on Mt Risnjak was situated along the hiking trail connecting Josip Schlosser Klekovski mountain hut and Lazac (1412 m a.s.l.; coordinates: 45.42959 N, 14.62155 E) (Fig. 2 – locality 2), where species with ripe fruits was recorded by A. Alegro on 30th August 2016. The species grew on the forest fringes between pine

krumholz vegetation (*Hyperico grisebachii*-*Pinetum mugii* (Horvat 1938) ex T. Wraber, Zupančić et Žagar 2004) and altimontane grasslands (*Festucetum pungentis* Horvat 1930) among limestone boulder together with *Epilobium angustifolium* L. and *Cirsium erisithales* (Jacq.) Scop.

The third locality on Mt Risnjak was near the end of Horvatova Staza hiking trail (which connects Crni Lug and the Josip Schlosser Klekovski mountain hut) (1365 m a.s.l.; coordinates: 45.42972 N, 14.62395 E) (Fig. 2 – locality 3), where the species in bloom was recorded by Lj. Borovečki-Voska (Fig. 1) on 27th July 2020. The species grew abundantly on the forest clearings of altimontane-subalpine beech forest (*Ranunculo platanifolii*-*Fagetum* (Horvat 1938) Marinček et al. 1993). Several accompanying species were noted: *Stachys recta* L., *Helianthemum nummularium* s.l., *Knautia drymeia* Heuff., *Silene vulgaris* (Moench) Garcke, *Allium victorialis* L., *Rosa pimpinellifolia* L. and *Juniperus communis* L. ssp. *nana* Syme.

The fourth record on Mt Risnjak was found along the upper third of the hiking trail connecting Josip Schlosser Klekovski mountain hut and Medvjeđa vrata (1421 m a.s.l., coordinates 45.42134 N, 14.62500 E) (Fig. 2 – locality 4) on 27th July 2020 by Lj. Borovečki-Voska. The species grew along the forest margin of *Ranunculo platanifolii*-*Fagetum*. It was not yet in bloom, due to a more shaded environment on the site.

Both localities on Mt Snježnik were located along the hiking trail connecting Platak and Moša Albahari mountain hut. First one was the location named Grlo, at 1372 m a.s.l. (coordinates: 45.50361 N, 14.58100 E) (Fig. 2 – locality 5), where only one specimen was noticed by B. Surina on 29th July 2015 within montane-subalpine dwarf willow shrub dominated by *Salix appendiculata* (*Rhododendro hirsuti*-*Salicetum appendiculatae* Horvat ex Horvat, Glavač et Ellenberg 1974 var. geogr. *Hypericum grisebachii*) (Dakskobler i Surina 2017). The second locality of *G. golaka* on Mt Snježnik was at location

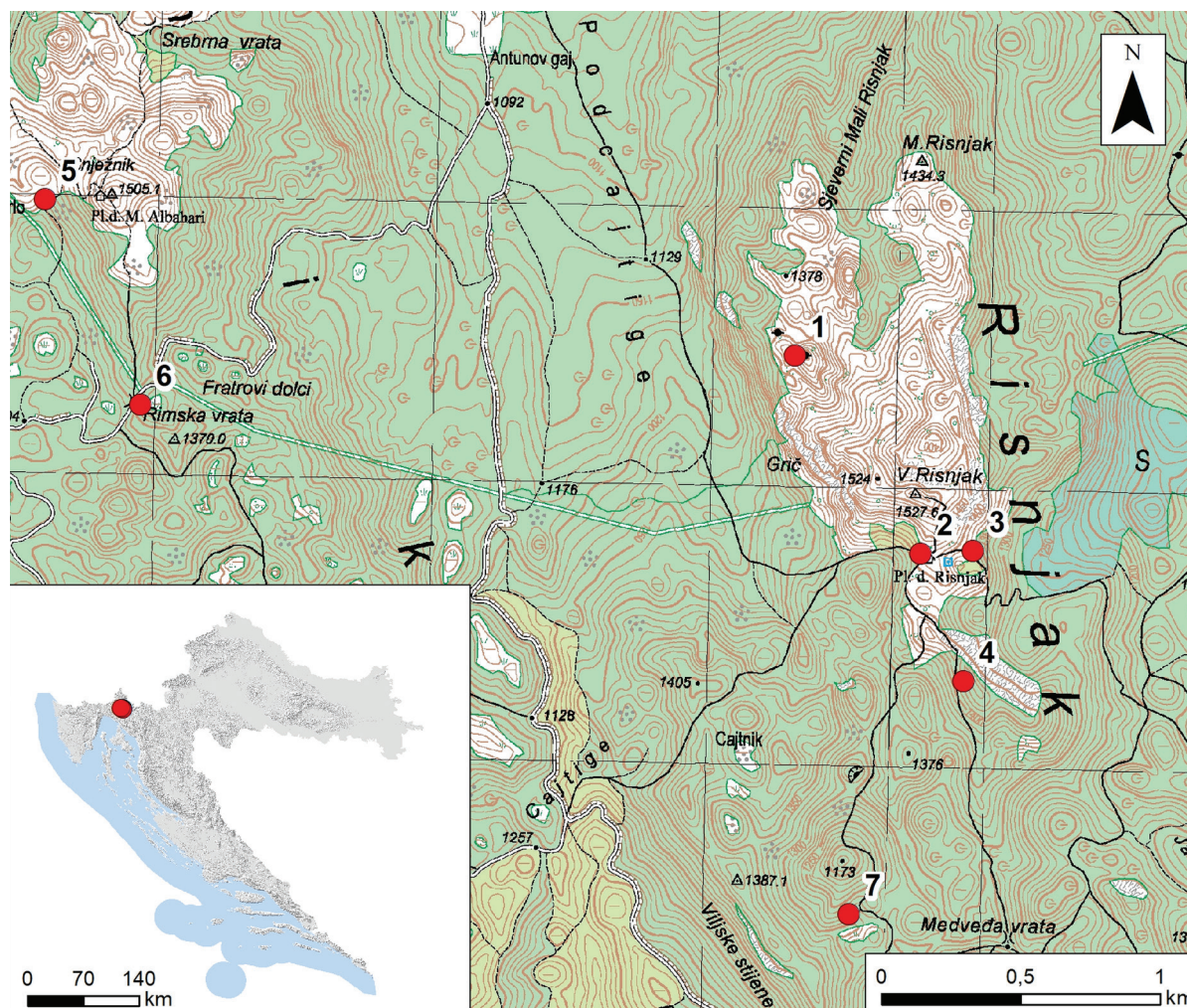


**Figure 1.** *Grafia golaka* (Hacq.) Rchb., basal leaves (a), umbells (b, c), involucre (d) (Photos by: Lj. Borovečki-Voska).

named Rimska vrata at 1345 m a.s.l. (coordinates: 45.43380 N, 14.58560 E) (Fig. 2 – locality 6), where few specimens with rippen fruits were found by V. Šegota on 27th August 2015. The species grew within altimontane-subalpine beech forest (*Ranunculo platanifolii-Fagetum*) among *Fagus sylvatica* L., *Daphne mezereum* L., *Lonicera alpigena* L., *Rubus idaeus* L., *Sorbus aucuparia* L., *Acer pseudoplatanus* L., *Lonicera xylosteum* L., *Cyclamen purpurascens* Mill., *Gentiana asclepiadea* L., *Cystopteris fragilis* (L.) Bernh., *Oxalis acetosella* L., *Mercurialis perennis* L., *Dryopteris filix-mas* (L.) Schott, *Anemone nemorosa* L., *Koeleria eriostachya* Pančić, *Epilobium montanum* L., *Aposeris foetida* (L.) Less., *Actaea spicata* L., *Lamium orvala* L., *Veronica urticifolia* Jacq., *Cardamine trifolia* L., *Viola reichenbachiana* Jord. ex Boreau, *Phyteuma spicatum* L., *Helleborus dumetorum* Willd., *Lathyrus vernus* (L.) Bernh.,

*Mycelis muralis* (L.) Dumort., *Maianthemum bifolium* (L.) F. W. Schmidt, *Prenanthes purpurea* L., *Paris quadrifolia* L., *Hacquetia epipactis* (Scop.) DC., *Polystichum aculeatum* (L.) Roth, *Adenostyles alpina* (L.) Bluff et Fingerh., *Aconitum lycoctonum* L. ssp. *vulparia* (Rchb.) Nyman, *Moehringia muscosa* L., *Valeriana tripteris* L., *Calamintha grandiflora* (L.) Moench, *Asplenium ruta-muraria* L., *Senecio ovatus* (P. Gaertn., B. Mey. et Scherb.) Willd., *Cirsium erisithales* (Jacq.) Scop., *Saxifraga rotundifolia* L., *Ranunculus platanifolius* L., *Calamagrostis varia* (Schrud.) Host.

The last locality was in the vicinity of Viljska Ponikva Sinkhole (SE from the sinkhole), at 1273 m a.s.l. (coordinates: 45,41789 N, 14,61864 E) (Fig. 2 – locality 7) in the forest clearings within altimontane-subalpine beech forest (*Ranunculo*



**Figure 2.** Recent localities of *Grafia golaka* (Hacq.) Rchb. in Croatia (numbers of localities are explained within the manuscript).

*platanifolii*-Fagetum), where a large population was found on 2nd September 2006 by B. Surina.

It is interesting to mention that in southern and southwestern Julian Alps (NE Italy) the species constitutes a montane-subalpine tall herb community *Laserpitio sileri*-*Grafietum golakae* Poldini in Dakskobler & Poldini 2012 representing a long-term stage in the succession of hay meadows in the altimontane and subalpine belts that have been abandoned for over 50 years (Dakskobler & Poldini 2012). In addition, another association, *Scabioso hladnikianae*-*Grafietum golakae* Čarni 2007 was described in Central Slovenia (Polhov Gradec Hills), occurring on the fringes of forest communities from the associations *Ostryo*-Fagetum, *Arunco*-Fagetum

and *Quercu-Ostryetum* (Čarni 2007). Due to its high allelopathic potential and tendency towards forming monodominant stands (Kaligarič et al., 2011), it acts as an inhibitor impairing and slowing the spontaneous afforestation with spruce and some deciduous trees (Dakskobler & Poldini 2012).

### Acknowledgement

We are grateful to Ermana Lagumdžija from the SARA herbarium of the National Museum of Bosnia and Herzegovina and Snežana Vuksanović from Natural History Museum of Montenegro, for providing distributional data on *Grafia golaka*. Many thanks to our colleague Anja Rimac for map and picture design and critical text reading.

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