



Galanthus panjutinii sp. nov.: a new name for an invalidly published species of *Galanthus* (Amaryllidaceae) from the northern Colchis area of Western Transcaucasia

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Abstract

Galanthus panjutinii, a new species endemic to the calcareous ridges of the northern Colchis area (Western Transcaucasia) is described and illustrated. Morphological differences between the new species and the closely related species, *G. krasnovii* and *G. platyphyllus*, are discussed. A line illustration, photographs, map and conservation assessment are provided.

Key words: Abkhazia, calciphylls, Krasnodar Territory, Russian flora, snowdrops

Introduction

During field studies on the Aibga Ridge in the Tuapse-Adler region (Krasnodar Territory, Russia) of Western Transcaucasia, in April 2008 and March and April 2011 a population of *Galanthus* Linnaeus (1753: 288) was discovered (D. Zubov, O. Bondareva, pers. observ.) with individuals possessing a morphology unlike any species known from the region (Davis 1999, 2001; Zubov 2011). In the last edition of the *Caucasian Flora Conspectus* (Takhtajan *et al.* 2006), the only *Galanthus* like this occurring in the Tuapse-Adler region was *G. platyphyllus* Traub & Moldenke (1948: 110) as reported by Artjushenko & Mordak (2006). These unusual plants were found growing in oriental beech forest, *Fagus orientalis* Lipsky (1898: 300), on humus-carbonaceous soils at around 800 m. More detailed studies showed that they shared morphological characters with *G. krasnovii* Khokhrjakov (1963: 140) (e.g. anthers tapering to an apiculum) and *G. platyphyllus* (e.g. inner perianth segments obovate, with an uncharacteristic barely developed apical notch). Some plants from this population also had an apical notch on each inner perianth segment, making the flowers somewhat similar to *G. woronowii* Losina-Losinskaya (1935: 749).

In order to elucidate the identity of this *Galanthus* population we turned to the relevant botanical works (Grossheim 1940, 1949; Khokhrjakov 1966; Artjushenko 1970; Kolakovsky 1938, 1986; Davis 1999, 2001; Artjushenko *et al.* 2006) and geomorphological literature (Zakharov, 1934; Kolakovsky, 1961), and the herbarium of the Komarov Botanical Institute, Russian Academy of Sciences (LE). During the study of the *Galanthus* herbarium specimens originating from Abkhazia housed at LE, we also examined material of an invalidly published name '*G. valentinae*'. *Galanthus valentinae* was first collected on 12 April 1913 by G. Sakharov (*Sakharov 634*; LE) in a clearing above Gagra (Abkhazia), at the boundary between Nordmann fir-tree (*Abies nordmanniana* (Steven) Spach (1841: 418)) forest and subalpine meadow, at 1600 m elevation. The specific epithet *G. valentinae* was given to this collection by P.S. Panjutin, as a determination on the herbarium specimen *Sakharov 634*, but this species was never validly published by him. Grossheim (1940) attempted to formalize the name *G. valentinae* Panjut. ex Grossh. with a brief description in Russian, but his

treatment lacked a Latin diagnosis (McNeill *et al.* 2006). Subsequent regional treatments of the Caucasian flora (Grossheim 1940, 1949; Kemularia-Nathadze 1947; Kolakovsky 1961, 1980, 1986; Khokhrjakov 1966) included this taxon, but *G. valentinae* remained unpublished according the rules of the *International Code of Botanical Nomenclature* (McNeill *et al.* 2006). *Galanthus valentinae* has been associated as an unpublished synonym of *G. krasnovii* by various authors, including Artjushenko (1970) and Davis (1999), but two regional experts of the Colchis flora, Khokhrjakov (1966) and Kolakovsky (1986), defended the distinctiveness of Panjutin's species. In a footnote to the species description of *G. valentinae*, Kolakovsky (1986) stated (translated from Russian): "Artjushenko integrates *G. valentinae* and *G. krasnovii* based on the similarity of the inner perianth segment, which has an obtuse or elongated apex, lacking a notch. However, as Khokhrjakov noted (1966), the inner perianth segments of *G. valentinae* are rounded at the apex, and in examples collected from Bzyb' gorge (Abkhazia) they are also slightly notched (i.e. with a small sinus). In any case, before more thorough population studies of species from the *Latifolii* and *Krasnoviani* series [*sensu* Khokhrjakov 1966] are obtained with respect to the inner perianth segment structure, we believe it is necessary to consider these species separately".

After this research it became clear that the specimens collected on the Aïbga Ridge were conspecific with invalid *G. valentinae*. We also studied and compared the type specimens of *G. krasnovii* (MHA, LE) and *G. platyphyllus* (LE), which *G. valentinae* resembles. These investigations revealed that *G. valentinae* is indeed a distinct species. In order to provide this taxon with a valid name, we describe it here as a new species: *G. panjutinii* Zubov & A.P.Davis.

Evidently, the plants collected by us on the Aïbga Ridge (Tuapse-Adler region) belong to the same taxon as represented by the specimen *Sakharov 634* (LE), corresponding with the delimitation of *G. valentinae* Panjut. ex Grossh. ined., in agreement with the notes of Khokhrjakov (1966) and Kolakovsky (1986). The validation of *G. valentinae* Panjut. ex Grossh. ined. would create a homonym, as this specific epithet has been used for another taxon in *Galanthus*, viz. *G. ×valentinei* Beck, a hybrid taxon (*G. nivalis* × *plicatus*), which occurs in the wild and is common in cultivation (Davis *et al.* 2001). It is therefore necessary to establish a new *Galanthus* species, which we publish here as *G. panjutinii*, in honour of Caucasian climber and naturalist Platon Sergejevich Panjutin (1889–1946). Panjutin was a chemist by education, but his love of nature made botany his second specialty; he became a great researcher and herbarium collector of the flora of Abkhazia (Feodorov 1948).

Materials and Methods

Field studies of *G. panjutinii* were undertaken in Western Transcaucasia in 2008. Herbarium specimens of *G. panjutinii*, *G. krasnovii*, *G. platyphyllus* and *G. woronowii* were examined at the herbaria of K, KWHA, LE, MHA and TBI (abbreviations after Holmgren *et al.* 1990); living material of these species was examined by us in cultivation and *in situ*, between 1987 and 2011. Measurements, colours, and other details given in the descriptions are based on living material, spirit and herbarium specimens and data derived from field notes. Morphological observations were made using a Leica MZ9 binocular microscope. Morphological terminology follows Beentje (2010). Distribution maps were plotted using specimen data held in an electronic database maintained at the Royal Botanic Gardens, Kew. All co-ordinates were carefully verified and/or error-corrected using Google Earth (Version 5; ©2010 Google). The map in Figure 3 was produced using SimpleMappr (Shorthouse, 2010). The conservation status of *G. panjutinii* was assessed using the Red List Category (IUCN, 2001) compliant software GeoCAT [Beta version] (Bachman *et al.* 2011), which generates IUCN threat categories based on Extent of Occurrence (EEO) and/or Area of Occurrence (AOO) of a given cell width.

Taxonomic Treatment

Galanthus panjutinii Zubov & A.P. Davis *sp. nov.* (Figs. 1 & 2)

[*Galanthus valentinae* Panjut. *nom. herb.* 1938 (LE)]

[*Galanthus valentinae* Panjut. ex Grossh. (1940: 194), *nom. nud.*; Kem.-Nath. (1947: 179), *nom. nud.*; Grossh. (1949: 631), *nom. nud.*; Kolak. (1961: 150), *nom. nud.*; Khokhr. (1966: 60), *nom. nud.*; Kolak. (1980: 201), *nom. nud.*; Kolak. (1986: 112, table 20, fig. 2), *nom. nud.*; Zubov & Didenko (2011: 219), *nom. nud.*]

[*Galanthus latifolius sensu* Kolak. (1938: 271), *non* Rupr.]

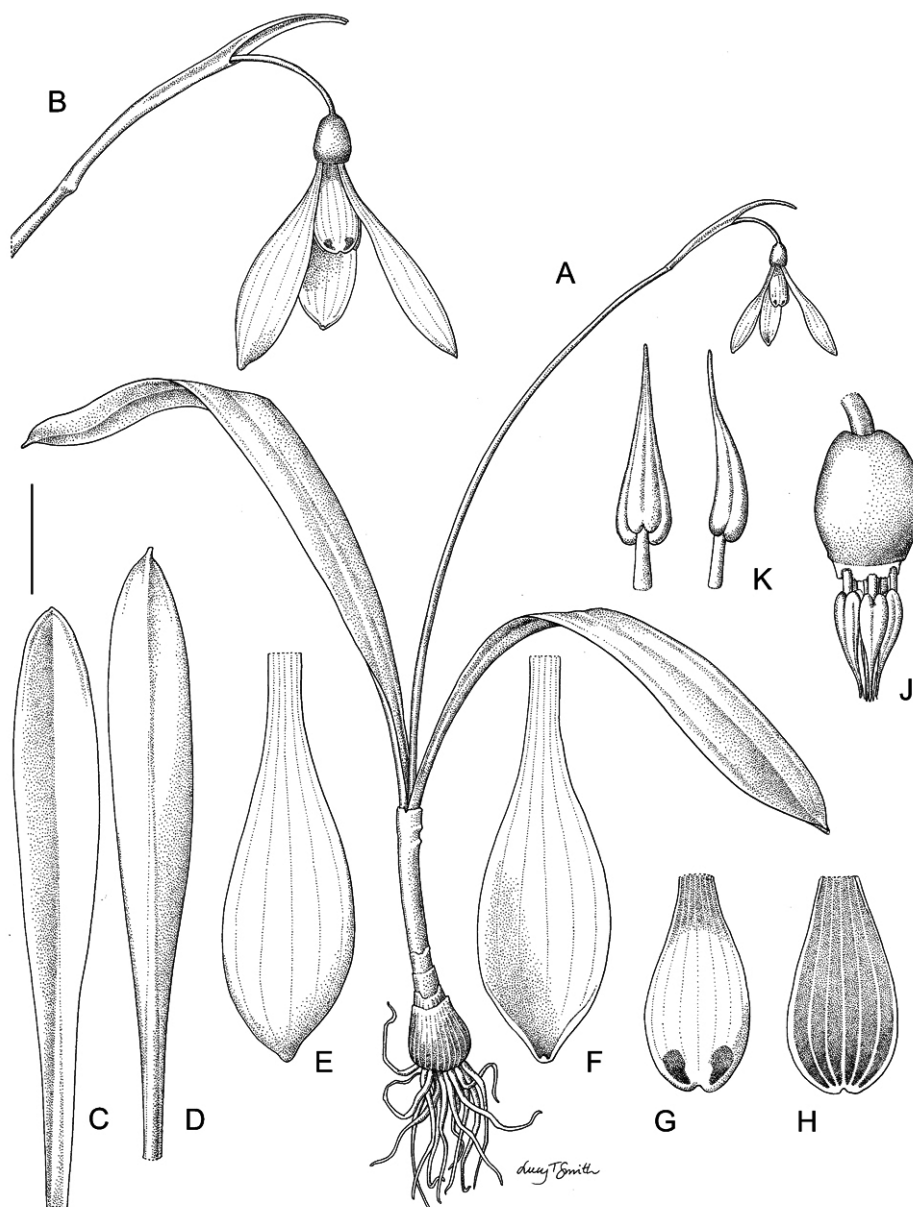


FIGURE 1. *Galanthus panjutinii* (A–J from Bondareva & Zubov s.n., by Lucy T. Smith). **A.** Habit. **B.** Flower and upper part of scape. **C.** Leaf (adaxial view). **D.** Leaf (abaxial). **E.** Outer perianth segment (abaxial). **F.** Outer perianth segment (adaxial). **G.** Inner perianth segment (abaxial). **H.** Inner perianth segment (adaxial view). **J.** Receptacle (including ovary), showing attachment of anthers. **K.** Anthers (abaxial and side views). Scale bar: A, C, D = 3.0 cm; B = 1.5 cm; E–H = 7.0 mm; J = 4.0 mm; K = 2.5 mm.

G. panjutinii a *G. krasnovii* foliis anguste oblongis ad anguste oblongis-ob lanceolatis (nec foliis anguste oblanceolatis ad oblanceolatis, sive oblanceolatis-spathulatis); perigonii phyllis internis obovatis (nec oblanceolatis); perigonii phyllarum internarum apice obtuse rotundato et marginibus planis (nec apice plus minusve acutato, integro et marginibus undulatis); sinu innotabili non characteristico vix praesenti vel raro sinu nullo (nec sinu nullo); perigonii phyllarum internarum macula basali suffusa viridula praesenti (nec macula basali nulla) differt. *G. panjutinii* a *G. platyphylli* foliis anguste oblongis ad anguste oblongis-ob lanceolatis (nec foliis anguste oblanceolatis ad oblanceolatis); antheris in apiculum distinctum angustatis (nec antheris apiculi destituti et apice mutico); floribus elongate pyriformibus anthesis initio (nec floribus subglobosis (plus minusve ovoideis)); folii apice revoluto (nec folii apice recto) differt.

Type—ABKHAZIA: Western Transcaucasia: Abkhazia, Gagra vicinities, 1600 m, 12 Apr. 1913, *Sakharov 634* (holotype LE; isotype LE).

Bulb ovoid-obclavate, (1.7–)2.0–3.0 × (1.2–)1.5–2.1 cm, bulb scales whitish, bulb partially and irregularly covered with a brown papery tunic; roots slightly succulent, whitish. Basal sheath tubular, (3.4–)4.0–6.5 × 0.6–0.9 cm, whitish. Leaves supervolute in vernation; leaf blades at the beginning of flowering and afterwards recurving, narrowly oblong to narrowly oblong-ob lanceolate, narrowing in basal 1/3, at maturity 22.0–25.0 × 2.0–4.0(–4.5) cm; apex acute, ± flat to cucullate, revolute, often with a short point at the tip; base narrowly attenuate; midrib conspicuous; margins flat to slightly undulate; surfaces often with two or four longitudinal folds (leaves bent slightly upwards or slightly downwards), texture smooth to slightly puckered; upper and lower surfaces concolorous, bright medium-green, with an oil-like sheen. Scape 1(–)2, 18.8–25.0 cm long, 2.1–2.3 mm in diameter, bright medium-green. Pedicel 2.7–4.0(–5.0) cm long, 0.8–1.0 mm in diameter. Spathe 2.9–4.1 × (0.9–)1.1–1.4 cm, light green. Flowers narrowly pyriform when closed (i.e. in outline shape). Outer perianth segments 3, narrowly obovate to narrowly obovate-elliptic, 2.3–3.0 × 0.7–1.3 cm; base unguiculate, particularly as flowers mature, claw 0.6–1.4 cm long; apex acute, slightly cucullate. Inner perianth segments 3, ± 1/3 the size of the outer perianth segments, obovate, 0.8–1.2 × 0.4–0.8 cm, white; apex rounded to rounded-truncate, with a small sinus (notch), 0.2–0.6 mm deep, or sinus sometimes absent, with a hemispherical or broad U-shaped green mark, or the mark reduced to two small, dot-like to triangular marks on both sides of the sinus or sometimes apical marks absent; base acute-truncate, with a diffuse, greenish mark covering the basal 1/4 of the segment or mark absent; margins flat. Anthers: filaments 6, in two whorls, c. 1.4 mm long, thicker at base, oval in cross section, c. 0.2 mm in diameter, whitish; anther sacs triangular-sagittate, (4–)5–7 × 4–5 mm, apex sharply acute, base ± cordate. Capsule (at flowering), ellipsoid-cylindrical to ellipsoid-obovoid, often slightly triangular, (0.5–)1.0–1.5 × (0.4–)0.7–0.9 cm, bright medium green; ovary trilocular, with several ovules per locule, placentation axile, ± ellipsoid, 0.4–0.6 cm in diameter. Capsule (at fruiting) not seen, seeds not seen. Chromosome number 2n=24 (Takhtajan 1990).

Distribution—Western Transcaucasia (Tuapse-Adler region: Aïbga Ridge; Abkhazia region: Bzyb' Ridge and Gagra Ridge); a narrowly local northern Colchis endemic. Possibly a preglacial relict of the ancient Mediterranean flora. (Fig. 3).

Habitat & ecology—Described from the border of the lower alpine montane meadow and *Abies nordmanniana* forest, at 1600 m; observed in the subalpine and middle montane forest belts (incl. *Fagus orientalis*) of calcareous ridges, along streams, in forest clearings, on limestone outcrops, rarely in inversion dells at c. 400 m; (400–)800–1800 m elevation; growing on humus-carbonaceous montane forest brown soils. Syntopic with *G. woronowii*. Sciophyte, calciphile.

Phenology—Flowering: (March–)April to June; fruiting period not recorded, but probably from May to July.

Specimens examined—Western Transcaucasia: **Abkhazia** – Gagra vicinities, 1600 m, 12 Apr 1913 (fl.), *Sakharov 634* (holotype: LE; isotype: LE); near Gagra, south slope of mountain range Berchil, of the river Sandripsh, vicinity of village Guzlya, 12 km NE of Gagra, 1200–1800 m, 27 Jun 1989 (fl.), *Geltman et al. 3204 & 3232* (LE); on the road to Ritza Auadkara [Auadkara], 1 Jun 1988 (fl.), *Chitanava s.n.* (LE). **Russia** – Tuapse-Adler region – Adler vicinities, Aïbga Ridge, oriental beech forest, 800 m, 12 Apr 2008 (fl.), *Bondareva & Zubov s.n.* (KWHA).



FIGURE 2. *Galanthus panjutinii* (all photographs by Olga Bondareva). **A.** Variation in inner perianth segment markings. **B.** Plants in natural habitat in the Tuapse-Adler region, on the Aibga Ridge. **C.** Close up of inflorescence.

Conservation assessment:—Considered ‘Endangered’ (EN; IUCN 2001). B1ab(i, iii)+2b(i). B1—extent of occurrence (EOO) estimated to be less than 5000 km² (549.5 km² for *G. panjutinii*); a—known to exist at no more than five locations (*G. panjutinii* is known from five locations based on seven user points); b (i, iii)—continuing decline projected for EOO (i), and quality of habitat (iii). 2b(i)—area of occupancy (AOO) estimated to be less than 500 km² (20 km² for *G. panjutinii* based on a cell width of 2 km). In March 2011 it was observed (D. Zubov, O. Bondareva) that a large part of one location is already destroyed due to the ongoing construction of facilities for the 2014 Winter Olympics, which will be held in Sochi.

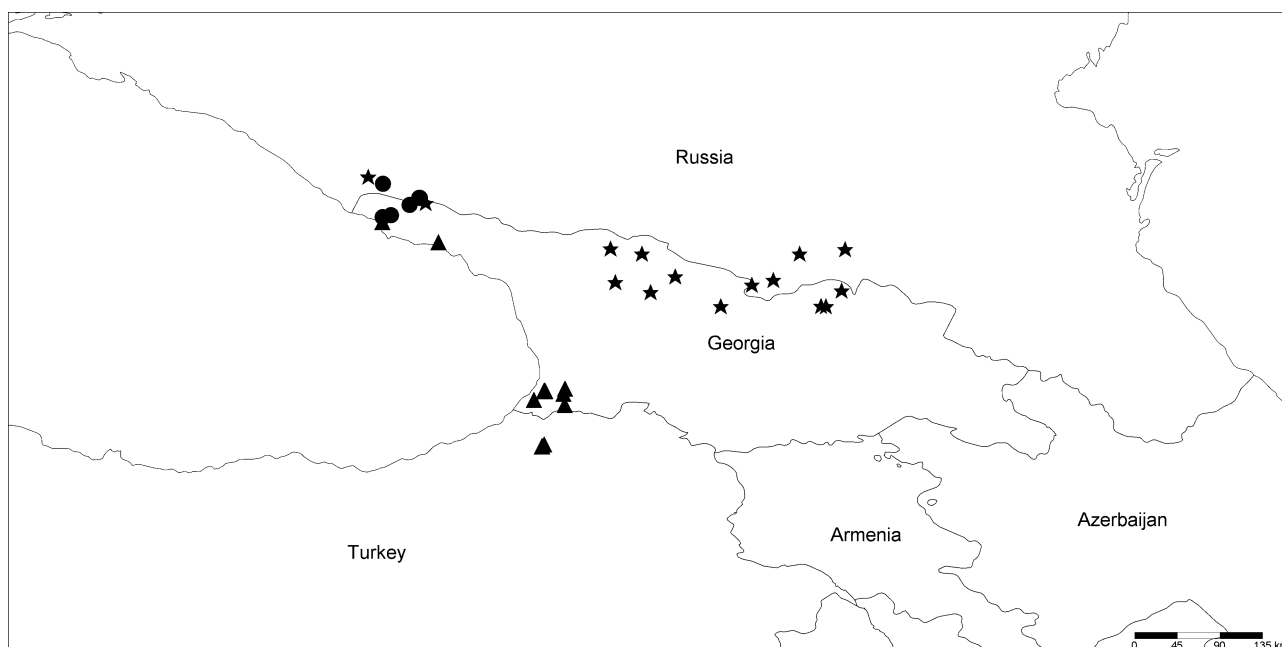


FIGURE 3. Approximate distribution of *Galanthus panjutinii* (●), *G. krasnovii* (▲), and *G. platyphyllus* (★) based on collection localities.

Discussion

Galanthus panjutinii, *G. krasnovii* and *G. platyphyllus* all have distinct supervolute vernation (in transverse section leaves rolled in bud, with one leaf enveloping the other), broad, bright medium-green leaves and a single distinct mark on the apex of each inner perianth segment. As stated in the introduction, *G. panjutinii* shares some critical morphological characters with *G. krasnovii* (i.e. anthers tapering to an apiculum) and with *G. platyphyllus* (i.e. inner perianth segments obovate, apex rounded to rounded-truncate, and an uncharacteristic, barely developed apical notch). Sequence data (N. Rønsted *et al.* in prep.) from the internal transcribed spacers of nuclear ribosomal DNA (nrITS) and plastid markers (*matK*, *trnL-F*, *ndhF*) show that *G. panjutinii* is confidently placed with *G. krasnovii* and *G. platyphyllus*, forming a well-supported clade of three species. Further work is required to ascertain the exact relationships of *G. panjutinii* with these two species, but it appears that it is more closely related to *G. platyphyllus*. *Galanthus platyphyllus*, *G. krasnovii* and *G. panjutinii* represent an isolated lineage within *Galanthus* (Khokhrjakov 1966, Zonneveld *et al.* 2003; Zubov and Didenko 2011), forming a clade that is sister to all other species in the genus (Lledo *et al.* 2004; Larsen *et al.* 2010; N. Rønsted *et al.* in prep.). *Galanthus woronowii* is broadly sympatric with *G. panjutinii*, *G. krasnovii* and *G. platyphyllus* but is genetically and morphologically distinct from these species, despite its broad green leaves (Davis, 1999). Greatly differing nuclear (2C) DNA content (e.g., 56.2 pg for *G. woronowii*, 90.4 pg for *G. platyphyllus*, and 90.3 pg for *G. krasnovii* (Zonneveld *et al.* 2003), coupled with differences in flowering time (see below) and floral morphology (Davis, 1999) indicate that *G. woronowii* is reproductively isolated from *G. platyphyllus* and its allies.

Galanthus panjutinii differs from *G. krasnovii* in the following characters: leaves narrowly oblong to narrowly oblong-oblongate (vs. leaves narrowly-oblongate to oblongate, or oblongate-spathulate); inner perianth segments obovate (vs. oblongate); apex of each inner perianth segment bluntly rounded, with a barely noticeable uncharacteristic notch (or notch rarely absent) and with margins flat (vs. apex more or less acute, entire (i.e. lacking a notch), and margin undulate); base of each inner perianth segment with a diffuse greenish basal mark (vs. basal mark absent or greenish in the middle of segment). *Galanthus panjutinii* is restricted to the Tuapse-Adler region of southwestern Russia and nearby sites in northwestern Abkhazia, near Gagra, whereas *G. krasnovii* is found in Abkhazia (where it is apparently rare), Ajaria (Adzharia) in southwestern Georgia and the Artvin Province of northeastern Turkey.

Galanthus panjutinii differs from *G. platyphyllus* in the following: narrowly oblong to narrowly oblong-oblongate leaves (vs. leaves narrowly-oblongate to oblongate); each anther tapering to a distinct apiculum (vs. anther apex blunt, without an apiculum); flowers narrowly pyriform (elongated pear-shaped) at the beginning of flowering (vs. ovoid (more or less egg-shaped)); leaf apex revolute (vs. straight). *Galanthus platyphyllus* occurs in the Greater Caucasus (Central Caucasus, Western and Central Transcaucasia, eastwards from Abkhazia to central Georgia and the republic of North Ossetia-Alania in southwestern Russia.

Galanthus panjutinii is found on the calcareous ridge of Aïbga in southwestern Russia and the adjoining calcareous ridges of Bzyb' and Gagra, which are located in Abkhazia. According to the Colchis geomorphologic zonation (Zakharov 1934; Kolakovsky 1961) all three calcareous ridges belong to the Western Transcaucasia limestone-karst region; and by Colchis phytogeographic zonation belong to the northern Colchis area of montane forest, represented by deciduous broadleaf oriental beech (*Fagus orientalis*) forest and mixed broadleaf/needleleaf forests oriental beech/Nordmann fir-tree (*Abies nordmanniana*) on humus-carbonaceous soils ranging from 600–2000 m, of the Colchis Province of the Mediterranean region. These montane massifs possess a peculiar and unique calciphile flora to which *G. panjutinii* species certainly belongs (Kolakovsky 1961). It is not possible at this stage to define the exact ecological characteristics of *G. platyphyllus* and *G. krasnovii*, although it is clear that *G. platyphyllus* occurs at higher elevations and has a later flowering period than the other two species. *Galanthus platyphyllus* occurs at (1550–)2400–2600(–2700) m and flowers from April to August; *G. krasnovii* 450–1200(–1500) m, flowering March to May; *G. panjutinii* (400–)800–1800 m, flowering April to June, and sometimes in March. Furthermore, in accordance with fundamental studies on the zonal distribution of Caucasus (including Colchis area) soils by Zakharov (1934), *G. panjutinii* and *G. krasnovii* could be attributed to montane forest brown soils, with a particular humus-carbonaceous type overlying coral limestone, whereas *G. platyphyllus* would be localized on montane meadow soils of the subalpine and alpine zones (acidic, leached soils). After further study of *G. platyphyllus* and *G. krasnovii*, and on the basis of what we presented here for *G. panjutinii*, we can summarize that these three species occur in Abkhazia, within a vertical zonation axis. *Galanthus platyphyllus* and *G. panjutinii* also occur in Russia; *G. platyphyllus* and *G. krasnovii* in Georgia; *G. krasnovii* is the only species of this group occurring in Turkey (in the northeast).

Since the most recent monograph of the genus (Davis 1999), the addition of *G. trojanus* Davis & Özhatay (2001: 409) and *G. panjutinii* brings the total number of *Galanthus* species to 20. The exact localities of *G. panjutinii* have not been documented here for fear of unlawful plant collecting.

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