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# *Minuartia juniperina (Caryophyllaceae)* in the Balkan Peninsula

By

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With 4 Figures

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Key words: *Caryophyllaceae, Minuartia juniperina* (L.) MAIRE & PETITMENGIN subsp. *glandulifera* (HALÁCSY) KAMARI subsp. nova, *M.j.* subsp. *gland.* var. *micropetala* KAMARI var. nova, *M.j.* subsp. *kosaninii* STEVANOVIĆ & KAMARI, subsp. nova. – Taxonomy. – Distribution. – Flora of Europe.

Summary

KAMARI G. & STEVANOVIĆ V. 1996. *Minuartia juniperina* (*Caryophyllaceae*) in the Balkan Peninsula. – Phyton (Horn, Austria) 36 (1): 93–105, 4 figures. – English with German summary.

This paper examines *Minuartia juniperina* (L.) MAIRE & PETITMENGIN in the Balkan Peninsula. It is divided here into three subspecies and two varieties. The typical subspecies occurs in Asia Minor and eastwards only. *M.j.* subsp. *glandulifera* (HALÁCSY) KAMARI comb. et stat. nov., grows in continental Greece from S. Peloponnisos to N. Pindos. This highly polymorphic subspecies has been separated into two new varieties: the typical one and var. *micropetala* KAMARI, var. nova, restricted to the mountains of Peloponnisos (S. Greece). The discovery of a third subspecies, *M.j.* subsp. *kosaninii* STEVANOVIĆ & KAMARI, subsp. nova in Mt. Šar Planina [FYROM (Makedonija)] suggests that *M. juniperina* has a wider distribution in the Balkan Peninsula than previously thought. The chorological relationship of ser. *Juniperinae* in the Balkan Peninsula is discussed.

Zusammenfassung

KAMARI G. & STEVANOVIĆ V. 1996. *Minuartia juniperina (Caryophyllaceae)* auf der Balkanhalbinsel. – Phyton (Horn, Austria) 36 (1): 93–105, 4 Abbildungen. – Englisch mit deutscher Zusammenfassung.

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*Minuartia juniperina* (L.) MAIRE & PETITMENGIN auf der Balkanhalbinsel wurde untersucht und in drei Subspecies und drei Varietäten gegliedert. *M.j.* subsp. *juniperina* kommt in Kleinasien und weiter ostwärts vor. *M.j.* subsp. *glandulifera* (HALÁCSY) KAMARI, comb. et stat. nov., wächst in Griechenland am Festland vom S-Peloponnes bis zum N-Pindus. Diese sehr polymorphe Subspecies wird in zwei neue Varietäten gegliedert: in die Typus-Varietät und in *M.j.* subsp. *g.* var. *micropetala* KAMARI, var. nova, welche auf Gebirge des Peloponnes beschränkt ist. Die Entdeckung einer dritten Subspecies, *M.j.* subsp. *kosaninii* STEVANOVIĆ & KAMARI, subsp. nova, auf der Šar Planina [FYROM (Makedonija)] macht es wahrscheinlich, daß *M. juniperina* auf der Balkanhalbinsel eine weitere Verbreitung hat, als bisher angenommen.

## Introduction

*Minuartia juniperina* is a Linnaean species known since 1767. BOISSIER 1867 considered it as a very variable species, and included five varieties under it, two of which were previously separate species. In this way, he extended even more the already wide geographical distribution of *M. juniperina.*

The distribution of *M. juniperina* s.l. lies throughout Asia Minor eastwards from Azerbaidjan to N. Iran, southwards to S. Lebanon and Israel and westwards to Greece. Later, BORNMÜLLER 1940 separated from it the species *M. glandulosa* (BOISS. & HUET) BORNM. and *M. lineata* BORNM.

MCNEIL 1963, 1967 maintained the distinction of the three taxa (*M. juniperina, M. glandulosa* and *M. lineata*) at species level. Furthermore, he considered that *M. juniperina* is the most distinct species within the genus and that it differs from *M. glandulosa* and *M. lineata* by its sterile shoot nodes (without inflorescences) and more swollen and more spinose leaves which are mostly spreading from 30°–90°.

However, studies from the abundant herbarium material from several herbaria showed that there is significant variation in the more or less swollen nodes, the more or less spinose leaves, the spreading of the leaves (from 30°–150°) and the indumentum.

*M. juniperina,* a chiefly Asiatic species, was known only from the Balkan Peninsula in Greece and especially from its southern continental part. References from N. Greece (ZAGANIARIS 1940: 52 and HALÁCSY 1900: 239) were considered doubtful and confirmation was needed (STRID 1986). Now, we confirm its occurence not only in N. Greece (Mt. Timfi) but also in FYROM (Makedonija).

In this work, we have only studied in detail *M. juniperina* from the Balkan Peninsula, since not enough material is known to us from its Asiatic distribution areas, except for the herbarium material of Genève (G-Bois) and that of the herbarium at Kew. Thus, a detailed study of *M. juniperina* and its related species from SW. Asia is also required.

## Material and Methods

Part of this work was undertaken by the first author for the purposes of "Flora Hellenica". However, a detailed study of such a polymorphic species with a distribution encompassing more than one country, like *M. juniperina,* could not be included in a comprehensive flora. Morever the discovery of *M. juniperina* in FYROM led us to its study in the Balkan Peninsula.

A large amount of herbarium material (ATH, ATHU, B, BEO, BEOU, C, G-Bois, K, LD, UPA) has been studied and additional observations were made in the field. Those herbarium specimens, that have been checked from the studied area are listed and the distribution is given in the map in Fig. 1.

## Taxonomy

*M. juniperina* (L.) MAIRE & PETITMENGIN in Bull. Seances Soc. Sci. Nancy, ser. 3,9: 196 (1908).

≡ *Arenaria juniperina* L., Mant. Pl.: 72 (1767) ≡ *Alsine juniperina* (L.) FENZL, Vers. Darstell. Alsin.: 18 (1833). Described without indication of origin (LINN 585/35).

Ic: SMITH, Pl. Ic. Ined. 2: t.35 (1790). Map. 4, p. 37.

Perennial, caespitose, forming large, loose cushions, glabrous or glandular-pubescent throughout or sometimes with a glabrous or sparsely glandular-pubescent inflorescence. Stems numerous, erect, (6–)8–20(–25) cm long, with prominent swollen nodes below, bearing very short conical to spreading axillary fascicles, at the time of flowering. Leaves 8–28(–30) × 0.5–0.8 mm, 1 to 3-veined (often the central ones very strong), rigid and rather pungent, all except the uppermost leaves of the non flowering stems, spreading at an angle of 30° to 150°. Bracts usually very short, 1–2.5 × 0.8–1.4 mm with narrow membranous margins. Inflorescence 3 to 10(–15)-flowered. Pedicels erect to suberect, usually as long as sepals or up to 10(–12) mm, often glandular-pubescent. Sepals (3–)3.5–6(–6.5) × (1.1–)1.3–1.5(–1.8) mm, lanceolate to broadly lanceolate, acute to acuminate, 3-veined, rarely sparsely glandular-pubescent, the inner ones with narrow membranous margins. Petals 3.0 to 7.5 mm, (0.5–)0.7 times to almost twice as long as sepals, obovate to oblanceolate, obtuse to truncate. Capsule subcylindrical to broadly cylindrical 4.0 to 6.3 mm, equal or often 1.3–1.7 times as long as sepals. Seeds (0.8–)0.9–1.0 mm, dark brown with low obtuse tubercles, and with few short papillae at the omphalos.

Chromosome number: 2n = 26 (see STRID 1986: 103, for references).

A mountainous species, widespread in Turkey extending north-eastwards to Armenia, southwards to S. Lebanon, Israel, N. Iraq and N. Iran, and westwards to the Balkan Peninsula (FYROM and Greece).

Three fairly distinct subspecies and two varieties can be recognized under *M. juniperina.*

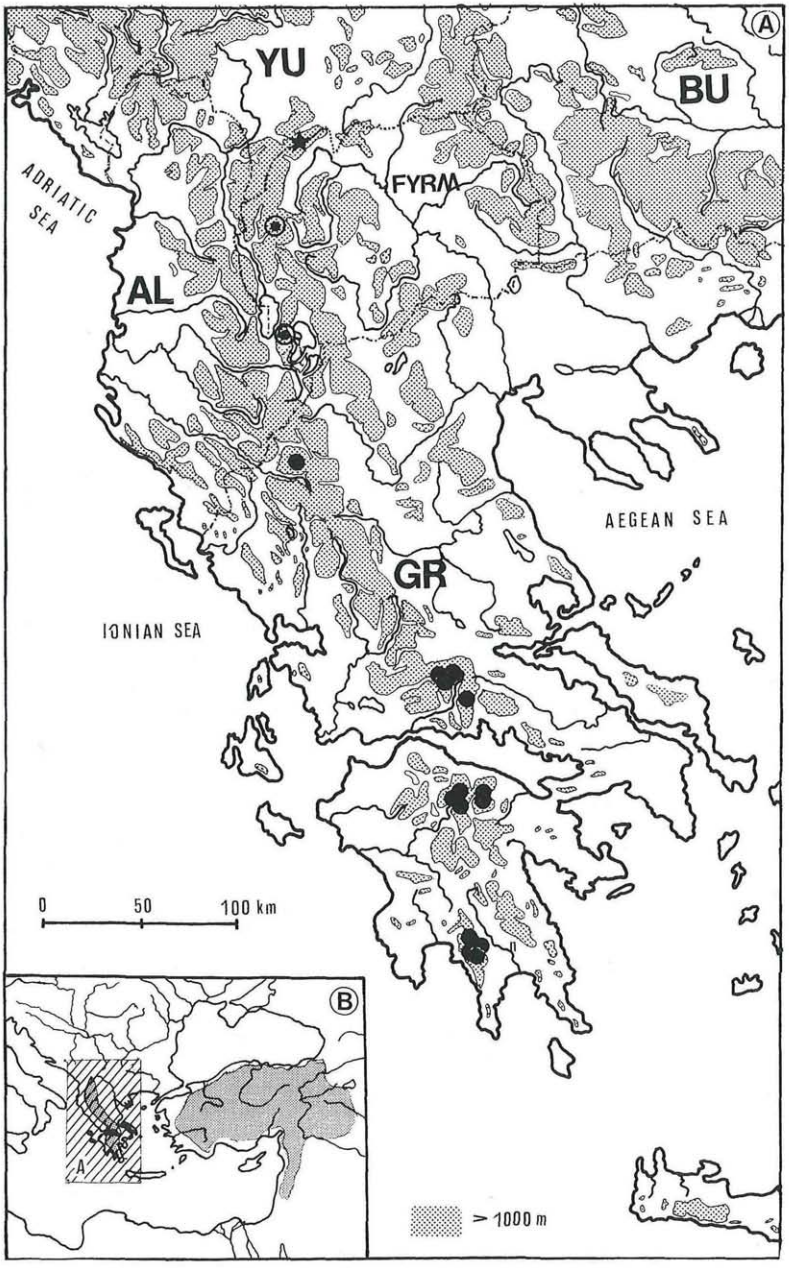


Fig. 1. Geographical distribution of *Minuartia juniperina*. – A in the Balkan Peninsula: ● *M.j.* subsp. *glandulifera*, ★ *M.j.* subsp. *kosaninii*, ◉ unchecked literature data. – B general distribution of the species.

Keys for the taxa of *M. juniperina*

1. Plants completely glabrous or rarely sparsely glandular-pubescent at the inflorescence . . . . . 2
– Plants glandular-pubescent throughout or sometimes with a subglabrous or glabrous inflorescence . . . . . 2. *M.j.* subsp. *glandulifera* 3
2. Non-flowering stems bearing dense globose axillary fascicles. Leaves spreading at an angle of 30°–90°. Sepals more than 4 mm long . . . . . 1. *M.j.* subsp. *juniperina*
– Non-flowering stems bearing short spreading axillary fascicles. Leaves spreading at an angle of 60°–150°. Sepals less than 4 mm long . . . . . 3. *M.j.* subsp. *kosaninii*
3. Petals (4–)4.5–6.5(–7) mm, (1.0–)1.2–1.7 times as long as the sepals, usually obtuse . . . . . 2a. *M.j.* subsp. *g.* var. *glandulifera*
– Petals (3.3–)3.5–4(–4.5) mm, 0.5.–0.7 times as long or rarely almost equal to the sepals, usually truncate . . .2b. *M.j.* subsp. *g.* var. *micropetala*

1. *Minuartia juniperina* subsp. *juniperina*

The typical subspecies occurs mainly in Turkey and in the eastern distribution area of the species. It does not occur in the Balkan Peninsula.

There is a record by HALÁCSY 1900: 239 from Mt. Gamila and from near Kalambaka, as var. *eglandulosa*. However, material from Mt. Gamila (GOULIMIS nos. 1921 & 1922, ATH!) is sparsely glandular-pubescent throughout, except the sepals. Moreover, material from Mt. Timfi, above Skamneli (AUTHIER no. 9662) is glandular-pubescent throughout, except the inflorescence.

The main morphological differences of the typical subspecies of *M. juniperina* from its other subspecies are given in Table 1.

2. *M.j.* subsp. *glandulifera* (HALÁCSY) KAMARI, comb. & stat. nov.

Lectotype (designated here): [Greece] "in cacumine montis Ziriae (Killini vet.) alt. 7000′, rara", 6/18 Juli 1851, Th. ORPHANIDES no. 23 (ATHU!; isotypes: B! G-Bois!, K!, LD!).

≡ *Alsine juniperina* L. var. *glandulifera* HALÁCSY in Consp. Fl. Graecae, Vol. 1: 239 (1900).

The main morphological differences of *M.j.* subsp. *glandulifera* from the other two subspecies of *M. juniperina* are given in Table 1 and in Figs. 2, 3 & 4.

However, *M.j.* subsp. *glandulifera* is a variable subspecies, showing considerable differences in petal size. Thus, two varieties (Figs. 3 & 4) can be recognized, under it, as follows:

Table 1.
The main morphological differences among the subspecies of *Minuartia juniperina*

| Taxon<br>Features | subsp. *juniperina* | subsp. *kosaninii* | subsp. *glandulifera* |
|---|---|---|---|
| Indumentum | glabrous or rarely sparsely glandular-pubescent inflorescence | glabrous throughout | glandular-pubescent throughout or rarely subglabrous to glabrous inflorescence |
| Leaves | spinose, except for the uppermost leaves of the sterile shoots<br>- - - - -<br>spreading at an angle of 30°–90° | spinose<br>- - - - -<br>spreading at an angle of 60°–150° | spinose, except for the upermost leaves of the sterile shoots<br>- - - - -<br>spreading at an angle of 30°–90° |
| Axillary fascicles | the non-flowering stems bearing dense globose axillary fascicles | the non-flowering stems bearing short spreading axillary fascicles only at the upper-half part | the non-flowering stems bearing short to very short conical axillary fascicles below or up to the half |
| Sepals size (mm)<br>- - - - -<br>shape | 4–5(–6)<br>- - - - -<br>ovate-lanceolate to lanceolate | (3–)3.5–4<br>- - - - -<br>ovate-lanceolate | (3.5)4–6(–6.5)<br>- - - - -<br>lanceolate to broadly-lanceolate |
| Petals (times as long as sepals) | 1.5–2 | 1–1.5 | (1.0–)1.2–1.5(–1.7) var. *glandulifera*<br>- - - - -<br>0.5–0.7(–1.0) var. *micropetala* |

2a. *M.j.* subsp. *g.* var. *glandulifera*

Sepals (3.8–)4–6(–6.5) × 1.1–1.5 mm, densely or sparsely glandular-pubescent, rarely glabrous. Petals (4–)4.5–6.5(–7) mm, (1.0–)1.2–1.7 times or often almost twice as long as the sepals, usually obtuse.

Chromosome number: 2n = 26 (FRANZÉN & GUSTAVSSON 1983).

Dry rocky places in openings of *Abies cephalonica* forest or on stabilized screes. Limestone, (1200–)1500–2400 m. Flowering from mid-June to July.

Endemic to Greece. Occurs mainly in the mountains of N. Peloponnisos and Sterea Ellas. It is also found on Mt. Timfi, N. Pindos (Fig. 1).

Except for the sepals and pedicels the plants from Mt. Timfi are sparsely glandular-pubescent throughout. The leaves are somewhat flat,

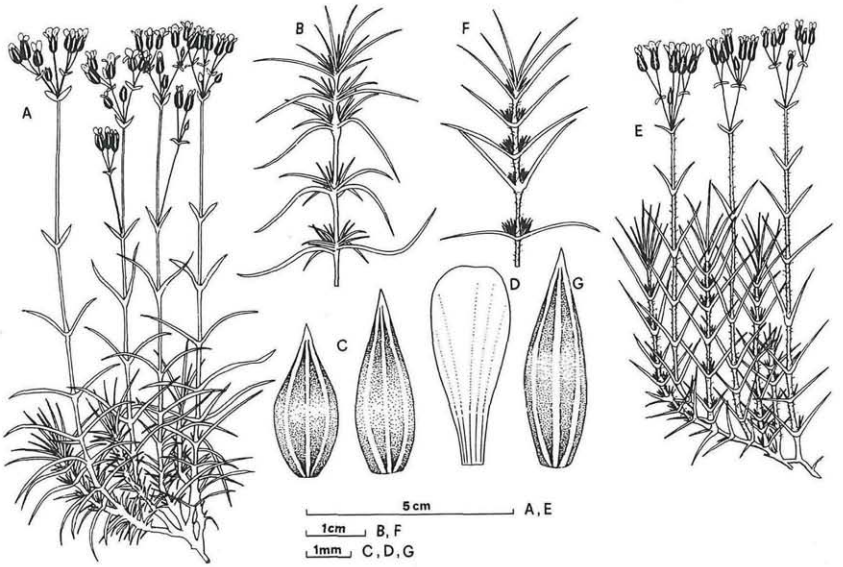


Fig. 2. *Minuartia juniperina* subsp. *kosaninii:* A habit. – B non-flowering stem. – C sepals. – *M.j.* subsp. *glandulifera* var. *glandulifera:* E habit. – F non-flowering stem. – *M.j.* subsp. *glandulifera* var. *micropetala:* D petal. – G sepal.

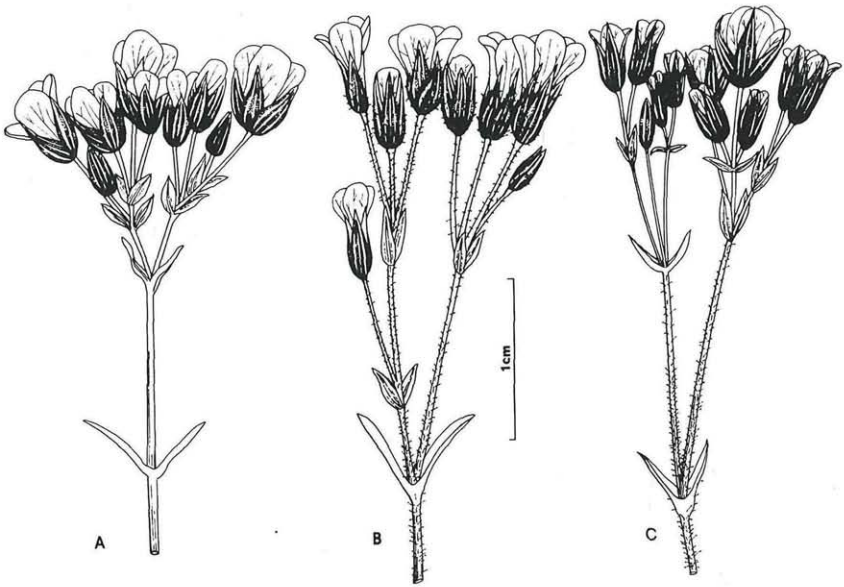


Fig. 3. Inflorescences of taxa of *Minuatria juniperina:* A *M.j.* subsp. *kosaninii.* – B *M.j.* subsp. *glandulifera* var. *glandulifera.* – C *M.j.* subsp. *glandulifera* var. *micropetala.*

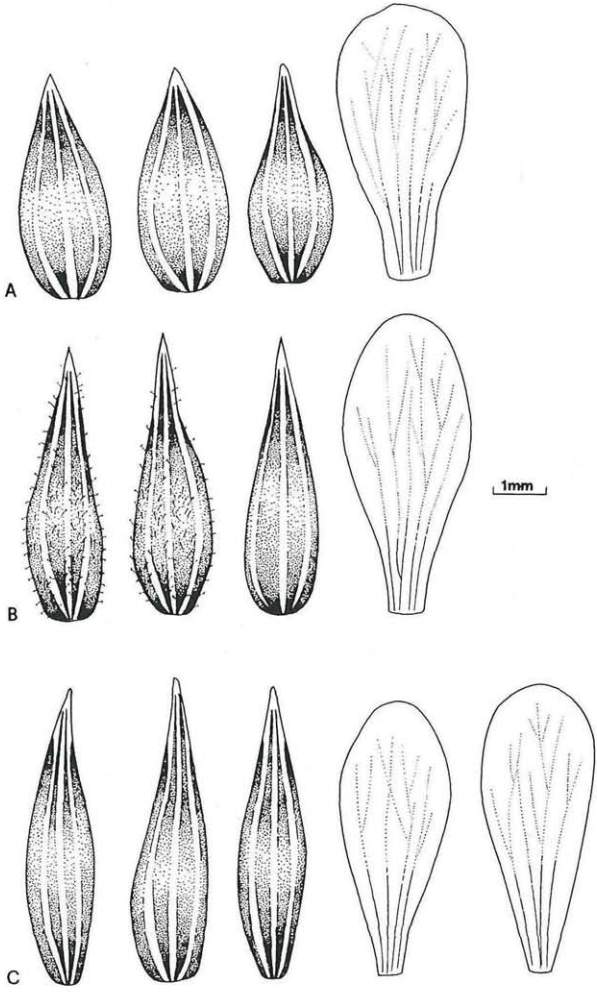


Fig. 4. Sepals and petals in taxa of *Minuartia juniperina:* A *M.j.* subsp. *kosaninii.* – B *M.j.* subsp. *glandulifera* var. *glandulifera.* – C *M.j.* subsp. *glandulifera* var. *micropetala.*

less rigid, widely spreading, and their nodes are less swollen than those of the typical form, features resembling those of *M. lineata* BORNM.

This variety is also related to *M. glandulosa* (BOISS. & HUET) BORNM. which occurs in NE. Armenia and in Iran. Material in G-Bois! (HUET DU PAVILLON, VII.1843; Lectotype designated by RECHINGER) of *M. glandulosa* has a glandular-pubescent inflorescence, which is glabrous below, with

pedicels 3 times as long as sepals and with leaves less spiny and narrower (up to 5 mm) than those of *M. juniperina*.

Specimina visa:

Peloponnisos: Mt. Killini: In cacumine montis Ziriae (Killini vet.), rara, alt. 7000', 37° 56′ N 22° 24′ E; 18-07-1851, ORPHANIDIS no. 23 Lectotype: ATHU; Isotypes: B, G-Bois, K, LD). – NO-Aufstieg zum Cipfel der Ziria. Felsige Bergwiesen, Bachlauf, Schneetälchen, alt. 1570–2000 m, 37° 56′ N 22° 24′ E; 06-06-1988, WILLING no. 5144 (B). – Summit area, alt. 1950–2250 m, 37° 56′ N 22° 24′ E; 16-07-1989, Dimopoulos no. 1589, (UPA) & 22-06-1990, DIMOPOULOS no. 2074 (UPA). – In rupibus et glareosis, ca 2200 m, supra pag. Trikala, 24-071983, O. GREBENSCIKOV, No 3563 (BEO). – Mt. Chelmos: Ad cacumen Avgo; in rupestribus calcareis, alt. 2150 m. 38° 00′ N 22° 11′ E; 26-07-1981, DUDLEY, PHITOS & al. no. 1471 (UPA). – N slopes of Mt. Chelmos, alt. 1700 m, 38° 01′ N 22° 11′ E; 17-06-1975, POLUNIN no. 12998 (UPA). – E of the village Kato Lousi, on ascending path to EOS Katafigion; Dry-rocky opening in Abies forest, alpine meadows and disturbed rocky slopes, limestone, alt. 1700–2100 m, 38° 00′ N 22° 11′ E; 04-07-1968, STAMATIADOU no. 3422 (ATH). – Supra Xerokampos; in saxosis calcareis, alt. 1700–1900 m, 38° 00′ N 22° 11′ E; 28-06-1983, TINIAKOU no. 715 (UPA). – In declivibus occidentalibus, inter locum Xirokampos et refugium, alt. 1200–1600 m, 38° 01′ N 22° 11′ E; 06-07-1975, TZANOUDAKIS no. 2129 (UPA). – Ski Zentrum Xirokambo N des Chelmos-Gipfels und Geröllhänge m. einz. Tannen und niedrigen Wacholder, Schneetälchen, alt. 1840–1940 m, 38° 00′ N 22° 11′ E; 03-06-1988, WILLING no. 4937a,b (B).

Sterea Hellas: Mt. Vardousia: Inter refugium et cacumen Gidovouni, alt. 1750 m, 38° 43′ N 22° 08′ E; 10-07-1974, PHITOS & al. no. 15216 (UPA). – 4 km N of Dafnos; small cliffs and scree along a ravine, alt. 1700–1800 m, 38° 41′ N 22° 06′ E; 18-07-1973, GUSTAVSSON no. 3079 (LD). – 7 km W of Athanasios Diakos; limestone gravel on a slope facing E, alt. 1900–2000 m, 38° 42′ N 22° 06′ E; 24-07-1975, GUSTAVSSON no. 7221 (LD). – Mt. Giona: 6 km N of Prosilion; scree, gravel and small cliffs facing S, alt. 1900–2000 m, 38° 38′ N 22° 17′ E; 21-05-1975, GUSTAVSSON no. 4661 (LD).

Ipiros: Mt. Timfi: Pigi Gouras, 39° 57′ N 20° 52′ E; 21-07-1954, GOULIMIS no. 1921 (ATH). – From Pigi Gouras to the summit Tsouka, 39° 57′ N 20° 52′ E; 19-07-1954, Goulimis no. 1992 (ATH). – Rocailles au dessus de Skamneli vers Vaurtaka, alt. 1700 m, 39° 57′ N 20° 52′ E; 09-07-1991, AUTHIER no. 9662 (Herb. AUTHIER).

2b. *M.j.* subsp. *g.* var. *micropetala* KAMARI, var. nova

Type: [Greece] "Prov. Lakonia: Mt. Taygetos, in declivibus meridio-orientalibus cacuminis; in saxosis calc., 1900 m", 1.VII.1966, PHITOS no. 5232 (UPA!).

Sepala (3.5–)4–5(–5.5) × 1.1–1.5(–1.7) mm, acuta vel acuminata plerumque glabra, raro glanduloso-pubescentia. Petala (3.3–)3.5–4(–4.5) mm longa, calyce plerumque ca. 0.7-plo breviora, raro calycem subaequilonga, plerumque truncata.

Chromosomatum numerus: 2n = 26 (ÇELEBIOGLU & FAVARGER 1982).

On limestone in rocky grassland and screes, (1500–)1800–2400 m. Flowering in July.

An endemic variety mainly growing on Mt. Taigetos (several localities), also occurring sporadically on Mt. Killini and Mt. Chelmos in N. Peloponnisos (Fig. 1).

Specimina visa:

Peloponnisos: Mt. Taigetos: In declivibus meridio-orientalibus cacuminis; in saxosis calc., alt. 1900 m, 36° 57′ N 22° 29′ E; 01-07-1966, PHITOS no. 5232 (Holotype: UPA). – NE side, Neraidhovouna top; grassland of stony calcareous soil, alt. 1750–1850 m, 37° 02′ N 22° 19′ E; 07-08-1974, STAMATIADOU no. 18013 (ATH). – Supra refugium EOS, ad cacumen Profitis Ilias, alt. 2250–2400 m, 36° 57′ N 22° 21′ E; 22-07-1978, TZANOUDAKIS & al. no. 4216 (UPA). – In ditione Megala Zonaria; in rupestribus calc., alt. 1800–2000 m, 36° 57′ N 22° 20′ E; 22-07-1978, TZANOUDAKIS & al. no. 4240 & no. 4404 (UPA). – 0.5 km NNE of the summit Prof. Ilias, along the path from the refuge; s-facing slope with limestone cliffs and some schist, alt. 2000 m, 36° 57′ N 22° 21′ E; 19-07-1980, BADEN & al. no. 644 (C). – In summo montis Profitis Elias, in rupibus calcareis regionis alpinae, alt. 2350 m, 36° 57′ N 22° 21′ E; 26-06-1978, CERNOCH no. 33563 (C, LD). – In latere boreo-occidentali montis Neraidhovouna; in clivis lapidosis vel rupestribus calcareis, in pascuis graminosis vel spinescenti-dumulosis, alt. 1500–1800 m, 37° 02′ N 22° 19′ E; 07-08-1974, GREUTER & al. no. 12018 (B,UPA). – In m. Taygeti regione superiori, ad rupes, alt. 1500–2000 m, 36° 57′ N 22° 20′ E; 09-07-1899, HELDREICH no. 1523 (ATHU). – Supra refugium, in loco Megala Zonaria, in rupestribus calc. alt. 1900–2000 m, 36° 57′ N 22° 21′ E; 07-06-1994, KAMARI & al. no. 24006 (UPA). – In regione superiores, ad rupes alt. 1500–2000 m, 09-07-1899, H. ZAHN (BEOU). – Pentaplu in mt. Taygetos, ?-06-1876, Th. PICHLER (BEOU). – Mt. Chelmos: In montis Chelmos (Aroania) regione alpina, alt. 1800 m, 37° 56′ N 22° 12′ E; 19-06-1926, BORNMÜLLER no. 226 (LD). – Hydata Stygos, in loco Stanes, alt. 1900–2100 m, 38° 00′ N 22° 12′ E; 05-07-1975, TZANOUDAKIS no. 10720 (UPA). – 38° 00′ N 22° 11′ E; 28-10-1987, GEORGIOU & TINIAKOU no. 906 (UPA). – In rupibus, ca. 2100 m, supra urb. Kalavryta, 30-07-1938, O. GREBENSCIKOV, No 3564 (BEO). – In rupestribus alpinis, ca. 2200 m, V. LINDTNER, No 3565 (BEO). – Mt. Killini: Summit area, alt. 1950–2376 m, 37° 56′ N 22° 24′ E; 25-06-1989, DIMOPOULOS no. 1669 & no. 1827 (UPA). – Ad cacumen; in petrosis, alt. 2300–2376 m, 37° 56′ N 22° 24′ E; 27-06-1978, TZANOUDAKIS & al. no. 4101 (UPA).

2c. Intermediate forms between var. *micropetala* and var. *glandulifera*

Specimina visa:

Peloponnisos: Mt. Taigetos: Along rocky ridge leading up to the main summit from the south, above place called Vrisi tou Dhespoti, just W of the crest, limestone, alt. 2300 m, 36° 57′ N 22° 21′ E; 01-07-1979, STRID & al. no. 15327 (ATH, B, C, EGE, RNG). – Summit area of Prof. Elias; stony slope with some scree, alt. 2200–2407 m, 36° 57′ N 22° 21′ E; 19-07-1980, BADEN & al. no. 667 (C). – Supra refugium, in loco Magala Zonaria, in rupestribus calc., alt. 1900–2000 m, 36° 57′ N 22° 21′ E; 07-06-1994, KAMARI & al. no. 24006a (UPA).

3. *M.j.* subsp. *kosaninii* STEVANOVIĆ & KAMARI subsp. nova

Type: [FYROM] "Mt. Šar Planina, loco Kule supra pagum Lešok, alt. 1800 m, in rupestribus calcareis, alt c. 1800 m", 25.08.1992, 42° 06' N 18° 41' E, leg. V. STEVANOVIĆ (Holotype: BEOU!; isotype: UPA!).

A subspecie typica foliis caulium et fasciculis foliorum ramorum sterilium patentibus, sepalis brevioribus, usque ad 4 mm longis differt; a subspecie *glandulifera* glabritia totae plantae differt.

Loose caespitose, perennial plant forming great cushions. Whole plant glabrous. Stems numerous, erect (7–)10–30(–33.2) cm long with swollen nodes in middle and lower part, bearing short spreading axillary fascicles, especially on non-flowering ones. Leaves green, 10–30 mm 1- to 3-veined at the base, linear to linear-setaceous, acute or acuminate, spinose, spreading at an angle 60°–150°. Leaves of upper part of flowering stem and bracts are short, obovate or linear-obovate, acute, 3-veined scarious at margins. Inflorescence cymose to cymose-corymbose, 5–12(–15) flowered. Pedicel 1–3 times longer than sepals, glabrous. Sepals (3–)3.5–4 × 1.5–1.8 mm, obovato-lanceolate, acute, 3-veined, glabrous. Petals (3.5–)4–5(–5.5) mm, 1–1.5 times as long as sepals, white, obovate to oblanceolate with rounded or slightly truncate apex. Capsula cylindrical slightly exceeding sepals, with 3 obtuse and slightly recurved teeth. Seeds 0.8–1 mm, reniform, brown with small obtuse tubercules. Flowers from June to July. – Figs. 2, 3 & 4 and Table 1.

The locus classicus of subsp. *kosaninii* is on the southern slopes of Mt. Šar Planina, above the village of Lešok on the mountain ridge between the Lešačka and Tearačka Bistrica rivers. It grows here on the steep southern and southwestern exposed limestone rocks like a typical chasmophyte. It inhabits with the following species: *Campanula versicolor* f. *tomentella*, *Silene schmuckeri*, *Jovibarba heuffelii*, *Edraianthus jugoslavicus*, *Minuartia graminifolia* subsp. *clandestina*, *Cerastium decalvans*, *Asplenium trichomanes*, *Asperula aristata* subsp. *condensata*, *Iris pallida*, *Sesleria korabensis*, *Achillea ageratifolia* subsp. *aizoon*, etc.

According to the current findings, *M.j.* subsp. *kosaninii* is distributed only in Mt. Šar Planina. This locality is a long distance from the nearest part of the Balkanic disjunct mountain distribution range of *M.j.* subsp. *glandulifera* in Ipiros (Mt. Timfi) in NW. Greece. However, there are literature data on the distribution of *M. juniperina* in FYROM in Mt. Galičica (ČERNJAVSKI 1943) and Mt. Bistra (HORVAT 1952) which, unfortunately, could not be checked either from herbarium material (BEO, BEOU) or in the field. It might be supposed, in view of the vicinity of these mountains to the *locus classicus* of *M.j.* subsp. *kosaninii* in Mt. Šar Planina, that this subspecies is distributed also in these mountains.

Specimina visa:

FYROM (Makedonija): Mt. Šar Planina: Kula-Bistrica, in rupestribus calcareis, 21-06-1924, Nedeljko Košanin, det. T. Soška sub. nom. *Minuartia verna* (BEOU). – Loco Kule supra pagum Lešok, alt. 1800 m, in rupestribus calcareis, alt c. 1800 m", 25.08.1992, 42° 06' N 18° 41' E, V. Stevanović (Holotype: BEOU!; isotype: UPA!).

## On the chorological relationship of *M.* ser. *Juniperinae* in the Balkan Peninsula

Bearing in mind the chorological relationship between the species from ser. *Juniperinae* sect. *Acutiflorae*, especially the chorological isolation of subspecies *kosaninii*, the question arises as to the taxonomic and distributional differentiation of this taxon with respect to other taxa in this series.

Ser. *Juniperinae* is distributed in the mountains of the Balkan Peninsula, Anatolia and C. Asia, with the centre of distribution in the eastern part of Asia Minor and Iran. Out of all the species in ser. *Juniperinae*, *M. juniperina* has the widest range comprising the mountains of Greece, Asia Minor, Syria and Lebanon (Fig. 1B). According to Diels' florogenetical division of the European mountain flora (Diels 1910), sect. *Acutiflorae*, particularly ser. *Juniperinae* belongs to the Mediterranean florogenetic branch, whose vast majority of ancestors differentiated as far back as the end of the Tertiary, in the course of alpine orogenesis. The distribution of *M. juniperina*, which is primarily characterized by a Balkan-Anatolian disjunction, including the disjunction of a high-mountain island type, clearly indicates the age of the species and fits well with Diels' florogenetic division.

Within such a large disjunct range, the species *M. juniperina* differentiates into three subspecies, which is in accordance with the geographical isolation of the populations and the species age. In the Balkan Peninsula two subspecies are recorded: subsp. *glandulifera* and subsp. *kosaninii*, while the typical subspecies *juniperina* occurs in Asia Minor and the Near East. *M.j.* subsp. *kosaninii* is not only chorologically isolated with respect to subsp. *glandulifera*, but its restricted range in Mt. Šar Planina represents the northermost point of the distribution of the entire species *M. juniperina* (Fig. 1B). The chorological isolation of subsp. *kosaninii* is suggestive of the relict nature of this taxon and its ancient relationship with Greek and Anatolian populations during the Tertiary when, we suppose, that the oro-mediterranean species *M. juniperina* had its maximum distribution and when intraspecific differentiation had not yet occured. Undoubtedly, the separation of the Balkan Peninsula and Asia Minor during the Pliocene, as well as the Pleistocene, resulted in an ever greater isolation of the populations and their independent evolution. The differentiation of *M. juniperina* in the Balkan Peninsula might be interpreted in the same way.

Furthermore, the presence of some other stenoendemic and endemic related species in the C. Balkan Peninsula, Greece and Asia Minor, e.g. *Campanula secundiflora* VIS. & PANČIĆ, a local endemic of W. Serbia, related to *C. versicolor* ANDREWS from Greece; *Bornmuellera dieckii* DEGEN, a local endemic of Mt. Šar Planina, related to *B. tymphaea* (HAUSSKN.) HAUSSKN. from Ipiros and *B. cappadocica* (DC.) CULLEN & DUDLEY from E. Asia Minor; *Potentilla doerfleri* WETTST., a local endemic of Mt. Šar Planina related to *P. doddsii* DAVIS from Asia Minor; *Colchicum macedonicum* KOŠANIN, a local endemic of Mt. Jakupica with *C. nivale* BOISS. & HUET from Asia Minor and Caucasus; *Arabis bryoides* BOISS., a widely distributed mountain endemic species from the southern part of FYROM to Greece related to *A. drabiformis* BOISS. from W. Asia Minor; *Dianthus cruentus* GRISEB., endemic to the C. Balkan Peninsula, related to *D. calocephalus* BOISS. from Asia Minor etc., indicates not only the age of the florogenetic connections of the C. Balkan Peninsula with Greece and Asia Minor but also the significance of these connections in the forming of the flora of this part of the Balkan Peninsula, particularly through the independent evolution of the population in refugia during the Ice Age and interglacial periods.

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