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Cytotaxonomical remarks on *Loncomelos visianicum* (Hyacinthaceae), a poorly known species endemic to Croatia

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Abstract

Loncomelos visianicum, a rare and poorly known geophyte of the Croatian flora, was described from the remote and uninhabited Adriatic island of Palagruža as *Ornithogalum visianicum*, and it has not been collected again for over a century. Basing on living materials, recently rediscovered in the locus classicus, it was possible to carry out a careful investigation regarding the morphology, karyology, leaf anatomy, and ecology of this very peculiar species. It is triploid, showing $2n = 42 + 0-5B$ chromosomes, taxonomically quite isolated, showing some morphological relationships with *L. narbonense* and *L. creticum*. Currently, *L. visianicum* is represented by a low number of individuals growing in rocky places within the xerophilous maquis. In addition to a detailed description, a new iconography, conservation status and identification key for Croatian taxa of the genus *Loncomelos* are also provided.

Keywords: Dalmatia, karyology, morphology, Ornithogaleae, taxonomy

Introduction

Ornithogalum Linnaeus (1753: 306) s.l. is a very heterogeneous genus from the morphological and karyological point of view that consequently has been subject to various, often conflicting, taxonomic treatments through the time. Previously, several authors considered *Ornithogalum* s.l. an artificial genus and split it in several distinct genera, which differ from each other in many significant morphological features (Rafinesque 1837, Salisbury 1866, Speta 1998a, 1998b, 2001, Pfosser & Speta 1999). Phylogenetic studies based on molecular data carried out by Manning *et al.* (2009) accept several genera but tend to distinguish within *Ornithogalum* s.l. infrageneric taxa represented by subgenera and sections as well. More recently, Martínez-Azorín *et al.* (2011), basing on extensive analyses including both morphological data and nuclear and plastid DNA sequences, proposed to maintain the hierarchical classification partly delineated by Speta (1998a). Particularly, among the recognized genera occurring in the Euro-Mediterranean territories, there are *Cathissa* Salisbury (1866: 34), *Melomphis* Rafinesque (1837: 21), *Loncomelos* Rafinesque (1837: 24), *Honorius* Gray (1821: 177), and *Ornithogalum* Linnaeus (1753: 306) s.str. Although such classification may appear rather drastic due to the large number of recognized genera, we agree with this statement, since it provides a more realistic view of the phylogenetic relationships among the taxa belonging to the subfamily Ornithogaloideae Speta (1998b: 53).

In the context of cytotaxonomical investigations of the flora endemic to Croatia (Nikolić *et al.* 2015), a very rare and still poorly known geophyte is here examined. It was described as *Ornithogalum visianicum* Tomm. ex Visiani (1876: 176) from Palagruža archipelago (also named Pelagosa), the most remote island of Dalmatia, where its occurrence had not been confirmed for over a century. In order to provide more detailed information regarding the morphology, karyology, leaf anatomy, ecology, and taxonomic relationships of this very peculiar species a field trip

was undertaken. Samples of this species were recently collected in some rocky places of Velika Palagruža and bulbs were cultivated in the Botanical Gardens of Catania (Italy) and of Novi Sad (Serbia). According to Speta (2001), the correct name of this species is *Loncomelos visianicum* (Tomm. ex Vis.) Speta (2001: 172), which Wittmann (1985) considered as a taxonomically quite isolated species endemic to Palagruža.

Material and methods

The study was carried out on living material of *Loncomelos visianicum* collected from the locus classicus, the islet of Palagruža (Croatia). Ten bulbs were cultivated in the Botanical Gardens of Catania (Italy) and of Novi Sad (Serbia). Voucher specimens are kept in the herbarium CAT and ZAGR (abbreviations are according to Thiers 2019). The morphological investigation was also based on specimens from various herbaria (B, CAT, PAD, TSM, WU, ZA, and ZAGR). Qualitative and quantitative morphological features were measured and scored on ten fresh plants, using a Zeiss Stemi SV11 Apo stereomicroscope at 6–66 \times magnification. Morphological comparison among *L. visianicum* and its most related species was carried out using literature data (Table 1).

TABLE 1. Comparative morphological features among *Loncomelos visianicum* and related species.

Morphological character	<i>L. visianicum</i>	<i>L. narbonense</i>	<i>L. creticum</i>	<i>L. insulare</i>
Bulb position	epigeous	hypogeous	hypogeous	-
Bulb shape	subconic	ovoid or spherical	ovoid	ovoid to ovoid-globose
Bulb size (mm)	30–60 × 20–50	(36–)50–70(–100) × (25–)30–50(–55)	25–50 × 20–22	45–70 × 40–60
Bulb base	truncate	ampullaceous	ampullaceous	ampullaceous
Bulb tunics	brownish	pale brown or whitish	brownish	brownish to dirty white
Leaf colour	green	green or glaucous	glaucous	pale green
Leaf number	(3–)4–7	(3–)5–8(–12)	3–7	4–6(–7)
Leaf size (cm)	28–80(–90) × 0.6–2.2	(22–)31–67 × (0.3–)0.5–1.6(–1.8)	25–30 × 0.7–1.3	50–60(–75) × 1.5–2.5(–3.5)
Leaf shape	canaliculate	keeled (V-section)	flat to canaliculate	flat to slightly canaliculate
Stem length, excluding the inflorescence (cm)	30–45	25–60	13–40	38–50(–70)
Inflorescence length (cm)	12–20(–25)	15–50	6–35	22–40(–50)
Flower number	12–25	(12–)19–64(–79)	9–30	37–50
Bract size (mm)	5–10 × 2–3.5	(10–)12–24(–26) × 2–6	5–12	8–28 × 2–5
Bract nerves	3–7	3	3	5–12
Bract apex	shortly acuminate	long acuminate	long acuminate	long acuminate
Floral pedicel (mm)	8–15	3–38	15–40	20–45
Flower diameter (mm)	10–22	20–30	18–21	20–30(–35)
Tepal position	patent, canaliculate	slightly reflexed, flat	patent	patent, canaliculate

.....continued on the next page

TABLE 1. (Continued)

Morphological character	<i>L. visianicum</i>	<i>L. narbonense</i>	<i>L. creticum</i>	<i>L. insulare</i>
Tepal color in the adaxial side	whitish tinged with pale yellow	white	greenish-yellow	white to dirty white
Tepal band in the abaxial side	yellowish green	green	dark greenish-yellow	green white to yellowish green
Tepal margin at maturity	rolled	flat	flat to slightly canaliculate	rolled
Outer tepals size (mm)	10 × 4–4.2	12–16 × 2.5–4.5	10.5–11 × 2.9–3	12–18 × 4.5–5.5
Outer tepal shape	elliptical-lanceolate	lanceolate-obovate	lanceolate	elliptical-lanceolate
Outer tepal apex	cucullate	flat, obtuse to acute	cucullate, obtuse to rounded	cucullate, papillate glandular
Inner tepal size (mm)	10 × 5.4–6	11–15 × 2.5–5	10.5–11 × 3–3.2	12–18 × 4.5–5.5
Inner tepal shape	oblong-elliptical	lanceolate-obovate	lanceolate	lanceolate-elliptical
Inner tepal apex	flat, rounded to slightly retuse	slightly cucullate, obtuse to acute	obtuse	flat, acute
Stamen filament shape at the base	abruptly widened and thickened	abruptly widened and flat	ovate-lanceolate, progressively attenuate	abruptly widened and flat
Outer stamen filament size (mm)	6 × 2.4–2.5	5–7.5 × 1.1–1.7	5.5–7 × 1.5–1.8	7–9 × 1.5–2
Inner stamen filament size (mm)	6 × 3–3.5	6–8 × 1.2–2	6–7 × 1.8–2	7–9 × 1.5–2
Anther colour	yellow	pale yellow or whitish	greenish-yellow	dirty white
Anther length (mm)	4.8–5.2	3–4	2.2–3.5	3.5–4.8
Ovary colour	yellowish-green	pale green	dark green	green
Ovary shape	ovoid	ovoid-lanceolate to cylindrical	globose to ovoid	subglobose to cylindrical
Ovary size (mm)	3–4 × 2.5–3	2.5–5 × 2–3.2	2.5–3.3 × 2–3.3	3–4 × 2.8–3.2
Style size (mm)	3–3.5	2–5	3–5	4–5.5
Capsule shape	ovoid	ellipsoid to slightly ovoid	ovoid-subglobose	ovoid
Capsule size (mm)	10–12 × 8–9	9–16 × 4.5–7	7–11 × 6.5–8.3	12–14 × 9–10
Chromosome number (2n)	42	54	28	44

Leaf anatomy was studied on leaf cross-sections from cultivated plants, using fresh leaf blades of maximum and minimum size in their optimal vegetative development.

Karyological analyses were performed on root tip meristematic cells of cultivated bulbs, pre-treated with a 0.3% (w/v) colchicine water solution for 3 h at room temperature, fixed in Farmer's fixative (3:1 v/v, absolute ethanol: glacial acetic acid) for 12 h and stored in 70% ethanol water solution. Then, root tips were hydrolyzed in 1 N HCl for 7 min at 60°C and stained according to the Feulgen technique. Microphotographs of 10 good metaphase plates from different individuals were taken using a Zeiss PrimoStar microscope equipped with a Canon PowerShot G9 digital camera. Metaphase chromosomes were measured by the Zeiss Axiovision 4.8 image analysis software, while karyotyping

was performed by CROMOLAB 1.1 software (Brullo 2002). The chromosome types were named according to the centromere position based on Levan (1964) and Tzanoudakis (1983). Karyotype symmetry indices followed Paszko (2006) and Peruzzi & Erođlu (2013). Mean karyomorphometric parameters are provided in Table 2.

TABLE 2. Karyomorphometric parameters and karyotype symmetry indices of *Loncomelos visianicum*. Values come from 10 good metaphase plates from individuals of the type locality.

Chromosome triplets	TAL (μm)		TRL%			AR	CI	Type
	Mean ± SD	Max	Min	Mean ± SD	Max			
I	11.50 ± 1.6	13.03	10.24	5.07 ± 0.4	5.72	4.52	1.22	45.11 m
II	8.57 ± 1.1	9.19	7.93	3.74 ± 0.3	3.99	3.48	2.18	31.47 sm
III	8.23 ± 0.8	8.70	7.86	3.65 ± 0.3	3.86	3.47	1.24	44.71 m
IV	6.98 ± 1.6	7.60	6.47	3.04 ± 0.3	3.32	2.83	1.91	34.38 sm
V	6.90 ± 1.1	7.34	6.49	3.03 ± 0.3	3.23	2.85	4.06	19.77 st
VI	5.75 ± 1.0	6.12	5.42	2.51 ± 0.1	2.69	2.36	2.16	31.65 sm
VII	5.48 ± 1.0	5.78	5.17	2.39 ± 0.2	2.52	2.26	3.51	22.19 st
VIII	4.98 ± 1.2	5.22	4.78	2.17 ± 0.3	2.28	2.09	2.03	32.95 sm
IX	4.50 ± 0.9	4.76	4.27	1.96 ± 0.2	2.07	1.86	3.48	22.33 st
X	3.84 ± 1.0	4.27	3.41	1.67 ± 0.2	1.84	1.48	1.40	41.61 msm
XI	3.23 ± 0.9	3.54	2.96	1.40 ± 0.2	1.53	1.28	2.09	32.35 sm
XII	2.34 ± 0.7	2.48	2.21	1.02 ± 0.2	1.08	0.96	1.27	44.06 m
XIII	2.03 ± 0.4	2.12	1.91	0.89 ± 0.1	0.93	0.84	1.68	37.52 sm
XIV	1.79 ± 0.3	1.97	1.61	0.79 ± 0.1	0.86	0.61	1.20	45.54 m

TCL: 228.31 ± 36.8 μm; MCL: 5.44 ± 2.8 μm; d-value: 70.78; DRL%: 5.0; S%: 12.32; MAR: 2.10;

MCI: 34.69; Cv_{CL}: 51.6; Cv_{CI}: 25.67; M_{CA}: 30.63

Abbreviations: TAL = total absolute length; TRL = total relative length; AR = arm ratio index; CI = centromeric index; Type=chromosome nomenclature; TCL = total chromosome length; MCL = mean chromosome length; d-value = difference between Long arms and Short arms; DRL% = difference of relative length; MAR = mean arm ratio index; MCI = mean centromeric index; Cv_{CL} = coefficient of variation of chromosome length; Cv_{CI} = coefficient of variation of centromeric index; MCA = mean centromeric asymmetry.

Taxonomy

Loncomelos visianicum (Tomm. ex Visiani 1876: 176) Speta (2001: 172) (Figs. 1, 2)

Basionym:—*Ornithogalum visianicum* Tomm. ex Visiani (1876: 176). Type (lectotype, designated here):—[Icon.] tav. I, fig. I. (Visiani 1876); epitype (designated here):—*Ornithogalum visianicum* Tommas. In ins. Pelagosa contra ins. Lesina Dalmatia, Stossich prof. Ad, s.n. (PAD HD01481!).

Perennial plant. Bulb epigeous, usually aggregated, 30–60 × 20–50 mm, subconic, truncate at the base, with peripheral roots; outer tunics brownish. Leaves green, slightly pruinose, uniformly colored, glabrous, (3–)4–7, in a basal rosette, 28–80(–90) cm long, 6–22 mm width, canaliculate, cucullate at the apex, proteranthous, often dried at the anthesis. Floral stem 30–45 cm long (excluding the inflorescence), erect, smooth, green. Inflorescence racemose, cylindrical, 12–20(–25) cm long, with 12–25 flowers; bracts membranous, 5–10 × 2–3.5 mm, 3–7-nerved, shorter than pedicels, ovate-lanceolate, with apex acuminate; floral pedicels erect-patent, 8–15 mm long, the lower ones usually longer; fruiting pedicels erect and appressed to the stem. Flowers 20–22 mm in diameter; tepals patent, smooth at the margin, whitish, tinged with pale yellow in the adaxial side, with a central yellowish-green band in the abaxial side, 5-nerved, rolled up when mature; outer tepals elliptical-lanceolate, cucullate at the apex and ending with a thickened appendix, 10 × 4–4.2 mm, slightly canaliculate; inner tepals oblong-elliptical, rounded to slightly retuse at the apex, usually with

a short mucro, $10 \times 5.4\text{--}6$ mm, markedly canaliculate. Stamens erect, slightly shorter than tepals; filaments white, 6 mm long, abruptly widened and thickened in the basal half, which is 2.4–2.5 mm wide in the outer stamens and 3–3.5 mm wide in the inner stamens; anthers dorsifixed, yellow, 4.8–5.2 mm long. Ovary yellowish-green, smooth, shining, ovoid, $3\text{--}4 \times 2.5\text{--}3$ mm, truncate at the apex, trigonous; style whitish, filiform, 3–3.5 mm long; stigma trilobed, papillose. Capsule 10–12 \times 8–9 mm, ovoid, trigonous. Seeds not seen.

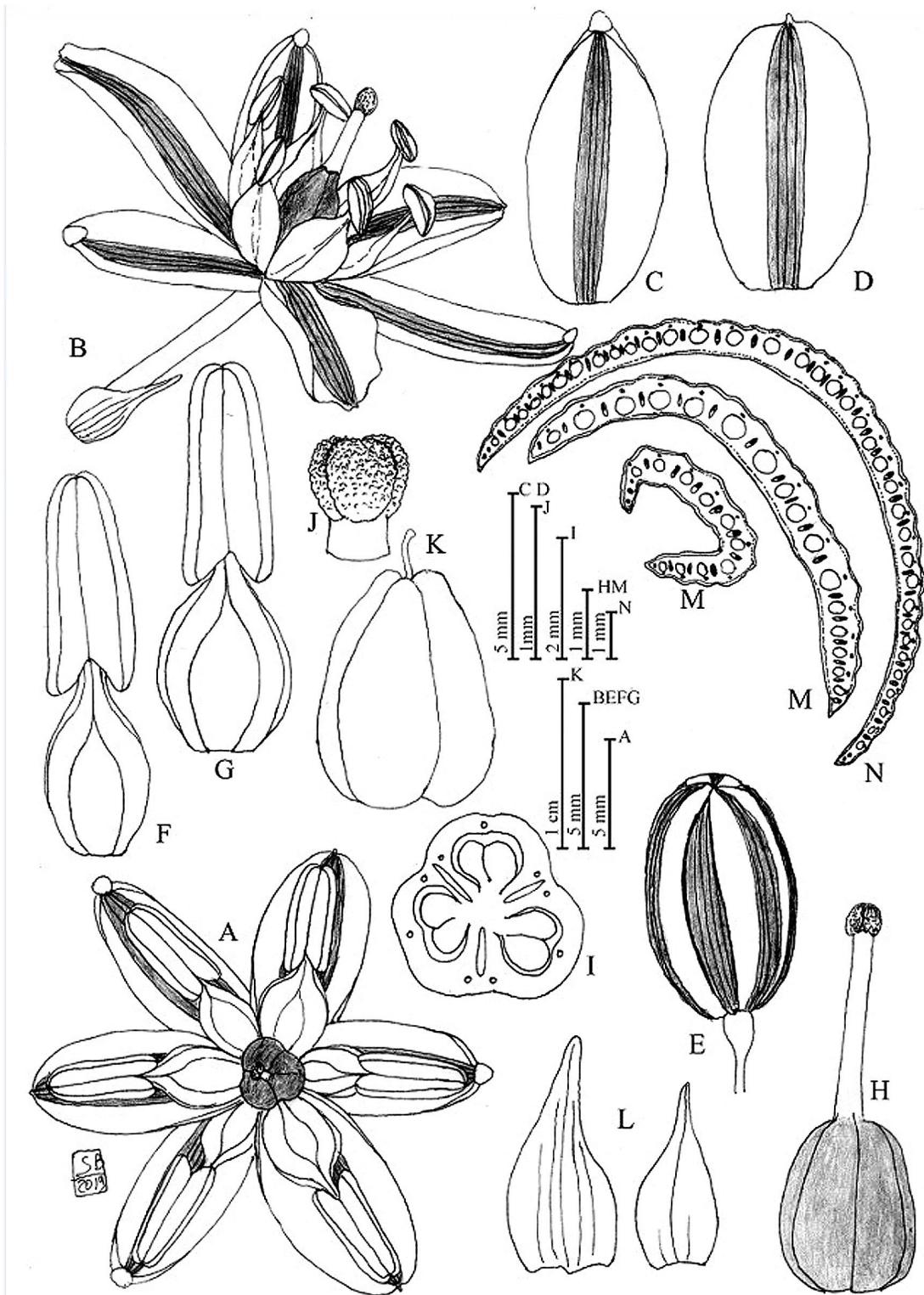


FIGURE 1. Diagnostic features of *Loncomelos visianicum*. A. Flower, frontal view. B. Flower, lateral view. C. Outer tepal. D. Inner tepal. E. Bud. F. Outer stamen. G. Inner stamen. H. Pistil. I. Ovary, cross section. J. Stigma. K. Capsule. L. Bracts. M. Medium and small leaf, cross section. N. Large leaf, cross section. Drawings by Salvatore Brullo on leaving material collected by Bogdanović & Ljubičić s.n. (CAT).

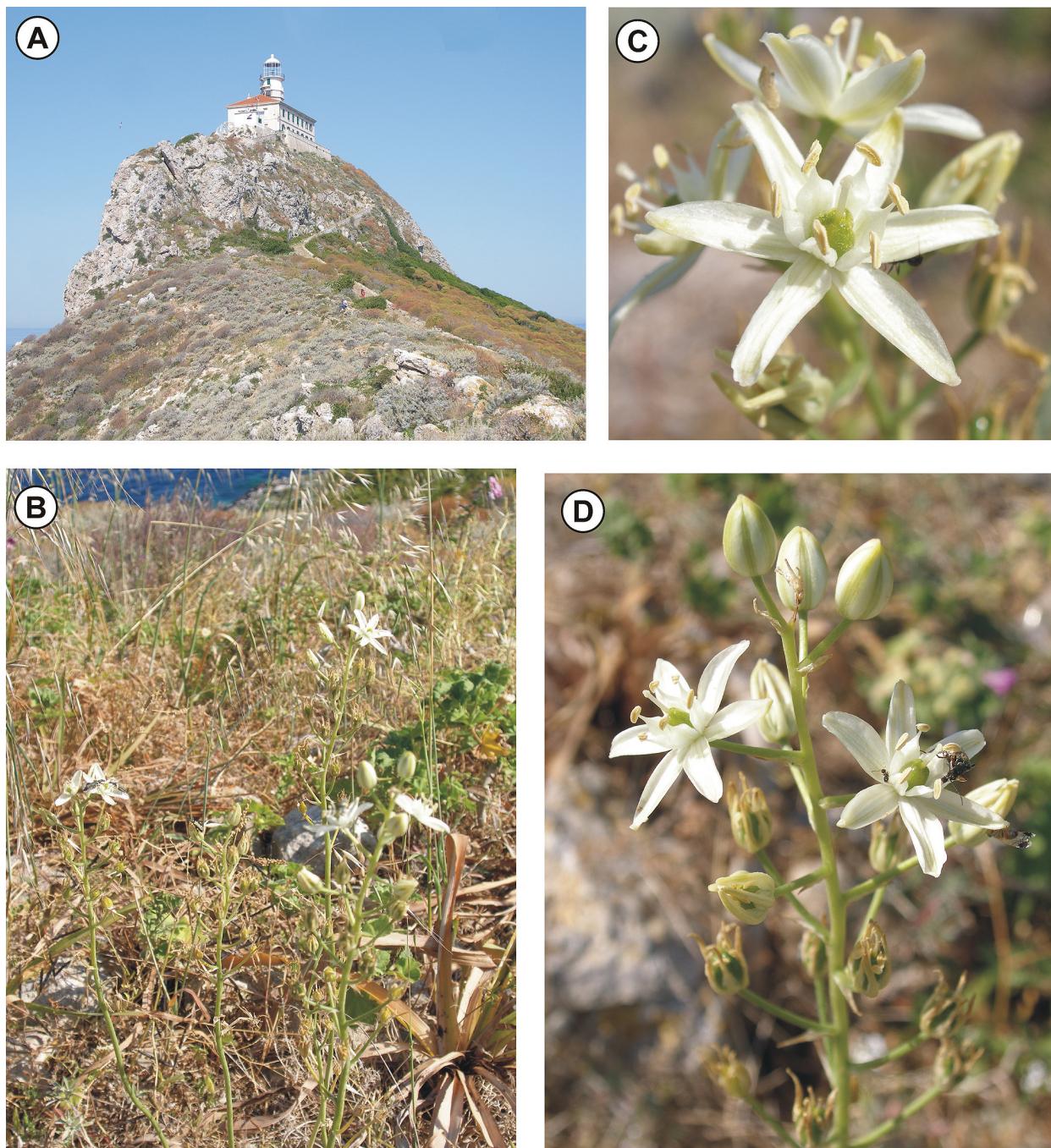


FIGURE 2. Phenological features of *Loncomelos visianicum* A. Natural habitat in the type locality. B. Habit. C. Flower. D. Inflorescence (Photos by S. Bogdanović).

Karyology:—The somatic chromosome number of *Loncomelos visianicum* is $2n = 42$ (Fig. 3A) with or without accessory chromosomes. Based on the chromosome arrangement observed in all the investigated samples, this species is triploid with a basic number $x = 14$. The karyotype is characterized by 14 triplets (Fig. 3B), distinct as big-sized and small-sized (less than 5 μm in length), as also highlighted by the values of different symmetric indices (Table 2). Four triplets are metacentric (2 big-sized and 2 small-sized), 1 meta-submetacentric (showing arm ratio exceeding 1.30), 6 were submetacentric (3 big-sized and 3 small-sized), and 3 were subtelocentric. Thus, the chromosome formula can be expressed as $2n = 3x = 42 = 12\text{ m} + 3\text{ msm} + 18\text{ sm} + 9\text{ st} + 0\text{--}5\text{ B}$. The longest chromosome was $13.0 \pm 2.3\text{ }\mu\text{m}$ long and the shortest one was $1.61 \pm 0.3\text{ }\mu\text{m}$ long, with a mean chromosome length of $5.44 \pm 2.8\text{ }\mu\text{m}$. Relative chromosome length varied from $5.7\% \pm 0.4$ to $0.71\% \pm 0.1$. Arm index varied on average from 1.16 to 4.1, while the centromeric index ranged from 46.3 to 19.6. Terminal satellites were occasionally detected in the short arms of some subterminal chromosomes in triplets IV and IX. In addition, 2–5 B-chromosomes (less than 1.5 μm long) were observed in some of the measured mitotic plates.

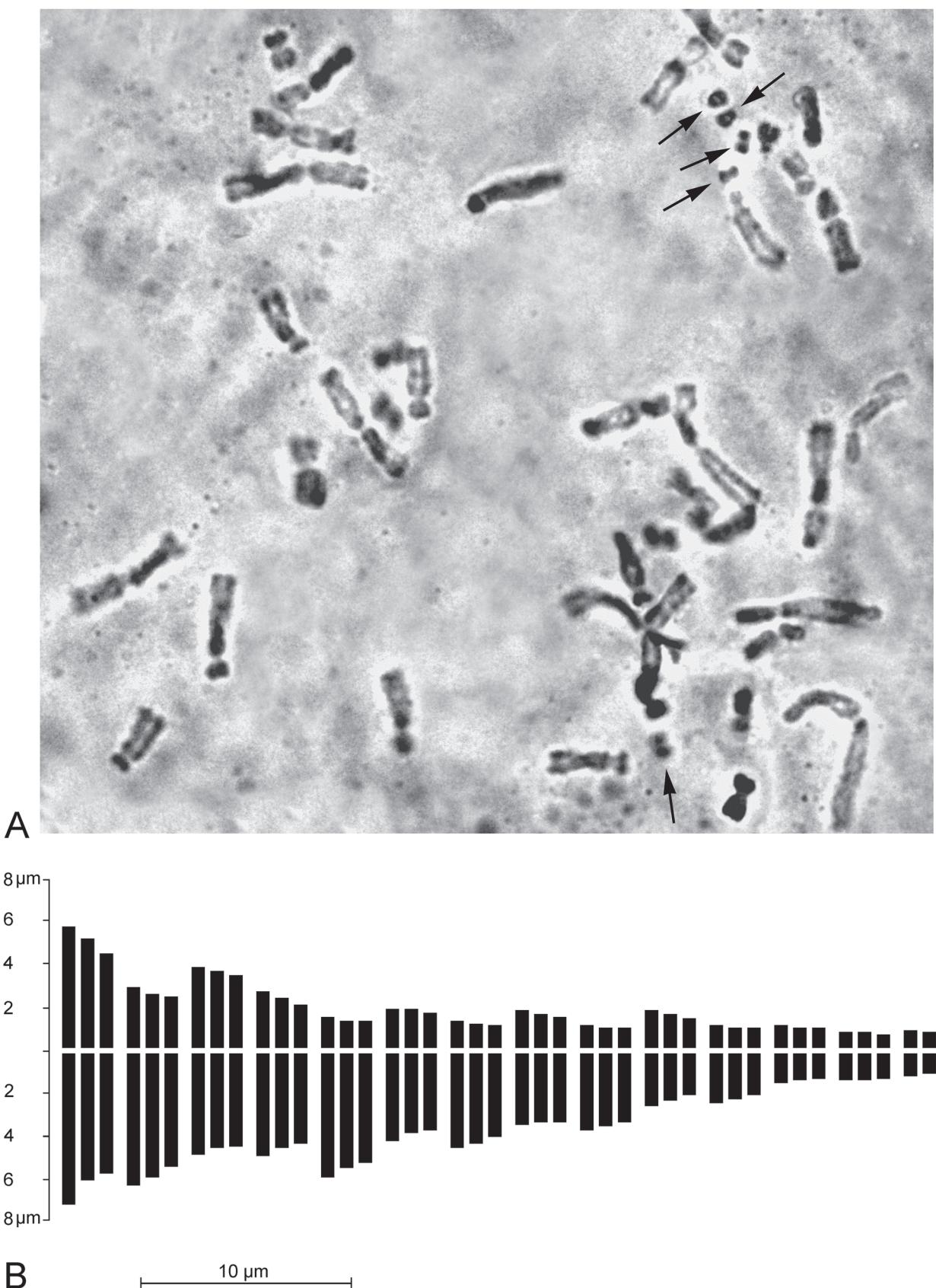


FIGURE 3. Chromosome complement ($2n = 3x = 42 + 0-5B$) of *Loncomelos visianicum* from type locality. A. Mitotic metaphase plate, arrows indicate accessory chromosomes. B. Idiogram.

Leaf anatomy:—According to literature (Wittmann 1985, Tornadore 1985, 1986, Tornadore & Orza 1987, Lynch *et al.* 2006, Peruzzi *et al.* 2007), *Loncomelos* species are characterized by leaves uniformly coloured, canaliculate, with a dorsiventral structure, smooth in the adaxial surface and ribbed in the abaxial one, showing at the margin epidermal cells covered by a thickened cuticle, palisade tissue distributed along the whole perimeter and spongy tissue occupying the inner part. There are two types of vascular bundles arranged in two rows along the mesophyll; larger vascular bundles are usually distributed in the central part of the mesophyll, alternating with smaller ones sorted towards the abaxial side. The larger bundles are interspersed with mucilage cells that in the mature leaves are replaced by rhexigenetic lacunae. *Loncomelos visianicum* leaves show a variable size, the largest ones are characterized by ca. 40 large vascular bundles, interposed among lacunae; these bundles decrease in number in the progressively narrower leaves up to a minimum of ca. 13, while the number of small vascular bundles coincides with that of the mesophyll lacunae (Fig. 1 M–N).

Phenology:—Flowering from April to late May, fruiting from late May to June.

Distribution and habitat:—Currently, this species occurs only in few stands on the island of Velika Palagruža, where it is localized in the maquis dominated by *Euphorbia dendroides* Linnaeus (1753: 462), mixed with *Olea europaea* Linnaeus (1753: 8) subsp. *sylvestris* (Miller 1768: n. 3) Rouy ex Hegi (1927: 1936) and *Artemisia arborescens* Linnaeus (1763: 1188). It grows in rocky places represented by Triassic dolomites, often associated with other endemic species, such as *Aurinia leucadea* (Gussone 1826: 268) Koch (1853: 23) subsp. *scopulorum* (Ginzberger 1921: 238) Plazibat (2009: 416), *Brassica botteri* Visiani (1850: 135), and *Muscati speciosum* Marchesetti (1882: 267). In the island of Velika Palagruža, as well as in the nearby Mala Palagruža, some other very rare endemic taxa occur, like *Limonium pelagosae* Bogdanović & Brullo (2015: 23), *Minuartia verna* (Linnaeus 1767: 72) Hiern (1899: 320) subsp. *insularis* Trinajstić & Pavletić (1978: 6), *Centaurea ragusina* Linnaeus (1753: 912), *Centaurea friderici* Visiani (1847: 40), and *Cymbalaria visianii* Kümmerle (1911: 299), which are usually localized in rupestrian places.

Conservation status:—*Loncomelos visianicum* was recorded for a single location (Vela Palagruža), though currently considered (Lansdown 2018) an extinct species (EX). Our recent surveys in the locus classicus led to the rediscovery of a single population, approximately represented by no more than 100 mature individuals growing in a very restricted area. The extent of occurrence (EOO) and the area of occupancy (AOO) are less than 1 km². Currently, the surface occupied by this geophyte is markedly affected by human activities (the presence of lighthouse keepers and tourist visitors) and seagulls, which caused a certain edaphic nitrification. According to the IUCN (2017) protocol, for its rarity, the low number of mature individuals and the restricted distribution, as well as for the environmental threats, *L. visianicum* should be included in the risk category Critically Endangered (CR, B1+B2ab,ii,iii).

Discussion

The genus *Loncomelos* has been the object of numerous morphological, nomenclatural, karyological and phylogenetic studies, which emphasized a remarkable variability in the vegetative and reproductive structures, as well as in the basic chromosome number and karyotype arrangement (Martinoli 1950, Zahariadi 1977a,b, 1980, Tornadore & Garbari 1979, Kamari & Georgiou 1981, Zahariadi *et al.* 1982, Tornadore 1985, 1986, Wittmann 1985, 2002, 2004, Moret *et al.* 1986, Moret 1987, Tornadore & Orza 1987, Pastor & Diosdado 1994, Dalgýç & Ozhatay 1997, Speta 1998a, 2001, 2006, 2010, Pfosser & Speta 1999, Garbari *et al.* 2007, Peruzzi *et al.* 2007, Ravenna 2007, Martínez-Azorín 2008, Manning *et al.* 2009, Martínez-Azorín *et al.* 2009, 2011, 2012, Mutlu & Karakuş 2012, Öztürk *et al.* 2014, Raluca1 *et al.* 2017, Kypriotakis *et al.* 2018). This high morphological and karyological heterogeneity was also well supported by phylogenetic analyses based on genetic sequences (plastid and nuclear DNA regions). Overall, these data confirmed the para- or polyphyly of the taxa previously included within the tribe Ornithogaleae J.C.Manning & Goldblatt in Manning *et al.* (2009: 99) and provided a strong support for a multigeneric arrangement of this tribe, as proposed by Speta (1998a, 2001), Pfosser & Speta (1999) and Martínez-Azorín *et al.* (2011). All these authors also emphasized that all recognized genera of Ornithogaleae can be easily identified by distinct syndromes of morphological character-states congruent with the distribution of clades in the phylogenetic trees and their biogeography. Therefore, with reference to *Ornithogalum visianicum*, we consider more appropriate to apply the generic name *Loncomelos*, as accepted in some recent European Floras (Dostál 1989, Jeanmonod & Gamisans 2007, Garbari *et al.* 2007, Fischer *et al.* 2008, Tison & de Foucault 2014, Rottensteiner 2014, 2018, FIWG 2016). Currently, the genus *Loncomelos* includes about 27 species, among which we can also mention *L. narbonense* (Linnaeus 1756: 15) Rafinesque (1840: 56), *L. pyrenaicum* (Linnaeus 1753: 306) Hrouda ex Holub (1988: 413), *L. pyrenaicum* subsp. *sphaerocarpum* (Kerner 1878: 15) Holub (1988: 413),

L. creticum (Zahariadi 1977b: 52) Speta (2001: 172), *L. prasinantherum* (Zahariadi 1977b: 57) Speta (2001: 172), *L. brevistylum* (Wolfner 1857: 230) Dostál (1984: 15), *L. brachystylum* (Zahariadi 1978: 249) Speta (2001: 172), *L. ulixis* Speta (2006: 5), *L. tardus* Speta (2006: 11), and *L. exalbescens* Speta (2006: 14).

As far as the typification of the name *Ornithogalum visianicum* is concerned, it must be highlighted that this species was firstly described by Tommasini in a contribution on the Dalmatian flora published by Visiani (1876). Soon after, Visiani (1877) reprinted this contribution in his own volume using the same title, but with different page and table numbering. In the protologue, Visiani (1876) quoted the inscription partially reported in the herbarium label: "Flores citrino-virescentes, nervis virentibus. Fl. Majo, Junio. Perenn. Legit Majo anni 1874 Ernestus Tommasini, et mihi dicavit pater ejus cl. Joseph Mutius Tommasini". Unfortunately, our investigations carried out in herbarium Visiani (PAD) and in herbarium Tommasini (TSM) were unsuccessful, since no specimen certainly referable to the type material is kept in these herbaria. Actually, in Visiani's collection (PAD HD01481!) there is only one herbarium specimen with the following label: "*Ornithogalum visianicum* Tommas. In ins. Pelagosa contra ins. Lesina Dalmatia, Stossich prof. Ad. s.n.", which however clearly does not coincide with the protologue, because it was not collected by E. Tommasini. Therefore, according to Art. 8.1 of the Shenzhen Code (Turland *et al.* 2018), the colour illustration published by Visiani (1876: tav. I, fig. I) is here designated as the lectotype of the species, as previously informally suggested by Wittmann (1985: 62). Besides, according to the Art. 9.9, an epitype is also designated, since the lectotype is a not detailed iconography without information about the diacritical characters of the species. We select as epitype the specimen of *O. visianicum* kept in Visiani's herbarium at PAD.

It must be also emphasized that most authors assigned masculine gender to *Loncomelos*, such as Speta (2001) and other abovementioned authors, while this genus has to be treated as neuter noun according to Euro+Med (2006-), since the term "melos" from Greek μέλος (= member) is neuter.

According to literature (Visiani 1876, Marchesetti 1876, Freyn 1878, Baldacci 1911, Zahariadi 1977b, 1980, Wittmann 1985, Jasprica 2015, Strid 2016), *L. visianicum* is endemic to Velika Palagruža island, although it was doubtfully quoted also from Crete by Hayek (1933) and by Greuter (1973), while Rechinger (1944) reported it from some Aegean islands. These reports are indeed erroneous because they have been recently referred to *L. creticum* (Zahariadi 1977: 52) Speta (2001: 172) by Strid (2016).

For its morphological peculiarities mainly regarding the floral features, *Loncomelos visianicum* is most related to the circum-Mediterranean *L. narbonense*, which differs from *L. visianicum* in having bulb hypogeous, ovoid to spherical, outer tunics pale brown or whitish, leaves often more numerous, usually shorter, narrower and keeled, stem and inflorescence much longer, bracts longer, long acuminate, 3-nerved, pedicels longer, flowers larger, tepals white, all similar in shape, longer, flat, slightly reflexed, with abaxial band green, staminal filaments narrower and flat, anthers pale yellow to whitish, shorter, ovary ovoid-lanceolate to cylindrical, capsule ellipsoid, to slightly ovoid, longer and narrower (Table 1). *Loncomelos visianicum* also resembles *L. creticum*, widespread in the southern Aegean area, by sharing brownish bulb tunics; leaf shape and number; stem and inflorescence size; and flower diameter. Nevertheless, *L. creticum* differs in having ovoid bulbs; shorter and narrower, glaucous leaves; longer, 3-nerved, acuminate, bracts; much longer pedicels; greenish-yellow, lanceolate, narrower tepals; ovate-lanceolate, progressively attenuate filaments; shorter, greenish-yellow, anthers; globose to ovoid, shorter, ovary; longer style; and ovoid-subglobose capsule (Table 1). Another species morphologically rather similar to *L. visianicum* has been recently described from small islets near Crete by Kypriotakis *et al.* (2018) as *Ornithogalum insulare* Kypriotakis *et al.* (2018: 119). This name should be transferred to the genus *Loncomelos*, thus we propose here the new combination (see Nomenclatural note). The two species, *L. insulare* and *L. visianicum*, share the same leaf number and size, patent and canaliculate tepals, elliptical-lanceolate outer tepals and ovoid capsule, but *L. insulare* differs in having ovoid to ovoid-globose bulb; longer inflorescence, with more flowers; longer, long acuminate bracts with up to 12-nerves; longer pedicels; larger flowers; white to dirty white tepals; longer and narrower filaments; dirty white, shorter anthers; subglobose to cylindrical ovary; longer style; and bigger capsule (Table 1). Conversely, the affinity of *L. visianicum* with *L. pyrenaicum* suggested by some authors (Visiani 1876, Freyn 1878, Zahariadi 1980) cannot be corroborated, as *L. pyrenaicum* markedly differs for the tepals greenish-yellow, strictly linear, as well as for the leaves very narrow and thin.

Based on literature (Martinoli 1950, Zahariadi 1977b, Tornadore & Garbari 1979, Kamari & Georgiou 1981, Wittmann 1985, 2002, 2004, Tornadore 1985, 1986, Moret *et al.* 1986, Tornadore & Orza 1987, Moret 1987, Pastor & Diosdado 1994, Speta 2006, Garbari *et al.* 2007, Martínez-Azorín 2008, Martínez-Azorín *et al.* 2009, Öztürk *et al.* 2014, Kypriotakis *et al.* 2018), the species belonging to the genus *Loncomelos* show a very diversified chromosome complement with different basic numbers. In particular, the following chromosome counts were reported: *L. pyrenaicum* subsp. *pyrenaicum* and subsp. *sphaerocarpum* $2n = 2x = 16$, *L. brevistylum* $2n = 2x = 24$, *L. creticum* and *L. prasinantherum* $2n = 2x = 28$, *L. brachystylum* $2n = 4x = 28$, *L. exalbescens* $2n = 2x = 36$, *L. insulare* $2n = 2x = 44$,

L. narbonense 2n = 6x = 54. Therefore, the basic chromosome number in *Loncomelos* species can be x = 7, 8, 9, 12, 14, 18, or 22. Only *L. narbonense* and *L. brachystylum* are clearly autoploid, while all other species are diploid or show diploidized karyotypes, especially those having a higher number of chromosomes (2n = 28, 36, 44). It must be highlighted that diploidization processes can indicate both ancient allopolyploid or autoploid origin followed by intergenic rearrangements which tend to increase the karyotype stability (Soltis & Soltis 1999). By comparison, *L. visianicum* revealed a very peculiar chromosome arrangement, resulting clearly triploid with a basic number x = 14, like *L. creticum* and *L. prasinantherum*.

On the base of current knowledge of the Croatian flora (Wittmann 1985, 2004, Rottensteiner 2014, 2018, Nikolić 2019), the genus *Loncomelos* is represented in the country by the following species: *L. narbonense*, *L. pyrenaicum* subsp. *pyrenaicum*, *L. pyrenaicum* subsp. *sphaerocarpum*, *L. brevistylum*, *L. prasinantherum*, and *L. visianicum*. In order to highlight the morphological differences among the species currently occurring in Croatia the following analytical key is provided.

Identification key to *Loncomelos* taxa in Croatia

1. Tepals linear to linear-lanceolate, 1.3–2.5 mm wide. Ovary 1.5–2.5 mm long. Capsule 7–9 mm long 2
- Tepals ovate-lanceolate to elliptical-lanceolate, 2.5–6 mm wide. Ovary 2.5–5 mm long. Capsule 9–17 mm long 3
2. Bulb 34–58 mm long. Leaves 40–80 cm long. Inflorescence 16–50 cm long. Flowers yellowish, tinged with green. Ovary ovoid to cylindrical. Capsule ovoid-cylindrical, 7–9.5 × 5–7 mm *L. pyrenaicum* subsp. *pyrenaicum*
- Bulb 20–35 mm long. Leaves max. 30 cm long. Inflorescence 9–13 cm long. Flowers hyaline, pale greenish-white. Ovary subglobose-ovoid. Capsule subglobose, 6–7 × 6–7 mm *L. pyrenaicum* subsp. *sphaerocarpum*
3. Bulb subconic, truncate at the base. Leaves up to 90 cm long and 22 mm wide. Bracts shortly acuminate. Tepals up to 10 mm long, whitish, tinged with pale yellow in adaxial side. Staminal filaments 2.4–3.5 mm wide. Anthers 4.8–5.2 mm long *L. visianicum*
- Bulb ovoid to subglobose-ovoid, ampullaceous at the base. Leaves up to 65 cm long and 18 mm wide. Bracts long acuminate. Tepals 10–15.5 mm long, white in adaxial side. Staminal filaments 1.2–2 mm wide. Anthers 3–4.5 mm long 4
4. Outer bulb tunics brown. Inflorescence conical, max. 30 cm long. Perigone patent. Inner tepals ovate. Stamen filaments 4–6 mm long. Ovary ovoid, yellow *L. brevistylum*
- Outer bulb tunics whitish-brown to whitish. Inflorescence sub-cylindrical, up to 45–50 cm long. Perigone slightly reflexed. Inner tepals ovate-lanceolate. Stamen filaments 6–8 mm long. Ovary ovoid-lanceolate to cylindrical, green 5
5. Leaves flat to canaliculate. Bracts 5–19-nerved. Tepals white with yellow green band in adaxial side. Anthers greenish *L. prasinantherum*
- Leaves keeled. Bracts 3-nerved. Tepals totally white in adaxial side. Anthers pale yellow or whitish *L. narbonense*

Additional examined specimens of *Loncomelos visianicum*:—CROATIA. Dalmatia: Dalmatien, Insel Pelagosa grande, 6 June 1901, A. Ginzberger s.n. (WU!); Flora Dalmatica, ex loc. class. comm. a clar. autore ex cl. Pančić, Insula Pelagosa, cult. in horto belgr., June 1887, J. Bornmüller s.n. (B-100108739!); Dalmatinsko primorje, Palagruža velika, 26 May 1911, K. Babić s.n. (ZA-7783!); colui ex bulbis ab isola Pelagosa a Matsi, folia hybernalia ad decembre, s.d., M. Tommasini s.n. (ZA-7784!); Dalmacija, otok Vela Palagruža, kamenjar na putu prema svjetioniku, N 42°23'31,81", E 16°15'32,57", 27 May 2016, S. Bogdanović, I. Ljubičić s.n. (CAT!, ZAGR-43851!).

Nomenclatural note:—*Loncomelos insulare* (Kypriotakis, Antaloudaki & Tzanoudakis) Bogdanović & Brullo *comb. nov.* ≡ *Ornithogalum insulare* Kypriotakis *et al.* (2018: 119), basionym.

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